

100

GODINA / YEARS

ZAVOD ZA ZAŠTITU BILJA

1909 - 2009

INSTITUTE FOR PLANT PROTECTION

100 godina Zavoda za zaštitu bilja

(1909.-2009.)

100 Years of the Institute for Plant Protection

(1909–2009)

Impressum

100 godina Zavoda za zaštitu bilja (1909.–2009.)

Nakladnik:
Hrvatski centar za poljoprivredu, hranu i selo
Hondlova 2/11, Zagreb

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Fotografije: dokumentacija HCPHS – Zavod za zaštitu bilja

Lektura:
Marijan Ričković, prof.

Prijevod:
Veronika Mišura, dipl. angl. i germ.

Grafička priprema i tisk:
Tangir, Samobor

Naklada: 700 primjeraka

Zagreb, siječanj 2011.

CIP zapis dostupan je u računalnom katalogu Nacionalne
i sveučilišne knjižnice u Zagrebu pod brojem 756521.
ISBN 978-953-56035-1-1

100 Years of the Institute for Plant Protection (1909–2009)

Publisher:
Croatian Centre for Agriculture, Food and Rural Affairs
Hondlova 2/11, Zagreb

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Photographies: CCAFRA – Institute for Plant Protection

Proofreading:
Marijan Ričković Prof.

Translation:
Veronika Mišura MA in English and German

Prepress and Printing:
Tangir, Samobor

Edition: 700 copies

Zagreb, January 2011

*CIP record is available in the computer catalogue of the
National and University Library in Zagreb under No. 756521.
ISBN 978-953-56035-1-1*

Iskoristit ćemo uvodne stranice, kako bismo zahvalili uvaženim kolegicama i kolegama, koji su nekad bili dio našeg Zavoda za zaštitu bilja, a sada su uz stručnjake Zavoda svojim nesebičnim sudjelovanjem u pripremi ove publikacije dali svoj doprinos. Iskreno hvala prof. dr.sc. Jasminki Igrc Barčić koja je osmisnila i detaljno obradila "Povijest i razvoj entomologije", prof. dr.sc. Bogdanu Cvjetkoviću koji je dao iscrpan prikaz "Povijesti i razvoja fitopatologije" te prof. dr.sc. Zvonimiru Ostojiću koji je detaljno prikazao "Povijest i razvoj herbologije". Prof. dr.sc. Jasminka Igrc Barčić i prof. dr.sc. Zvonimir Ostojić napisali su i dio "Registracija i kontrola sredstava za zaštitu bilja". Također zahvaljujemo i kolegi dr.sc. Zlatku Koruniću na prikazu "Povijesti zaštite uskladištenih poljoprivrednih proizvoda", kao i mr.sc. Nedi Chiari Pagliarini na "Povijesti zaštite bilja u zaštićenim prostorima".

Let us use these introductory pages to thank the honourable colleagues, who used to be a part of our Institute for Plant Protection and now gave their contribution with unselfish participation in preparing this publication next to the experts from the Institute. We wish to express our sincere thanks to Prof. Jasminka Igrc Barčić PhD who conceived and elaborated in detail the "History and Development of Entomology", Prof. Bogdan Cvjetković PhD who gave a comprehensive account of the "History and Development of Phytopathology" and Prof. Zvonimir Ostojić PhD who gave a detailed coverage of the "History and Development of Herbology". Prof. Jasminka Igrc Barčić PhD and Prof. Zvonimir Ostojić PhD wrote also a section on the "Registration and Control of Plant Protection Products". We also thank our colleague Zlatko Korunić PhD for his presentation of the "History of Stored Agricultural Products Protection" as well as Neda Chiara Pagliarini MSc for the "History of Plant Protection in Greenhouses".

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Petar Čobanković, dipl.ing.
potpredsjednik Vlade i ministar
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razvoja Republike Hrvatske

Petar Čobanković, BSc
*Vice Prime Minister and Minister
of Agriculture, Fisheries and Rural
Development of the Republic of
Croatia*

Čast mi je i zadovoljstvo da mogu uputiti čestitke u prigodi sljeća uspješnog rada Zavoda za zaštitu bilja! Doista, ovakvom tradicijom može se pohvaliti rijetko koja institucija u Hrvatskoj. Tijekom bogate povijesti, u ovom Zavodu radili su i rade brojni ugledni stručnjaci s područja fitomedicine.

Uspješno provedena zaštita kultiviranih biljaka od štetnih organizama jedan je od značajnih uvjeta poljoprivredne proizvodnje. Ostvarujući aktivnosti u skladu sa Zakonom o biljnom zdravstvu i Zakonom o sredstvima za zaštitu bilja te njihovim pratećim propisima, Zavod predstavlja vrlo značajnu sastavnicu u sustavu zaštite poljoprivrednih kultura prateći i direktive Europske unije i EPPO standarde.

Tijekom svih ovih godina Zavod za zaštitu bilja izrastao je u snažnu državnu instituciju koja je na usluzi hrvatskoj poljoprivredi radi postizanja europske razine zaštite bilja. Ta je institucija bila i ostala nezaobilazan čimbenik u aktivnostima kojima otvaramo nove perspektive suvremene hrvatske poljoprivrede.

Svojom visokom znanstvenom i stručnom razinom, stručnjaci Zavoda kroz svoje djelatnosti uvelike su pridonijeli u zatvaranju pregovaračkog poglavlja o pristupanju EU-u, poglavlja 12. - Sigurnost hrane, veterinarstvo i fitosanitarni nadzor. Osim toga, pohvalio bih i istaknuo ulogu Zavoda u pružanju znanstvene i stručne potpore nadležnoj upravi u području biljnog zdravstva, dijagnostike i postupku registracije sredstava za zaštitu bilja.

Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja, u suradnji sa Svjetskom bankom, od 2006. godine provodi

It is my honour and pleasure to be able to convey my congratulations to the Institute for Plant Protection for the century of its successful work! Indeed, there is rarely an institution in Croatia that can boast about such a tradition. In the rich history, many eminent experts in the field of phytomedicine worked and work in this Institute.

Successfully implemented protection of cultivated plants against harmful organisms makes one of the important conditions of agricultural production. By accomplishing the activities in compliance with the Plant Health Act and the Plant Protection Products Act and its related regulations, the Institute represents a very important component in the protection system of agricultural cultures following also the directives of the European Union and EPPO standards.

During all these years, the Institute for Plant Protection has grown into a strong national institution at service to the Croatian agriculture in order to achieve European levels of plant protection. This institution was and remains an unavoidable factor in the activities used to open new perspectives of the contemporary Croatian agriculture.

High scientific and professional level of the activities performed by the experts from the Institute contributed greatly to the closing of the chapter of EU accession negotiations, chapter 12 – Food Safety, Veterinary and Phytosanitary Policy. Furthermore, I would like to commend and point out the role of the Institute in providing scientific and professional support to the responsible government authorities in the field of plant health, diagnostics and registration procedure of plant protection products.

As of 2006, the Ministry of Agriculture, Fisheries and Rural Development, in cooperation with the World Bank, has been conducting the project: "Agricultural Acquis Cohesion Project" (AACP). This project includes the construction of a new building to improve working conditions for the experts from the Institute. It is exactly this important investment in new premises, including six new diagnostic laboratories and a control laboratory for plant protection products as well, that indicates an exceptional significance of the activities performed by the Institute for the State, considering the challenges in phytosa-

projekt: "Pravno i institucionalno usklađivanje u području poljoprivrede s pravnom stečevinom EU-a" (AACP). U sklopu tog projekta odvija se i gradnja nove zgrade kojom će se unaprijediti radni uvjeti stručnjaka Zavoda. Upravo ova značajna investicija u nove prostore, koja uključuje i šest novih dijagnostičkih laboratorija te laboratorij za kontrolu sredstava za zaštitu bilja, ukazuje na izuzetan značaj poslova koje Zavod provodi za državu, s obzirom na izazove u fitosanitarnom području koji proistječu iz aktualne situacije pridruživanja Europskoj uniji.

Također, potpuno sam uvjeren kako će Zavod sa svojim ljudskim potencijalima, suvremenom opremom i stručnim djelovanjem, nastaviti razvijati modernu, inovativnu, konkurentnu i ekološki prihvatljivu zaštitu bilja, usuglašenu s institucionalnim i pravnim okvirom Europske unije i Republike Hrvatske, što će u konačnici osigurati proizvodnju zdravstveno ispravne hrane.

Tako će hrvatska zaštita bilja i ubuduće u Zavodu imati snažan oslonac u rješavanju aktualnih problema te u svladavanju zapreka na putu uključivanja u zajednicu europskih zemalja.

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potpredsjednik Vlade i
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nitary area arising from the actual situation of the European Union accession.

In addition hereto, I am absolutely convinced that the Institute with its human potentials, up-to-date equipment and professional operation, will continue to develop a modern, innovative, competitive and environmentally acceptable plant protection, aligned with institutional and legal frame of the European Union and the Republic of Croatia, which shall eventually provide for healthy food production.

Thus, the Croatian plant protection will continue to have a strong support provided by the Institute in future in solving current issues and in overcoming obstacles on the road to access the community of the European countries.

Petar Čobanković, BSc
Vice Prime Minister and
Minister of Agriculture, Fisheries and Rural Development
of the Republic of Croatia



Ravnateljica HCPHS –
dr.sc. Ljiljana Gašparec-Skočić

Director of CCAFRA –
Ljiljana Gašparec-Skočić PhD

Obilježavanje 100. obljetnice postojanja Zavoda za zaštitu bilja neizmjerno je radostan događaj za sve djelatnike Hrvatskog centra za poljoprivredu, hranu i selo, naročito zaposlenike i suradnike ovog Zavoda. S ponosom možemo naglasiti kako kontinuirano djelovanje te naše ustanove, koja je tijekom stoljeća mijenjala svoje nazive i institucionalne oblike, zaslužuje danas posebnu pozornost i poštovanje.

Sadržaj ove svojevrsne monografije stoljetnog rada, odnosno opisana kronologija stručne i znanstvene aktivnosti, osvjetjava nam pojedine faze razvoja zaštite bilja na ovim prostorima i samog Zavoda te njegovih prethodnica. Istodobno nas upućuje na mnoge stručnjake, znanstvenike i ostale djelatnike koji su dali svoj nemjerljivi prinos razvitku specijaliziranih segmenata u cjelokupnom području što ga nazivamo zaštita bilja. Iako su djelovali u vrlo različitim društvenim sustavima, često i neshvaćeni u široj društvenoj zajednici pa i marginalizirani, ostavili su neizbrisiv trag u našoj povijesti agrara i gospodarstva uopće. Onaj skriveni znanstveni duh i entuzijazam pokretao je te marljive ljude na nova istraživanja, čije rezultate danas baštinimo. Potrebno je ovdje spomenuti da je u proteklom stogodišnjem razdoblju bilo i mnogo poznatih i priznatih znanstvenika, profesora i stručnjaka koji nisu djelovali samo u Hrvatskoj, već i diljem Europe i svijeta, gdje su također ostavili svoje tragove. Osim tih, da tako kažemo, egzaktnih rezultata u poljoprivredi i gospodarstvu, Zavod i njegovi zaposlenici značajno su pridonijeli obrazovnom procesu u okviru svoga područja.

The 100th anniversary celebration of the Institute for Plant Protection is an immensely joyful event for all employees of the Croatian Centre for Agriculture, Food and Rural Affairs, especially for the employees and associates of this Institute. We can proudly emphasise that continuous operation of this institution of ours, that has changed its names and institutional forms during the century, deserves today a special attention and respect.

The contents of this kind of a monograph on one hundred-year-old operation, or a chronology describing the professional and scientific activity, highlight certain development stages of plant protection in these areas and of the Institute itself and its predecessors. At the same time, it refers to many experts, scientists and other employees who gave their immeasurable contribution to the development of specialised segments in the entire field called plant protection. Although having worked in very different social systems, having been often misunderstood in a wider social community and even marginalised, they left an indelible trace in the Croatian history of agriculture and economy in general. That hidden scientific spirit and enthusiasm drove these diligent people to new research, the results of which we inherit today. It needs to be mentioned here that in the past hundred-year-old period there were also many renowned and recognised scientists, professors and experts who were active not only in Croatia but throughout Europe and the world, where they also left their traces. In addition to these, let us say, concrete results in agriculture and economy, the Institute and its employees made a significant contribution to the process of education within their scope of work.

Even today, plant protection is of crucial importance for every agricultural economy, and thereby for the food of a nation as well. The quality of soil, plants and protection products and their final effect on the environment are unavoidable factors in modern agricultural production. Integral production method is today an imperative in preserving the environment and rural area. Therefore, systematic monitoring, checking the attestations for planting material and protection products still remain basic tasks of the Institute. Thereby, processes of quick changes

Zaštita bilja i danas je od sudbonosne važnosti za svaku poljoprivrednu ekonomiju, a time i za prehranu nacije. Kvaliteta tla, kvaliteta bilja i zaštitnih sredstava te njihov krajnji učinak na okoliš, nezaobilazni su čimbenici u suvremenoj poljoprivrednoj proizvodnji. Integralni način proizvodnje danas je imperativ u očuvanju okoliša i ruralnog prostora. Sustavni nadzor, provjera atestiranja sadnog materijala i zaštitnih sredstava stoga su i dalje temeljne zadaće Zavoda. Pritom, procesi brzih promjena i napredak tehnologije zahtijevaju neprekidnu prilagodbu novim standardima u istraživanju i djelovanju. U tom smislu HCPHS ulaze značajne napore da se stvore primjereni uvjeti za rad svake od sastavnica Centra, pa tako i za Zavod za zaštitu bilja. Već su uložena značajna sredstva u opremu, a dovršenjem prostornih uvjeta na Rimu bit će stvoreni optimalni uvjeti za rad svih laboratorijskih Zavoda, kao novi temelj za još uspješniji stručni i znanstveni odnosno istraživački rad.

Hrvatski centar za poljoprivredu, hranu i selo ima zakonsku obvezu da podupire svaki projekt primjenjiv za poboljšanje poljoprivredne proizvodnje, bio on specijalistički ili interdisciplinarni unutar Centra, ili pak u okviru suradnje s domaćim ili međunarodnim znanstvenim institucijama i fondovima.

Vjerujem da će, uz svesrdnu suradnju s djelatnicima Centra iz drugih zavoda, zaposlenici Zavoda za zaštitu bilja uložiti maksimalne napore u obavljanju svojih zadaća, s još većim žarom od svojih prethodnika, a na vlastito zadovoljstvo i korist svim građanima Republike Hrvatske.

dr.sc. Ljiljana Gašparec-Skočić
ravnateljica Hrvatskog centra za poljoprivredu, hranu i selo

and technology progress require incessant adjustment to new standards in research and operation. In terms hereof, CCAFRA makes significant efforts in order to create adequate working conditions for every constituent of the Centre, thus for the Institute for Plant Protection as well. Considerable resources have been already invested in the equipment, and final construction of premises on the Rim location shall provide for optimum working conditions of all laboratories of the Institute, as a new foundation to an even more successful professional and scientific or research work.

Croatian Centre for Agriculture, Food and Rural Affairs has a legal obligation to support every project applicable for the improvement of agricultural production, either a specialist or an interdisciplinary one within the Centre, or within the cooperation with Croatian or international scientific institutions and foundations.

I believe that, in a wholehearted cooperation with employees from other institutes of the Centre, the employees of the Institute for Plant Protection shall make maximum efforts in performing their tasks, with an even greater zest than their predecessors, to their own satisfaction and to the benefit of all the citizens of the Republic of Croatia.

Ljiljana Gašparec-Skočić, PhD
Director of the Croatian Centre for Agriculture,
Food and Rural Affairs

Proslov

Zavod za zaštitu bilja započinje s radom 3. veljače 1909. kao Entomološka sekcija. Prof. dr.sc. Antun Korlević, (1851. – 1915.), usamljeni honorarni stručnjak u početku postojanja Entomološke sekcije sigurno nije znao da je svojim predanim praćenjem štetnika pripremio put generacijama akademika, profesora, doktora i magistara znanosti, diplomiranih inženjera i drugih, koji će svoja znanja prenositi poljoprivrednim proizvođačima. U tome ih nisu sprječile ni promjene naziva institucije, niti promjene kad su se ispreplitali stručni, znanstveni i obrazovni poslovi.

Broj zaposlenih nije bio preprekom u obavljanju zadaća koje su postavljali proizvođači tražeći rješenja, iako je do Drugoga svjetskog rata bilo zaposleno samo nekoliko stručnjaka. Najviše djelatnika, više od 50, bilo je osamdesetih godina 20. st., kada su se udružili stručnjaci srodnih profila iz Zavoda i Agronomskog fakulteta te ugovornim odnosima surađivali s poljoprivrednim proizvođačima, prehrambenom industrijom, proizvođačima sredstava za zaštitu bilja i drugim sudionicicima u zaštiti bilja.

Sve promjene koje su nastajale kao posljedica različitih odluka nisu sprječavale stručnjake Zavoda da savjetuju kako zaštititi bilje i biljne proizvode od raznih štetnih organizama, bez obzira na to zvalo se to zaštita bilja, fitomedicina ili biljno zdravstvo, jer cilj i svrha bili su isti: "... planski, savjetima osigurati proizvodnju bilja i biljnih proizvoda uz najmanje moguće gubitke, vrhunske kakvoće i najveće moguće urode..." .

Prologue

The Institute for Plant Protection started operating as Entomological Section on 3 February 1909. Clearly Prof. Antun Korlević PhD (1851 – 1915) a solitary part-time expert working in the early days of the Entomological Section coming to existence could not know that his dedicated pest monitoring prepared the path for the generations of academics, professors, Doctors and Masters of Science, graduate engineers and others, who would transfer their knowledge to agricultural producers. Not even institution name changes kept them from their path, nor changes during which professional, scientific and educational activities were interwoven.

The number of employees was not a hindrance to performing the tasks required by producers, although there were only a few experts employed before the Second World War. The Institute had most employees, over 50, in the eighties of the 20th century, when experts of relevant background from the Institute and the Faculty of Agriculture were associated and cooperated with agricultural producers, food industry, producers of plant protection products and other participants in plant protection on a contractual basis.

None of the changes which occurred as a consequence of different decisions prevented experts of the Institute from providing advice on the protection of plants and plant products against various harmful organisms, regardless of whether it was called plant protection, phytomedicine or plant health, because it had the same goal and purpose: "... providing plans and advice for the production of plants and plant products with as small as possible damages of top quality and highest possible yields..." .

1. Povijest i razvoj Zavoda za zaštitu bilja

1.1. Osnivanje

Iako je Entomološka sekcija, osnovana 3. veljače 1909., prva specijalistička ustanova za poslove zaštite bilja u jugoistočnom dijelu Europe, tek joj je intenziviranje poljoprivredne proizvodnje poslije Drugoga svjetskog rata dalo na važnosti i omogućilo izdvajanje zaštite bilja kao posebne znanstvene grane.

Zbog pomanjkanja odgovarajućih prostorija, Entomološka sekcija kao državna ustanova s godišnjim proračunom od 1000 kruna, od 4. svibnja 1909. do izgradnje zgrade u Kačićevoj 9 bila je smještena u Zoologičkom kabinetu Kraljevske šumarske akademije. Godine 1917. je Entomološka sekcija preseljena u novoizgrađenu zgradu u Kačićevoj 9 u Zagrebu. Entomološka sekcija postaje Fitopatološko-entomološki odsjek Poljoprivredne ogledne i kontrolne stanice u Zagrebu (12. veljače 1922.) prema Zakonu o poljoprivrednim, oglednim i kontrolnim stanicama. Entomološka sekcija zadržala je svoju samostalnost do kraja 1925., kad rješenjem Ministarstva poljoprivrede i voda od 24. prosinca 1925. prestaje njena samostalnost. Zakonom o Poljoprivrednim kontrolnim i oglednim stanicama od 2. veljače 1926. Entomološka sekcija uključena je u Fitopatološki odsjek Poljoprivredne ogledne i kontrolne stanice u Zagrebu, koja pod tim imenom posluje do 1945. Od 1945. do 1954. posluje kao proračunska ustanova pod nazivom Zavod za zaštitu bilja u sklopu Zemaljskoga poljoprivrednog zavoda. Pokusno dobro u Ulici Rim 98 preuzima 1947. godine. Rješenjem Izvršnog vijeća Sabora NR Hrvatske (1954.) Zavod za zaštitu bilja postaje ustanova sa samostalnim financiranjem. Od 9. travnja 1960. Zavod za zaštitu bilja posluje pod nazivom Institut za zaštitu bilja u sklopu Poljoprivrednog fakulteta u Zagrebu. Institut za zaštitu bilja registriran je (29. svibnja 1961.) pri Savjetu za naučni rad SR Hrvatske kao znanstvena institucija. Kao Institut za zaštitu bilja u sklopu Poljoprivred-

1. History and Development of the Institute for Plant Protection

1.1. Establishment

Although the Entomological Section, established on 3 February 1909, was the first specialist institution for plant protection activities in the south-eastern part of Europe, it was only the intensification of agricultural production after the Second World War that gave it significance and enabled plant protection to be distinguished as a separate scientific branch.

Due to the lack of adequate premises, the Entomological Section a national institution with an annual budget of 1000 Crowns was situated in the Zoological Cabinet of the Royal Forest Academy from 4 May 1909 until the premises in Kačićeva 9 was built. In 1917, the Entomological Section was moved to the newly constructed building in Kačićeva 9, Zagreb. On 12 February 1922 the Entomological Section became the Phytopathological-Entomological Section of the Agricultural Testing and Control Station in Zagreb pursuant to the Law on Agricultural Testing and Control Stations. The Entomological Section maintained its independence until the end of 1925, when it was terminated by the decision of the Ministry of Agriculture and Waters dated 24 December 1925. The Law on Agricultural Control and Testing Stations from 2 February 1926 provided for the Entomological Section to be included in the Phytopathological Section of the Agricultural Testing and Control Station in Zagreb operating under this name until 1945. From 1945 to 1954 it operated as a fiscal institution called the Institute for Plant Protection within the National Agricultural Institute. It took over the experimental station at the address of Rim 98 in 1947. The Executive Council of the Parliament of the People's Republic of Croatia (1954) made a decision for the Institute for Plant Protection to become an institution with independent financing. From 9 April 1960 the

nog instituta u Zagrebu djeluje od 1973., a od 1978. do 1992. posluje u sklopu Fakulteta poljoprivrednih znanosti kao OO-UR Institut za zaštitu bilja. Odlaskom nastavnog osoblja 1992. na Agronomski fakultet formira se Zaštita bilja d.o.o. Ponovne promjene nastupile su 1994. kad je Ministarstvo poljoprivrede i šumarstva 1. kolovoza donijelo rješenje o osnivanju Zavoda za zaštitu bilja u poljoprivredi i šumarstvu Republike Hrvatske, temeljem Zakona o zaštiti bilja (NN 10/94), (slika 1.). Kroz



Slika 1. Logo Zavoda 1994.–2009.

Fig. 1 Logotype of the Institute from 1994 to 2009

povijesni prikaz uočava se da povremeno dolazi do organizacijskih promjena pa je tako i u stotoj godini poslovanja došlo do promjene. Zakonom o osnivanju Hrvatskog centra za poljoprivredu, hranu i selo (NN 25/09), Zavod za zaštitu bilja postao je njegovom strukturnom jedinicom od 1. srpnja 2009. U tablici 1. prikazani su nazivi Zavoda tijekom povijesti.

Sjedišta i izgradnja

Prvo je sjedište Entomološke sekcije bilo u Zoologičkom kabinetu Kraljevske šumarske akademije, današnjoj zgradi Rektorata Sveučilišta, do 1917. kad dolazi do preseljenja u novoizgrađenu zgradu u Kačićevoj 9, gdje je Zavod bio smješten do 1978. Prodajom prostora u Kačićevoj središnjica Zavoda preseljena je u Svetosimunsku 25 u Zagrebu (slika 2.). Pokusna postaja u Ulici Rim 98 koristi se još od 1947. do danas (slika 3., slika 4.). Podružnice Zavoda danas se nalaze u Solinu i Osijeku, a kraće razdoblje bila je i u Opuzenu.

Već nakon Drugoga svjetskog rata uočen je nedostatak prostora u laboratorijima, radnim sobama i skladištima i dr., ali

Institute for Plant Protection operated under the name of the Institute for Plant Protection within the Faculty of Agriculture in Zagreb. The Institute for Plant Protection was registered (on 29 May 1961) at the Council for Scientific Work of the Socialist Republic of Croatia as a scientific institution. Since 1973 it operated as the Institute for Plant Protection within the Agricultural Institute in Zagreb, and from 1978 to 1992 it operated within the Faculty of Agricultural Sciences as the Institute for Plant Protection. After the teaching staff has left to the Faculty of Agriculture in 1992, the Plant Protection Ltd. (Zaštita bilja d.o.o.) was established. There were changes again in 1994 when the Ministry of Agriculture and Forestry (MAF) made a decision on 1 August to establish the Institute for Plant Protection in Agriculture and Forestry of the Republic of Croatia, pursuant to the Plant Protection Act (Official Gazette/NN 10/94), (fig. 1). Throughout time there have been organisational changes, including a change in the hundredth year of operation. Pursuant to the Establishment Act of the Croatian Centre for Agriculture, Food and Rural Affairs (Official Gazette/NN 25/09), the Institute for Plant Protection emerged on 1 July 2009. Table 1 displays the names of the Institute during history.

Headquarters and Construction

The first headquarters of the Entomological Section were in the Zoological Cabinet of the Royal Forest Academy, the present building of the University Rectorate, until 1917 when they were moved to the newly constructed building in Kačićeva 9, where the Institute was situated until 1978. The sale of the premises in Kačićeva meant the Institute's head office was moved to Svetosimunska 25 in Zagreb (fig. 2). The testing station at Rim 98 was used as early as from 1947 until today (fig. 3, fig. 4). Branch offices of the Institute are located today in Solin and Osijek, and for a short period of time there was also one in Opuzen.

By the Second World War there was a lack of space observed in laboratories, working premises and warehouses etc., but lack of funding has always prevented the construction of new premises, which can be seen in the following citations.

Institucija u sklopu koje djeluje <i>Institution of operation</i>	Naziv <i>Name</i>	Datum <i>Date</i>
Hrvatska biološka centrala <i>Croatian Biological Centre</i>	Entomološka sekcija <i>Entomological Section</i>	3.2.1909.-11.2.1922.
Poljoprivredna ogledna i kontrolna stanica <i>Agricultural Testing and Control Station</i>	Djeluje samostalno u sklopu Fitopatološko-entomološkog odsjeka <i>Operating independently within the Phytopathological-Entomological Section</i>	12.2.1922.-23.12.1925.
Poljoprivredna ogledna i kontrolna stanica <i>Agricultural Testing and Control Station</i>	Fitopatološki odsjek <i>Phytopathological Section</i>	2.2.1926.-1945.
Zemaljski poljoprivredni zavod <i>National Agricultural Institute</i>	Zavod za zaštitu bilja (odjeli – zoološki, botanički, fitofarmacijski, za virose bilja, laboratorijski za istraživanje entomofaune i nematoda) <i>Institute for Plant Protection (departments – zoological, botanical, phytopharmacological, for plant virosis, laboratories for research on entomofauna and nematodes)</i>	1945.-1954.
	Zavod za zaštitu bilja <i>Institute for Plant Protection</i>	1954.-1960.
Poljoprivredni fakultet u Zagrebu <i>Faculty of Agriculture in Zagreb</i>	Institut za zaštitu bilja <i>Institute for Plant Protection</i>	9.4.1960.
Poljoprivredni institut Zagreb <i>Agricultural Institute Zagreb</i>	OOUR Institut za zaštitu bilja <i>Institute for Plant Protection</i>	1973.-1978.
Fakultet poljoprivrednih znanosti <i>Faculty of Agricultural Sciences</i>	OOUR Institut za zaštitu bilja <i>Institute for Plant Protection</i>	1978.-1992.
	Zaštita bilja d.o.o. <i>Plant Protection Ltd.</i>	1992.-31.7.1994.
	Zavod za zaštitu bilja u poljoprivredi i šumarstvu Republike Hrvatske <i>Institute for Plant Protection in Agriculture and Forestry of the Republic of Croatia</i>	1.8.1994.-30.6.2009.
Hrvatski centar za poljoprivredu, hranu i selo <i>Croatian Centre for Agriculture, Food and Rural Affairs</i>	Zavod za zaštitu bilja <i>Institute for Plant Protection</i>	1.7.2009.-

Tablica 1. Nazivi Zavoda kroz povijest
Table 1 Names of the Institute during history

uvijek je manjak novaca sprječavao izgradnju novih prostorija, što je vidljivo iz sljedećih dokumenata.

Rješenjem Ministarstva poljoprivrede od 8. siječnja 1948. osniva se: "Naučno istraživačka ustanova Zavod za zaštitu bilja ... u cilju pravilnog izvršavanja zadataka omogućiti će se podizanje vlastitih objekata ...". Iste godine 9. prosinca Zavod za zaštitu bilja šalje Upravi za naučno-istraživački rad i unapređenje poljoprivredne proizvodnje "...ubrzanje izradbe projekata za slijedeću plansku godinu... narudžbu idejnog projekta kao i podatke o gradilištu, zgradi koja se ima podići, zatim o pogonskim i specijalnim uređajima i podatke o montažnim postrojenjima". Novogradnja je trebala doći na Rudinu u Zaprešiću k. č. 481., Novi Dvori. Međutim, do realizacije nije došlo.

Ponovno je sredinom šezdesetih godina 20. st. načinjen plan za dogradnju zgrade s laboratorijima, staklenika, spremišta s garderobom i adaptaciju podruma u kotlovnici na lokaciji Rim 98. Ni tada nije se uspjelo realizirati plan, osim što je izgrađen staklenik do kraja šezdesetih godina. Početkom



Slika 2. Sjedište Zavoda u Svetosimunskoj 25 u Zagrebu
Figure 2 Institute's head office in Svetosimunská 25 in Zagreb

The decision of the Ministry of Agriculture from 8 January 1948 provided for the establishment of: "The scientific research institution called the Institute for Plant Protection ... for the purpose of proper performance of tasks it shall be enabled to built its own facilities ...". That same year, on 9 December, the Institute for Plant Protection sends a note to the Management Board for Scientific-Research Work and Improvement of Agricultural Production "...to speed up the project design for the next plan year... the order of the concept design and the data on the construction site, the building to be built, then on working and special instruments and the data on prefabricated plants". The new building was supposed to to bi built in Rudina in Zaprešić cadastral plot 481, Novi Dvori. However, it was never realised.

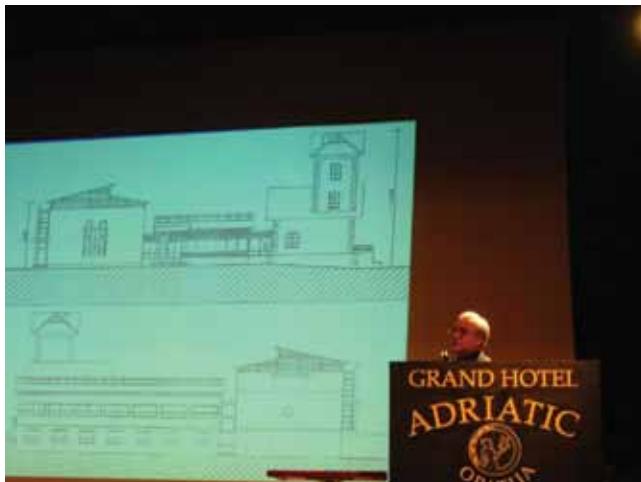
Again in the mid sixties of the 20th century there was a plan to build an annex with laboratories, a glasshouse, a store room with cupboards and to adapt the cellar into the central heating unit at the location of Rim 98. However, the plan was not carried out, except for a glasshouse that was built by the end of the sixties. In the



Slika 3. Objekt na pokusnoj postaji Rim 98, Zagreb
Figure 3 Testing station at Rim 98, Zagreb



Slika 4. Vinograd na pokusnoj postaji Rim 98, Zagreb
Figure 4 Vineyard at testing station at Rim 98, Zagreb



Slika 5. Predstavljanje idejnog projekta nove zgrade na seminaru biljne zaštite u Opatiji 2008. – mr.sc. Radoslav Masten

Figure 5 Presenting the concept design of the new business building at the Plant Protection Seminar in Opatija 2008 – Radoslav Masten MSc



Slika 7. Početak radova u siječnju 2010. na lokaciji Rim 98, Zagreb

Figure 7 Start of construction work in January 2010 at Rim 98, Zagreb



Slika 6. Idejni projekt nove poslovne zgrade na lokaciji Rim 98, Zagreb
Figure 6 Concept design of the new business building at Rim 98, Zagreb

early nineties plans were made again for the construction of a new building at the same location, but also to no success. In the mid nineties activities began to resolve planning and solving the issue of inadequate space, since specialist laboratories were equipped with obsolete instruments, and there was neither space or money for the new ones, which made it difficult for experts to implement modern diagnostic standards.

Obligations as stipulated under the new Croatian regulations, adjusting to the EU Legal Acquis in the area of plant health (PH) including harmful organisms (HO) and plant protection products (PPP), in the process of accessing the EU have required intensive consideration of solutions to the problems with respective business premises of the Institute. The Ministry of Agriculture, Fisheries and Rural Development (MAFRD) has provided for resources credited by the World Bank to construct a new building of the Institute. In 2004, based on the Decision of the Management Council of the Institute, confirmed and approved by the Managing Board of MAFRD, concrete activities were initiated relating to the construction of a new building at the address of Rim 98. A concept design of the new business building (fig. 5, fig.

devedesetih godina opet se započelo s izradom planova za izgradnju nove zgrade na istoj lokaciji, ali također neuspješno. Sredinom devedesetih godina počele su aktivnosti planiranja i rješavanja neprimjerenog prostora, jer specijalistički su laboratoriji bili opremljeni zastarjelom opremom, a za novu nije bilo ni prostora niti novaca, što je stručnjacima otežavalo implementaciju suvremenih dijagnostičkih standarda.

Obvezne koje su određene novim hrvatskim propisima, usklađenim s pravnom stečevinom EU-a iz područja biljnog zdravstva (BZ) koje obuhvaća štetne organizme (ŠO) i sredstva za zaštitu bilja (SZB), u procesu pridruživanja EU-u uvjetovale su intenzivno rješavanje nedostataka odgovarajućih poslovnih prostorija Zavoda. Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja (MPRRR) osiguralo je sredstva za izgradnju nove zgrade Zavoda iz kredita Svjetske banke. Godine 2004., na temelju Odluke Upravnog vijeća Zavoda, koju je potvrdio i odobrio Kolegij MPRRR-a, pokrenute su konkretnе aktivnosti vezane uz izgradnju nove zgrade na adresi Rim 98. Godine 2005. pripremljen je idejni projekt nove poslovne zgrade (slika 5., slika 6.), 2006. ishodena je lokacijska dozvola, 2007. dovršen je glavni projekt zgrade, s detaljnim prijedlogom potrebnih specijalističkih laboratorija, uredskih prostorija i dr., a 11. veljače 2008. dobivena je građevinska dozvola. Potom se dalje radilo na izvedbenom projektu i pripremi dokumentacija za izvođača radova. Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja je 9. prosinca 2009. potpisalo Ugovor o izgradnji nove zgrade i restauriranju postojeće s građevinskim konzorcijem Lavčević d.o.o. i Teh-gradnja d.o.o. Izgradnja zgrade započela je početkom 2010. godine (slika 7.).

Rukovoditelji Zavoda za zaštitu bilja

Prvim predstojnikom Entomološke sekcije imenovan je prof. dr.sc. Antun Korlević, koji je tu dužnost obavljao do 1915. U razdoblju od 1915. do 1920. predstojnik je bio prof. dr.sc. August Langhoffer. Dužnost predstojnika preuzima prof. dr.sc. Vatroslav Vogrin 1920., a krajem iste godine prof. dr.sc. Franjo Operman, koji na toj dužnosti ostaje do 1937. Predstojnik je Odsjeka prof. dr.sc. Željko Kovačević od 1937. do 1947.

6) was prepared in 2005, the location permit was obtained in 2006, the main plan of the building was finished in 2007, including a detailed proposal of necessary specialist laboratories, office premises etc., and the building permit was received on 11 February 2008. This was then followed by preparation of the executive plan and documentation for a contractor. On 9 December 2009 the MAFRD signed the Contract on the construction of the new and restoration of the existing building with the Lavčević d.o.o. and Teh-gradnja d.o.o. construction consortium. The construction of the building started at the beginning of 2010 (fig. 7).

Heads of the Institute for Plant Protection

Prof. Antun Korlević PhD was appointed the first Head of the Entomological Section, who performed this duty until 1915. Prof. August Langhoffer PhD was the Head in the period from 1915 to 1920. The duty of the Head was assumed by Prof. Vatroslav Vogrin PhD in 1920, and then Prof. Franjo Operman PhD by the end of the same year, who remains at this position until 1937. Prof. Željko Kovačević PhD is the Head of the Section from 1937 to 1947. Milan Panjan PhD becomes the new director in 1947 and performs this duty until 1973. Under the leadership of M. Panjan the Institute for Plant Protection experienced progress and obtained a position in science having created a reputation in Croatia and the world. Director's duty was performed by Alenka Regan BSc from 1973 to 1974. In the period from 1974 to 1975 Ivan Ciglar PhD is the Director, and from 1975 to 1976 Marija Bedeković BSc and from 1976 to 1978 Zlatko Korunić PhD. Prof. Milan Maceljski PhD is the Director of the Institute from 1979 to 1985, and then Bogdan Cvjetković PhD until 1990. That same year, 1990, Radoslav Masten MSc becomes the Director and performs this duty until 1994. Darka Hamel PhD performs the duty of the acting Head of the Institute 1994 - 1995, when Radoslav Masten MSc assumes this duty again and remains at that position all until 30 June 2009. Darka Hamel PhD becomes acting Head of the Institute on 1 July 2009 and performs this duty until 2010. By the beginning of 2010 Tatjana Masten Milek PhD assumes the position of acting Head. Table 2 shows the chronology of Heads of the Institute from establishment until today.



Slika 8. mr.sc. Radoslav Masten – dugogodišnji ravnatelj Zavoda za zaštitu bilja

Figure 8 Radoslav Masten MSc – longtime Director of the Institute for Plant Protection

Dr.sc. Milan Panjan postaje novi direktor 1947. i tu dužnost obavlja do 1973. Pod vodstvom M. Panjana Institut za zaštitu bilja doživio je napredak i izborio položaj u znanosti i struci te stvorio ugled u zemlji i svijetu. Dužnost direktora obavlja Alenka Regan, dipl.ing. od 1973. do 1974. U razdoblju od 1974. do 1975. direktor je dr.sc. Ivan Ciglar, a od 1975. do 1976. Marija Bedeković, dipl.ing. te od 1976. do 1978. dr.sc. Zlatko Korunić. Direktor je Instituta prof. dr.sc. Milan Maceljski od 1979. do 1985., a zatim dr. Bogdan Cvjetković do 1990. Te iste godine, 1990., mr.sc. Radoslav Masten postaje direktor te obavlja tu dužnost do 1994. Dr.sc. Darka Hamel obavlja dužnost v. d. ravnatelja Zavoda 1994. - 1995., kada mr.sc. Radoslav Masten ponovo preuzima tu dužnost te na tome mjestu ostaje sve do 30. lipnja 2009. Dr.sc. Darka Hamel postaje v. d. predstojnikom Zavoda 1. srpnja 2009. te obavlja tu dužnost do 2010. Početkom 2010. na mjesto v. d. predstojnika dolazi dr.sc. Tatjana Masten Milek. U tablici 2. prikazana je kronologija rukovoditelja Zavoda od osnutka do danas.

Kronologija zaposlenih u Zavodu za zaštitu bilja

Zavod je tijekom više od 100 godina postojanja uspješno djelovao na poslovima zaštite bilja. U Zavodu je u tom razdoblju bilo zaposleno mnogo poznatih i priznatih znanstvenika, profesora i stručnjaka koji nisu djelovali samo u Hrvatskoj, već i diljem svijeta. Popis do sada zaposlenih znanstvenika, stručnjaka, tehničkoga i administrativnog osoblja sustavno se

Godine <i>Period</i>	Rukovoditelj <i>Head</i>
1909. – 1915.	prof. dr.sc. Antun Korlević
1915. – 1920.	prof. dr.sc. August Langhofer
1920.	prof. dr.sc. Vatroslav Vogrin
1920. – 1937.	prof. dr.sc. Franjo Operman
1937. – 1947.	prof. dr.sc. Željko Kovačević
1947. – 1973.	dr.sc. Milan Panjan
1973. – 1974.	Alenka Regan, dipl.ing.
1974. – 1975.	dr.sc. Ivan Ciglar
1975. – 1976.	Marija Bedeković, dipl.ing.
1976. – 1978.	dr.sc. Zlatko Korunić
1979. – 1985.	akademik prof. dr.sc. Milan Maceljski
1986. – 1990.	prof. dr.sc. Bogdan Cvjetković
1990. – 1993.	mr.sc. Radoslav Masten
1994. – 1995.	dr.sc. Darka Hamel
1995. – 2009.	mr.sc. Radoslav Masten
2009. – 2010.	dr.sc. Darka Hamel
2010. –	dr.sc. Tatjana Masten Milek

Tablica 2. Kronologija rukovoditelja Zavoda od osnutka do danas

Table 2 Chronology of Heads of the Institute from establishment until today

Chronology of employees in the Institute for Plant Protection

The Institute has been successfully dealing with plant protection activities for over 100 years. In this period the Institute employed many renowned and recognised scientists, professors and experts who were active not only in Croatia, but all over the world. The list of scientists, experts, technical staff and administration staff employed so far at the Institute has been systematically recorded in the Register of Employees only since 1 October 1953, but there exist some incomplete data of the previous period and they are compiled together in table 3.

vodi u Matičnoj knjizi službenika Zavoda tek od 1. listopada 1953., no postoje i neki nepotpuni podatci od prije te su svi zajedno prikazani u tablici 3.

U Zavodu su zaposljavani mladi, ambiciozni stručnjaci, od kojih su mnogi danas i u svijetu poznati i priznati. To nije uvijek bilo ni lako niti prihvaćeno, ali upornost je pobjeđivala.

r. br. Ord. No.	Ime prezime Name Surname	Datum nastupa službe <i>Employment Date</i>	Datum razrješenja od dužnosti <i>Termination Date</i>	Umrli (upisano dostupno) <i>Deceased (available records)</i>
1.	Milan Panjan	28.7.1933.	30.11.1972.	30.11.1981.
2.	Ema Groman	1.2.1934.	14.2.1964.	
3.	Budislav Borjan*	1934.	1941.	1941.
4.	D. Erlich*	-	-	
5.	S. Križanović*	-	-	
6.	Blanka Arčanin	1.4.1939.	31.10.1971.	
7.	Višnja Špehar	1.7.1941.	31.12.1957.	
8.	Moise Danon	1.9.1939.	28.7.1969.	28.7.1969.
9.	Vera Lušin	20.4.1946.	30.6.1975.	12.3.1998.
10.	Zdenka Prpić	14.12.1945.	-	14.12.1945.
11.	Đurda Perko	1.9.1943.	1.7.1979.	
12.	Marija Bedeković	5.11.1948.	1.7.1979.	4.1.1995.
13.	Mira Plečko Vuković	14.1.1938.	31.7.1966.	
14.	Ante Tuđman	1.1.1928.	30.9.1974.	
15.	Vera Kraus	1.12.1941.	28.2.1978.	1.12.2005.
16.	Lina Rajmer-Filipović	17.9.1936.	30.6.1970.	
17.	Slavko Bregeš	-	-	
18.	Nikolina Morović	-	31.1.1953.	
19.	Blaž Petroci	30.12.1930.	-	
20.	Milan Večerić	14.7.1947.	-	
21.	Perina Lakoš	-	28.2.1952.	
22.	Marija Lupinski	1.9.1949.	28.2.1952.	
23.	Terezija Matais	-	16.2.1953.	

The Institute has been employing young, ambitious experts, many of whom are renowned and recognised today in the world. This has not always been easy or accepted, but persistence kept winning. Whereas at the beginning there was only one part-time clerk working at the Entomological Section, and since 1926 one permanent expert, in the next twenty years approximately

24.	Marija Milčec	16.5.1951.	-	
25.	Slavica Petroci	5.3.1945.	-	
26.	Ivan Kovačević	16.5.1945.	1.11.1978.	
27.	Rudolf Čokor	7.1.1953.		
28.	Alenka Regan Mastnak	1.3.1953.	30.9.1960.	
29.	Karolina Povrlišak	-	-	
30.	Josipa Godina	12.10.1953.	31.8.1970.	
31.	Vlado Zmiš	10.1.1956. 3.8.1965.	20.8.1957. 25.8.1971.	
32.	Jelena Malković	1.1.1956.	31.7.1977.	5.6.2004.
33.	Nikola Lukić	2.3.1958.	1.3.1979.	
34.	Neda Hrdlička	17.6.1957.	31.3.1958.	
35.	Ivan Pleša	1.3.1957.	31.5.1959.	
36.	Vid Brcko	25.1.1958.	6.11.1958.	
37.	Andrija Glivarec	1.11.1958.	31.10.1959.	
38.	Josip Keber	7.3.1959.	31.5.1959.	
39.	Andrija Trumbetaš	1.6.1959.	30.6.1959.	
40.	Dragica Kolarić	15.6.1959.	14.6.1960.	
41.	Josip Galović	4.11.1959.	25.8.1964.	
42.	Anica Labavić	1.1.1960.	31.8.1960.	
43.	Viktor Tušak	17.2.1960.	25.4.1965.	
44.	Slavica Haviža	16.4.1960.	15.7.1960.	
45.	Ivana Đerkeš	1.5.1960.	1.10.1971.	
46.	Vera Vist	15.6.1960.	30.9.1960.	
47.	Zdravka Iskra	1.8.1960.	28.2.1978.	
48.	Zvonimir Forenbacher	15.9.1960.	28.2.1961.	
49.	Vladimir Velagić	1.12.1959.	31.1.1960.	
50.	Ivan Jurina	15.6.1961.	31.12.1961.	

51.	Andjela Peračković	15.7.1961.	30.4.1973.	
52.	Nada Kovačević	16.8.1961.	25.12.1961.	
53.	Marija Vešliga	11.9.1961.	24.3.1985.	25.3.1985.
54.	Marija Trumbetaš	15.11.1961.	31.12.1989.	
55.	Ivan Jazbinšek	1.12.1961.	15.9.1970.	29.12.1999.
56.	Dragica Hrastnik	15.2.1962.	30.9.1963.	
57.	Petar Smičiklas	1.4.1962.	10.10.1962.	
58.	Janko Češnovar	27.3.1963.	3.5.1963.	
59.	Stjepan Keglević	1.5.1963.	30.6.1965.	
60.	Slavko Dugan	5.6.1963.	1.6.1993.	26.11.1997.
61.	Zdenka Jazbinšek	1.2.1964.	1.8.1988.	
62.	Tomislav Levar	1.2.1964.	31.8.1975.	
63.	Alenka Regan	20.4.1964.	29.10.1974.	19.10.1989.
64.	Josip Logar	15.5.1964.	15.8.1964.	
65.	Zdenka Luckars	15.7.1964.	31.8.1965.	
66.	Vilim Bračun	5.8.1964.	31.12.1994.	
67.	Nedeljka Pagliarini	15.10.1964.	30.12.1994.	
68.	Luka Krizmanić	16.4.1965.	1.5.1965.	
69.	Josip Krstitović	6.5.1965.	8.5.1965.	
70.	Zlatko Korunić	1.9.1965.	28.3.1967.	
71.	Nikola Đeldum	11.4.1966.	28.2.1969.	
72.	Ivan Ciglar	1.9.1966.	1.10.1975.	13.10.2003.
73.	Tomo Tomić	1.11.1966.	31.12.1966.	
74.	Ante Anić – Antić	15.3.1967.	31.12.1968.	
75.	Slavica Pehar	15.5.1967.	15.5.1968.	
76.	Josip Vatlja	25.5.1967.	14.1.1970.	
77.	Olga Šepel	1.9.1967.	31.1.1970.	
78.	Đuro Radiković	1.1.1968.	31.12.2006.	
79.	Zlatko Korunić	18.3.1968.	1.8.1975.	
80.	Božidar Grabušić	20.3.1968.	30.4.1968.	
81.	Ivan Tonković	5.4.1968.	31.10.1968.	
82.	Zvonimir Ostojić	29.1.1969.	31.7.1984.	
83.	Đuro Milošević	15.4.1969.	1.9.1970.	
84.	Zdravko Rucner	15.4.1969.	30.12.2006.	

85.	Ljerka Oštrec	1.4.1969.	31.3.1992.	19.4.2009.
86.	Zlatica Drašković	16.10.1969.	30.4.1970.	
87.	Fritz Krempeler	17.11.1969.	-	
88.	Tatjana Dočkal	11.12.1969.	11.1.1970.	
89.	Mirko Posavec	15.1.1970.	31.8.1971.	
90.	Ivana Barić	9.2.1970.	1.3.1970.	
91.	Josipa Makek	1.3.1970.	30.6.1971.	
92.	Slavica Primorac	1.8.1970.	31.3.1972.	
93.	Andrija Bužančić	1.9.1970.	15.3.1975.	
94.	Jadranka Mihalić	1.7.1970.	29.12.2006.	
95.	Klement Ganza	1.10.1970.	16.11.1980.	
96.	Bogdan Cvjetković	15.10.1970.	31.3.1992.	
97.	Jozo Zadro	1.3.1971.		
98.	Aljoša Burić	15.3.1971.	31.1.1975.	
99.	Marija Bračun	1.10.1971.	27.12.1992.	
100.	Dragica Žumić	1.10.1971.	31.3.1972.	
101.	Željko Markeš	15.3.1972.	31.7.1973.	
102.	Marija Vrdoljak	25.3.1972.	31.3.1975.	
103.	Marko Fadiga	10.4.1972.	27.3.1973.	
104.	Katica Patrčević	1.8.1972.	16.2.2009.	
105.	Goran Hrlec	1.4.1973.	10.4.2008.	
106.	Zdenka Vogrinec	7.5.1973.	-	
107.	Petar Sandalić	15.11.1973.	30.4.1974.	
108.	Ružica Vitas	1.5.1974.	15.6.1977.	
109.	Štefica Emrović	10.6.1974.	15.10.1974.	
110.	Mira Rucner	1.9.1974.	30.6.2009.	
111.	Dubravka Pejnović	16.12.1974.	30.12.2010.	
112.	Radoslav Masten	1.2.1975.	30.4.2010.	
113.	Branka Vrhovec	1.3.1975.	30.8.1976.	
114.	Zlatko Korunić	1.12.1975.	29.2.1984.	
115.	Milan Šoškić	1.12.1975.	31.12.1975.	
116.	Ivanka Čizmić	16.2.1976.	30.12.2007.	
117.	Zoran Željko	20.4.1976.	30.4.1977.	
118.	Ana Kremer	1.7.1976.	1.9.2002.	

119.	Veljko Lodeta	30.8.1976.	30.6.2010.	
120.	Tomislava Hranueli	1.11.1976.	25.4.1981.	25.4.1981.
121.	Rada Kecman	11.11.1976.	3.5.1977.	
122.	Vladimir Danon	15.12.1976.	15.8.1988.	
123.	Rada Kecman	15.7.1977.	20.5.1979.	
124.	Zdenka Jurjević Jelić	15.3.1978.	30.12.2005.	
125.	Nevenka Glavica	1.4.1978.	31.12.2009.	
126.	Jasminka Igrc	16.10.1978.	31.3.1992.	
127.	Vesna Majhen	16.10.1978.	15.9.1979.	
128.	Velimir Seiwerth	1.11.1978.	31.10.1981.	
129.	Milan Maceljski	1.11.1978.	31.3.1992.	24.6.2007.
130.	Josip Kišpatić	1.11.1978.	30.9.1987.	1.2.1994.
131.	Valentina Gaži	1.11.1978.	28.2.1981.	2.5.1992.
132.	Dasović Stjepan	1.11.1978.	28.5.1982.	
133.	Jasenka Bach	1.11.1978.	30.12.1993.	
134.	Inoslava Balarin	1.11.1978.	4.3.1987.	4.3.1987.
135.	Ivan Butorac	1.11.1978.	31.7.1980.	
136.	Ivanka Milatović	1.11.1978.	30.9.1979.	6.3.1998.
137.	Nevenka Plavšić	1.11.1978.	30.9.1989.	14.11.1991.
138.	Ivan Mudifaj	1.11.1978.	31.3.1992.	
139.	Marija Lederer	1.11.1978.	1.7.1979.	8.8.2000.
140.	Katarina Dubravec	1.11.1978.	31.3.1992.	
141.	Nada Hulina	1.11.1978.	31.3.1992.	
142.	Ana Šarić	1.11.1978.	30.9.1986.	16.6.2001.
143.	Radoslav Tomac	15.3.1979.	21.1.1987.	
144.	Borislav Levatić	1.6.1979.		
145.	Puzak Đuro	1.6.1979.	22.8.2006.	
146.	Marija Medvedec	2.7.1979.	30.6.1980.	
147.	Nevenka Vezaj-Željeznak	1.11.1979.	31.1.1996.	
148.	Lidija Gavlik	23.2.2981.	26.3.1982.	
149.	Ivan Ciglar	1.3.1981.	31.3.1992.	13.10.2003.
150.	Ivan Mikec	1.3.1981.	30.11.1989.	
151.	Darka Hamel	1.5.1981.		
152.	Stjepan Jakopanec	1.5.1981.		

153.	Vilka Beketić-Bratković	6.5.1981.	30.9.1981.	
154.	Darko Jelković	14.5.1981.		
155.	Mirjana Čustić	15.7.1981.	23.10.1981.	
156.	Zora Jović	21.12.1981.	3.4.1982.	
157.	Zdravka Glumac	1.1.1982.	3.4.1982.	
158.	Katica Klancir	15.4.1982.	-	
159.	Mirjam Bing-Drempetić	12.5.1982.	4.8.1982.	
160.	Vesna Kajić	1.8.1982.		
161.	Mladen Ljubić	16.8.1982.		
162.	Dragica Oslaković	1.11.1982.	9.7.1984.	
163.	Štefica Petrović	3.10.1983.	29.12.1983.	
164.	Kolumbina Mrva	21.11.1983.	20.11.1984.	
165.	Siniša Vdović	1.6.1984.	27.8.1987.	
166.	Mirjana Prepelić	1.6.1984.	30.11.1985.	
167.	Zrinka Gregov	1.6.1984.	31.3.1992.	
168.	Ljubo Isaković	1.7.1984.	30.4.1985.	
169.	Zvonimir Flegar	11.3.1985.	31.3.1989.	
170.	Tihomir Gojak	1.6.1985.	1.1.1988.	
171.	Vlasta Žlof	1.6.1985.	31.5.1986.	
172.	Božidar Rušnjak	1.6.1985.	13.11.1994.	
173.	Nikola Šestak	1.6.1985.	10.12.1985.	
174.	Mihovil Stanišić	1.6.1985.	31.5.1986.	
175.	Silvana Barbarić	8.7.1985.	13.5.1987.	
176.	Mirjana Prepelić	16.12.1985.	15.12.1986.	
177.	Ljubo Isaković	3.6.1986.	10.11.1991.	
178.	Vlasta Žlof	9.6.1986.	31.3.1992.	
179.	Mihovil Stanišić	9.6.1986.	8.6.1987.	
180.	Mihaela Britvec	1.10.1986.	31.3.1992.	
181.	Renata Peranec	1.10.1986.	2.12.1986.	
182.	Jasnica Čehko	24.2.1987.	9.9.1987.	
183.	Damir Petrinac	1.3.1987.	8.6.1987.	
184.	Zvonko Razum	2.7.1987.	12.12.1993.	
185.	Marija Mihetec	2.7.1987.	24.4.1990.	
186.	Ljiljana Dimitrov	1.10.1987.	31.12.1987.	

187.	Željko Tomic	1.6.1988.		
188.	Nenad Vukmirović	1.6.1988.	31.5.1989.	
189.	Tvrtko Mikec	1.6.1988.	30.11.1988.	
190.	Željko Budinčak	1.6.1988.		
191.	Tvrtko Mikec	1.1.1989.		
192.	Zvonko Ostojić	20.1.1989.	31.3.1992.	
193.	Tomislav Melić	1.4.1989.	1.1.1995.	
194.	Davor Batas	11.7.1989.	11.7.1990.	
195.	Mladen Šimala	11.7.1989.		
196.	Siniša Dorontić	11.7.1989.	31.3.1992.	
197.	Nada Varešanin	12.3.1990.	31.3.1992.	
198.	Piruška Dinarina	2.4.1990.	31.3.1992.	
199.	Denis Novak	2.4.1990.	1.7.2001.	
200.	Mirjana Rangelov	5.7.1990.		
201.	Krunoslav Brunović	2.5.1991.	12.8.1991.	
202.	Željko Jurjević	16.9.1991.	31.3.1992.	
203.	Josip Špoljarić	1.4.1992.	1.5.1994.	
204.	Ivan Mikec	6.4.1992.	27.5.2010.	27.5.2010.
205.	Zvonimir Flegar	9.4.1992.		
206.	Bogdan Korić	2.11.1992.	30.5.2010.	
207.	Zlatko Korunić	1.2.1993.	31.12.1993.	
208.	Vladimir Pelicarić	2.2.1993.	30.12.2005.	
209.	Vlasta Žlof	1.9.1993.	31.12.1994.	
210.	Vera Koroskoski	1.9.1994.	29.5.2001.	29.5.2001.
211.	Mina Špoljar	24.11.1994.	29.4.1996.	
212.	Đurdica Coha	9.1.1995.		
213.	Vlasta Žlof	7.2.1995.	31.12.1997.	
214.	Branimir Rucner	17.7.1995.		
215.	Tatjana Masten Milek	8.1.1996.		
216.	Andrija Vukadin	8.1.1996.		
217.	Vlatka Lipovac	8.1.1996.	15.7.2001.	
218.	Brankica Schäperl	15.1.1996.		
219.	Mario Bjeliš	1.6.1998.		
220.	Gorana Peček	1.3.2000.		

221.	Martina Peroš	13.7.2001.		
222.	Smiljan Kraljević	16.7.2001.		
223.	Ivan Poje	15.3.2002.		
224.	Ivana Križanac	15.3.2002.		
225.	Adrijana Novak	20.5.2002.		
226.	Nenad Novak	20.5.2002.		
227.	Dražen Radunić	1.8.2002.	20.10.2009.	
228.	Iva Pavlinić-Prokurica	15.12.2004.		
229.	Ivana Mikec	21.12.2005.	20.9.2006.	
230.	Angelca Perković	23.10.2006.	2.12.2007.	
231.	Ivone Jakaša	1.1.2007.	31.10.2008.	
232.	Kristijan Kuš	2.2.2007.	16.2.2009.	
233.	Ana Mrnjavčić	1.3.2008.		
234.	Mario Šokčević	11.11.2008.	14.12.2008.	
235.	Dubravka Somogyi	1.1.2009.		
236.	Maja Poldrugač	1.1.2009.		
237.	Nataša Čorić	6.1.2009.		
238.	Silvija Kauković	1.1.2009.	23.4.2010.	
239.	Maja Kravarščan	16.3.2009.		
240.	Jelena Plavec	16.3.2009.		
241.	Jasna Milanović	16.3.2009.		
242.	Mirna Šabarić	16.3.2009.	24.4.2010.	
243.	Iris Šimala	1.4.2009.		
244.	Sara Dolores Podnar	15.4.2009.		
245.	Ivana Marušić	1.4.2010.	17.1.2011.	
246.	Tina Fazinić	1.4.2010.		
247.	Krešimir Skočić	1.4.2010.		
248.	Dario Ivić	5.7.2010.		
249.	Marija Jozić	5.7.2010.		
250.	Tamara Rehak	2.8.2010.		

* Prema podatcima iz literature

* According to the data from literature

Tablica 3. Ispis iz Matične knjige službenika Zavoda

Table 3 Print-out from the Register of Employees of the Institute

Dok je u početku u Entomološkoj sekciji radio samo jedan honorarni službenik, a od 1926. jedan stalni entomološki stručnjak, u idućih dvadesetak godina bilo je zaposleno tek nekoliko stručnjaka, a danas je u Zavodu zaposleno 7 doktora znanosti, 7 magistara znanosti, 12 diplomiranih inženjera, 1 inženjer, 6 tehničara, 2 administratora i 1 osoba na poslovima čišćenja. Svakako da je uloga stručnjaka u obavljanju poslova presudna, no treba naglasiti i pomoći tehničkoga i administrativnog osoblja kao važnu kariku u postizanju uspjeha.

1.2. Poslovi Zavoda za zaštitu bilja tijekom povijesti

Poslovi Zavoda mijenjali su se tijekom sto godina postojanja, ali uvijek su obuhvaćali zaštitu bilja.

U samom su početku bili određivani programi za sakupljanje podataka o proširenosti kukaca i grinja, kasnije i uzročnika biljnih bolesti te korova, što se radilo tijekom kalendarske godine, a tako je to i danas. Prikupljeni podatci bili su osnova za izvještajne poslove, a poslije su s prognoznim poslovima postali važan izvor informacija o proširenosti štetnih organizama i njihovu suzbijanju. Te informacije bile su bitne pri osnivanju antiperonosporne, anticerkosporne, antifitoftorne i sličnih službi. Uz kraće prekide ti poslovi obavljaju se kontinuirano sve do danas. Stručnjaci Zavoda povremeno su bili uključeni u pregledе bilja kod izvoza i uvoza još tridesetih godina 20. stoljeća, kad je zbog razvoja trgovine, uvoza i izvoza te pojave karantenskih štetnih organizama organiziran nadzor na graničnim prijelazima Čakovec i Koprivnica te u Zagrebu. Na prijelazu stoljeća 20./21., tijekom desetak godina to su bili među važnijim poslovima, kad su stručnjaci Zavoda izdavali fitocertifikate pri izvozu bilja i biljnih proizvoda, ali promjenom propisa te su poslove prestali obavljati 2006. Danas se prati pojava karantenskih štetnih organizama u prvom redu programima posebnog nadzora i analizama uvozne bilje i biljnih proizvoda. Važnost proizvodnje zdravog sjemena i sadnog materijala bila je poznata i u drugoj polovici 19. i prvoj polovici 20. stoljeća, a 1954. donesen je prvi propis o obve-

there were only a few experts employed, and today the Institute employs 7 Doctors of Science, 7 Masters of Science, 12 graduate engineers, 1 engineer, 6 technicians, 2 administrators and 1 person for cleaning chores. The role of an expert in performing the activities is undoubtedly crucial, but the assistance of technical and administrative staff needs to be stressed as an important link in achieving success.

1.2. Activities of the Institute for Plant Protection during History

The activities of the Institute have been changing during hundred years of existence, but they have always included plant protection.

At the very beginning there were programmes defined for collecting the data on the spread of insects and mites, later on of agents causing plant diseases and weeds, which was being done during a calendar year, and so it is today as well. Collected data made the basis for reporting activities, and later on, together with early warning system, they became an important source of information on the spread of harmful organisms and their control. This information was crucial with establishing anti-peronosporosis, anti-cercosporosis, anti-phytophtrosis and similar services. Apart from short periods of interruption these activities have been continuously performed all until today. Experts from the Institute were occasionally involved in plant inspections at both export and import as early as in the thirties of the 20th century, when the development of trade, import and export and appearance of quarantine harmful organisms induced the organisation of supervision at border crossings in Čakovec and Koprivnica and Zagreb. At the turn from the 20th to the 21st century during about ten years these were among fairly important activities, when the experts from the Institute issued phytocertificates with exporting plants and plant products. However, upon the change of regulations they ceased to perform these activities in 2006. The appearance of quarantine harmful organisms is being monitored today primarily by surveys and analyses of imported plants and plant products. The importance of producing healthy seed and seedlings was well known even

znom pregledu sjemenskih usjeva, kojim je bilo propisano da institucije koje imaju stručnjake za zaštitu bilja, laboratorijsku opremu i literaturu mogu obavljati zdravstveni pregled sjemenskih usjeva. Sukladno tome stručnjaci Zavoda bili su ovlašteni za obavljanje zdravstvenog nadzora sjemenskih usjeva, a poslije i sadnog materijala, pa je to i danas jedna od djelatnosti. U sklopu zdravstvenog nadzora sjemenskih usjeva važno je bilo određivanje zdravstvenog stanja sjemena. Od 1922. Uredbom o kontroli sjemena kulturnih biljaka i poslije Pravilnikom i normama o kontroli sjemena kulturnih biljaka bila je propisana kontrola sjemena na nazočnost korova, viline kosice, uzročnika bolesti i štetnika. U razdoblju od 1995. do 1999. stručnjaci Zavoda i 19 stručnjaka iz drugih ovlaštenih laboratorija obavljali su analize zdravstvenog stanja sjemena domaće proizvodnje i iz uvoza. Tijekom tog razdoblja, stručnjaci Zavoda za zaštitu bilja osposobili su djelatnike iz 16 ovlaštenih laboratorija u Hrvatskoj. Izobrazba stručnjaka raznih specijalnosti zaštite bilja od najranijeg je razdoblja imala važno mjesto u Zavodu, kao i danas što uključuje ospozobljavanje poljoprivrednih proizvođača, zaposlenika u poljoprivrednim ljekarnama, fitosanitarnih inspektora, stručnjaka savjetodavne službe i drugih subjekata uključenih u poslove zaštite bilja. U Zavodu postoji višegodišnja tradicija istraživanja učinkovitosti sredstava za zaštitu bilja u prirodnim i kontroliranim uvjetima u stakleniku i laboratoriju te provjera njihovih fizikalno-kemijskih svojstava u laboratoriju. Prva istraživanja sa sredstvima za zaštitu bilja (SZB), (insekticidi, fungicidi, herbicidi i dr.) na osnovi sumpora, modre galice, anorganskih insekticida, živinih sredstava za tretiranje sjemena, nikotina, voćnih karbolineuma i nekih herbicida, provedena su u razdoblju prije Drugoga svjetskog rata. Učinkovitost sredstava za zaštitu bilja istraživala se sve do 2008. i bila je važna djelatnost u sklopu entomologije, fitopatologije i herbologije.

Povjesni tijek razvoja Zavoda teško je pokazati bez straha da će netko biti izostavljen ili da će nešto ostati nezabilježeno. Na idućim stranicama navedeni su važniji dostupni podaci o stručnjacima, zaposlenim u Zavodu koji su tijekom rada, kad god je to bilo moguće, usavršavali svoje znanje u domovini

*in the second half of the 19th and the first half of the 20th century, and in 1954 the first regulation was passed on mandatory inspection of crops for seed production, providing that institutions having experts on plant protection, laboratory equipment and literature are allowed to perform health inspection of crops for seed production. In line herewith the experts from the Institute were authorized to perform health supervision of crops for seed production, and seedlings thereafter as well, which is one of the activities today too. Within health supervision of crops for seed production it was important to identify health condition of the seed. Since 1922, seed control to the presence of weeds, *Cuscuta europaea*, agent causing diseases and pests was regulated by the Regulation on Culture Plant Seed Control and later on by the ordinance and Standards on Culture Plant Seed Control. In the period from 1995 to 1999 experts from the Institute and 19 experts from other authorized/certified laboratories performed analyses of health condition of the seed produced in as well as imported to Croatia. During this period, experts from the Institute for Plant Protection trained employees from 16 authorized/certified laboratories in Croatia. From the earliest time the education of experts of various specialisations in plant protection had an important place in the Institute, as well as today it includes education of agricultural producers, employees in agricultural pharmacies, phytosanitary inspectors, experts of extension service and other subjects involved in plant protection activities. In the Institute there is a several year-long tradition of researching on the efficacy of plant protection products in natural and controlled conditions in a glasshouse and a laboratory as well as in testing their physical and chemical properties in the laboratory. The first research on plant protection products (PPP), (insecticides, fungicides, herbicides etc.) on the basis of sulphur, bordeaux mixture, inorganic insecticides, plant protection products based on mercury for seed treatment, nicotine, fruit carbolineum and some herbicides, was conducted in the period before the Second World War. The efficacy of plant protection products has been researched until 2008 and it was an important activity within entomology, phytopathology and herbology.*

It is difficult to show the historical course of the Institute's development without being afraid of leaving someone out or leaving some-

i inozemstvu (Francuska, Italija, Kanada, Mađarska, Nizozemska, Njemačka, SAD, Slovenija, Španjolska, Ujedinjeno Kraljevstvo, Švicarska, Belgija i dr.). Stručnjaci i specijalisti svoja znanja i iskustva prenose objavljanjem članaka u popularnim, stručnim i znanstvenim časopisima te predavanjima i preporukama za zaštitu bilja i proizvoda korisnicima. Propisi koji određuju tijekom povijesti rad Zavoda se mijenjaju, a stručnjaci Zavoda sudjeluju u pripremi njihove izrade.

1.3. Povijest i razvoj entomologije

Entomologijom se u 19. i početkom 20. stoljeća bavilo mnogo amatera, no organiziranoga stručnoga ili znanstvenog rada na području entomologije nije bilo sve do 1909. Te je godine unutar Hrvatske biološke centrale u Zagrebu osnovan odjel nazvan Entomološka sekcija, od koje je nastao Zavod za zaštitu bilja.

Od osnutka sve do danas obavljana su faunistička istraživanja i determinacije kukaca, nematoda, grinja puževa i dr. Zabilježeni su začetci inventarizacije štetnika, a rjeđe uzročnika bolesti te gubitci u poljoprivrednoj proizvodnji. U početku je naglasak bio na proučavanju domaće faune i entomofaune, inventarizacijom i stvaranjem zbirki kukaca kojoj su se neki stručnjaci potpuno posvetili, kao što su to bili A. Korlević, A. Langhofer i Ž. Kovačević. Kasnije se veća važnost počela pridavati gospodarski važnim štetnicima. Sakupljanje faune provodilo se na cijelom području bivše države, određivane su biljke domaćini i domaćini kukaca te ostalih vrsta. Materijal je spreman, determiniran i pohranjen u zbirke. Nažlost, mnoge od tih vrijednih zbirki nisu sačuvane i tijekom seobi su uništene ili izgubljene.

Za potrebe brojnih istraživanja i pokusa u laboratorijima i staklenicima uzgajane su razne vrste kukaca, uglavnom štetnika uskladištenih poljoprivrednih proizvoda, ali i drugih štetnih i korisnih vrsta (biološko suzbijanje). Danas se u entomološkom laboratoriju provodi detekcija i identifikacija gospodarski važnih štetnika u uzorcima, kao i određene vrste kukaca iz redova Thysanoptera, Hemiptera, Hymenoptera,

thing unrecorded. On the following pages there are given certain important data available on experts, employed at the Institute who were improving their knowledge during work, whenever possible, in Croatia and abroad (France, Italy, Canada, Hungary, Netherlands, Germany, USA, Slovenia, Spain, United Kingdom, Switzerland, Belgium etc.). Experts and specialists transmit their knowledge and experience by publishing articles in popular, professional and scientific journals and by giving lectures and recommendations for plants and plant products protection to users. Regulations defining operation of the Institute during history have been changing, and experts from the Institute participate in their preparation.

1.3. History and Development of Entomology

There were many amateurs dealing with entomology in the 19th and the beginning of the 20th century, but there was no organised professional or scientific work in the field of entomology up to 1909. This was the year of a department having been established within the Croatian Biological Centre and called the Entomological Section, from which the Institute for Plant Protection originated.

As from establishment until today faunistic research has been conducted and determinations made of insects, nematodes, snails, mites etc. Rudiments of pest inventories were recorded, and rarely agents causing diseases and losses in agricultural production. At the beginning the emphasis was on research on the Croatian fauna and entomofauna, by making inventory records and creating insect collections to which certain experts were thoroughly dedicated, such as A. Korlević, A. Langhofer and Ž. Kovačević. Later on greater importance was attached to economically important pests. Fauna has been collected on the entire territory of the former state, host plants and insect hosts and other species have been identified. Material has been saved, determined and stored in collections. Unfortunately, many of these valuable collections were not preserved and during removals they were either destroyed or lost.

Various species of insects, mainly pests of stored agricultural products, but of other harmful species and natural enemies as well (biological control) have been bred for the needs of numerous research and tests in laboratories and glasshouses. Today, the ento-

Coleoptera, Lepidoptera i Diptera s Popisa I. i Popisa II. Pravilnika o mjerama za sprječavanje unošenja i širenja organizama štetnih za bilje, biljne proizvode i druge nadzirane predmete i mjerama suzbijanja tih organizama (NN 74/06) tzv. karanternskih štetnika.

Tijekom godina u suradnji s SAD-om i nekim europskim zemljama u okviru znanstvenih projekata prikupljana je korisna fauna u svrhu biološkog suzbijanja korova i kukaca, koja su provodena na području SAD-a i Europe s vrlo dobrim uspjehom.

Stručni i znanstveni projekti omogućili su istraživanja biologije i ekologije raznih štetnih i korisnih vrsta. Proučavani su najvažniji štetnici: ratarskih kultura (sovice pozemljuše, žičnjaci, kukuruzni moljac, kukuruzne pipe, repine pipe, repičin sjajnik, repičina osa listarica, žitne stjenice, lisne uši, krumpirova zlatica i dr.); voćaka i vinove loze (jabučni, kruškin, breskvin i šljivin savijač, jabučni cvjetar, linski mineri, savijač lista, kožice i ploda, lisne uši, breskvin moljac, štitaste uši, grozdovi moljci, pipe na vinovoj lozi i dr.) povrćarskih kultura (lisne i sovice pozemljuše, mineri lista i ploda, lisne uši, stjenice, buhači, tripsi, zlatice i dr.), ukrasnog bilja, skladišnih štetnikai dr. Također je istraživana biologija štetnih grinja, nematoda i glodavaca, a posebno biologija i ekologija korisnih kukaca koji su korišteni u svrhu biološkog suzbijanja korova (*Zygogramma satralis*) i kukaca, npr. učinkovitost parazitske osice *Trichogramma evanescens* u suzbijanju kukuruznog moljca te korisne grinje u suzbijanju štetnika u zaštićenim prostorima.

Prof. dr.sc. **Antun Korlević** (Sv. Ivan od Šterne kraj Višnjan, 1851. – Zagreb, 1915.), entomolog bio je prvi predstojnik Entomološke sekcije. Najveći dio njegova rada je bio istraživanje kukaca, uređenje entomoloških zbirki. Bio je začetnik propagande o organiziranju obavještajne službe da bi se ljudi upoznali s važnosti štetnika. Uspostavio je brojne veze s gotovo svim poznatim entomologima u svijetu, a nekoliko je kukaca koje je otkrio, dobilo ime po njemu.

U razdoblju od 1915. do 1920., u Zavodu radi profesor zoologije na Filozofском fakultetu, prof. dr.sc. **August Langhofer**, (Kisač, 1861. – Zagreb, 1940.). Proučavao je štetnu faunu pećina, a posebno štetne insekte, također se bavio šteticima

mological laboratory conducts detection and identification of economically important pests in samples, as well as of particular insect species from orders of Thysanoptera, Hemiptera, Hymenoptera, Coleoptera, Lepidoptera and Diptera as provided in the List I and the List II of the Ordinance on Measures Against the Introduction and Spread of Organisms Harmful to Plants, Plant Products and Other Regulated Objects, and Measures to Control these Organisms (Official Gazette/NN 74/06) the so called quarantine pests.

During years of cooperation with the USA and certain European countries within scientific projects, useful fauna has been collected for the purpose of biological control of weeds and insects, which was conducted on the territory of the USA and Europe with a great success.

*Professional and scientific projects enabled research on the biology and ecology of various harmful pest species and natural enemies. The most important pests have been studied: in arable crops (cut-worms, wireworms, European corn borer, corn weevil, sugar beet weevil, pollen beetle, turnip sawfly, *Eurygaster* spp. and *Aelia* spp., aphids, Colorado potato beetle, etc.); in fruits and grapevine (codling moth, pear fruit moth, peach moth and plum fruit moth, apple blossom weevil, leaf miner moths, leaf roller moths, aphids, peach twig borer, scale insects, grapevine moth, grapevine weevils etc.), in vegetable crops (cabbage moth and cutworms, leaf-miner flies, bugs, flea beetles, thrips, leaf beetles etc.), on ornamental plants, stored product pests etc. Furthermore, biology of harmful mites, nematodes and rodents has been studied, and in particular biology and ecology of natural enemies used for biological control of weeds (*Zygogramma satralis*) and insects, e.g. efficacy of parasite wasp *Trichogramma evanescens* in control of European corn borer and efficacy of predatory mites in biological control of pests on crops in greenhouses.*

Prof. Antun Korlević PhD (Sv. Ivan od Šterne near Višnjan, 1851 – Zagreb, 1915), an entomologist, was the first Head of the Entomological Section. The majority of his work was insect research, arrangement of entomological collections. He was the originator of propaganda on organising information service for people to get acquainted with the importance of pests. He established many connections with almost all of the renowned entomologists in the world, and several insects he discovered were named after him.

u šumama (gubar, bagremov crvac, rusa pilatka) te cvrčcima, potkornjacima, dvokrilcima i ribama. U tom je vremenu na službovanju u Entomološkoj sekciji od 1918. do 1919. proveo i entomolog i faunist, prof. dr.sc. **Željko Kovačević**, istražujući entomofaunu u mnogim dijelovima zemlje i popunjavajući entomološke zbirke. Kratko razdoblje, tijekom 1920., radio je prof. dr.sc., **Vatroslav Ignjat Vogrin**, (Štrigova, 1886. – Zagreb, 1956.), himenopterolog i apidolog, proučavao je opnokrilce u Primorju i štetne kukce masline. Bio je znanstveni suradnik Zoološkog muzeja u Zagrebu.

Profesor **Franjo Operman**, (Bjelovar, 1885. – Zagreb, 1965.), naslijedio je V. Vogrina na dužnosti ravnatelja 1920. i na tome mjestu ostaje do 1937., kad odlazi za poljoprivrednog inspektora u Ministarstvo poljoprivrede. Bio je entomolog, stručnjak zaštite bilja.

Uz Opermana je radio dr.sc. **Božidar Hergula**, (Zagreb, 1899. – Zagreb, 1939.), koji je 1929. prvi u svijetu postavio pokuse za biološko suzbijanje kukuruznog moljca (*Ostrinia nubilalis* Hbn.) u prirodi, u zagrebačkom Botaničkom vrtu, s bakterijama *Cocacobacillus ellingeri*, *Bacterium canadensis*, *Bacterium galeriae* te *Bacterium* (*Bacillus*) *thuringiensis*, koja je ujedno bila i najdjelotvornija. Sljedeće godine B. Hergula koristi i neke druge bakterije te gljivice, od kojih je najdjelotvornija *Metarrhizium anisopliae*. Tim pokusima B. Hergula utro je put biološkom suzbijanju kukuruznog moljca i integriranoj zaštiti od tog štetnika u svjetskim razmjerima. Njegova istraživanja omogućila su razvoj biološkog suzbijanja, pa se danas široko u svijetu primjenjuju *Bacillus thuringiensis* sredstva protiv kukuruznog moljca. B. Hergula bio je suradnik uz botaničara **Vale Vouka**, (1886. – 1962.) i botaničarku **Zoru Klas**, (1902. – 1991.), u američkom projektu "International Corn Borer Investigation" (1927.). Čini se da je to prvo uključenje hrvatskih stručnjaka u jedan međunarodni istraživački projekt. Osnovan je laboratorij u kojem su proučavani patogeni mikroorganizmi uzročnici bolesti gusjenica kukuruznog moljca i paraziti gusjenica, a radovi su objavljeni u svjetski priznatim časopisima i citirani u cijelom svijetu.

A professor of zoology at the Faculty of Philosophy, Prof. August Langhoffer PhD (Kisač, 1861 – Zagreb, 1940) worked at the Institute in the period from 1915 to 1920. He studied harmful fauna of caves, particularly harmful insects; he also dealt with pests in woods (gypsy moth, European fruit lecanium, European pine sawfly) and with crickets, bark beetles, Diptera and fish. In this period from 1918 to 1919 Prof. Željko Kovačević PhD, an entomologist and faunist, spent also his years of service in the Entomological Section researching entomofauna in many parts of the country and filling in entomological collections. For a short period of time, during 1920, Prof. Vatroslav Ignjat Vogrin PhD (Štrigova, 1886 – Zagreb, 1956), a hymenopterologist and apidologist, worked at the Section studying Hymenoptera in the Croatian coastal area and harmful olive insects. He was a scientific associate of the Zoological Museum in Zagreb.

Professor Franjo Operman, (Bjelovar, 1885 – Zagreb, 1965), came in for V. Vogrin on the director's duty in 1920 remaining at this position until 1937, when he leaves to be an agricultural inspector at the Ministry of Agriculture. He was an entomologist, an expert in plant protection.

*Next to Operman there worked Božidar Hergula PhD (Zagreb, 1899 – Zagreb, 1939), who was the first one in the world in 1929 to set up experiments for biological control of European corn borer (*Ostrinia nubilalis* Hbn.) in nature, in Zagreb Botanical Garden, with bacteria *Cocacobacillus ellingeri*, *Bacterium canadensis*, *Bacterium galeriae* and *Bacterium* (*Bacillus*) *thuringiensis*, that was also the most efficient one. Next year B. Hergula uses some other bacteria and fungi as well, the most efficient one of which is *Metarrhizium anisopliae*. B. Hergula paved the way by these experiments to biological control of the European corn borer and to integrated protection against this pest in world scale. His research enabled the development of biological control, so that *Bacillus thuringiensis* products against European corn borer are being widely applied all over the world. B. Hergula was an associate together with botanists Vale Vouk, (1886 – 1962) and Zora Klas, (1902 – 1991), in the American "International Corn Borer Investigation" project (1927). It seems to be the first involvement of Croatian experts in one international research project. A laboratory was established to study*

U Fitopatološko-entomološkom odsjeku Poljoprivredne ogledne i kontrolne stanice također su radili: dr. B. Kršnjav, poljoprivredni savjetnik, ing. B. Borjan, fitopatolog, ing. D. Erlich i dr. Nastavljeni su svi poslovi i zadatci koje su počeli i utemeljili A. Korlević i A. Langhoffer, poglavito praćenje entomofaune i uređenje entomoloških zbirk, no počeo se razvijati i znanstveno-istraživački rad. Proučavala se biologija i ekologija raznih kukaca; običnog hrušta, šljivine štitaste uši, jabučne krvave uši, kukavičnjeg suzničkog, jabučnog savijača i cvjetara, maslinine muhe, grozdovih moljaca, kukuruznog moljca, švedske i žute žitne mušice i dr. Provodile su se opsežne akcije suzbijanja važnih poljoprivrednih štetnika: žičnjaka, sovica pozemljuša, grčica hrušta i dr. Vođena je evidencija o pojavi štetnika i njihovu kretanju. Osnovana je kartoteka o štetnicima u koju su bilježeni svi važni podaci, ne samo za štetne, nego i ostale pronađene vrste. To je početak izvještajno-prognozne službe, koja kasnije prerasta u izvještajno-prognosnu službu za cijelo područje Hrvatske. Prvi podatci su dobivani od privatnih izvjestitelja i općina, a sve je bilo organizirano na dobrovoljnoj osnovi. Nakon Drugoga svjetskog rata nastavlja se faunistički te sve više i znanstveno-istraživački rad na raznim projektima proučavanja biologije i ekologije štetnih i korisnih životinja. Razvojem zoocida stručnjaci entomolozi uključuju se u određivanje djelotvornosti, istraživanja metoda primjene i pojave rezistentnosti kod najvažnijih štetnih vrsta te sudjeluju u radu Komisije za zaštitu bilja, a istodobno obavljaju edukaciju studenata visokoobrazovnih poljoprivrednih ustanova u Zagrebu, Križevcima, Osijeku i drugdje, kao predavači ili gostujući ekspertri.

Svjetski poznati entomolozi i zoolozi radili su kao stalni zaposlenici ili vanjski suradnici u Zavodu.

Prof. dr.sc. **Željko Kovačević**, (Varaždin, 1893. – Zagreb, 1984.), već 1918. zapošjava se kao asistent u tadašnjoj Entomološkoj sekciiji i u njoj radi do kraja 1919. Kao mladi doktor znanosti, (disertacija: "Prilog poznавању Glomerida hrvatskog krša i Zagorja", 1922.), u području entomologije 1925. postaje predstojnik Odsjeka za entomologiju i fitopatologiju Poljoprivredne ogledne stanice u Osijeku, a 1937. postaje

pathogen microorganisms causing diseases of larvae of European corn borer and parasites of larvae. Reports were published in magazines recognised and quoted throughout the world.

In the Phytopathological-Entomological Section of the Agricultural Testing and Control Station there worked also: B. Kršnjav, PhD, an agricultural advisor, B. Borjan BSc, a phytopathologist, D. Erlich BSc etc. All the activities and tasks initiated and founded by A. Korlević and A. Langhoffer were continued, notably monitoring of entomofauna and arrangement of entomological collection, but scientific-research work started developing too. Biology and ecology of various insects was studied: European cockchafer, European fruit lecanium, woolly apple aphid, lackey moth, codling moth and apple blossom weevil, olive fruit fly, grapevine moth, European corn borer, frit fly and yellow cereal fly etc. Comprehensive activities were conducted to suppress important agricultural pests: wireworms, cutworms, European cockchafer etc. Records were kept on the appearance of pests and their circulation. Card file on pests was established to record all the important data, not only for harmful but also for other species found. This is the beginning of reporting-forecasting service, which is to become a reporting-forecasting service for the entire area of Croatia. The first data were received from private reporters and municipalities, and everything was organised on a voluntary basis. After the Second World War faunistic and more and more scientific-research work on various projects of studying biology and ecology of harmful and useful species continued. Entomologists get involved in identifying the efficacy of insecticides and acaricides with their development, in researching the application methods and resistance of the most important harmful species and they participate in the work of the Plant Protection Committee, educating at the same time students of Agricultural Faculty in Zagreb and Osijek and Agricultural High School in Križevci and elsewhere, as lecturers or visiting experts.

The world renowned entomologists and zoologists worked as permanent employees or external associates at the Institute.

Prof. Željko Kovačević PhD, (Varaždin, 1893 – Zagreb, 1984), employed as early as in 1918 as an assistant in the then Entomological Section and works there until the end of 1919. As a young

predstojnik analogne ustanove u Zagrebu. Na toj dužnosti ostaje do 1947., kad odlazi na Poljoprivredno-šumarski fakultet u Zagrebu za profesora entomologije i poljoprivredne zoologije do umirovljenja 1964. Dva desetljeća istraživa je gradacije štetnika, uzročnika golobrsta bjelogorice i voćaka. Posebno se bavio poliedrijom kod štetnika golobrsta i viroza te primjenom subletalnih ili sniženih doza, koje su aktivacijom virusa utjecale na mortalitet gusjenica. Tijekom pedagoškoga, stručnoga i znanstvenog rada objavio je više od 200 znanstvenih ili stručnih radova u domaćim i stranim časopisima, mnogo knjiga, priručnika i skriptata. Kapitalno djelo mu je "Primijenjena entomologija" objavljena u tri knjige. Iako je drugo izdanje izašlo još 1962., mnogi stručnjaci se i danas služe tim knjigama. Aktivno je radio i nakon umirovljenja u Zavodu za poljoprivrednu zoologiju Poljoprivrednog fakulteta i Zavodu za zaštitu bilja, uređujući zbirke insekata, objavljajući kataloge zbirk i druge radove. Bio je suradnik Akademije znanosti i umjetnosti.

Blanka Arčanin, dipl.ing., (Crikvenica, 1913. – Zagreb, 1981.), radila je u Zavodu od 1939. do 1971., pune 32 godine na pokusnom dobru Rim, gdje je stvorila uvjete za rad entomološkog laboratoriјa. Bila je među prvim ispitivačima i stručnjacima koji su zagovarali uporabu kemijskih sredstava za zaštitu bilja i među prvim karantenskim inspektorima za pregled voća u izvozu. Radila je na prognoznim poslovima, otkrivanju i suzbijanju novih štetnika. Pisala je radove o jabučnom savijaku, crvenom pauku, lisnim minerima, kruškinoj buhi i dr. U istraživanjima je već tada krenula suvremenim putem integrirane i usmjerene zaštite bilja. Cilj je bio sa što manjim brojem kemijskih tretiranja postići što bolju kakvoću i veće prinose zdravih plodova.

Dr.sc. **Moise Danon**, (Sarajevo, 1913. – Zagreb, 1969.), bavio se štetnicima ratarskih i povrćarskih kultura te štetnicima uskladištenih poljoprivrednih proizvoda (disertacija: "Graščak /*Acanthoscelides obsoletus* Say/ i graškov žižak /*Bruchus pisorum* L./ kod nas", 1958.). Istraživa je suzbijanje štetnika u tlu, naročito klisnjaka i crnog žitarca, zatim repičinog sjajnika, djetelinskog cvjetoždera, kupusne pipe, graškovog

Doctor of Science in the field of entomology, (dissertation title: "Contribution to the Knowledge of Glomeridae of the Croatian Karst and Zagorje", 1922), in 1925 he becomes the Head of the Section for Entomology and Phytopathology of the Agricultural Testing Station in Osijek, and in 1937 he becomes the Head of an analogue institution in Zagreb. He remains on this duty until 1947, when he leaves to the Faculty of Agriculture and Forestry in Zagreb to be a professor of entomology and agricultural zoology until his retirement in 1964. For two decades he has been researching on gradation of pests, defoliation pests of leaf forest and fruit trees. He was particularly dealing with polydry of defoliation pests and viruses and by applying sub lethal or reduced doses that affected larvae mortality by virus activation. During pedagogical, professional and scientific work he published over 200 scientific or professional papers in Croatian and international journals, many books, manuals and scripts. His capital work titled "Applied Entomology" was published in three volumes. Although the second edition was published as early as in 1962, many experts have been using these books even today. Even after the retirement he was actively working at the Department for Agricultural Zoology of the Faculty of Agriculture and the Institute for Plant Protection, arranging insect collections, publishing catalogues of collections and other papers. He was an associate of the Academy of Science and Arts.

Blanka Arčanin BSc, (Crikvenica, 1913 – Zagreb, 1981), worked at the Institute from 1939 until 1971, full 32 years on the experimental station Rim, where she created conditions for the work of an entomological laboratory. She was among the first experts who solicited the use and testing of chemical plant protection products and among the first quarantine inspectors for the inspection of fruit to be exported. She worked on early warning system, detection and control of new pests. She wrote about codling moth, red spider mite, leaf miners, pear's psylla etc. As early as then, she initiated a modern way of integrated plant protection in her research. The intention was to apply as few chemical treatments as possible in order to achieve as good quality and as high yields of healthy products as possible.

Moise Danon PhD, (Sarajevo, 1913 – Zagreb, 1969), was dealing with pests of agricultural and vegetable crops and the pests of stored

žiška. Radio je na istraživanju insekticidnih gnojiva, utjecaju prašiva na klijavost sjemena, suvremenim metodama zaštite šećerne repe od štetnika tretiranjem sjemena. Napisao je 40 bibliografskih jedinica.

Marija Bedeković, dipl.ing., (Gospic, 1920. – Zagreb, 1995.), radila je u Zavodu od 1948. do umirovljenja 1979. Proučavala je ekologiju i biologiju štetnih kukaca, njihovu gospodarsku važnost i mogućnosti suzbijanja. Izučavala je pojavu i važnost vektora virusnih bolesti kulturnog bilja te proučavala mogućnosti njihova suzbijanja. Istraživala je učinkovitost insekticida, pojave fitotoksičnog djelovanja insekticida i rezidue u biljkama i tlu. Bila je uključena u istraživanja bioloških metoda za suzbijanje krumpirove zlatice. Objavila je dvadesetak znanstvenih i stručnih radova.

Prof. dr.sc. **Ivan Ciglar**, (Mala Subotica, 1933. – Italija, 2003.), u dva razdoblja radio je ukupno 20 godina u Zavodu, (magistarski rad: "Pojavljivanje lisnih minera *Stigmella malella* Stt. dominantne vrste na nasadima voća na području Hrvatske", 1971.; disertacija: "Prilog poznавању morfoloških, bioloških i ekoloških karakteristika minera voćaka", 1975.). Bio je redoviti profesor na Agronomskom fakultetu u Zagrebu od 1996. Predavao je Integriranu zaštitu bilja i Aplikaciju pesticida. Sudjelovao je u faunističkim istraživanjima i istraživanjima dinamike populacije štetnika u voćarstvu. Izučavao je elemente i znanstvene osnove za integriranu zaštitu bilja, naročito utjecaj primarnih i sekundarnih učinaka sredstava za zaštitu bilja. Bio je istaknuti stručnjak za integriranu zaštitu u voćnjacima. U većini je naših voćnjaka i vinograda uveo suvremene i nove metode za praćenje pojave štetnika (feromoni i neke vlastite metode), koje su bile rezultat vlastitih istraživanja te automatsko praćenje klimatskih uvjeta za pojavu bolesti. Prijavio je patent za proizvodnju repelenta za odbijanje štetne divljači Kunilent R14. Sudjelovao je u izradi domaćeg uređaja za praćenje pojave bolesti i štetnika, poznatog pod nazivom "AGRA". Svoja znanja stjecao je i u inozemstvu. Kao ekspert FAO-a boravio je dvije godine u Alžиру, a na kraćim studijskim boravcima bio je u raznim institutima u Nizozemskoj,

agricultural products (dissertation: "Bean Weevil /Acanthoscelides obsoletus Say/ and Pea Weevil /Bruchus pisorum L./ in Croatia", 1958). He researched on control of pests in soil, particularly click beetles and corn ground beetle, than pollen beetle, clover seed weevil, seedpod weevil, bean seed beetle and pea beetle. He conducted research on insecticide fertiliser, the impact of powders on seed germination, by modern methods of protecting sugar beet against pests via seed treatment. He wrote 40 bibliographic entries.

Marija Bedeković BSc, (Gospic, 1920 – Zagreb, 1995), worked at the Institute from 1948 until her retirement in 1979. She analysed ecology and biology of harmful insects, their economic importance and possibilities of control. She studied appearance and importance of virus disease vectors of cultural plants and analysed possibilities of their control. She researched on the efficacy of insecticides, the appearance of phytotoxic effects of insecticides and residues in plants and soil. She was involved in the research on biological methods for Colorado potato beetle control. She published about twenty scientific and professional papers.

Prof. Ivan Ciglar PhD, (Mala Subotica, 1933 – Italy, 2003), worked at the Institute in two periods for 20 years in total, (Master's thesis: "Appearance of Dominant Species of Leaf Miner Moths *Stigmella malella* Stt. on Fruit Plantations in Croatia", 1971; dissertation: "A Contribution to the Knowledge of Morphological, Biological and Ecological Characteristics of Leaf Miner Moths", 1975). He was a full-time professor at the Faculty of Agriculture in Zagreb since 1996. He lectured on Integrated Plant Protection and Pesticide Application. He participated in faunistic research and the research on pest population dynamics in pomology and studied elements and scientific foundations for integrated plant protection, in particular the influence of primary and secondary effects of plant protection products. He was a distinguished expert in integrated protection in orchards. In the majority of Croatian orchards and vineyards he introduced both modern and new monitoring methods of pest appearance (pheromones and certain methods of his own), as a result of his own research, and automatic monitoring of climate conditions for disease appearance. He notified a patent for repellent production for harmful wild animals Kunilent R14. He participated in the design of a

Francuskoj, Njemačkoj, SAD-u i Ukrajini. Objavio je više od 50 znanstvenih i oko sto stručnih radova te više knjiga, od kojih je osobito vrijedna "Integrirana zaštita voćnjaka i vinograda" doživjela dva izdanja.

Prof. dr.sc. **Ljerka Oštrec**, (Zagreb, 1942. – Zagreb, 2009.), diplomirala je na Prirodoslovno-matematičkom fakultetu, biološkom odsjeku stručnom smjeru Zoologija. U Zavodu radi od 1969. do 1992., a do umirovljenja na Agronomskom fakultetu, (magistarski rad: "Istraživanje sastava faune Oribatei-a Dugés u nekim tipovima šumskih tala", 1977.; disertacija: "Parazitske nematode (Nemathelminthes, Nematoda) na duhaništima Podravine i njihov značaj za proizvodnju duhana", 1988.).

Od godine 1980. uključena je u nastavu kad je izabrana za asistenticu, 1989. izabrana je u zvanje docentice, a 1996. postaje izvanredna profesorica za predmet "Primijenjena zoologija". Predavala je i predmete "Opća entomologija" te "Osnove biologije" na dodiplomskom te kolegije "Akarologija, nematologija" i "Urbana entomologija" na poslijediplomskom studiju na Agronomskom fakultetu u Zagrebu kao i u Višoj poljoprivrednoj školi u Križevcima. Bila je vrsna i savjesna nastavnica. Vodila je jedan doktorski i jedan magistarski rad te desetke diplomskega radova. Utemeljila je nematološki laboratorij na Agronomskom fakultetu. Posebno se specijalizirala za područje nematologije, no istraživala je i oribatide (zemljische grinje) i puževe. Specijalizirala se u taksonomskoj identifikaciji nematoda u Wageningenu, u Nizozemskoj, 1976. Posebni znanstveni interes imala je za biljno-parazitske nematode i njihovu taksonomsku identifikaciju, integriranu zaštitu poljoprivrednih kultura od nematoda, entomopatogene nematode za biološko suzbijanje kukaca i suzbijanje štetnih puževa u povrćarstvu. Bavila se i izučavanjem faune tla te uvođenjem novih metoda sterilizacije tla, prije svega solarnom energijom. Bila je voditelj dva znanstvena projekta i sudjelovala je u nekoliko drugih projekata. Sudjelovala je kao koautorica u pisanju triju knjiga i udžbenika. Sama je objavila 1998. sveučilišni udžbenik "Zoologija – štetne i korisne životinje u poljoprivredi", a u

Croatian monitoring instrument for disease and pest appearance, known as "AGRA". He acquired his knowledge abroad as well. As a FAO expert he spent two years in Algeria, and during short study trips he visited various institutes in the Netherlands, France, Germany, the USA and Ukraine. He published over 50 scientific and about hundred professional papers and several books, of which an especially valuable one titled "Integrated Protection of Orchards and Vineyards" was published in two editions.

Prof. Ljerka Oštrec PhD, (Zagreb, 1942 – Zagreb, 2009), graduated from the Faculty of Natural Sciences and Mathematics, the biological section majoring in Zoology. She worked at the Institute from 1969 to 1992, and at the Faculty of Agriculture until her retirement (Master's thesis: "Research on Oribatei-a Dugés Fauna Composition in Certain Types of Forest Soils", 1977; dissertation: "Parasitic Nematodes (Nemathelminthes, Nematoda) on Tobacco Plantations of Podravina and Their Significance in Tobacco Production", 1988).

She was involved in teaching since 1980 when she was elected assistant, in 1989 she was elected assistant lecturer, and in 1996 she becomes an associate professor in "Applied Zoology". She lectured also on the following subjects: "General Entomology" and "Fundamentals of Biology" at the undergraduate level and courses in "Acarology, Nematology" and "Urban Entomology" at the post-graduate level at the Faculty of Agriculture in Zagreb and the Agricultural High School in Križevci. She was a distinguished and conscientious teacher. She tutored in one doctoral and one Master's thesis and tens of graduation theses. She established a nematological laboratory at the Faculty of Agriculture. She specialised specifically in nematology, but she researched on both oribatide mites and snails. She specialised in taxonomic identification of nematodes in Wageningen, the Netherlands, in 1976. She had a special scientific interest in plant-parasitic nematodes and their taxonomic identification, integrated protection of agricultural crops against nematodes, entomopathogen nematodes for biological control of insects and control of harmful snails in production of vegetables. She was also dealing with the study of soil fauna and the introduction of new soil sterilisation methods, primarily solar energy. She was a coordinator of two scientific projects and participated in several other projects. As a co-author she participated in writing three

suautorstvu s Tanjom Gotlin Čuljak, 2005. knjigu "Opća entomologija". Napisala je pedesetak znanstvenih i stručnih radova, a izlagala je na brojnim skupovima u zemlji te na nekoliko u inozemstvu.

Mr.sc. **Vladimir Danon**, (1949.), nakon završetka Agromorskog fakulteta radi u Zavodu od 1976. do 1988., istražujući štetnike ratarskih usjeva, posebno zemljšne štetnike i štetnike uljane repice, (magistarski rad: "Proučavanje štetnika uljane repice s posebnim osvrtom na suzbijanje", 1984.). Provodio je istraživanja učinkovitosti insekticida i mogućnosti biološkog suzbijanja kukuruznog moljca jajnim parazitom *Trichogramma* sp. u okviru projekta USDA. U pokušima je istraživao utjecaj tretiranog sjemena na suzbijanje štetnika. Nakon odlaska iz Zavoda radi u Duhanskom institutu, a od 1992. u vlastitoj tvrtki. Autor je više desetaka znanstvenih i stručnih radova.

Prof. dr.sc. **Inoslava Balarin**, (Zagreb, 1927. – Zagreb, 1987.), diplomirala je na Poljoprivredno-šumarskom fakultetu u Zagrebu, 1951. Specijalizirala je entomologiju i opredijelila se za istraživanje Heteroptera (stjenica), poglavito onih na ratarskim kulturama, (magistarski rad: "Prilog poznавању i suzbijanju žitnih stjenica", 1966., disertacija "Fauna Heteroptera na krmnim leguminozama i prirodnim livadama u SRH", 1975.). Godine 1985. izabrana je u zvanje redovite profesorice na Agronomskom fakultetu, gdje je predavala entomološke predmete. Tijekom pedagoškoga, znanstvenoga i stručnog rada objavila je oko pedesetak bibliografskih jedinica, znanstvenih i stručnih te mnogo popularnih članaka. Bila je suautorica u nekoliko stručnih knjiga. Kao suradnica sudjelovala je u istraživanjima na nekoliko znanstvenih projekata, vodila je istraživanja o mogućnostima biološkog suzbijanja platanine stjenice i dr.

Prof. dr.sc. **Milan Maceljski**, (Zagreb, 1925. – Malinska, 2007.), nakon što je diplomirao na Agronomskom fakultetu (1950.) radio je kao agronom Fonda za mehanizaciju u Slavonskoj Orahovici, referent za zaštitu bilja u Fitosanitetskoj stanici Zagreb te referent i stručni savjetnik u tvrtki "Agrariacoop" u Zagrebu. Od 1961. bio je honorarni, a zatim

books and textbooks. Her first university textbook titled "Zoology – Harmful and Useful Animals in Agriculture" was published in 1998 and as a co-author with Tanja Gotlin Čuljak she wrote the book titled "General Entomology" in 2005. She wrote about fifty scientific and professional papers, and she presented papers at many meetings in Croatia and a few abroad.

Vladimir Danon MSc, (1949), having finished the Faculty of Agriculture, works at the Institute from 1976 to 1988, researching on pests in arable crops, especially soil pests and oil seed rape pests, (Master's thesis: "Research on Oil Seed Rape Pests with a Special Reference to Control", 1984). He conducted research on the efficacy of insecticides and possibilities of biological control of the European corn borer with the egg parasite *Trichogramma* sp. within the USDA project. In the experiments he researched on the impact of the treated seed on pest control. Having left the Institute he worked at the Tobacco Institute and from 1992 in his own company. He is the author of several tens of scientific and professional papers.

Prof. Inoslava Balarin PhD, (Zagreb, 1927 – Zagreb, 1987), graduated from the Faculty of Agriculture and Forestry in Zagreb, in 1951. She specialised in entomology and chose to research on Heteroptera (bug), mainly the ones on farming cultures (Master's thesis: "A Contribution to the Knowledge and Control of Corn Bugs", 1966, dissertation "Fauna Heteroptera on Forage Legumes and Natural Meadows in the Socialist Republic of Croatia", 1975). In 1985 she was elected full-time professor at the Faculty of Agriculture, where she lectured on entomological subjects. During her pedagogical, scientific and professional work she published about fifty bibliographic entries, scientific and professional and many popular articles. She was a co-author in several professional books. As an associate she participated in research on several scientific projects, she conducted research on possibilities of the biological control of the sycamore lace bug etc.

Prof. Milan Maceljski PhD, (Zagreb, 1925 – Malinska, 2007), having graduated from the Faculty of Agriculture (1950), worked as an agronomist at the Mechanisation Fund in Slavonska Orahovica, a plant protection officer at Zagreb Phytosanitary Station and an officer and expert advisor at the "Agrariacoop" company in Zagreb. From 1961 he was a part-time, and then full-time

redoviti asistent na predmetu Poljoprivredne entomologije na Agronomskom fakultetu, (dizertacija "Blitvina pipa - *Lixus junci* Boh. – novi opasni štetnik sjemenske šećerne repe na našem obalnom pojusu", 1963.). U zvanje docenta izabran je 1964., za izvanrednog profesora 1969., a za redovitog profesora na Agronomskom fakultetu u Zagrebu 1974. Od 1973. do 1976. bio je predsjednik Biotehničkog OOOUR-a Agronomskog fakulteta, od 1978. do 1985. direktor Zavoda za zaštitu bilja, od 1985. do 1987. dekan Agronomskog fakulteta, a od 1988. do umirovljenja 1993. predstojnik Zavoda za poljoprivrednu zoologiju. Počasna titula *professor emeritus* dodijeljena mu je 2000.

Izabran je za redovitog člana Hrvatske akademije znanosti i umjetnosti 1992., a za predsjednika Znanstvenog vijeća za poljoprivredu i šumarstvo iste Akademije 1999. Bio je dopisni član talijanske Accademia dei Georgofili, a 1999. izabran je za dopisnog člana Slovenske akademije znanosti in umetnosti.

Na dodiplomskoj i postdiplomskoj nastavi predavao je više predmeta iz područja entomologije i zaštite bilja. Aktivno je sudjelovao u pokretanju poslijediplomskog studija zaštite bilja u kojem je od 1962. nositelj kolegija "Fitofarmacija" i "Aplikacija" pesticida. Od 1970. do 1994. voditelj je tog studija. Pokrenuo je i obrazložio potrebu osnivanja usmjerena Zaštita bilja na dodiplomskom studiju 1982., kojeg je bio voditelj od 1982. do 1990. Vodio je više desetaka diplomskih radova. Pod njegovim je vodstvom magistriralo 30 i doktoriralo 16 znanstvenika.

Bavio se entomologijom, fitofarmacijom, aplikacijom pesticida, integriranom zaštitom bilja od štetnika i ekološkom zaštitom bilja. Bio je glavni istraživač mnogo znanstvenih projekata koje su finansirali Ministarstvo znanosti i Vlada SAD-a, npr. "Proučavanje djelovanja inertnih prašiva na insekte", "Proučavanje vrste *Autographa gamma* L.", "Biološko suzbijanje nametnika", "Biološko suzbijanje šest sjevernoameričkih i jugoslavenskih korova" i "Biološko suzbijanje korova."

Prvi "Seminar biljne zaštite" organizirali su M. Maceljski i prof. Željko Kovačević 1957., uza sudjelovanje tridesetak sudsionika. M. Maceljski je bio nazočan na svakom od njih

assistant in the subject titled *Agricultural Entomology at the Faculty of Agriculture* (dissertation "Common Beet Weevil - *Lixus junci* Boh. – the New Harmful Pest of Sugarbeet for Seed Production in the Croatian Coastal Area", 1963). He was elected assistant lecturer in 1964, associate professor in 1969, and full-time professor at the Faculty of Agriculture in Zagreb in 1974. From 1973 to 1976 he was the president of the Biotechnical Department at the Faculty of Agriculture, from 1978 to 1985 the director of the Institute for Plant Protection, from 1985 to 1987 the dean of the Faculty of Agriculture, and from 1988 until his retirement in 1993 the Head of the Department of Agricultural Zoology. He was awarded an honorary title of professor emeritus in 2000.

In 1992 he was elected full-time member of the Croatian Academy of Science and Art, and the president of the Scientific Council for Agriculture and Forestry at the same Academy in 1999. He was a corresponding member of the Italian Accademia dei Georgofili, and in 1999 he was elected corresponding member of the Slovenian Academy of Science and Art.

In undergraduate and postgraduate classes he lectured on several subjects in the field of entomology and plant protection. He actively participated in initiating the postgraduate study of plant protection where he tutored in the courses of "Phytopharmacy" and "Application of Pesticides" from 1962. From 1970 to 1994 he is the head of this study. He initiated and explained the need to establish the study of Plant Protection at the undergraduate study in 1982, which he was the head of from 1982 to 1990. He tutored in several tens of graduate theses. Under his tutorship 30 scientists obtained a Master's and 16 a doctoral degree.

He was dealing with entomology, phytopharmacy, application of pesticides, integrated plant protection against pests and ecological plant protection. He was the main researcher in many scientific projects financed by the Ministry of Science and the Government of the USA, e.g. "Study of Inert Dusts Effects on Insects", "Study of *Autographa gamma* L.", "Biological Pest Control", "Biological Control of Six North-American and Yugoslav Weeds" and "Biological Weed Control".

The first "Plant Protection Seminar" was organised by M. Maceljski and Prof. Željko Kovačević PhD in 1957, with parti-

od 1957. do 2007. održavši jedno ili više izlaganja. Na međunarodnim skupovima u inozemstvu održao je mnoga predavanja i priopćenja na engleskom, njemačkom, francuskom i talijanskom jeziku.

Bio je glavni urednik ili član uredivačkih odbora mnogih znanstvenih i stručnih časopisa, a u rekordnom razdoblju od 1957. do veljače 2007. glavni i odgovorni urednik Glasnika, a poslije Glasila biljne zaštite. U svakom godištu u dvostrukoj Glasniku i Glasila, u svojstvu prvog autora, objavljivao je "Popis sredstava za zaštitu bilja" koja su imala dozvolu za stavljanje u promet na području Hrvatske. Taj popis dobro su prihvaćali stručnjaci na terenu, ali i studenti. Između ostalih, uredivao je časopise Entomologia Croatica, Acta forestales te više priručnika i zbornika znanstvenih skupova. Bio je urednik i koautor prvog "Atlasa biljnih bolesti i štetnika". Godine 1991. pokrenuo je i bio urednik edicije "Savjeti poljodjelcima" Matice Hrvatske, namijenjene prilagodbi u ratnim uvjetima (7 tiskanih uputa).

Bio je višegodišnji predsjednik i član Komisije za zaštitu bilja, a početkom 1993. jedan je od autora službene "Strategije razvoja hrvatske poljoprivrede", koju je prihvatio Sabor RH. Suautor je nacionalnog izvješća "Hrvatska poljoprivreda na raskriju". Imenovan je 1998. za predsjednika Povjerenstva za nadzor nad istraživanjima sjemena transgenih biljaka, a 2004. za predsjednika Vijeća za poljoprivrednu politiku Vlade RH. Godine 1991. uvršten je u "European directory of pesticide experts". Aktivnost svoga članstva, dijelio je u više međunarodnih radnih skupina IOBC-a i EWRS-a. Četiri godine bio je član Savjeta Međunarodne organizacije za biološko suzbijanje (IOBC). Od 1982. do 1988. bio je voditelj radne skupine "Corythuca ciliata".

U svom istraživačkom radu, u trajanju od više od 40 godina, M. Maceljski dao je velik znanstveni doprinos entomologiji i fitofarmaciji te utjecao na znanstveni razvoj tih dviju disciplina. Prvi se počeo znanstveno baviti aplikacijom pesticida, ukazao na važnost štetnika u tlu, utvrdio je interakcije između štetnika i korova i mjera njihova suzbijanja, ukazao na važnost integrirane zaštite bilja već 1967., dokazao

pation of about thirty attendees. M. Maceljski attended every one of them held from 1957 to 2007 having given one or several presentations. At international meetings abroad he gave many lectures and reports in English, German, French and Italian.

He was the chief editor or a member of editing boards at many scientific and professional journals and in the record period from 1957 until February 2007 he was the editor-in-chief at "Glasnik zaštite bilja" (Plant Protection Herald), and thereafter at "Glasilo biljne zaštite" (Plant Protection Bulletin). In every volume of two editions of the Herald and the Journal, in the role of the first author, he published the "List of Plant Protection Products" registered in Croatia. This list was well accepted by agricultural experts, farmers and students. Among others, he edited at the magazines called Entomologia Croatica, Acta forestales and several manuals and collections of papers from scientific conferences. He was editor and co-author of the first "Atlas of Plant Diseases and Pests". In 1991 he initiated and edited at the publication of "Advice to Farmers" by Matica Hrvatska, intended for adjustment to war conditions (7 printed instructions).

For many years he was the president and a member of the Plant Protection Committee, and by the beginning of 1993 he is one of the authors of the official "Croatian Agriculture Development Strategy", accepted by the Parliament of the Republic of Croatia. He is a co-author of the national report titled "Croatian Agriculture at the Crossroads". In 1998 he was appointed president of the Transgenic Plant Seed Research Monitoring Committee, and in 2004 president of the Agricultural Policy Council of the Government of the Republic of Croatia. In 1991 he was included in the "European Directory of Pesticide Experts". He was an active member of several international working groups at IOBC and EWRS. For four years he was a member of the International Organisation for Biological Control Council (IOBC). From 1982 to 1988 he was the "Corythuca ciliata" working group leader.

In his research work, which lasted over 40 years, M. Maceljski made a huge scientific contribution to entomology and phytopharmacy and influenced the scientific development of these two disciplines. He was the first one to have started scientifically dealing with the application of pesticides, pointed to the

rezistentnost krumpirove zlatice na DDT i druge insekticide te istraživao djelotvornost bioloških insekticida. Pronašao je i neke nove vrste kukaca u našoj entomofauni i proučio njihovu biologiju i ekologiju. Iz brojnih istraživanja nastao je velik broj znanstvenih i stručnih radova. M. Maceljski objavio je 66 znanstvenih radova, od čega 15 u inozemstvu, 104 znanstvena priopćenja i visoko stručnih radova, 9 pozivnih izlaganja, 6 preglednih radova, oko 680 stručnih i stručno-popularnih radova u raznim časopisima. Sam i u koautorstvu napisao je 35 knjiga i sveučilišnih skriptata, 1 monografiju te 23 popularna izdanja u vidu brošura. Posebno je želio prenijeti novosti do proizvođača poljoprivrednih proizvoda. To je proveo sudjelovanjem u radioemisijama i stručnim emisijama na TV-u i popularnim člancima kojih je objavio više od 1000.

Za svoj predani rad primio je brojne nagrade. Dobitnik je godišnje Državne nagrade za popularizaciju i promidžbu znanosti za područje biotehničkih znanosti 1997. i Nagrada za životno djelo 1999.

U inozemstvu je bio priznat i vrlo cijenjen znanstvenik, čime je pridonio priznavanju i ugledu naše znanosti u svijetu.

U razdoblju od 1994. do 2007., deset godina je bio predsjednik Upravnog vijeća Zavoda za zaštitu bilja u poljoprivredi i šumarstvu RH, a nakon toga je bio njegov član.

Nemoguće je nabrojiti sve dužnosti, sva zaduženja ili poslove koje obavljao, a svima je pristupao nematljivom prnicljivošću i temeljitošću.

Prof. dr.sc. **Jasminka Igrc Barčić**, (1953.), radila je u Zavodu od 1978. do 1992., (magistarski rad: "Prilog poznавању kompatibilnosti pesticida", 1983.; disertacija: "Proučavanje zlatice *Zyogramma suturalis* Fabricius (Coleoptera Chrysomelidae) – potencijalnog agensa biološkog suzbijanja korova *Ambrosia artemisiifolia* L.", 1987.).

Godine 1978. postaje pripravnica u Zavodu pa potom prolazi sve stepenice u znanstvenim i nastavnim zvanjima: 1979. asistentica, 1988. docentica, 1992. izvanredna profesorica, 1997. redovita profesorica, 2000. redovita profesorica u trajnom zvanju. Predavala je 6 kolegija na starom dodiplomskom stu-

importance of pests in soil, identified interactions between pests and weeds and measures for their control, pointed to the importance of integrated plant protection as early as in 1967, provided evidence of Colorado potato beetle resistance to DDT and other insecticides and conducted research on the efficacy of biological insecticides. Furthermore, he detected certain new species of insects in the Croatian entomofauna and studied their biology and ecology. Numerous research works resulted in a large number of scientific and professional papers. M. Maceljski published 66 scientific papers, 15 of which abroad, 104 scientific notices and highly professional papers, 9 complimentary presentations, 6 overview papers, about 680 professional and professional-popular papers in various magazines. Individually and as a co-author he wrote 35 books and university scripts, 1 monograph and 23 popular editions in the form of brochures. He was especially eager to convey the news to the producers of agricultural products. He carried it out by participating in radio-shows and professional TV-programmes and by publishing over 1000 popular articles.

He received numerous awards for his devoted work. He was awarded with the annual National Award for Popularisation and Promotion of Sciences in the field of biotechnical sciences in 1997 and with the Lifetime Achievements Award in 1999.

From 1994 to 2007, for ten years he was the Management Council president of the Institute for Plant Protection, after which he was a member of the council.

He was a recognised and a much appreciated scientist abroad, thus making a contribution to the recognition and reputation of the Croatian science in the world.

It is impossible to list all the duties, all the obligations or tasks he performed, approaching them all with an unobtrusive insight and thoroughness.

*Prof. Jasminka Igrc Barčić PhD, (1953), worked at the Institute from 1978 to 1992, (Master's thesis: "A Contribution to the Knowledge of Pesticide Compatibility", 1983; dissertation: "Research on Ragweed Leaf Beetle *Zyogramma suturalis* Fabricius (Coleoptera Chrysomelidae) – a Potential Biological Control Agent of the *Ambrosia artemisiifolia* L. Weed", 1987).*

diju, 4 na novom prediplomskom i 4 na diplomskom studiju. Predavala je 6 kolegija na poslijediplomskom studiju Zaštita bilja i 1 na Ribarstvenoj ekotoksikologiji te 1 na doktorskom studiju u Zagrebu, na prediplomskom studiju u Splitu kao nositelj modula "Osnove fitomedicine", "Zaštitu bilja" na Visokom gospodarskom učilištu u Križevcima te redovitim studentima "Entomologiju s fitofarmacijom" u Mostaru. Bila je vrnsna i vrlo cijenjena nastavnica i pedagoginja. Vodila je više od 100 diplomskih radova, 13 magistarskih radova i 8 doktorskih disertacija. U tri je mandata bila prodekanica za nastavu Agronomskog fakulteta (1991.-1993; 1997.-1999.; 1999.-2001.), 10 je godina bila voditeljica usmjerjenja Zaštita bilja, a od 1996. do 2009. bila je voditeljica poslijediplomskog studija Zaštita bilja.

Cetrtnaest je godina bila voditeljica Izvještajno-prognozne službe za cijelo područje Hrvatske (1978. – 1992.), a 10 godina član Komisije za zaštitu bilja MPŠ-a. Istraživala je štetnu i korisnu faunu kukaca u ratarstvu, povrćarstvu, ukrasnom bilju i voćarstvu, no najviše se posvetila istraživanjima faune, biologije i ekologije lisnih ušiju. Njezinom zaslugom na fakultetu je postavljen ACTAFID, uređaj za praćenje dinamike leta i pojave lisnih ušiju. Posebno je proučavala biološko suzbijanje korova i kukaca, uvodeći nove neprijatelje korova *Ambrosia artemisiifolia* na područje Europe i Hrvatske.

Objavila je više od 180 znanstvenih i stručnih radova u međunarodnim i domaćim časopisima, održala 111 izlaganja na međunarodnim i više od 150 na domaćim skupovima. Suautorica je u 5 udžbenika, 3 knjige i autorica 1 knjige. Vodila je 7 međunarodnih projekata (USDA, FAO, COST 816), te 7 domaćih znanstvenih projekata. Bila je predstavnica u dva Steering Committee: Behavioural Ecology of Insect parasitoides – European Science Foundation i IWGO Integrated pest management for WCR in Central and Eastern Europe. Usavršavala je znanja u mnogim institucijama u inozemstvu SAD (6) i Francuska (2). Aktivni je član raznih povjerenstava, radnih skupina, uređivačkih odbora, a osobito se ističe svojim članstvom i kao predsjednica Hrvatskog društva bilj-

In 1978 she becomes a trainee at the Institute passing thereafter all the steps in scientific and teaching positions: in 1979 an assistant, in 1988 an assistant lecturer, in 1992 a part-time professor, in 1997 a full-time professor, in 2000 a full-time professor in permanent rank. She lectured on 6 courses at the previous graduate study and 4 at the undergraduate as well as 4 at the graduate study according to the new program. She lectured on 6 courses at the postgraduate study of the Plant Protection and 1 at the Fishery Ecotoxicology and 1 at the doctoral study in Zagreb, on undergraduate study in Split teaching general phytomedicine, plant protection on Agricultural High School in Križevci and entomology with phytopharmacy to students in Mostar. She was a competent and much appreciated teacher and educator. She tutored in over 100 graduate theses, 13 Master's theses and 8 doctoral dissertations. For three mandates she was a vice-dean for the education at the Faculty of Agriculture (1991-1993; 1997-1999; 1999-2001), for 10 years she was the manager of the major course in the Plant Protection, and from 1996 to 2009 she was the leader of the postgraduate study of the Plant Protection.

For fourteen years she was leading the Reporting-Forecasting Service for the entire territory of Croatia (1978 – 1992) and for 10 years a member of the Plant Protection Committee at MAF. She was dealing with harmful and useful fauna of insects in arable crops, vegetable crops, ornamental plants and pomology, but she was dedicated mostly to the research on fauna, biology and ecology of aphids. It was her merit to install ACTAFID at the Faculty of Agriculture in Zagreb, a monitoring instrument for the flight and appearance dynamics of aphids. In particular she was dealing with biological control of weeds and insects, introducing new enemies of the Ambrosia artemisiifolia weed to the territory of Europe and Croatia.

She published over 180 scientific and professional papers in international and Croatian journals; she held 111 presentations at international and over 150 at the Croatian conferences. She is a co-author in 5 textbooks, 3 books and the author of 1 book. She led 7 international projects (USDA, FAO, COST 816) and 7 Croatian scientific projects. She was a representative in two Steering Committees: Behavioural Ecology of Insect Parasitoides – European Science Foundation and IWGO Integrated Pest Man-

ne zaštite u dva mandata, zalažeći se uvijek za unapređenje zaštite bilja.

Mr.sc. **Vlasta Žlof**, (1962.), u Zavodu je radila deset godina, s prekidima, u razdoblju od 1985. do 1997., (magistarski rad: "Entomofauna *Euphorbia esula* Lagg. (Euphorbiaceae) u Hrvatskoj s posebnim osvrtom na vrstu *Aphthona venustula* Kutsch (Coleoptera: Chrysomelidae", 1991.). Predstavnica Republike Hrvatske u EPPO-u je od 1993. do 1997. U EPPO-u radi od 1998. do danas, gdje vodi razne radne skupine za SZB, dijagnostiku i determinaciju karantenski štetnih organizama, fitosanitarne regulative i dr. Također, sudjeluje u radnoj skupini za pesticide OECD-a. Sudjelovala je u nastavi na Agronomskom fakultetu te u znanstvenim projektima iz područja biološkog suzbijanja i integrirane zaštite bilja, u izvještajno-prognoznoj službi, radila je na determinaciji insekata, aprobaciji sjemenskih usjeva u polju, istraživanju učinkovitosti sredstava za zaštitu bilja i dr. Specijalizaciju iz područja entomologije obavila je u Velikoj Britaniji, Francuskoj i SAD-u. Sudjelovala je na mnogim stručnim i znanstvenim skupovima u zemlji i inozemstvu te objavila 7 stručnih i 12 znanstvenih radova.

Kraće su razdoblje u Zavodu radili: mr.sc. Siniša Dorontić, mr.sc. Piruška Dinarina, mr.sc. Josip Špoljarić, dr.sc. Vladimir Pelicarić, mr.sc. Vera Koroskoski i dr.

Mr.sc. **Radoslav Masten**, (1945.), (magistarski rad: "Štetnici vinove loze u nekim područjima sjeverozapadne Hrvatske", 1981.) – specijalist za zaštitu voćaka i vinove loze od štetnika.

Dolaskom u Zavod, uz prof. dr.sc. Ivana Ciglara, usmjerava se u zaštitu voćaka i vinove loze od štetnika. Dugi niz godina provodio je biološka istraživanja učinkovitosti insekticida i akaricida za suzbijanje štetnika na voćkama i vinovoj lozi u sklopu postupka izdavanja stalne dozvole za stavljanje u promet sredstava za zaštitu bilja u Hrvatskoj. Sudjelovalo je u programu zaštite na objektima kao što su "Borinci", PIK "Umag", PIK "Neretva", "Moslavačko vinogorje", PPK "Kutjevo", Poljoprivredni institut Osijek-Stanica za voćarstvo i dr.

Godine 1990. postaje ravnateljem Zavoda te više od osmaest godina obavlja tu dužnost. U tom razdoblju zaštitu bilja, pa i sama institucija, prolazi kroz teško razdoblje u kojem

agement for WCR in Central and Eastern Europe. She improved her knowledge in many institutions abroad, like the USA (6) and France (2). She is an active member of various committees, working groups, editing boards, and she particularly excels herself with being a member and the president of the Croatian Plant Protection Society (CPPS) in two mandates, advocating always the improvement of the plant protection.

Vlasta Žlof MSc, (1962), worked at the Institute for ten years, with interruptions, in the period from 1985 to 1997, (Master's thesis: "Entomofauna *Euphorbia esula* Lagg. (Euphorbiaceae) in Croatia with a Special Reference to the *Aphthona venustula* Kutsch (Coleoptera: Chrysomelidae", 1991). She is a representative of the Republic of Croatia in EPPO from 1993 to 1997. She has worked at EPPO since 1998 until today, where she leads various working groups for PPP, diagnostics and determination of quarantine harmful organisms, phytosanitary regulations etc. Furthermore, she participates in a working group for pesticides of OECD. She participated in teaching classes at the Faculty of Agriculture and in scientific projects in the field of biological control and integrated plant protection, in the reporting-forecasting service; she worked on determination of insects, surveillance of crops for seed production, research on the efficacy of plant protection products etc. She completed her specialisation course in the field of entomology in Great Britain, France and the USA. She participated in many professional and scientific conferences in Croatia and abroad and published 7 professional and 12 scientific papers.

For a short period of time the Institute employed the following experts: Siniša Dorontić MSc, Piruška Dinarina MSc, Josip Špoljarić MSc, Vladimir Pelicarić PhD, Vera Koroskoski MSc etc.

Radoslav Masten MSc, (1945), (Master's thesis: "Vine Pests in Some Areas of the North-West of Croatia", 1981) – a specialist in the protection of fruit trees and vine against pests.

Upon arrival to the Institute, next to Prof. Ivan Ciglar PhD, he focuses on the protection of fruit trees and vine against pests. For many years he has been conducting biological research on the efficacy of insecticides and acaricides for pest control on fruit trees and vine within the procedure of registration of plant protection products in Croatia. He participated in the protec-

je ravnatelj uspio očuvati jednu jezgru zaštite bilja u službi hrvatske poljoprivrede.

Zdušno potiče napredovanje stručnjaka Zavoda, pružajući im mogućnost pohađanja magistarskih i doktorskih studija te različitih specijalizacija i suradnji radi podizanja znanstvene i stručne razine Zavoda. Tijekom njegova ravnateljskog mandata, Zavod je iznjedrio 10 magistara znanosti i 4 doktora znanosti iz znanstvenog polja fitomedicine.

Njegovo višegodišnje zalaganje i neumorna borba za novi, prikladniji prostor koji nedostaje Zavodu, pridonijeli su ostvarenju sna o izgradnji nove zgrade, za koju je u 2008. dobivena gradevinska dozvola te je početkom 2010. započeta gradnja na lokaciji Rim 98 u Zagrebu.

Iako je dugi niz godina obnašao dužnost ravnatelja, istodobno sudjeluje u rješavanju entomoloških problema u voćarstvu i vinogradarstvu na području cijele Hrvatske, kao i u biološkim istraživanjima učinkovitosti insekticida u voćarstvu i vinogradarstvu. Posljednjih godina uključio se i u zdravstvene preglede sadnog materijala voćaka i vinove loze.

Hrvatsko društvo biljne zaštite dodijelilo mu je, 2009., zlatnu povelju uz zlatnu plaketu za doprinos u osnivanju Hrvatskog društva biljne zaštite i svekoliku potporu društvu. Član je Hrvatskog društva biljne zaštite i Povjerenstva za trajne nasade. Bio je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavio je više desetaka stručnih i popularnih članaka. Umirovljen je 1. svibnja 2010.

Dr.sc. Darka Hamel, (1956.), (magisterski rad: "Štetnici soje i sojine sačme u nas", 1985.; disertacija: "Ugljični dioksid kao sredstvo za zaštitu bilja", 1994.) – specijalistica za zaštitu uskladištenih poljoprivrednih proizvoda. Magisterski rad i disertacija napravljeni su u sklopu projekata koje je finansiralo Ministarstvo poljoprivredes SAD (USDA). Istraživala je učinkovitost insekticida koji se koriste za suzbijanje skladišnih štetnika te rodenticida koji se primjenjuju u skladištima poljoprivrednih proizvoda ili na poljoprivrednim površinama. Specijalizacije s područja zaštite uskladištenih proizvoda, fumiganata i feromona obavila je u: INRA, Montpellier, Fran-

tion programme of the facilities like "Borinci", and companies "Umag", "Neretva", "Moslavačko vinogorje", "Kutjevo", as well as Agricultural Institute Osijek-Station for Pomology etc.

In 1990 he became the Head of the Institute and for over eighteen years he had performed this duty. This was a tough period for the plant protection, and the institution itself, where the Head thereof succeeded in saving one entity of the plant protection at the service of the Croatian agriculture.

He wholeheartedly encouraged the improvement of experts at the Institute, providing them with the opportunity to attend studies to obtain Master's or doctoral degree and various specialisation and cooperation courses in order to raise the scientific and professional level of the Institute. 10 Masters of Science and 5 Doctors of Science completed their specialisation courses in the scientific field of phytomedicine during his mandate as the Head of the Institute.

His perennial advocating and tireless struggle for a new, adequate premises lacking at the Institute, contributed to a dream about the construction of a new building come true; the building permit was obtained in 2008 and at the beginning of 2010 the construction began at the location of Rim 98 in Zagreb.

Although for many years he has performed the duty of the Head, at the same time he participates in the solution of entomological problems in orchards and vineyards on the territory of the entire Croatia, as well as in biological research on the efficacy of insecticides in pomology and vineyards. In the past years he got involved in health surveillance of the fruit and vine planting material.

CPPS awarded him, in 2009, with a golden charter in addition to the golden plaque for a contribution in the establishment of the CPPS and the overall support to the Society. He is a member of the CPPS and the Committee for Permanent Plantations. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. He published several tens of professional and popular articles. He was retired on 1 May 2010.

Darka Hamel PhD, (1956), (Master's thesis: "Soybean and Soybean Meal Pests in Croatia", 1985; dissertation: "Carbon Dioxide as a Plant Protection Product", 1994) – a specialist in the protection of stored agricultural products. Master's thesis and dissertation were

cuska, 1983., u USDA-Stored Product Laboratory, Savannah, Manhattan, SAD, 1985. i 1988., u CINADCO, Tel Aviv, Izrael, 1990., u Insects Limited, Bologna, Italija, 1993., u Insects Limited, Solun, Grčka, 2001. te u Insects Limited, Kopenhagen, Danska, 2003. Od 2006.-2009. obnašala je dužnost stručne voditeljice Zavoda. Također je obnašala dužnost v.d. ravnateljice u razdoblju 1994. - 1995. te dužnost v.d. predstojnice Zavoda 2009. - 2010. U sklopu izvještajno-prognoznih poslova određuje nazočne populacije skladišnih štetnika i glodavaca te puževa. Od 2005 član je MBTOC (Tehnički odbor za metil bromid). Član je Hrvatskoga entomološkog društva i Hrvatskog društva biljne zaštite. Stečenim iskustvima koristi se danas pri ocjenjivanju dokumentacije u postupku registracije sredstava za zaštitu bilja. Bila je član radnih skupina za poglavljje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor te poglavljje Okoliš u pregovorima o pristupanju EU. Objavila je 90 stručnih i znanstvenih radova te popularnih članaka.

Dr.sc. Željko Budinšćak, (1962.), (magisterski rad: "Štetnici pupova, listova i pokožice plodova iz porodica Tortricidae Geometridae i Noctuidae (Lepidoptera) na jabuci", 1993.; disertacija: "Vektori fitoplazmi voćaka i vinove loze u Republici Hrvatskoj", 2008.) – specijalist za štetnike voćaka i vinove loze. U višegodišnjem radu uz istraživanja učinkovitosti insekticida na štetnike voćaka i vinove loze pratilo je njihove pojave i sudjelovalo u izradi programa integrirane zaštite u mnogim voćnjacima u Hrvatskoj. Danas sudjeluje u programima posebnog nadzora i zdravstvenim pregledima voćnoga i loznoga sadnog materijala. U okviru programa posebnog nadzora prvi u Hrvatskoj pronašao je orahovu muhu - *Rhagoletis completa*, također stečenim iskustvima koristi se danas pri ocjenjivanju dokumentacije u postupku registracije sredstava za zaštitu bilja. Specijalizaciju s područja dijagnostike vektora fitoplazmi voćaka i vinove loze, lisne buhe (Psyllidae) i cvrčaka (Auchenorrhyncha) provodi u Novoj Gorici, Slovenija, 2003. i 2004., dok je specijalizirao dijagnostiku leptira (Lepidoptera), s naglaskom na porodicu Tortricidae, na Sveučilištu Molise (Università degli studi del Molise), Campobasso, Italija 2005. Održao je mnoga predavanja proizvođačima i na znanstvenim

made within the projects financed by USDA. She researched on the efficacy of insecticides used for the control of storage product pests and rodenticides applied in the storages of agricultural products or on agricultural fields. Also she uses the acquired experience in evaluating the documentation in the registration procedure of plant protection products. She completed specialisation courses in the field of the protection of stored products, fumigants and pheromones on several occasions: at INRA, Montpellier, France, in 1983, at USDA-Stored Product Laboratory, Savannah, Manhattan, USA, in 1985 and 1988, at CINADCO, Tel Aviv, Israel, in 1990, at Insects Limited, Bologna, Italy, in 1993, at Insects Limited, Thessaloniki, Greece, in 2001 and at Insects Limited, Copenhagen, Denmark, in 2003. From 2006-2009 she performed the duty of the expert head of the Institute. She also performed the duty of the acting head in the period 1994-1995 and the duty of the Acting Head of the Institute from 2009-2010. Within reporting-forecasting tasks she identifies present populations of storage pests, rodents and snails. Since 2005 she is a member of MBTOC (Methyl Bromide Technical Option Committee). She is a member of the Croatian Entomological Society and CPPS. She held many presentations at conferences in Croatia and some abroad. She was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy and Chapter Environment in the negotiations for accession to the EU. She published 90 professional and scientific papers and popular articles.

Željko Budinšćak PhD, (1962), (Master's thesis: "Bud, Leaf and Peel Pests from the Family of Tortricidae Geometridae and Noctuidae (Lepidoptera) on Apple", 1993; dissertation: "Vectors of Fruit Tree and Vine Phytoplasma in the Republic of Croatia", 2008) – a specialist in fruit tree and vine pests. In addition to research on the efficacy of insecticides and acaricides in the procedure of registration to control fruit tree and vine pests for many years he has monitored their appearance and participated in preparing the programme of integrated protection in many orchards in Croatia. Today, he participates in surveys and in health surveillance of fruit and vine planting material. Within the survey he detected as the first in Croatia Rhagoletis completa; also he uses the acquired experience in evaluating the

i stručnim skupovima u Hrvatskoj te nekoliko u inozemstvu. Bio je član radne skupine za poglavlje Sigurnost hrane, vetrinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavio je desetak znanstvenih i stručnih radova te više od tridesetak popularnih članaka.

Dr.sc. **Mladen Šimala**, (1963.), (magisterski rad: "Frankliniella occidentalis (Perg.) (Thysanoptera, Thripidae) novi štetnik povrća i ukrasnog bilja u Hrvatskoj", 1994., disertacija: "Fauna štitastih moljaca (Insecta: Hemiptera: Aleyrodidae) u Republici Hrvatskoj s posebnim osvrtom na vrstu *Bemisia tabaci* (Gennadius, 1889)", 2008.) – specijalist iz područja dijagnostike štitastih moljaca, tripsa, buha i nekih lisnih minera.

Od početka rada u Zavodu usmjeravao se na istraživanja populacije faune štetnika u ratarskim i povrćarskim kulturama, bilja u zaštićenim prostorima te njihova suzbijanja. Radio je na zaživljavanju biološkog suzbijanja u zaštićenim prostorima te u tu svrhu obavio specijalizaciju na temu dijagnostike predatora i parazitoida štetnika u zaštićenim prostorima u Koppertu, Berkel en Rodenrijs, Rotterdam, Nizozemska, 2003.

Dijagnostiku štitastih moljaca (Aleyrodidae), uključujući i vrstu duhanov štitasti moljac (*Bemisia tabaci*), specijalizirao je u: u Poljoprivredno-šumarskom zavodu (Kmetijsko - gozdarški zavod), Nova Gorica, Slovenija, 2001. i 2002. te u Službi za zaštitu bilja (Plantenziektenkundige Dienst), Wageningen, Nizozemska, 2004. i 2005.

Dijagnostiku tripsa (Thysanoptera) izučio je te usavršio također u Poljoprivredno-šumarskom zavodu, Nova Gorica, Slovenija, 2003. te u Službi za zaštitu bilja, Wageningen, Nizozemska, 2004. i 2005.

Specijalizaciju s područja lisnih buha (Psyllidae) i lisnih minera (Agromyzidae) obavio je u Službi za zaštitu bilja, Wageningen, Nizozemska, 2005.

Zaslužan je za prvi nalaz graškovog lisnog minera *Liriomyza huidobrensis*. Tripsi *Frankliniella occidentalis*, *Echinothrips americanus*, *Hercinothrips femoralis*, *Parthenothrips dracaenae* i *Thrips simplex*, nove su vrste za hrvatsku faunu koje je također otkrio M. Šimala u svojim istraživanjima.

documentation in the registration procedure of plant protection products. He completed a specialisation course in the field of vector diagnostics of fruit tree and vine phytoplasma, psyllids (Psyllidae) and crickets (Auchenorrhyncha) in Nova Gorica, Slovenia, in 2003 and 2004, whereas he completed a specialisation course in butterfly diagnostics (Lepidoptera), with an emphasis on the family of Tortricidae, at the Italian University of Molise, Campobasso, in 2005. He held many presentations to farmers and at conferences in Croatia and some abroad. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. He published about ten scientific and professional papers and over thirty popular articles.

Mladen Šimala PhD, (1963), (Master's thesis: "Frankliniella occidentalis (Perg.) (Thysanoptera, Thripidae) the New Vegetable and Decorative Plant Pest in Croatia", 1994, dissertation: "Fauna of Whiteflies (Insecta: Hemiptera: Aleyrodidae) in the Republic of Croatia with a Special Reference to the *Bemisia tabaci* (Gennadius, 1889)", 2008) – a specialist in diagnostics of whiteflies, thrips, psyllids and some leaf miner flies.

Since he started working at the Institute he focused on the research on fauna population of pests in farming and vegetable crops, plants in greenhouses and their control. He worked on the implementation of biological control in greenhouses and for the purpose hereof he completed a specialisation course in diagnostics of predators and parasitoids of pests in greenhouses at Koppert, in Berkel en Rodenrijs, Rotterdam, the Netherlands, in 2003.

He completed a specialisation course in diagnostics of whiteflies (Aleyrodidae), including the species of tobacco whiteflies (*Bemisia tabaci*), on several occasions: at the Agriculture and Forestry Institute Nova Gorica, Slovenia, in 2001 and 2002 and at the Plant Protection Service, Wageningen, the Netherlands, in 2004 and 2005. He studied and improved the diagnostics of thrips (Thysanoptera) also on several occasions at the Agriculture and Forestry Institute, Nova Gorica, Slovenia, in 2003 and at the Plant Protection Service, Wageningen, the Netherlands, in 2004 and 2005. He completed a specialisation course in the field of psyllids (Psyllidae) and leaf miner flies (Agromyzidae)

Tijekom faunističkih istraživanja otkrio je i 20 novih vrsta štitastih moljaca za Hrvatsku: *Aleurochiton acerinus*, *A. pseudoplatani*, *Aleuroclava hikosanensis*, *A. jasmini*, *Aleurolobus wunni*, *Aleurotuba jelinekii*, *Aleuroviggianus adrianae*, *Aleyrodes asari*, *A. elevatus*, *A. lonicerae*, *Asterobemisia carpini*, *A. obenbergeri*, *A. paveli*, *Bemisia afer*, *Massilieuropodes chittendeni*, *Massilieuropodes setiger*, *Neopealius rubi*, *Simplaleurodes hemisphaerica*, *Tetraleurodes hederae* i *Tetralicia ericae*.

Istraživao je učinkovitost insekticida i akaricida koji su temeljem rezultata i prijedloga bili registrirani u Hrvatskoj. Stečenim iskustvima koristi se danas pri ocjenjivanju dokumentacije u postupku registracije sredstava za zaštitu bilja.

Bio je na brojnim studijskim putovanjima i stručnim i znanstvenim skupovima u Portugalu, Češkoj, Mađarskoj, Kanadi, Velikoj Britaniji, Francuskoj, Sloveniji, Austriji i Italiji, na kojima je aktivno sudjelovao. Član je Hrvatskoga entomološkog društva i Hrvatskog društva biljne zaštite. Danas obnaša dužnost rukovoditelja Odjela za dijagnostiku. Bio je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavio je 20 znanstvenih i više od 60 stručnih radova i sažetaka. Krajem 2009. godine, u znanstvenom zvanju stiče status znanstvenog suradnika.

Dr.sc. Tatjana Masten Milek, (1969.), (magistarski rad: "Izveštajno-prognozni poslovi kao temelj ekonomske i ekološke zaštite bilja u Republici Hrvatskoj", 2002.; disertacija: "Fauna štitastih uši (Insecta: Coccoidea) u Republici Hrvatskoj", 2007.) – jedina specijalistica iz područja dijagnostike štitastih ušiju poljoprivrednoga i šumarskog bilja u Hrvatskoj. Specjalizacije dijagnostike štitastih uši (Coccoidea) obavila je u uglednim institucijama u inozemstvu. Osnove dijagnostike štitastih uši naučila je u Službi za zaštitu bilja, Wageningen, Nizozemska, 2004. i 2005. Naprednu dijagnostiku štitastih uši specijalizirala je u Poljoprivredno-šumarskom zavodu, Nova Gorica, Slovenija, 2006., 2007., 2008. i 2010., u Službi za zaštitu bilja, Wageningen, Nizozemska, 2007. i 2010. te na Poljoprivrednom fakultetu (Facoltà di Agraria), Padova, Italija, 2006., 2007. i 2010.

at the Plant Protection Service, Wageningen, the Netherlands, in 2005. He is meritorious for the first findings of pea leaf miner *Liriomyza huidobrensis*. The thrips *Frankliniella occidentalis*, *Echinothrips americanus*, *Hercinothrips femoralis*, *Parthenothrips dracaenae* and *Thrips simplex*, are the new species for the Croatian fauna also detected by M. Šimala in his research.

During faunistic research he also detected 20 new species of whiteflies for Croatia: *Aleurochiton acerinus*, *A. pseudoplatani*, *Aleuroclava hikosanensis*, *A. jasmini*, *Aleurolobus wunni*, *Aleurotuba jelinekii*, *Aleuroviggianus adrianae*, *Aleyrodes asari*, *A. elevatus*, *A. lonicerae*, *Asterobemisia carpini*, *A. obenbergeri*, *A. paveli*, *Bemisia afer*, *Massilieuropodes chittendeni*, *Massilieuropodes setiger*, *Neopealius rubi*, *Simplaleurodes hemisphaerica*, *Tetraleurodes hederae* and *Tetralicia ericae*.

He researched on the efficacy of insecticides and acaricides that were registered in Croatia on the basis of results. Today, he uses the acquired experience in evaluating the documentation in the registration procedure of plant protection products. He was on many study trips and professional and scientific conferences in Portugal, the Czech Republic, Hungary, Canada, Great Britain, France, Slovenia, Austria and Italy, which he actively participated in. He is a member of the Croatian Entomological Society and CPPS. He is now performing the duty of the Manager of the Diagnostics Department. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. He published 20 scientific and over 60 professional papers and abstracts. By the end of 2009, he acquired the scientific rank of a scientific associate.

Tatjana Masten Milek PhD, (1969), (Master's thesis: "Reporting and early warning system as the Basis of Economic and Ecological Plant Protection in the Republic of Croatia", 2002; dissertation: "Fauna of Scale Insects (Insecta: Coccoidea) in the Republic of Croatia", 2007) – the only specialist in the field of scale insects diagnostics of agricultural and forest plants in Croatia. She completed specialisation courses in scale insects (Coccoidea) diagnostics on several occasions at eminent institutions abroad. She acquired knowledge of the rudiments of scale

Obavila i dijagnostiku karantenskih grinja i lisnih ušiju. Specijalizaciju s područja osnove akarologije i dijagnostike grinja (Acari) u poljoprivredi obavila je na Ohio državnom Sveučilištu (Ohio State University), Columbus, SAD, 2005. Dijagnostiku karantenskih i njima sličnih vrsta lisnih uši obavila je u Službi za zaštitu bilja, Wageningen, Nizozemska, 2007.

Faunističkim istraživanjima otkrila je 29 novih vrsta štitastih uši za Hrvatsku. To su: *Abgrallaspis cyanophylli*, *Antonina crawi*, *Aonidiella comperei*, *Aulacaspis yasumatsui*, *Ceroplastes japonicus*, *Chaetococcus phragmitis*, *Diaspis boisduvalii*, *Dysmicoccus brevipes*, *Kuwanaspis pseudoleucaspis*, *Lepidosaphes flava*, *Lepidosaphes juniperi*, *Lepidosaphes newsteadi*, *Melanaspis bromiliae*, *Neopolvinaria innumerabilis*, *Nipaecoccus delassusi*, *Parlatoria. pergandii*, *Parlatoria cinerea*, *Parthenolecanium fletcheri*, *Parthenolecanium pomeranicum*, *Pinnaspis aspidistrae*, *Pinnaspis strachani*, *Planococcus vovae*, *Pseudaonidia trilobitiformis*, *Pseudococcus calceolariae*, *Pseudococcus comstocki*, *Pseudococcus viburni*, *Pulvinaria hydrangea*, *Pulvinariella mesembryanthemi* i *Selenaspidus articulatus*. Tijekom faunističkih istraživanja štitastih uši bavi se i njihovom biologijom i ekologijom te prirodnim neprijateljima. Osim toga, zasluzna je i za prvi nalaz tripta *Microcephalothrips abdominalis* u Hrvatskoj.

Dolaskom u Zavod ponovno je organizirala te vodi izvještajno-prognozne poslove. Vodi i sudjeluje u programima posebnog nadzora.

Radila je s dr.sc. Mladenom Šimalom na zaživljavanju biološkog suzbijanja u zaštićenim prostorima te u tu svrhu obavila specijalizaciju na temu dijagnostike predatora i parazitoida štetnika u zaštićenim prostorima u Koppertu u Berkel en Rodenrijs, Roterdam, Nizozemska, 2003.

Sukladno propisima vodila je i organizirala edukaciju zaposlenih u poljoprivrednim ljekarnama. Bila je na brojnim studijskim putovanjima te stručnim i znanstvenim skupovima u Portugalu, Belgiji, Češkoj, Mađarskoj, Kanadi, Velikoj Britaniji, Francuskoj, Albaniji, Sloveniji, Austriji i Italiji, na kojima je aktivno sudjelovala. Od 2004. obnaša dužnost predsjednice Upravnog vijeća Javne ustanove "Parka pri-

insects diagnostics at the Plant Protection Service, Wageningen, the Netherlands, in 2004 and 2005. She specialised in advanced scale insects diagnostics at the Agriculture and Forestry Institute, Nova Gorica, Slovenia, in 2006, 2007, 2008 and 2010, at the Plant Protection Service, Wageningen, the Netherlands, in 2007 and 2010 and at the Faculty of Agriculture, Padua, Italy, in 2006 and 2007.

She also performs diagnostics of quarantine mites and aphids. She completed a specialisation course in the field of the rudiments of mite acarology and diagnostics of mites (Acari) in agriculture at the Ohio State University, Columbus, USA, in 2005. She completed diagnostics of quarantine and similar species of aphids at the Plant Protection Service, Wageningen, the Netherlands, in 2007.

*In her faunistic research she detected 29 new species of scale insects for Croatia. These are: *Abgrallaspis cyanophylli*, *Antonina crawi*, *Aonidiella comperei*, *Aulacaspis yasumatsui*, *Ceroplastes japonicus*, *Chaetococcus phragmitis*, *Diaspis boisduvalii*, *Dysmicoccus brevipes*, *Kuwanaspis pseudoleucaspis*, *Lepidosaphes flava*, *Lepidosaphes juniperi*, *Lepidosaphes newsteadi*, *Melanaspis bromiliae*, *Neopolvinaria innumerabilis*, *Nipaecoccus delassusi*, *Parlatoria. pergandii*, *Parlatoria cinerea*, *Parthenolecanium fletcheri*, *Parthenolecanium pomeranicum*, *Pinnaspis aspidistrae*, *Pinnaspis strachani*, *Planococcus vovae*, *Pseudaonidia trilobitiformis*, *Pseudococcus calceolariae*, *Pseudococcus comstocki*, *Pseudococcus viburni*, *Pulvinaria hydrangea*, *Pulvinariella mesembryanthemi* and *Selenaspidus articulatus*. During her faunistic research on scale insects she is also dealing with their biology and ecology and natural enemies. Moreover, she is also meritorious for the first findings of the *Microcephalothrips abdominalis* thrips in Croatia.*

Upon arrival to the Institute she organised again and conducts reporting and early warning system. She conducts and participates in surveys.

She worked with Mladen Šimala PhD on the implementation of biological control in greenhouses and for this purpose she completed a specialisation course in diagnostics of predators and pest parasitoides of crops grown in greenhouses at Koppert in Berkel en Rodenrijs, Rotterdam, the Netherlands, in 2003.

rode Žumberak- Samoborsko gorje”. Član je Hrvatskoga entomološkog društva, Hrvatskog društva biljne zaštite te uredivačkog odbora Glasila biljne zaštite. Od veljače 2010. obnaša dužnost v.d. predstojnika Zavoda. Bila je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavila je 22 znanstvena i više od 50 stručnih radova i sažetaka. Krajem 2009. godine, u znanstvenom zvanju stiče status znanstvene suradnice.

Mr.sc. **Andrija Vukadin**, (1969.), (magistarski rad: “Bolesti i štetnici u šumskim i hortikulturnim rasadnicima”, 2000.) – specijalist za štetnike u šumarstvu i ukrasnom drvenastom bilju. Obavlja zdravstvene preglede sadnog materijala šumskoga i ukrasnoga drvenastog bilja. Specijalizirao je dijagnostiku leptira (Lepidoptera) s naglaskom na porodicu Tortricidae na Sveučilištu Molise (Universita degli studi del Molise), Campobasso, Italija, 2005. Specijalizaciju s područja dijagnostike nekih kornjaša (Coleoptera), porodica (Cerambycidae), vrste: *Monochamus galloprovincialis*, *M. sutor*, *M. sartor*, *M. urussovi*, *M. alternatus*, *M. carolinensis*, *M. scutellatus*, *Anoplophora chinensis*, *A. glabripennis* te nekih leptira (Lepidoptera): taksonomska identifikacija karantenski važnih ličinki iz porodica Noctuidae, Geometridae, Tortricidae i Pyralidae u Službi za zaštitu bilja, Wageningen, Nizozemska, 2007. Vodeći programe posebnog nadzora odredio je nazočnost azijske strizibube – *Anoplophora chinensis* te venuće i sušenje hortikulturnih biljaka *Phytophthora ramorum* u suradnji sa Željkom Tomićem. Radi na doktorskoj disertaciji naslova: *Anoplophora chinensis* (Forster, 1771) (Coleoptera, Cerambycidae) - biologija, putovi introdukcije i mogućnost njenog štetnog utjecaja na šumsku vegetaciju Hrvatske. Bio je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavio je 4 znanstvena i 10 stručnih radova te više popularnih članaka.

Dr.sc. **Mario Bjeliš**, (1972.), (magistarski rad: “Ocjena vrijednosti atraktanata i suzbijanje maslinine muhe *Bactrocera oleae* Gmelin (Diptera, Tephritidae) masovnim lovom”, 2005.,

In accordance with regulations she conducted and organised education of employees in agricultural pharmacies. She was on many study trips and professional and scientific conferences in Portugal, Belgium, the Czech Republic, Hungary, Canada, Great Britain, France, Albania, Slovenia, Austria and Italy, which she actively participated in. Since 2004 she has been performing the duty of the Management Council President of the Public Institution called “Nature Park Žumberak – Samoborsko gorje”. She is a member of the Croatian Entomological Society, CPPS and the editing committee of “Glasilo biljne zaštite” (Plant Protection Bulletin). From February 2010 she performs the duty of the Acting Head of the Institute. She was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. She published 22 scientific and over 50 professional papers and abstracts. By the end of 2009, she acquired the scientific rank of a scientific associate.

Andrija Vukadin MSc, (1969), (Master's thesis: “Diseases and Pests in Forest and Horticultural Plant Nurseries”, 2000) – a pest specialist in forestry and ornamental tree plants. He performs health surveillance of the planting material of forest and ornamental tree plants. He completed a specialisation course in butterfly diagnostics (Lepidoptera) with an emphasis on the Tortricidae family at the University of Molise, Campobasso, Italy, in 2005. He completed a specialisation course in the field of diagnostics of certain beetles (Coleoptera), families (Cerambycidae), species: *Monochamus galloprovincialis*, *M. sutor*, *M. sartor*, *M. urussovi*, *M. alternatus*, *M. carolinensis*, *M. scutellatus*, *Anoplophora chinensis*, *A. glabripennis* and certain butterflies (Lepidoptera): taxonomic identification of quarantine important larvae from the families Noctuidae, Geometridae, Tortricidae and Pyralidae at the Plant Protection Service, Wageningen, the Netherlands, in 2007. While conducting special monitoring programmes he identified the presence of the Citrus Long-horned Beetle – *Anoplophora chinensis* and sudden oak death *Phytophthora ramorum* in cooperation with Željko Tomić. He works on a doctoral dissertation titled: *Anoplophora chinensis* (Forster, 1771) (Coleoptera, Cerambycidae) – biology, ways of introduction and the possibility of its harmful influence on the forest vegetation of

disertacija: "Fauna Tephritidae (Diptera) primorske Hrvatske", 2007.). Specijalist za štetnike mediteranskih voćnih kultura. Od početka rada u Zavodu, podružnici u Solinu, usmjerao se na istraživanje korisne i štetne entomofaune masline i agruma, istraživanje i uvodenje novih metoda praćenja upotrebom atraktanata. Utvrđio je nazočnost virusa CMV, OLV2, OLYaV i SLRV na 25% autohtonog fonda masline. Istraživao je i uveo nove biotehničke i ekološki prihvativljive metode suzbijanja štetnih organizama masline. O toj temi napisao je knjigu "Zaštita masline u ekološkoj proizvodnji", 2005, i "Zaštita masline u ekološkoj proizvodnji - drugo prošireno izdanje" 2009. Jedini je specijalist iz područja dijagnostike voćnih muha (Tephritidae) u koju svrhu je obavio niz specijalizacija: Kraljevski muzej Središnje Afrike (Musée royal de l'Afrique centrale), Tervuren, Belgija, Prirodoslovni muzej (Muséum d'histoire naturelle de la Ville de Genève), Ženeva, Švicarska (2005. - 2009). Istraživao je i korisnu faunu potporodice Tephritisinae (Tephritidae) – potencijalnih agensa za suzbijanje korovnih vrsta. Faunističkim istraživanjima je utvrđio nazočnost pet novih vrsta voćnih muha za Hrvatsku. To su: *Campiglossa misella*, *Orellia falcata*, *Tephritis carmen*, *Carpomyia schineri* i *Rhagoletis cingulata*. Napisao je knjigu "Voćne muhe – Tephritidae gospodarskog i faunističkog značenja za područje Hrvatske", 2009. Istražuje metode praćenja populacije voćnih muha, s naglaskom na gospodarski najvažnije vrste. Istražuje i uvodi nove selektivne metode suzbijanja. Njegovom zaslugom, prvi put u Hrvatskoj, uvedena je metoda sterilnih kukaca (tehnika SIT).

U više međunarodnih projekata s FAO/IAEA (2007.-2011.), proveo je studije provodljivosti i isplativosti primjene metode u našim uvjetima, edukaciju i opremanje te istraživanje učinkovitosti metode. SIT tehniku za suzbijanje sredozemne voćne muhe – *Ceratitis capitata* provodi na području doline Neretve u nasadima južnog voća, poglavito onom koji je orijentiran na uzgoj mandarine za izvoz. Tijekom 2009/2010. godine u Opuzenu je uz njegov angažman izgrađen i opremljen laboratorij za prijem i razvoj sterilnih mužjaka te je pokrenut program suzbijanja na više od 1000 ha. Istraživao

Croatia. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. He published 4 scientific and 10 professional papers and a number of popular articles.

Mario Bjeliš PhD, (1972), (Master's thesis: "Evaluation of Attractants and Control of Olive Fly *Bactrocera oleae* Gmelin (Diptera, Tephritidae) by Massive Catching", 2005, dissertation: "Tephritidae (Diptera) Fauna of the Coastal Croatia", 2007), a specialist in the Mediterranean fruit pests. Since he started working at the Institute, a branch office in Solin, he focused on the research on useful and harmful entomofauna of olive and citrus fruit, research and introduction of new monitoring methods by using attractants. He identified the presence of the virus CMV, OLV2, OLYaV and SLRV on 25% of autochthonous olive fund. He researched and introduced new biotechnical and environmentally acceptable control methods of harmful organisms in olive. He wrote a book on this subject titled "Protection of Olive in Environmental Production", in 2005, and "Protection of Olive in Environmental Production – the second expanded edition" in 2009. He is the only specialist in the field of fruit fly diagnostics (Tephritidae) for the purpose of which he completed an array of specialisation courses: Royal Museum for Central Africa, Tervuren, Belgium, Natural History Museum, Geneva, Switzerland (2005-2009). He also researched on useful fauna of the subfamily Tephritisinae (Tephritidae) – potential organism for weed control. In faunistic research he identified the presence of five new species of fruit fly for Croatia. These are: *Campiglossa misella*, *Orellia falcata*, *Tephritis carmen*, *Carpomyia schineri* and *Rhagoletis cingulata*. He wrote a book titled "Fruit Flies – Tephritidae of Economic and Faunistic Importance for the Territory of Croatia", in 2009. He researches on the monitoring methods of fruit fly population, with an emphasis on the economically most important species. He researches and introduces new selective control methods such as the control by using attractants, by chemosterilants and the sterile insect technique (SIT). He takes the credit for the introduction, for the first time in Croatia, of the sterile insect technique. This was the subject of his specialisation course in Canada (in 2002), Austria (in

je i učinkovitost insekticida koji su temeljem rezultata i prijedloga bili registrirani u Hrvatskoj. Bio je na brojnim studijskim putovanjima, stručnim i znanstvenim skupovima u EU-u, Africi, Južnoj, Središnjoj i Sjevernoj Americi. Član je Hrvatskog društva biljne zaštite, Tephritis of Europe, Africa and Middle East (TEAM), Tephritid Workers Database (TWD). Od rujna 2009. obnaša dužnost pomoćnika ravnateljice Hrvatskog centra za poljoprivredu, hranu i selo za stručne istraživačke i razvojne programe. Objavio je tri knjige, 20 znanstvenih radova te više od 80 stručnih članaka i sažetaka. Krajem 2009. godine, u znanstvenom zvanju stiče status znanstvenog suradnika.

Smiljan Kraljević, dipl.ing. (1949) diplomirao je 1976. na ratarskom smjeru na Poljoprivrednom fakultetu u Osijeku. Od 1977. do 1994. radi u tvrtki Agroslavonija, od 1994. do 1998. u Saponiji, a od 1998. do 2001. u poljoprivrednoj ljekarni Agrotrg, na prodaji sredstava za zaštitu bilja. Od 2001. zaposlen je u Zavodu u kojem obavlja zdravstveni pregled poljoprivrednog bilja i proizvoda za izvoz i izdaje fitocertifikate u razdoblju do 2006. kad zbog promjene propisa taj posao Zavod prestaje obavljati. Od 2006. obavlja zdravstveni pregled presadnica cvijeća i povrća i izdaje svjedodbi o zdravstvenom stanju, a od 2010. i zdravstveni pregled usjeva lucerne i suncokreta za proizvodnju sjemena,

2006, 2007 and 2008); he participated in international research projects aimed at improving the efficiency of SIT application (2005-2009) and he conducted two international projects of SIT introduction into the Neretva valley (2007-2008; 2009-2011).

In several international projects with FAO/IAEA (2007-2011), he carried out feasibility and cost-effectiveness studies on the application of the method in the Croatian conditions, education and equipment and research on the efficiency of the method. He carries out the technique called SIT for the control of the Mediterranean fruit fly – *Ceratitis capitata* on the territory of the Neretva valley in plantations of southern fruit, mainly the one oriented towards mandarins grown for export. In the course of 2009/2010 a laboratory for receipt and development of sterile males was built and equipped in Opuzen with his engagement and the control programme has been initiated on over 1000 ha. He also researched on the efficacy of insecticides that were registered in Croatia on the basis of results. He was on numerous study trips, professional and scientific conferences in EU, Africa, South, Central and North America. He is a member of CPPS, Tephritis of Europe, Africa and Middle East (TEAM), Tephritid Workers Database (TWD). From September 2009 he performs the duty of the Assistant Director of the Croatian Centre for Agriculture, Food and Rural Affairs responsible for professional research and development programmes. He published three books, 20 scientific papers and over 80 professional articles and abstracts. By the end of 2009, he acquired the scientific rank of a scientific associate.

Smiljan Kraljević, BSc, (1949) graduated from the Agricultural Faculty on arable crops in Osijek in 1976. From 1977 until 1994 he worked in company Agroslavonija, from 1994 until 1998 in company Saponija, and from 1998 until 2001 in agricultural pharmacy shop Agrotrg on selling plant protection products. Since 2001 he is employed in the Institute. He performed health surveillance on agricultural plants and products and issued phytocertificates until 2006. Due changes in the regulations Institute was not involved in these any more. From 2006 he is performing health surveillance of flower and vegetable preplants and is issuing health certificate whereas from 2010 also health surveillance of alfa alfa and sunflower for seed production.

1.4. Povijest i razvoj nematologije

Akademik **Milan Maceljski** godine 1964. osniva Laboratorij za nematode, a Savezna uprava za zaštitu bilja osigurala je finansijska sredstva za njihovo opremanje.

Dr.sc. **Zlatko Korunić**, radi u laboratoriju od 1965. (magistarski rad: "Prilog poznавању и сузбијању купусне нематоде – *Heterodera cruciferae*, F., 1967"; disertacija: "Пroučavanje biologije, ekologije i suzbijanje kupusne nematode – *Heterodera cruciferae* F.", 1973.). usavršavao je svoja znanja o nematodama na Sveučilištu u Wageningenu u Nizozemskoj. Uveo je obavljanje pregleda uzoraka tla iz različitih područja Hrvatske. U tom laboratoriju određena je nazočnost krumpirove nematode (Gorski kotar, 1964.; Žumberak, 1965.), a od 2003. istražuje se rasprostranjenost *Globodera rostochiensis* i *G. palida* u Hrvatskoj. Nazočnost repine nematode počela se određivati u okolini Županje, 1964. i 1965., a kasnije na važnim uzgojnim područjima šećerne repe na širem području Vukovara do Domovinskog rata, 1991. Kupusna nematoda prvi put je određena u Varaždinu i Ogulinu, 1965., ali zbog manjih šteta nije bilo čestih analiza. Također su određivane i druge vrste nematoda u uzorcima povrća i na duhanu, uzorcima tla iz staklenika i plastenika u Hrvatskoj, Makedoniji i Sloveniji te s polja krumpira i kupusa. Načinjen je prvi popis cistilikih nematoda u Hrvatskoj. Na osnovi rezultata analiza davale su se preporuke o načinu suzbijanja. Od jeseni 1969. na određivanju nazočnosti nematoda radi prof. dr.sc. Ljerka Oštrec i uključuje se u projekte s nematodama. Stručnjaci Zavoda istraživali su učinkovitost nematocida i drugih metoda za suzbijanje nematoda, npr. primjenom solarne energije (Oštrec). Z. Korunić koordinirao je projekt u svezi kupusne nematode i integriranog suzbijanja nematoda, koje je finansiralo Ministarstvo poljoprivrede SAD (USDA). Lj. Oštrec je bila suradnik na projektu integriranog suzbijanja te je koristila rezultate za izradu svoje doktorske disertacije. Z. Korunić sudjelovao je također, u mnogim istraživanjima sa skladišnim štetnicima.

1.4. History and Development of Nematology

Academician Milan Maceljski establishes the Laboratory for Nematodes in 1964, and the Federal Plant Protection Administration provided for the financial resources for its equipment.

*Zlatko Korunić PhD worked in the laboratory since 1965, (Master's thesis: "A Contribution to the Knowledge and Control of the Cabbage Nematode – *Heterodera cruciferae*, F., 1967"; dissertation: "Research on the Biology, Ecology and Control of the Cabbage Nematode – *Heterodera cruciferae* F.", 1973). He had training regarding nematodes at University of Wageningen, the Netherlands. He introduced analysing of soil samples from different areas of Croatia and neighbouring countries. The presence of the potato nematode was identified in this laboratory (Gorski kotar, 1964; Žumberak, 1965), and since 2003 the distribution of *Globodera rostochiensis* and *G. palida* in Croatia has been researched on. The presence of the beet nematode has started to be identified in the countryside of Županja, in 1964 and 1965, and afterwards on important growing areas of sugar beet wide around Vukovar until the Croatian War of Independence, in 1991. The cabbage nematode was first identified in Varaždin and Ogulin, in 1965, but because of less damage there were no frequent analyses. Other types of nematodes were also identified in vegetable samples and on tobacco, soil samples from greenhouses in Croatia, Macedonia and Slovenia and from potato and cabbage fields. The first list of cyst-nematodes in Croatia has been compiled. Recommendations on control methods were given on the basis of analysis results. In autumn 1969 Prof. Ljerka Oštrec PhD started working on identifying the presence of nematodes. Experts from the Institute researched on the efficacy of nematicides and other methods for the control of nematodes, e.g. by using solar energy (Oštrec). Z. Korunić coordinated the project on cabbage nematodes and integrated control of plant parasitic nematodes financed by USDA. Lj. Oštrec was a co-worker on the project and used results for her doctoral thesis. Z. Korunić was involved in many studies regarding stored product pests.*

Mr.sc. **Ivan Poje**, (1975.), (magistarski rad: "Štetnici brokule /*Brassica oleracea* L. var. *italica* Plenck./ i mogućnosti njihovog suzbijanja", 2009.) – specijalist za biljno parazitske nematode poljoprivrednoga i šumskog bilja i voditelj nematološkog laboratorija Zavoda. Prvu specijalizaciju iz nematologije obavlja na Institut za zaštitu bilja Poljoprivrednog fakulteta u Osijeku. Također se 2002. specijalizira za nematode na Kmetijskom institutu u Ljubljani, Slovenija. Nematološki laboratorij Zavoda za zaštitu bilja 2003. uvodi u funkciju. Od 2003. voditelj je programa posebnog nadzora "Krumpirove cistolike nematode u RH". Na laboratorijskom usavršavanju je bio 2004. na Sveučilištu u Wageningenu, a tijekom 2007. i 2010. pohađa specijalističke treninge na Služba za zaštitu bilja Wageningen, Nizozemska. Od 2005. stručni je suradnik na PPN-u "Borova nematoda", čiji koordinator postaje 2010. Od 2007. preuzima koordinaciju PPN-a "Kukuruzna zlatica". Suradnja s Institutom AGES u Beču (Austrija) započeta je 2005. na temelju biotestova populacija krumpirovih cistolikih nematoda koje bečki laboratorij na godišnjoj bazi ugovorno provodi. Tijekom 2009. sudjelovao je u međulaboratorijskom ispitivanju (Proficiency testing) za detekciju i determinaciju krumpirovih cistolikih nematoda u organizaciji LNPV Station de Nématologie, Francuska. U ime Zavoda za zaštitu bilja sudjelovao je u međulaboratorijskim ispitivanjima baziranim na detekciji zajedno s 25 uglednih europskih laboratorija. U ispitivanju detekcije sudjelovala su ukupno 23 laboratorija. Tijekom 2009. optimizirao je provedbu molekularne metode detekcije i determinacije krumpirovih cistolikih nematoda (PCR) u laboratoriju Zavoda.

Početkom 2010. koordinira adaptaciju i rekonstrukciju nematološkog laboratorija na Rimu. Radovi su izvedeni zbog pripreme laboratorijske infrastrukture i opreme za proces akreditacije metode analize tla na krumpirove cistolike nematode prema ISO HRN 17025. Tehnička priprema dokumentacije za akreditaciju započeta je tijekom 2009.

Uz poslove u nematološkom laboratoriju I. Poje obavlja i poslove usko vezane uz biljno zdravstvo (analize tla na krumpirove cistolike nematode prije sadnje sjemenskoga

Ivan Poje MSc, (1975), (Master's thesis: "Broccoli Pests / *Brassica oleracea* L. var. *italica* Plenck./ and Possibilities of Their Control", 2009) – a specialist in plant parasitic nematodes of agricultural and forest plants and the manager of the laboratory of nematology at the Institute. He completed his first specialisation course in nematology at the Institute for Plant Protection at the Faculty of Agriculture in Osijek. Furthermore, in 2002 he completed a specialisation course in nematodes at the Agricultural institute in Ljubljana, Slovenia. He put again the nematological laboratory at the Institute for Plant Protection into operation in 2003. Since 2003 he conducts the survey called "Potato Cyst-Nematodes in the Republic of Croatia". He completed laboratory training in 2004 at the University in Wageningen, and in the course of 2007 and 2010 he attends specialist training courses at the Plant Protection Service Wageningen, the Netherlands. Since 2005 he has been an expert associate at the survey called "Pine Nematode", the coordinator of which he becomes in 2010. From 2007 he assumes the coordination of survey called "Western Corn Rootworm". The cooperation with the Institute AGES in Vienna (Austria) has started in 2005 on the basis of population biotests of the potato cyst-nematodes contractually carried out by the Vienna laboratory on a yearly basis. In the course of 2009 he participated in inter-laboratory research (proficiency testing) for detection and determination of potato cyst nematodes organised by LNPV Station de Nématologie, France. On behalf of the Institute for Plant Protection he participated in inter-laboratory research based on detection together with 25 eminent European laboratories. 23 laboratories in total participated in the detection testing. In the course of 2009 he optimised the implementation of molecular detection and determination method of potato cyst nematodes (PCR) in the laboratory of the Institute.

At the beginning of 2010 he coordinates the renovation and reconstruction of the laboratory of nematology at Rim. This was needed in order to prepare laboratory infrastructure and equipment for the accreditation process of soil analysis method for potato cyst nematodes according to ISO HRN 17025. Technical preparation of accreditation documents has started in the course of 2009.

krumpira). Obavlja i izvještajno-prognozne poslove u ratarstvu, povrću i ukrasnom bilju. Sudjeluje i u poslovima registracije sredstava za zaštitu bilja (nematocida) u području učinkovitosti. Bio je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU.

1.5. Povijest i razvoj fitopatologije

Pojave mnogih bolesti na bilju zabilježili su znanstvenici koji su se bavili mikologijom na području Hrvatske još u 19. stoljeću. To su: Stjepan Schulzer von Müggelburg (*Die Pilze aus Slawonien I.-III.*, 1857. – 1883.), rođen u Viduševcima; G. Bolle, F. de Thümen (*Contribuzioni allo studio dei funghi del Litorale con speciale riguardo a quelli che vegetano sulle piante utili I i II.*, 1878. i 1880.); I. Radić, (*Bolesti trsa ili vino-ve loze*, 1908.); F. Bubak (*Ein Beitrag zur Pilzflora von Tirol und Istrien*, 1914.); H. Sydow i P. Sydow, (*Beitrag zur Pilzflora des Litoral-Gebietes und Istriens*, 1903.); E. Baudyš (*Beitrag zur Kenntnis der Mikromyceten-Flora von Österreich-Ungarn, insbesondere von Dalmatien*, 1914.); O. Jaap (*Beiträge zur Kenntnis der Pilze Dalmatiens*, 1916.); V. Vouk, (*Medljika pepelnica ogrozda*, 1917.); R. Picbauer (*Fungi Croatici*, 1928.); i mnogi drugi. Tako je sakupljeno mnogo podataka o pojavi nekih uzročnika bolesti. Opravdano možemo ponoviti riječi Vojtjeha Lindtnera: "Hrvatska je u nekom smislu kolijevka mikologije" na ovim prostorima. Dok su sustavna entomološka istraživanja započela već 1909., sustavna istraživanja uzročnika bolesti započela su kasnije osnivanjem Fitopatološko-entomološkog odsjeka 1922. Nakon usvajanja Konvencije o zaštiti bilja (Rim, 1929.) pokazale su se i administrativne potrebe za takvim proširenjem. Pred budućim stručnjacima postavljeni su zadaci nadzora nad voćem u izvozu na graničnim stanicama, evidencija pojave i širenja pojedinih štetnika i uzročnika bolesti.

Između dva svjetska rata istraživanja su bila usmjerena na nekoliko najvažnijih patogenih gljiva koje su činile štete na poljoprivrednom bilju. O veličini šteta i važnosti istraživanja

In addition to the tasks in the laboratory of nematology I. Poje performs tasks closely related to plant health as well (soil analyses for potato cyst nematodes before planting seed potato). He performs reporting and early warning system in farming, vegetable growing and decorative plants. He participates in the registration activities of plant protection products (nematicides) regarding efficacy. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU.

1.5. History and Development of Phytopathology

*The appearance of many diseases of plants was recorded by scientists who were dealing with mycology on the territory of Croatia as early as in the 19th century. These are: Stjepan Schulzer von Müggelburg (*Die Pilze aus Slawonien I-III*, 1857-1883), born in Viduševci; G. Bolle, F. de Thümen (*Contribuzioni allo studio dei funghi del Litorale con speciale riguardo a quelli che vegetano sulle piante utili I and II*, 1878 and 1880); I. Radić, (*Vine Diseases*, 1908); F. Bubak (*Ein Beitrag zur Pilzflora von Tirol und Istrien*, 1914); H. Sydow and P. Sydow, (*Beitrag zur Pilzflora des Litoral-Gebietes und Istriens*, 1903); E. Baudyš (*Beitrag zur Kenntnis der Mikromyceten-Flora von Österreich-Ungarn, insbesondere von Dalmatien*, 1914); O. Jaap (*Beiträge zur Kenntnis der Pilze Dalmatiens*, 1916); V. Vouk, (*Medljika pepelnica ogrozda*, 1917); R. Picbauer (*Fungi Croatici*, 1928); and many others. In this way many data on the appearance of some agents causing diseases were collected. It is justified to quote Vojtjeh Lindtner: "In a sense Croatia is the cradle of mycology" in this region. Whereas systematic entomological research started as early as in 1909, systematic research on agents causing diseases started later upon establishment of Phytopathological-Entomological Section in 1922. After the Plant Protection Convention has been adopted (Rome, 1929) such expansion resulted from administrative needs as well. Future experts were faced with the tasks to control the fruit in export on border stations, to keep records on the appearance and outspread of individual pests and disease agents.*

u području fitopatologije govori podatak iz 1932., kada je crna žitna hrđa uzrokovala gubitak čak 90% uroda pšenice. U to vrijeme znatne štete čine i prašne snijeti žitarica, na šećernoj repi pjegavost lista šećerne repe, na krumpiru plamenjača, u voćnjacima krastavost jabuke, a na vinovoj lozi peronospora. Nakon Drugoga svjetskog rata istraživanja se usmjeravaju i na virusne na raznim kulturama.

Poslije Prvoga svjetskog rata do 1930. smrdljiva snijet pšenice je u uvjetima ekstenzivne proizvodnje, na seljačkim gospodarstvima, uništila i do 20% uroda, pa je već prije Drugoga svjetskog rata izao propis da se pšenica smije sijati samo ako je sjeme tretirano tileticidom. Fitopatolozi su se ubrzo uključili u istraživanja uzročnika bolesti koji se prenose sjemenom, pa je to u Zavodu duga tradicija. Posebno, nakon Drugoga svjetskog rata, prepoznavajući važnost sjetve zdravog sjemena, tim istraživanjima bavili su se Zdenka Prpić, Budislav Borjan, osobito Vera Lušin, Ivanka Milatović, Josip Kišpatić, a kasnije Bogdan Cvjetković, Ivanka Čizmić i danas Željko Tomić. U istom razdoblju istraživala se učinkovitost fungicida za tretiranje sjemena koji su na osnovi pozitivnih rezultata registrirani za uporabu. Pojavom smrdljive snijeti 1998. stručnjaci Zavoda zalažu se za poboljšanje kakvoće tretiranja sjemena i uvođenje provjere kakvoće tretiranja sjemena međunarodno priznatim metodama. Od 1999. ti poslovi se više ne obavljaju u Zavodu zbog promjene propisa.

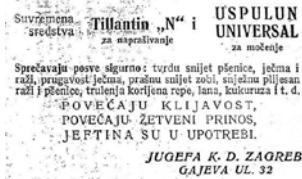
Zbog šteta na poljoprivrednim kulturama uzrokovanim gljivama započela su istraživanja s fungicidima. Uz univerzalne fungicide na osnovi sumpora i bakra počeli su se pojavljivati i tileticidi na osnovi žive, koji su morali proći provjeru djelotvornosti. Među prvima je bio Ceresan 1920. Nakon toga se spominju Uspulun, Segetobran (M. Šeringer, 1924.) (slika 9.). Premda su neka sredstva za zaštitu bilja bila i prije u uporabi, prvi popis SZB-a kojima je dopušten promet objavljen je 1927. Popis navodi 10 pripravaka, a među njima i fungicide. Očito je da su oni prošli provjeru u Fitopatološko-entomološkom odsjeku. Germisan Abavit, Abavit i drugih 26 pripravaka, svi na osnovi žive, pojavlju-

Between the two world wars research was focused on the several most important pathogenic fungi that incurred damage to agricultural plants. The size of damage and the importance of research in the field of phytopathology can be seen in the information from 1932, when the black stem rust caused the loss of almost 90% of the wheat yield. At that time substantial damage is incurred by the loose smuts on cereals, cercospora leaf spot on sugar beet, potato late blight apple scab in orchards, and downy mildew on vine. After the Second World War research is being focused on viruses on various crops.

After the First World War until 1930 the common bunt of wheat damaged up to 20% of yield on farms in the conditions of extensive production, so that even before the Second World War there was issued a regulation that permitted the seeding of the wheat only if the seed was treated with fungicide. Phytopathologists got soon involved in research on the, seed-borne plant pathogens which thereby has a long tradition at the Institute. In particular, after the Second World War, having recognised the importance of seeding the healthy seed, Zdenka Prpić, Budislav Borjan, especially Vera Lušin, Ivanka Milatović, Josip Kišpatić, and afterwards Bogdan Cvjetković, Ivanka Čizmić and today Željko Tomić were engaged in this research. In the same period the efficiency of seed treatment fungicides was researched that were registered for use on the basis of positive results. Upon appearance of the common bunt in 1998 experts from the Institute advocate the improvement of the seed treatment quality and the introduction of the seed treatment quality control by internationally recognised methods. As of 1999 these activities have not been performed at the Institute anymore because of the change in regulations.

Due to damages on agricultural crops caused by different fungi research with fungicides was performed. In addition to universal fungicides on the basis of sulphur and copper there also started appearing fungicides on the basis of mercury that had to be submitted to the efficacy control. Ceresan was among the first ones in 1920. Uspulun and Segetobran are mentioned thereafter (M. Šeringer, 1924) (fig. 9). Although some of the plant protection products have been in use before, the first list of the

Zdravo sjeme - zdrava žetva!



Slika 9. Gospodarski list 1935. – reklamni letak za preparat Tilantin

Figure 9 Farmers magazine (Gospodarski list) 1935 – leaflet for fungicide Tilantin

ju se 1929. U Rušama 1933. počinje proizvodnja Tilantina, pripravka istovjetna Ceresanu, pa je i taj pripravak prošao provjeru u Zavodu.

Prvi ditiokarbamati na osnovi TMTD-a trgovackog naziva Tutan i Ob-21 pojavljuju se 1936., nedugo nakon patentiranja.

Tek godine 1954. istražuju se brojni pripravci na osnovi koloidnog sumpora. Posebna pozornost posvećena je istraživanju novih organskih fungicida, koji su na osnovi preporuke stručnjaka Zavoda dobivali dopuštenje za stavljanje u promet. Nakon razdoblja prečeste primjene sredstava za zaštitu bilja, prišlo se njihovu racionalnom korištenju pa su u duhu integrirane zaštite provjeravani prognozni modeli za bolesti na vinovoj lozi (*Plasmopara viticola*- Müllerova, Vederevka i Shatsky) i krumpiru (*Phytophthora infestans* - Evedingova i Post-Richelova), a nakon toga odabrani su najprihvativiji i predani praksi na korištenje. Tu su se posebno istaknuli suradnici s terena: Bela Majurčić, dipl.ing. (Osijek) i Ratimir Metz, dipl.ing. (Varaždin). Podizanjem najveće plantaže jabuka "Borinci" obvezno je postalo određivanje rokova za suzbijanje mrljavosti lista i krastavosti plodova jabuke (*Venturia inaequalis*) pa je Millsov prognozni model provjeren i uveden u sve veće voćnjake u Hrvatskoj.

Od osnutka Zavoda do završetka Drugoga svjetskog rata, sudeći po objavljenim radovima, nekolicina fitopatologa obavljala je stručne poslove i započela sa znanstvenim istraživanjima. Istraživani su uzročnici bolesti ratarskih kultura, industrijskog bilja, povrća, cvijeća, voćaka i vinove loze te uzročnici koji se prenose sjemenom i mogućnosti njihova suzbijanja. Početkom pedesetih godina 20. st. povećao se broj stručnjaka fitopatologa i proširio obujam istraživanja u tom

plant protection products licensed for market was published in 1927. The list contained 10 preparations, among which fungicides too. They were obviously verified at the Phytopathological-Entomological Section. Germisan Abavit, Abavit and other 26 preparations, all of them on the basis of mercury, appear in 1929. In Ruše in 1933 there started the production of Tilantin, a preparation identical to Ceresan, so that this preparation was tested at the Institute as well.

The first dithiocarbamates on the basis of TMTD under the trade name of Tutan and Ob-21 appear in 1936, not long after having been patented.

It was only in 1954 that numerous preparations on the basis of lime sulphur were being researched on. Special attention was dedicated to the research on new organic fungicides that were licensed for market on the basis of recommendations by the experts from the Institute. After the period of too frequent application of plant protection products, they started being used rationally so that in the spirit of integrated protection forecast models for diseases were tested on vine (*Plasmopara viticola* - Müller's, Vederevka's and Shatsky's incubation methods) and potato (*Phytophthora infestans* - Eveding's and Post-Richel's incubation methods), and thereafter the most acceptable ones were selected and given for use. The most prominent associates out in the field were: Bela Majurčić, BSc (Osijek) and Ratimir Metz, BSc (Varaždin). In the process of establishing the largest apple plantation "Borinci" it became obligatory to define deadlines for the control of apple scab (*Venturia inaequalis*) so that Mills' forecast model was tested and introduced into all major orchards in Croatia.

Since the establishment of the Institute until the end of the Second World War, judging by the published papers, a few phytopathologists performed professional activities and started with scientific research. The research covered the agents causing diseases in agricultural crops, industrial crops, vegetable, flowers, fruit and vine, the agents transmitted through the seed and the possibilities of their control. At the beginning of the fifties of the 20th century there was an increase in the number of expert phytopathologists and in the scope of research in this field, so

području, da bi najveći broj stručnjaka fitopatologa radio u Zavodu u razdoblju od 1978. do 1992.

Ema Groman, dipl.ing. agr. (Stari Banovci, 1908. – Rijeka, 1976.) radi kao prvi fitopatolog u Zavodu od 1934. Specijalizirala je fitopatologiju u Središnjoj stanici za biljnu patologiju (Station centrale de pathologie vegetale) u Versaillesu 1940. Nakon rada na drugim radnim mjestima vratila se 1948. u Zavod, gdje je ostala do umirovljenja 1964. Primjenjujući znanje stečeno u Francuskoj, proučavala je bolesti srži vinove loze, bolesti riže te opisala njihove uzročnike, gljive *Pyricularia oryzae* i *Helminthosporium sigmoideum*. Ispitivanjem otpornosti pojedinih linija i hibrida kukuruza na gljivu *Helminthosporium turicum* započelo je provjeravanje osjetljivosti novih kultivara na uzročnike bolesti. Istraživala je i neparazitske bolesti, bakterioze i tumore biljaka. Da bi upoznala metode provjere djelotvornosti herbicida, provela je šest mjeseci u Braunschweigu (Biologische Bundesanstalt für Land und Forstwirtschaft – BBA) te po povratku iz Njemačke uvela službeno istraživanje herbicida radi dobivanja dopuštenja za promet. Posljednje godine rada potpuno je posvetila suzbijanju korova.

Budislav Borjan, dipl.ing. agr., (Kričke, Drniš, 1904. – Zagreb, 1941.), godine 1934. postavljen je za asistenta. U kratkoj agronomskoj karijeri bavio se provjerom djelotvornosti fungicidnih pripravaka za tretiranje sjemena pšenice. Drugo područje rada bila je tada karantenska bolest crna trulež boba vinove loze (*Guignardia bidwellii*). Istraživao je biologiju i suzbijanje kalifornijske štitaste uši (*Quadrapsidiotus perniciosus*).

Prof. dr.sc. **Milan Panjan**, (Bačuga, Petrinja, 1906. – Zagreb, 1981.), nakon završenog studija na Visokoj poljoprivrednoj školi u Pragu i kratkoga radnog staža na Poljoprivrednoj i kontrolnoj stanici u Osijeku, 1935. premješten je u Zagreb na mjesto asistenta (disertacija: "Viroze rajčice u Hrvatskoj", 1957.). Tijekom Drugoga svjetskog rata boravio je na specijalizaciji iz virologije u Berlin Dahlemu kod dr. E. Köhlera, gdje je započeo svoju karijeru biljnog virologa. Od 1933. radi u Zavodu te 1947. postaje direktor. Tijekom 26 godina obna-

that the largest number of expert phytopathologists worked at the Institute in the period from 1978 to 1992.

Ema Groman, BSc Agr. (Stari Banovci, 1908 – Rijeka, 1976) works as the first phytopathologist at the Institute since 1934. She completed her specialisation course in phytopathology at the Central Station of Plant Pathology in Versailles in 1940. Having worked on other jobs she came back to the Institute in 1948, where she remained until her retirement in 1964. Applying knowledge acquired in France, she researched on diseases of grapevine trunk diseases, rice diseases and described their agents, *Pyricularia oryzae* and *Helminthosporium sigmoideum* fungi. Checking the susceptibility of new cultures to agents causing diseases has started with testing the resistance of certain maize lines and hybrids to the *Helminthosporium turicum* fungus. She also researched on non-parasitic diseases, bacterial diseases and plant tumours. In order to learn about the control methods of herbicide efficiency, she spent six months in Braunschweig (Biologische Bundesanstalt für Land und Forstwirtschaft – BBA) and upon return from Germany she introduced the official research on herbicides for placing on the market. The last years of work she dedicated completely to the weed control.

Budislav Borjan, BSc Agr., (Kričke, Drniš, 1904 – Zagreb, 1941), was appointed assistant in 1934. In his short agricultural career he dealt with controlling the efficacy of fungicide preparations for the wheat seed treatment. Another field of work was then quarantine disease called black rot of grape (*Guignardia bidwellii*). He researched on biology and control of the San Jose scale (*Quadrapsidiotus perniciosus*).

Prof. Milan Panjan PhD, (Bačuga, Petrinja, 1906 – Zagreb, 1981), having finished the studies at the High School of Agriculture in Prague and spent a few years of service at the Agricultural and Control Station in Osijek, was transferred to Zagreb in 1935 to the position of an assistant (dissertation: "Tomato Viroses in Croatia", 1957). During the Second World War he completed a specialisation course in virology in Berlin Dahlem at Dr. E. Köhler, where he started his career as a plant virologist. As of 1933 he works at the Institute and in 1947 he becomes the director. During 26 years

šanja dužnosti direktora, Milan Panjan je u Zavodu razvio stručni i znanstveni rad. Prijateljstva s akademikom C. Blatnýem, profesorom na Visokoj poljoprivrednoj školi u Pragu i s dr. V. Valentom iz Virološkog instituta u Bratislavi samo su produbljivala ideje o istraživanjima virusa. S akademikom D. Milićem vezala ga je suradnja na polju virologije. Bio je vrstan agronom, koji je kao rijetko tko znao tako mnogo o zaštiti bilja, a posebno o virologiji. U stručnom pogledu smatrali su ga biljnim liječnikom opće prakse. Malo je struka koje se mogu pohvaliti da su s puno povjerenja prihvaćale i uspješno provodile savjete svojih znanstvenika. Naše je biljno zdravstvo to činilo i uvijek tražilo savjete i pomoć Milan Panjana. Ipak, njegov znanstveni interes bio je usmjerjen prije svega na Solanaceae (rajčica, duhan), a posebno je krumpir bio njegova omiljena kultura. Uz istraživanje virusa na krumpiru uveo je testiranje sjemenskoga krumpira na viruse. U suradnji s Verom Lušin i M. Zeljkom proizveo je prvi serum za dokazivanje virusa krumpira u nas. Uza zeljaste test biljke uveo je i prve serološke metode (aglutinacije i precipitacije) u dokazivanju virusa. Prvi je dokazao neke virusne u nas na rajčici, duhanu, krumpiru, šećernoj repi, stočnom kelju i dr. Istraživao je fitoplazmozu Stolbur na pomoćnicama. Proučavao je na krumpiru i gljivične bolesti. Istraživao je uzročnika raka krumpira (*Synchytrium endobioticum*) kada se pojavio u Hrvatskoj, ispitivao je osjetljivost sorata krumpira na plamenjaču krumpira (*Phytophthora infestans*), razjasnio je uzrok propadanja krumpira u Botincu. Sudjelovao je u donošenju propisa iz područja biljnog zdravstva i zahvaljujući njemu imali smo dobre propise za aprobaciju sjemenskih usjeva, a posebno krumpira. M. Panjan jedan je od naših najistaknutijih fitopatologa u povijesti ove znanosti u Hrvatskoj i šire, a posebno treba naglasiti da je osnivač biljne virologije u Hrvatskoj. Objavio je 65 znanstvenih radova u domaćim i stranim znanstvenim časopisima, održao je brojna predavanja i referate na znanstvenim skupovima u zemlji i inozemstvu. Napisao je devet knjiga sam ili u suautorstvu. Mnogo godina bio je predsjednik Sekcije za zaštitu bilja Saveza poljoprivrednih inženjera i tehničara Hrvatske, za koje je vrijeme po

*of performing the duty of the director, Milan Panjan developed professional and scientific work at the Institute. Friendships with academician C. Blatný, a professor at the High School of Agriculture in Prague and with Dr. V. Valent from the Virological Institute in Bratislava only deepened the ideas of virus research. He was connected with academician D. Milićić by cooperation on virology. He was an excellent agronomist, who was among the rare ones to know so much about plant protection, particularly virology. Professionally, he was considered to be a plant general practitioner. There are only a few professions that can boast about having accepted with full confidence and successfully implemented the advice given by their scientists. Our plant health has done that and always asked for advice and help from Milan Panjan. Still, his scientific interest was focused primarily on Solanaceae (tomato, tobacco), and particularly potato was his favourite culture. In addition to the virus research on potato he introduced the testing of the seed potato for viruses. In cooperation with Vera Lušin and M. Zeljko he produced the first serum to prove potato viruses in Croatia. In addition to cabbage test plants he also introduced the first serological methods (of agglutination and precipitation) in proving the existence of viruses. He was the first one to prove certain viruses in Croatia on tomato, tobacco, potato, sugar beet, stock kale etc. He researched on Stolbur phytoplasma on Solanaceae. He researched on fungal diseases on potato as well. He researched on potato wart disease (*Synchytrium endobioticum*) when it had appeared in Croatia, and on the susceptibility of potato varieties to potato late blight (*Phytophthora infestans*); he explained the cause of potato decay in Botinec. He participated in passing the regulations on plant health and thanks to him we had good regulations for the surveillance of crops for seed production, especially potato. M. Panjan is one of the most prominent Croatian phytopathologists in the history of this science in Croatia and wider region, and it must be particularly emphasised that he is the founder of plant virology in Croatia. He published 65 scientific papers in Croatian and international scientific journals, he held numerous lectures and presentations at scientific conferences in Croatia and abroad. He wrote nine books individually or in co-authorship. For many years he was the president of the*

općoj ocjeni, sekcija i najaktivnije radila na širenju znanja iz biljnog zdravstva. Predavao je na Poljoprivrednom fakultetu u Osijeku na kojem je izabran za profesora fitopatologije.

Prof. dr.sc. **Josip Kišpatić**, (Osijek 1917. – Zagreb, 1994.), radio je u kratkom razdoblju u Zavodu, ali je tijekom cijelog radnog vijeka ostao povezan s njim. Diplomirao je na Poljoprivredno-šumarskom fakultetu u Zagrebu na Poljoprivrednom odjelu u lipnju 1939. Od 1. kolovoza 1939. do 1. studenoga 1940. stažirao je i obavio specijalizaciju u Zavodu za fitopatologiju Poljoprivredno-šumarskog fakulteta u Zagrebu, gdje je 1941. postavljen za asistenta (dissertacija: "Prilog poznавању биологије и сузбијања бобове рде *Uromyces fabae* (Pers.) de By f. sp. *viciae fabae* de By" 1946.). Na tome mjestu ostaje tri godine. U međuvremenu, od veljače 1942. do veljače 1943. bio je na specijalizaciji kod prof. G. Gassnera u Magdeburgu (Njemačka). U listopadu 1945. premješten je za zamjenika upravitelja Zemaljskoga poljoprivrednog dobra Novi Dvori u Zaprešiću, gdje je bio i rukovoditelj pokusnog polja Zavoda. Premješten je 13. svibnja 1946. na mjesto asistenta u Zavodu u Zagrebu, gdje je bio šef fitopatološkog odjela. Predmete "Poljoprivredna fitopatologija" i "Šumarska fitopatologija" predaje honorarno (od 1947. do 1951.), radeći i dalje kao znanstveni suradnik u Zavodu. Od izbora za docenta 1953. do odlaska u mirovinu obavljao je dužnost predstojnika Zavoda za fitopatologiju na Agronomskom fakultetu u Zagrebu. Preveo je čitav niz važnih radova i dostignuća stranih autora i učinio ih na taj način dostupnim i našoj praksi. Objavio je pedesetak znanstvenih i oko dvjestotinjak stručnih radova. Generacije studenata Poljoprivrednog i Šumarskog fakulteta učile su i uče iz njegovih knjiga i skriptata opću i specijalnu fitopatologiju. Bio je izvrstan predavač i rado su studenti Agronomskog i Šumarskog fakulteta pohađali njegova predavanja. Prvi u našoj zemlji počinje se sustavno baviti uzročnicima bolesti koji se prenose sjemenom. Mnogim pokusima i laboratorijskim istraživanjima utjecao je na razvoj fitomedicine. Uvodi Gassnerovu metodu testiranja fungicida za tretiranje sjemena. Povezao je fitopatologiju sa selekcijom. Uveo je moderne metode testiranja otpornosti so-

Plant Protection Section at the Union of Agricultural Engineers and Technicians of Croatia, which is generally judged to be the most active time of the Section in extending knowledge of plant health. He lectured at the Faculty of Agriculture in Osijek where he was appointed professor of phytopathology.

*Prof. Josip Kišpatić PhD, (Osijek 1917 – Zagreb, 1994), worked at the Institute for a short period, but remained connected therewith during the entire working life. He graduated from the Faculty of Agriculture and Forestry in Zagreb at the Agricultural Department in June 1939. From 1 August 1939 until 1 November 1940 he completed internship and a specialisation course at the Institute for Phytopathology of the Faculty of Agriculture and Forestry in Zagreb, where he was appointed assistant in 1941 (dissertation: "A Contribution to the Knowledge of Biology and Control of Bean Rust *Uromyces fabae* (Pers.) de By f. sp. *viciae fabae* de By" 1946). He remains three years at this position. In the meantime, from February 1942 until February 1943 he attended a specialisation course with Prof. G. Gassner in Magdeburg (Germany). In October 1945 he was transferred to the position of Deputy Manager of the National Agricultural Farm Novi Dvori in Zaprešić, where he was also the head of the Institute's experimental field. On 13 May 1946 he was transferred to the position of an assistant at the Institute in Zagreb, where he was the chief of the phytopathological department. He lectures on the subjects of "Agricultural Phytopathology" and "Forest Phytopathology" on a part-time basis (from 1947 to 1951), keeping working as a scientific associate at the Institute. As from having been appointed assistant lecturer in 1953 until retirement he performed the duty of the Head of the Institute for Phytopathology at the Faculty of Agriculture in Zagreb. He translated a whole array of important papers and achievements made by foreign authors thus making them available to our practice too. He published about fifty scientific and about twenty hundred professional papers. Generations of students at the Faculty of Agriculture and Forestry have learned and are still learning the general and special phytopathology from his books and scripts. He was well accepted orator and students of Agricultural and Forestry faculty attended his classes with pleasure. He is the first one in Croatia to have researched*

rata pšenice na gljivične bolesti. Razradio je vlastitu metodu za proizvodnju micelija šampinjona. Poznati su njegovi prilozi proučavanju bolesti crvenila srca bukve i smeđenje srca jasena. Kao svjetski priznati poznavatelj bolesti vinove loze, bio je savjetnik FAO-a u Afganistanu 1971., gdje je proučio bolest vinove loze naziva "jal" (afg.). Uskoro nakon otkrića organskih herbicida, uočio je da će njihova primjena znatno unaprijediti našu poljoprivredu. Josip Kišpatić je objedinio znanost s primjenom u praksi, na području fitopatologije, herbologije i ekologije, jer je uvijek bio nazočan tamo gdje je trebalo rješavati probleme iz širokog područja zaštite poljoprivrednih kultura i šumarstva.

Vera Lušin, dipl.ing. agr., (Zagreb, 1921. – Zagreb, 1998.), nakon završetka studija 1948., zaposlila se u Zavodu kao mlađa agronomka pripravnica te je radila do 1975. Njezin znanstveni i stručni interes na području fitopatologije bio je vrlo širok. U skromnim uvjetima laboratorijske i stakleničke opreme dala je velik doprinos hrvatskoj fitopatologiji. Tijekom radnog vijeka pratila je pojavu uzročnika gljivičnih bolesti koji se prenose sjemenom bijelih žitarica, kukuruza, heljde, krmnog bilja, povrća, sjemena cvijeća i dr. Budući da se gljive, uzročnici bolesti sjemena, suzbijaju tretiranjem, povjerenja su joj istraživanja djelotvornosti novih aktivnih tvari i njihovih formulacija za predispitivanja i službena ispitivanja. Među mnogim istraživanjima važno je spomenuti istraživanja virusa, posebno virusa koštičavih voćaka, determinaciju fitopatogenih gljiva, od kojih je neke odredila prvi put na području Hrvatske, npr.: *Septoria linicola*, *Colletotrichum lini*, *Phytophthora erytroseptica*, *Tilletia brevisfaciens*, *Cercospora kikuchi*, *Puccinia horiana* i mnoge druge. Uvela je metodu za provjeru osjetljivosti sorata pšenice na *Septoria nodorum*, a nakon pojave raka krumpira (*Synchytrium endobioticum*), provjeravala je otpornost sorata na rak. Vrlo je uspješno (s Nedom Pagliarini) u skromnim uvjetima radila na projektu "Međuodnos grinja i gljiva na uskladištenim žitaricama", koji je financiralo Ministarstvo poljoprivrede SAD-a. Kao dobar taksonom, bila je nezamjenjiva suradnica Granične službe za zaštitu bilja Hrvatske, u čijem je izdanju napisala nekoliko zapaženih publikacija i skriptu

agents causing diseases transmitted by seed. He made an impact on the development of phytomedicine by many experiments and laboratory research. He introduces the Gassner testing method on fungicides for seed treatment. He made a connection between phytopathology and plant selection. He introduced modern testing methods of resistance of wheat varieties to fungal diseases. He developed on his own method for the production of champignon mycelium. Famous are his contributions to the research on the diseases of beech core redness and ash core browning diseases. As the world-recognised connoisseur of vine diseases, he was a FAO advisor in Afghanistan in 1971, where he researched on the vine disease called "jal" (Afgh.). Soon after discovery of organic herbicides, he perceived that their application would substantially improve the Croatian agriculture. Josip Kišpatić consolidated science and practical application, in the field of phytopathology, herbology and ecology, because he was always present at the place where problems from the wide area of agricultural cultures and forestry protection needed to be solved.

Vera Lušin BSc Agr., (Zagreb, 1921 – Zagreb, 1998), having completed the studies in 1948, got employed at the Institute as a junior agronomist trainee and worked there until 1975. Her scientific and professional interest in the field of phytopathology was very wide. In modest conditions of laboratory and greenhouse equipment she made a great contribution to the Croatian phytopathology. During her working life she monitored the appearance of seed-borne fungal diseases of cereals, maize, buckwheat, forage, vegetables, flowers seed etc. Since fungi, the seed born diseases, are controlled by treatment, she was entrusted with research on the efficacy of new active substances and their formulations for pre-testing and official testing. Among many research projects it is important to mention virus research, in particular viral diseases of stone fruit, determination of phytopathogenic fungi, some of which she determined for the first time on the territory of Croatia, e.g.: *Septoria linicola*, *Colletotrichum lini*, *Phytophthora erytroseptica*, *Tilletia brevisfaciens*, *Cercospora kikuchi*, *Puccinia horiana* and many others. She introduced a method to test the susceptibility of wheat varieties to *Septoria nodorum*, and after the appearance of potato wart disease (*Synchytrium*

“Pregled bolesti kukuruza u svijetu”. Objavila je 137 radova s područja fitopatologije, od čega 56 priloga u Glasniku zaštite bilja, ubrajući i one objavljene nakon umirovljenja.

Zdenka Prpić, dipl.ing. agr., (Požega, 1921. – 1996.), od dolaska u ZZB 1950. posvetila se fitopatologiji i fitofarmaciji, prošavši sva područja fitopatologije kao što je tada bio običaj. Počela je s patologijom sjemena i istraživala je važnije uzročnike bolesti toga razdoblja. Nakon pojave plamenjače duhana (*Peronospora tabacina*) u našim krajevima provjeravala je djelotvornost fungicida za njeno suzbijanje. S Višnjom Špehar radila je na određivanju patotipova crne žitne hrđe (*Puccinia graminis*). Proučila je prašnu krastavost krumpira (*Spongospora subterranea*). Jedina je u nas proučavala fiziološke rase gljive *Phytophthora infestans* i odredila je dominantne rase u Hrvatskoj. Razradila je temeljne elemente potrebne za organizaciju antifitoftorne službe. Ispitivala je utjecaj desikacije cime na izrođivanje krumpira. Razjasnila je problem nekroza na kocenu stočnog kelja, dokazavši (s Milanom Panjanom) da je uzrok tim promjenama virus. Proučavala je viruse paprike. Najvažniji njen doprinos struci je zaštita voćaka, prije svega jabuka, na tada novoosnovanoj velikoj plantaži jabuka “Borinci” kraj Vinkovaca, jer do tada ni u Europi nije bilo iskustava sa zaštitom na tako velikim površinama. Trebalo je imati vjere u svoje znanje i hrabrosti te prihvati jedan takav izazov. Zdenka Prpić i Blanka Arčanin, dipl.ing. bile su pioniri u rješavanju zaštite jabuka na tako velikim površinama, kojoj su od početka priše kompleksno i integrirano. Iskustva stečena u Borincima prenosile su na ostale voćnjake u Hrvatskoj s kojima su surađivale (Jasinje – Sl. Brod, Agrozadar – Zadar). Prva rosna vaga (De Wit) u Hrvatskoj nabavljena je 1964. njenom zaslugom. Pomoću de Wit-ove rosne vase moglo se prognozirati pojavu infekcija i odrediti rokove za zaštitu jabuka od *Venturia inaequalis*, što je bilo od iznimne važnosti pri istraživanju novih fungicida za suzbijanje krastavosti plodova i mrljavosti listova. Tijekom uvođenja novih sredstava za zaštitu bilja istraživala je sporedne učinke na populaciju crvenoga voćnog pauka, pojavu mrežavosti na Golden deliciousa, pojavu pepelnice,

endobioticum) she tested the resistance of varieties to wart. She worked very successfully (together with Neda Pagliarini) in modest conditions on the project called “Interrelation between Mites and Fungi on Stored Cereals”, financed by the Ministry of Agriculture of the USA (USDA). As a good taxonomist, she was an indispensable associate of the Border Plant Protection Inspection of Croatia, in the edition of which she wrote a few noticed publications and a script titled “An Overview of Maize Diseases in the World”. She published 137 papers in phytopathology, 56 contributions of which in the Plant Protection Herald, including the ones published after her retirement.

Zdenka Prpić BSc Agr., (Požega, 1921 – 1996), since her arrival to the Plant Protection Institute in 1950 dedicated herself to phytopathology and phytopharmacy, having passed through all the areas of phytopathology as it was a custom then. She started with the seed pathology and researched on major agents causing diseases of that period. After the blue mould of tobacco (*Peronospora tabacina*) has appeared in some parts of Croatia, she tested the efficacy of fungicides for its control. Together with Višnja Špehar she worked on identification of pathotypes of stem rust of wheat (*Puccinia graminis*). She studied the powdery scab of potato (*Spongospora subterranea*), and was the only one in Croatia that studied physiological races of *Phytophthora infestans* and identified dominant races in Croatia. She elaborated on basic elements necessary to organise the potato blight forecast service. She examined the influence of haulm desiccation on potato degeneration. She explained the problem of necrosis, on stem base of stock kale having proved (together with Milan Panjan) that these changes are caused by virus. She researched on paprika viruses. Her most important contribution to the profession is fruit protection, primarily apples, on the then newly established large apple plantation “Borinci” near Vinkovci, because so far even Europe has had no experience in protection on such big land surfaces. One should have had faith in one's knowledge and courage to accept a challenge like that. Zdenka Prpić and Blanka Arčanin, BSc were pioneers in solving apple protection on such big land surfaces, which they approached from the start in a complex and integrated manner. They transferred experience acquired in

kompatibilnost fungicida, akaricida i insekticida te ostale parametre važne za pravilno provođenje zaštite. Mnoga su istraživanja, nažalost, ostala neobjavljena kao npr. primjena antibiotika u zaštiti bilja i dr.

Dr.sc. Višnja Špehar, (Livno, 1917. – 1991.), diplomirala je 1941. na Poljoprivrednom odjelu Poljoprivredno-šumarskog fakulteta u Zagrebu (dizertacija: "Prilog poznavanju biologije crne žitne hrđe", 1963.). Nakon diplomiranja zaposlila se u Zavodu za fitopatologiju Poljoprivredno-šumarskog fakulteta u Zagrebu, najprije kao stažistica, a zatim kao pomoćna asistentica. Na toj dužnosti ostala je do 1947. kada prelazi na dužnost referentice za zaštitu bilja u Ministarstvo poljoprivrede u Zagrebu. Iz Ministarstva 1951. dolazi u Zavod na mjesto asistentice fitopatologa, a poslije postaje stručna suradnica. Izučavala je plamenjaču (*Plasmopara halstedii*) na suncokretu. Provjeravala je djelotvornost nekih fungicida. Povezavši se s oplemenjivačima iz Zavoda za ratarstvo počela je zajedno sa Zdenkom Prpić rad na otpornosti genotipova pšenice na crnu žitnu hrđu. To će postati njezina osnovna specijalnost u znanstveno-istraživačkom radu. Radi usavršavanja, provela je 1957. godine 8 mjeseci u SAD-u na Sveučilištu Cornell. Po povratku sa specijalizacije 1957. prelazi u Zavod za ratarstvo (BC Institut za oplemenjivanje i proizvodnju bilja).

Mr.sc. Andrija Bužančić, (1942.), diplomirao je 1966. na Poljoprivrednom fakultetu, voćarsko-vinogradarsko-vrtlarški smjer. Nakon završenog studija tri je godine radio u PZ "Začretje". Od 1970. do 1975. zaposlen je u Zavodu, u Odjelu za virologiju. Tada odlazi u Duhanski institut u Zagrebu, u kojemu na mjestu stručnog suradnika radi do umirovljenja. Poslijediplomski studij iz biologije upisao je 1970. u Centru za postdiplomski studij Sveučilišta u Zagrebu (magistarski rad: "Svojstva nekih virusa duhana rasprostranjenih u Hrvatskoj", 1977.). Hrvatsko društvo biljne zaštite uručilo mu je Povelju sa srebrnom medaljom za doprinos HDBZ-u i struci 2003. Napisao je više od 70 bibliografskih jedinica i sudjelovao je na mnogim znanstvenim skupovima u zemlji i inozemstvu.

*Borinci to other orchards in Croatia they cooperated with (Jasinje – Sl. Brod, Agrozadar – Zadar). The first dew balance (De Wit) in Croatia was procured in 1964 by her merit. By means of de Wit's dew balance it was possible to forecast the appearance of infections and to determine deadlines for apple protection against *Venturia inaequalis*, which was of exceptional importance with researching on new fungicides for the control of apple scab. During the introduction of new plant protection products she researched on side-effects to the population of red spider mite, the appearance of russetting on Golden delicious, the appearance of powdery mildew, the compatibility of fungicides, acaricides and insecticides and other parameters important for proper protection implementation. Unfortunately, many research studies remained unpublished like e.g. the application of antibiotics in plant protection etc.*

Višnja Špehar PhD, (Livno, 1917 – 1991), graduated in 1941 from the Agricultural Section of the Faculty of Agriculture and Forestry in Zagreb (dissertation: "A Contribution to the Knowledge of Biology of Stem Rust", 1963). After graduation she got employed at the Institute for Phytopathology of the Faculty of Agriculture and Forestry in Zagreb, first as a trainee, and then as an associate assistant. She remained on this duty until 1947 when she assumes the duty of a plant protection officer at the Ministry of Agriculture in Zagreb. She came from the Ministry to the Institute in 1951 to the position of an assistant phytopathologist, and afterwards she became an expert associate. She studied downy mildew (*Plasmopara halstedii*) on sunflower. She tested the efficacy of some fungicides. Having associated with plant breeding experts from the Arable Crops Institute she started working together with Zdenka Prpić on the resistance of wheat genotypes to stem rust. This shall become her basic specialty in scientific-research work. For the purpose of improvement, she spent 8 months in 1957 in the USA at the Cornell University. Upon return from specialisation in 1957 she goes over to the Arable Crops Institute (BC Institute for Breeding and Production of Field Crops).

Andrija Bužančić MSc, (1942), graduated in 1966 from the Faculty of Agriculture, majoring in pomology-viticulture-gardening. Having completed the studies he worked for three years at the Agricultural Cooperative/PZ "Začretje". From 1970 to 1975

Prof. dr.sc. **Bogdan Cvjetković**, (1939.), diplomirao je na Poljoprivrednom fakultetu u Zagrebu 1966. (magistarski rad: "Rasprostranjenost virusa nekrotične prstenaste pjegavosti trešnje na breskvi i ruži u Hrvatskoj", 1976. – PMF; disertacija: "Neke vrste roda *Phytophthora* s posebnim osvrtom na metode izolacije", 1982.). Na Poljoprivrednom fakultetu u Zavodu za fitopatologiju radi kao novak od 1967. do 1968. Od 1969. radi u Zavodu, u Kačićevoj 9. Obnašao je razne dužnosti. Bio je predsjednik Savjeta, a od 1. 12. 1985. od 1.03. 1990. direktor. Na Agronomski fakultet, u Zavod za fitopatologiju kao predstojnik, prelazi 1992. Predaje na Agronomskom fakultetu u Zagrebu i Mostaru, Mediteranskom studiju u Splitu i Veleučilištu "Marko Marulić" u Kninu. Sudjelovao u izobrazbi 30 generacija agronoma. Specijalizirao je u svjetski poznatim mikološkim centrima: Institut za biljnu patologiju (Istituto di Patologia vegetale) Bologna, Institut za mikologiju Commonwealtha (Commonwealth Mycological Institute), -London i Središnji ured za gljive (Centraalbureau voor Schimmelcultures), Baarn, Nizozemska. Bio je na mnogim studijskim putovanjima u SAD-u, Rusiji, Francuskoj i Italiji. Uza znanstveni rad na domaćim i međunarodnim projektima, u suradnji s poljoprivrednim proizvođačima i gospodarskim subjektima promicao je primjenu znanosti u praksi. Prvi je pronašao i determinirao biljne patogene u nas: *Erwinia amylovora*, *Phytophthora citricola*, *Phytophthora megasperma*, *Phytophthora cryptogea*, *Phytophthora nicotianae*, *Pseudoperonospora cubensis*, *Kuenhuela uredinis*, *Seiridium cardinale* na čempresu, *Eutypa lata* i dr., *Prunus necrotic ringspot* i *Pear decline*. Objavio je više od 260 znanstvenih i stručnih radova. Održao je velik broj popularnih predavanja i napisao približno 100 popularnih članaka (Gospodarski list, Večernji list, Šibenski list i dr.) te upozorenja o biljnim bolestima putem postera.

Bio je član Komisije za zaštitu bilja od 1991. do 2006. i Komisije za sjemenarstvo pri MPŠ. Predsjednik je stručne komisije MPŠ za praćenje zaštite jabuka, krušaka i drugih biljnih vrsta od karantenske bolesti *Erwinia amylovora* 1990. – 2000. godine. Bio je voditelj brojnih nacionalnih

he is employed at the Institute, with the Virology Department. Then he leaves for the Tobacco Institute in Zagreb, where he works at the position of an expert associate until his retirement. He enrolled the postgraduate study in biology in 1970 at the Postgraduate Study Centre of the University in Zagreb (Master's thesis: "Characteristics of Some Tobacco Viruses distributed in Croatia", 1977). CPPS awarded him a Silver Medal with Charter for a contribution to the Society (CPPS) and the profession in 2003. He wrote over 70 bibliographic entries and participated in many scientific conferences in Croatia and abroad.

*Prof. Bogdan Cvjetković PhD, (1939), graduated from the Faculty of Agriculture in Zagreb in 1966 (Master's thesis: "Distribution of *Prunus Necrotic Ringspot Virus* on Peach and Rose in Croatia", 1976 – PMF; dissertation: "Some Species of the *Phytophthora* Genus with a Special Reference to Isolation Methods", 1982). He worked as a novice at the Faculty of Agriculture in the Institute for Phytopathology from 1967 to 1968. From 1969 he worked at the Institute, in Kačićeva 9. He performed various duties. He was the president of the Council, and from 1 December 1985 until 1 March 1990 the director. He goes over to the Faculty of Agriculture, to be the Head of the Institute for Phytopathology, in 1992. He was teaching at the Faculty of Agriculture in Zagreb and in Mostar, at the Mediterranean Study in Split and at the "Marko Marulić" Associate-Degree College in Knin. He participated in the education of 30 generations of agronomists. He attended specialisation courses in the world-renowned mycological centres: Institute for Plant Pathology Bologna, Italy Commonwealth Mycological Institute, -London, United Kingdom and Central Bureau of Fungus Cultures, Baarn, the Netherlands. He was on many study trips in the USA, Russia, France and Italy. In addition to the scientific work on Croatian and international projects, in cooperation with agricultural producers and economic entities he promoted the application of science in practice. He was the first one to detect and determine plant pathogens in Croatia: *Erwinia amylovora*, *Phytophthora citricola*, *Phytophthora megasperma*, *Phytophthora cryptogea*, *Phytophthora nicotianae*, *Pseudoperonospora cubensis*, *Kuenhuela uredinis*, *Seiridium cardinale* on cypress, *Eutypa lata* etc., *Prunus necrotic ringspot* and *Pear decline*. He*

projekata te voditelj četiriju međunarodnih projekata, a na jednom suradnik.

Napisao je udžbenik Mikoze i pseudomikoze voćaka i vinove loze, a koautor je 8 stručnih i znanstvenih knjiga.

Predsjednik je HDBZ-a od 2000. do 2004. Glavni je urednik Glasila biljne zaštite od 2007. Član je Upravnog odbora HDBZ-a. Predstavnik je Hrvatske u Udrži fitopatologa Sredozemlja (Mediterranean Phytopathological Union) (MPU) od 1991. Kao istaknuti fitopatolog član je Upravnog odbora u MPU-u od 2007.

Dodijelili su mu priznanja - US Depratment of Agriculture: Certification of Appreciation za uspješno vođenje projekta (2000. g.); Hrvatski sabor: Državnu nagradu za znanost (2003.); HDBZ: Povelju uza zlatnu plaketu - prvom predsjedniku HDBZ-a (2006.); Veleučilište "Marko Marulić": Zahvalnicu Veleučilišta "M. Marulić" u Kninu (2010.) i dr. Novootkrivena vrsta u SAD-u njemu u čast nazvana je *Penicillium cvjetkovicii* (Jurjević & Pererson).

Mr.sc. Ivanka Čizmić, (1946.), diplomirala je na Poljoprivrednom fakultetu Sveučilišta u Zagrebu u svibnju 1970. (magistarski rad: "Ispitivanja toksikoloških vrijednosti nekih insekticida za pojedine vrste test insekata pomoću mikroaplikatora", 1975.). Nakon završetka studija radi kao volontер suradnik u Zavodu za poljoprivrednu zoologiju Poljoprivrednog fakulteta. U Zavodu radi na projektu o *Autographa gamma* 1971/1972., a kao fitopatolog od 1976. do umirovljenja 2007. Sudjelovala je u nastavi predmeta "Fitopatologija s fitofarmacijom" na Agronomskom fakultetu i Visokom gospodarskom učilištu u Križevcima. Specijalizirala je patologiju sjemena u Danskoj 1977./78. te nakon povratka implementirala nove pouzdane, brže, tehnike za dokazivanje mikroorganizama na sjemenu. Prenosila je svoja znanja poljoprivrednim proizvođačima i gospodarskim subjektima, promičući primjenu znanosti u praksi izravnom suradnjom, održavanjem prvih tečajeva iz patologije sjemena 1986., provjerom djelotvornosti pripravaka za tretiranje sjemena i ratarskih usjeva u postupku registracije u Hrvatskoj te je obavljala stručni nadzor sjemenskih usjeva. Vodila je programe eradicacije smrđljive snijeti

published over 260 scientific and professional papers. He held a large number of popular lectures and wrote about 100 popular articles Farmers Magazine (Gospodarski list), Evening Newspaper (Večernji list), Šibenik Magazine (Šibenski list) etc. and warnings of plant diseases via posters.

*He was a member of the Plant Protection Committee from 1991 to 2006 and of the Seed Production Committee at MAF. He was the president of an expert committee at MAF for the monitoring of apple, pear and other plant species protection against quarantine disease *Erwinia amylovora* from 1990-2000. He led numerous national projects and four international projects, and participated in one as an associate.*

He wrote the textbook titled Mycoses and Pseudomycoses of Fruit Trees and Grape Vine, and was a co-author of 8 professional and scientific books.

He is the president of the CPPS from 2000 to 2004. He is the editor-in-chief of the Plant Protection Bulletin since 2007. He is a member of the Management Board of CPPS. He is a representative of Croatia at the Mediterranean Phytopathological Union (MPU) since 1991. As a distinguished phytopathologist he is a member of the Management Board at MPU since 2007.

*He was awarded recognitions from - US Department of Agriculture: Certification of Appreciation for successful leading of the project (2000); Croatian Parliament: National Award for Science (2003); CPPS: Charter with Golden Plaque – to the first president of CPPS (2006); "Marko Marulić" Associate-Degree College: Letter of Thanks from "M. Marulić" Associate-Degree College in Knin (2010) etc. In his honour the newly detected species in the USA was named *Penicillium cvjetkovicii* (Jurjević & Pererson).*

*Ivana Čizmić MSc, (1946), graduated from the Faculty of Agriculture of the University in Zagreb in May 1970. (Master's thesis: "Research on Toxicological Values of Certain Insecticides on Some Insect Species by a Micro-Applicator", 1975). Having completed the studies she works as a volunteer associate at the Institute for Agricultural Zoology of the Faculty of Agriculture. In the Institute she works on the project on *Autographa gamma* 1971/1972, and as a phytopathologist from 1976 until her retirement in 2007. She participated in teaching of "Phytopathology with Phytopharmacy"*

žitarica, kontrole kvalitete tretiranog sjemena i uređaja za tretiranje sjemena. Radila je na edukaciji zaposlenika u poljoprivrednim apotekama, inspektora, stručnjaka HZPSS-a, dorađivača sjemena i dr. Od 2005. predsjednica je SULIKSA (Sekcije uposlenih u laboratorijima za ispitivanje kvalitete sjemena) HDBZ-a, gdje se posebno zalaže za bolje uvjete rada i edukaciju stručnjaka zaposlenih u laboratorijima za ispitivanje kakvoće sjemena. Za zasluge za unapređenje zaštite bilja Hrvatsko društvo biljne zaštite uručilo joj je Priznanje uza zlatnu plaketu 2008. Bila je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavila je više desetaka stručnih i znanstvenih radova te popularnih članaka i sudjelovala je na mnogim skupovima u Hrvatskoj.

Prof. dr.sc. **Ana Šarić**, (Opuzen, 1916. – Zagreb, 2001.,) gimnaziju je završila u Splitu 1934. Diplomirala je 1939. na Poljoprivredno-šumarskom fakultetu Sveučilišta u Beogradu. Nakon završenog studija radila je u Poljoprivrednoj stanici u Splitu, a od 1945. do 1949. u Zemaljskom poljoprivrednom zavodu u Zagrebu. Prirodoslovno-matematički fakultet – Biološki odjel upisala je 1946./47. u Zagrebu, gdje je diplomirala 1950. (dissertacija: "Istraživanja o mikrobakterijama na tlima Jugoslavije", 1955.). Habilitirala je 1959. iz predmeta "Fitopatologija". Na Agronomskom fakultetu u Zagrebu izabrana je za asistenticu u Zavodu za botaniku 1949., a od 1954. do umirovljenja radi u Zavodu za fitopatologiju. Za docentiku je izabrana 1962., izvanrednu profesoricu 1968., a 1973. godine za redovitu profesoricu. Završila je specijalizaciju 1957. u Odjelu za mikrologiju i virologiju u Pavijiji pod vodstvom prof. R. Cifferija. Bila je cijenjeni član stručne asocijacije International Council for the Study of Grapevine virus and virus like diseases te jedan od osnivača 1964. Predavala je na dodiplomskom i poslijediplomskom studiju Agronomskog fakulteta, na poslijediplomskom studiju na Biotehničkom fakultetu u Ljubljani te na talijanskom Zavodu za biologiju i zaštitu bilja Sveučilišta Udine u Italiji (Dipartimento di biologia Applicata alla Difesa delle Piante Università di Udine). Sudjelovala je na kongresima, savjetovanjima i simpozijima u

at the Faculty of Agriculture and the Agricultural High School in Križevci. She completed a specialisation course in the seed pathology in Denmark in 1977/78 and upon return implemented new reliable, faster, techniques of proving the existence of microorganisms in the seed. She transferred her knowledge to agricultural producers and entities, promoting the application of science in practice by direct cooperation, by holding the first courses in the seed pathology in 1986, by testing the efficacy of fungicides for seed treatment and arable crops in the procedure of registration in Croatia and conducted surveillance of crops for seed production. She led programmes of common bunt eradication on cereals, quality controls of the treated seed and of instruments for the seed treatment. She worked on education of employees in agricultural pharmacies, of inspectors, of experts from the Croatian Agricultural Extension Institute (CAEI), of the seed coating experts etc. As of 2005 she is the president of the Section of Employees in the Seed Quality Testing Laboratories at CPPS, where she particularly advocates for better working conditions and education of experts employed in the seed quality testing laboratories. CPPS awarded her with Recognition and a golden plaque in 2008 for the merits in improving plant protection. She was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. She published several tens of professional and scientific publications and popular articles and participated in many conferences in Croatia

Prof. Ana Šarić PhD, (Opuzen, 1916 – Zagreb, 2001,) finished secondary school in Split in 1934. She graduated in 1939 from the Faculty of Agriculture and Forestry of the University in Belgrade. Having completed the studies she worked at the Agricultural Station in Split, and from 1945 to 1949 at the National Agricultural Institute in Zagreb. She enrolled the Faculty of Science – Department of Biology in 1946/47 in Zagreb, where she graduated in 1950 (dissertation: "Research on Mixobacteria in the Soils of Yugoslavia", 1955). She habilitated in 1959 on the subject of "Fitopathology". She was elected assistant in the Institute for Botany at the Faculty of Agriculture in Zagreb in 1949, and from 1954 until her retirement she worked at the Department for Phytopathology at the Faculty of Agriculture in Zagreb. She was elected

zemlji i inozemstvu. Nakon umirovljenja nastavila je surađivati s mnogim virolozima iz važnijih viroloških institucija u Europi. U skromnim uvjetima finansijskih izvora, uz vlastita odricanja i mnogo entuzijazma, stavila je u funkciju virološki laboratorij na Agronomskom fakultetu. Zahvaljujući velikom biološkom znanju, lako je svladavala nove tehnike rada i primjenjivala ih. Istraživanja je uvijek usmjeravala na najaktualnija zbivanja u fitopatološkoj znanosti. Područje njezine znanstvene djelatnosti mogli bi podijeliti u nekoliko opusa. Prvi su radovi bili iz botanike, zatim fitopatogenih gljiva i bakterija. Kod nas je prva s Ivankom Milatović determinirala sušicu cvata vinove loze (*Peyronellaea glomerata*). Istraživala je olovnu bolest breskve (*Stereum purpureum*) i upozorila na gljive razarače drva u rudnicima. Sljedeća faza obuhvatila je izučavanje *Bacillus turingiensis* i bakteriofaga te *Miksobacteria* koje su bile tema disertacije.

Uz M. Panjana i akademika D. Miličića utemeljitelj je biljne virologije u Hrvatskoj. Ana Šarić počela je istraživati virusе i fitoplazme poljoprivrednih kultura: rajčice, kruške, jabuke, zatim virusе: trešnje, šljive, breskve, citrusa, salate, soje, karanfila i dr. Otkrila je nazočnost nekih karantenskih bolesti u nas, npr. Citrus tristeza virus i fitoplazmu Bois Noir (BN). Mnoge je virusе opisala prvi put u Hrvatskoj. Njezina istraživanja imala su praktičnu primjenu u selekciji zdravog sadnog materijala, voćaka (jabuka, citrusi) u PIK-u Neretva i vinove loze u Jastrebarskom. Objavila je sama ili u suautorstvu 75 radova, većinom u svjetski priznatim časopisima.

Tradicija rada u virološkom laboratoriju nastavlja se dolaskom mr.sc. Vesne Kajić 1982. Analiziraju se uzorci sjemenskoga krumpira A6 testom i vizualno na naklijalom krumpiru nakon vađenja i određuju zaraze gospodarski važnim virusima. Dvostranom radikalnom imunodifuzijom u agarskom gelu testira se CarMV u karanfilima predviđenim za vegetativno razmnožavanje. Godine 1983. uveden je serološki test DAS-ELISA za kontrolu zdravstvenog stanja sjemenskoga i sadnog materijala na nazočnost karantenskih i gospodarski važnih virusa. PVA, PVY i PLRV određivani su u uvoznom i domaćem sjemenskom krumpiru, PPV u matičnim biljkama

assistant lecturer in 1962, associate professor in 1968, and in 1973 full-time professor. She completed a specialisation course in 1957 at the Mycology and Virology Department in Pavia led by Prof. R. Cifferi. She was an esteemed member of the professional association of the International Council for the Study of Grapevine Virus and Virus-Like Diseases and one of its founders in 1964. She lectured at the undergraduate and postgraduate study of the Faculty of Agriculture, at the postgraduate study of the Faculty of Biotechnology in Ljubljana and at the Biology and Plant protection Department of the University of Udine, Italy. She participated in congresses, conferences and symposia in Croatia and abroad. After retirement she continued cooperation with many virologists from major virology institutions in Europe. In modest conditions of financial sources, with her own withholdings and abundant enthusiasm, she established the laboratory of virology at the Faculty of Agriculture. Thanks to her extensive biological knowledge, she easily adopted and applied new working techniques. She always focused research on the most current happenings in the phytopathological science. The area of her scientific activity could be divided into several opuses. The first works were in botany, then phytopathogenic fungi and bacteria. She was the first one in Croatia together with Ivanka Milatović to determine flower blight of grapevine (*Peyronellaea glomerata*). She researched on silver leaf disease of peach (*Stereum purpureum*) and warned of wood-decay fungi in mines. Next phase covered the research on *Bacillus turingiensis* and bacteriofage and Mixobacteria which was the subject of dissertation.

Together with M. Panjan and academician D. Miličić, she is the founder of plant virology in Croatia. Ana Šarić started researching on viruses and phytoplasmas on cultures: tomato, pear, apple, and then viruses on cherry, plum, peach, citrus, salad, soybean, carnation etc. She detected the presence of certain quarantine diseases in Croatia, e.g. *Citrus tristeza virus* and *Bois Noir* phytoplasma (BN). She described many viruses for the first time in Croatia. Her research found practical application in the selection of healthy fruit planting material (apple, citrus varieties) at the company "Neretva" and vine in Jastrebarsko. She published 75 papers individually or in co-authorship, mostly in recognised international journals.

koštičavog voća, GFLV, GVLRa V I i III u matičnim biljkama podloga i plemki vinove loze.

Prof. dr.sc. **Ivanka Milatović**, (Koprivnica 1917. – Zagreb, 1998.), u Koprivnici je završila osnovnu školu i gimnaziju. Diplomirala je 1941. na Poljoprivrednom odsjeku Poljodjelsko-šumarskog fakulteta u Zagrebu. Po završetku studija provela je specijalistički staž u Zavodu za fitopatologiju istog fakulteta kod profesora Vladimira Škorića, poliglota i svjetski priznatog fitopatologa. Nakon specijalizacije ostala je raditi na mjestu gospodarske vježbenice do 1945. Čitav radni vijek provela je u Zavodu za fitopatologiju Agronomskog fakulteta u Zagrebu. Godine 1947. izabrana je za asistenticu (dissertacija: "Prilog poznavanju biologije (*Isariopsis griseola*) uzročnika sive pjegavosti graha", 1953.), a habilitirala je 1958. Izabrana je za docentiku 1961., za izvanrednu profesoricu 1967., a 1972. za redovnu profesoricu. Kao autorica ili suautorica napisala je više od pedeset znanstvenih radova iz determinacije gljiva ili proučavanja njihove biologije. Napisala je u to vrijeme vrlo traženu skriptu "Bolesti povrća" (1968.), koju je sama ilustrirala. U suautorstvu napisala je knjige: "Suvremena proizvodnja kukuruza", (1967.) "Soja" (1966.), "Zaštita kukuruza" (1971.) i dr. Za potrebe poslijediplomske studije napisala je internu skriptu "Osnovi sistematike i determinacije gljiva" (1974.).

Uvijek je pokazivala osobujnu nadarenost i znanstvenu znatiželju kada se radilo o determinaciji patogenih gljiva. Stručnjaci se opredjeluju za determinacije vrsta unutar jednog roda gljiva. Malo je taksonoma u svijetu koji su spremni determinirati gljive iz različitih sistematskih razdjela, no Ivanka Milatović s istim je žarom prilazila determinaciji patogenih gljiva poljoprivrednih i šumarskih kultura, cvijeća, sjemena ili samoniklog bilja, bez obzira kojoj porodici ili rodu pripadali. S lakoćom, u tišini, uvijek je dolazila do cilja. Svima je znano da bez točne identifikacije uzročnika nema uspješne zaštite, pa je često njezina riječ bila presudna u dalnjim odlukama Zavoda u kojem je radila.

Prva je opisala neke gljive u nas kao što su *Peyronella glomerata* - uzročnik sušice cvata loze i njezino suzbijanje,

The tradition of work in the laboratory of virology continues with the arrival of Vesna Kajić MSc in 1982. Seed potato samples are being analysed by A6 test and visually on germinated potato after digging it up and infections by economically important viruses identified. CarMV in carnations planned for vegetative propagation is tested by agar gel immunodiffusion. A serological test DAS-ELISA has been introduced in 1983 to control the health status of the seeds and planting material for the presence of quarantine and economically important viruses. PVA, PVY and PLRV have been identified in imported and Croatian seed potato, PPV in mother plants of stone fruit, GFLV, GVLRa V 1 and 3 in mother plants of vine rootstocks and varieties.

*Prof. Ivanka Milatović PhD, (Koprivnica 1917 – Zagreb, 1998), finished primary and secondary school in Koprivnica. She graduated in 1941 from the Agricultural Section of the Faculty of Agriculture and Forestry in Zagreb. Upon completion of the studies she spent specialist years of service at the Institute for Phytopathology of the same Faculty with Professor Vladimir Škorić, a polyglot and the world recognised phytopathologist. After specialisation she remained working at the position of an economic trainee until 1945. She spent the entire working life at the Institute for Phytopathology of the Faculty of Agriculture in Zagreb. In 1947 she was elected assistant (dissertation: "A Contribution to the Knowledge of Biology of *Isariopsis griseola*, causal agent of bean angular leaf spot", 1953), and habilitated in 1958. She was elected assistant lecturer in 1961, associate professor in 1967, and in 1972 full-time professor. As an author or a co-author she wrote over fifty scientific papers dealing with fungi determination or research on their biology. She wrote a much demanded script at that time titled "Vegetable Diseases" (1968), which she illustrated by herself. In co-authorship she wrote the following books: "Modern Maize Production", (1967) "Soybean" (1966), "Maize Protection" (1971) etc. For the needs of postgraduate study she wrote an internal script titled "Elements of Fungi Taxonomy and Determination" (1974).*

She has always shown a peculiar talent and scientific curiosity when it was the matter of pathogenic fungi determination. Experts choose to determine species within one fungi genus. There are only few taxonomists in the world ready to determine fungi

Blumeriella jappii - uzročnik kozičavosti višnje, *Pleospora clavescens* na maku, *Ustilago nigra* - crna snijet ječma, *Sciria pini* - uzročnik osipanja iglica bora i druge, što samo potvrđuje njezinu širinu poznavanja te problematike. Za znanost bile su posebice zanimljive determinacije nekih karantenskih gljiva, kao što su *Helminthosporium maydis* rasa T na kukuruzu, nakon čega je pravodobno upozorila oplemenjivače kukuruza na posljedice koje može uzrokovati taj patogen ako se proširi. Prva je u Europi otkrila uzročnika osipanja borovih iglica (*Sciria accicola*) i o tome obavijestila svjetsku javnost. Bila je priznati taksonom za gljive iz roda *Fusarium*. Pozivana je u ekipu stručnjaka za oplemenjivanje kukuruza i pšenice, ali i šumara, na međunarodnim i domaćim projektima jer je bila vrstan poznavatelj patogenih gljiva.

Osim nastave na dodiplomskom i poslijediplomskom studiju, održavala je tečajeve te neobvezne kolokvije iz mikologije. Mnoge fitopatologe uputila je u tajne carstva mikroskopskih gljiva, npr. Ivanka Čizmić, Branka Palaveršića, Ivana Buturca, Matu Dominkovića i Bogdana Cvjetkovića. Nesebičnom preddajom znanja i iskustava popločila je cestu kojom fitopatolozi Hrvatske idu naprijed.

Za predani, dugogodišnji pedagoški rad i doprinos razvitku Agronomskog fakulteta dobila je priznanje 1979. Iste godine primila je i Plaketu Sveučilišta u Zagrebu.

Tomislava Hranueli, dipl.ing., (Trogir, 1949. – 1981.), u Trogiru je započela svoje školovanje. Gimnaziju je pohađala u Šibeniku i Splitu. Upisala se na Biotehnički odjel Tehnološkog fakulteta u Zagrebu 1969. i diplomirala u travnju 1976. Iстicala se tijekom izrade diplomskog rada koji je objavila u časopisu Genetika 1977. pod naslovom "Utjecaj kofeina na reparaciju nakon UV zračenja pri različitim uvjetima uzgoja bakterije *Streptomyces rimosus* R7". Prije završetka studija radila je nešto manje od godine dana na karakterizaciji mutanata bakterije *Bacillus subtilis* elektronском mikroskopijom, u Institute of Microbiology, Oxford (Engleska).

Nakon što je diplomirala, Tomislava Hranueli počela je raditi u virološkom laboratoriju u ZZB-u na karakterizaciji virusa izoliranih iz vinove loze, a poslije na istraživanjima

from various systematic divisions, but Ivanka Milatović approached the pathogenic fungi determination on agricultural and forest cultures, on flowers, seeds or wild plants, with the same zeal regardless of which family or genus they belong to. Easily, silently, she has always reached the goal. Everybody knows that there is no successful protection without precise identification, so that her say was often crucial in further decisions made by the Institute she worked at.

She was the first one to describe certain fungi in Croatia such as *Peyronella glomerata* – agent causing grapevine flower blight and its control, *Blumeriella jappii* – cherry leaf spot, *Pleospora clavescens* on poppy, *Ustilago nigra* – semiloose smut of barley, *Scirrhia pini* – red band needle blight of pines and others, which only confirms her extensive knowledge of these issues. There were some determinations of certain quarantine fungi that were especially interesting for science, such as *Helminthosporium maydis* race T on maize, after which she timely warned maize breeders of the consequences this pathogen might cause if it spreads out. She was the first one in Europe to detect the brown spot needle blight on pine (*Scirrhia accicola*) and notify the world public thereof. She was a recognised taxonomist for fungi from the *Fusarium* genus. She was invited to join the expert teams for maize and wheat breeding, but the foresters as well, in international and Croatian projects as she was an excellent connoisseur of pathogenic fungi.

In addition to teaching at the undergraduate and postgraduate study, she held courses and optional colloquia in mycology. She instructed many phytopathologists in the secrets of the microscopic fungi kingdom, e.g. Ivanka Čizmić, Branko Palaveršić, Ivan Buturac, Mato Dominković and Bogdan Cvjetković. With her unselfish transfer of knowledge and experience she paved the road which phytopathologists of Croatia take to move forward.

For her devoted, pedagogical work for many years and a contribution to the development of the Faculty of Agriculture she received a recognition award in 1979. That same year she also received a Plaque from the University in Zagreb.

Tomislava Hranueli, BSc, (Trogir, 1949 – 1981), started her education in Trogir. She attended secondary school in Šibenik and in

virusa duhana i povrća. Godine 1977. upisala je poslijediplomski studij iz eksperimentalne biologije na Sveučilištu u Zagrebu, a za temu magistarskog rada obradila je uvjete pripreme i fuzije protoplasta. Istraživala je bolesti ukrasnoga bilja i povrća u staklenicima, rješavajući vrlo uspješno brojne probleme iz prakse kao i mogućnosti primjene biološke borbe u staklenicima. Dovršavala je pisanje magistarskog rada, kada je prerana, tragična smrt prekinula životni put mlade kolegice. U vrlo kratkom razdoblju svoga uspješnoga rada objavila je dva znanstvena rada (Hranueli, D. i B. Hranueli: Karakterizacija i mapiranje šesnaest novoizoliranih asporogenih mutanata. *Genetika*, 7, 47 – 60, 1975.; Šarić, A., Hranueli, T., 1977: Istraživanje virusnih bolesti loze u SR Hrvatskoj. Proc. Symp. Ekskoriosis in vine, Mostar, 149 – 151.)

Mr.sc. **Ljubo Isaković**, (1958.), završio je Agronomski fakultet u Zagrebu 1984. (magistarski rad: "Gljivične bolesti rozgve s posebnim osvrtom na gljivu *Phomositis viticola* Sacc.", 1991.). Sudjelovao je u istraživanjima na znanstvenim projektima "Hrana" i "Posavina" i na međunarodnom projektu "Biološko suzbijanje jugoslavenskih i sjevernoameričkih korova s pomoću insekata, patogena i alelopatskih odnosa", koji je financiralo Ministarstvo poljoprivrede SAD-a. Godine 1990. bio je mjesec dana na specijalizaciji u Središnjem uredu za gljive (Centraalbureau voor Schimmelcultures), Baarn (Nizozemska). Vodio je vježbe iz predmeta "Fitopatologija s fitofarmacijom". Tijekom rada u ZZB-u objavio je deset radova u suautorstvu. Krajem 1991. odlazi iz ZZB-a i radi za razne tvrtke koje zastupaju ili proizvode sredstva za zaštitu bilja.

Kraće su razdoblje u Zavodu radili: mr.sc. Ivan Buturac, Mihovil Stanišić, dipl.ing., Davor Batas, dipl.ing., Vlatka Lipovac, dipl.ing., Dražen Radunić, dipl.ing. i dr.

Zahvaljujući entuzijazmu, upornosti, temeljitosti i vjerovanju u uspjeh svih tih djelatnika, fitopatologija je dobila odgovarajući status u zaštiti bilja i hrvatskoj znanosti te je utrt put kojim nasljednici mogu nastaviti.

Split. She enrolled the Department of Biotechnology at the Faculty of Technology in Zagreb in 1969 and graduated in April 1976.

*She excelled in writing her graduation thesis that she published in the magazine called Genetics in 1977 titled "The Influence of Caffeine on Reparation after UV Irradiation with Different Conditions of Breeding the Streptomyces rimosus R7 Bacteria". Before she completed the studies she had worked a little less than a year on characterisation of the *Bacillus subtilis* bacteria mutants by electronic microscopy, at the Institute of Microbiology, Oxford (England).*

*After graduation, Tomislava Hranueli started working in the laboratory of virology at the Plant Protection Institute on characterisation of viruses isolated from vine, and thereafter on tobacco and vegetable virus research. In 1977 she enrolled postgraduate study in experimental biology at the University in Zagreb, and in her Master's thesis she elaborated the topic of protoplast preparation and fusion conditions. She researched on diseases of ornamental plants and vegetable in greenhouses, very successfully solving numerous problems from practice as well as possibilities of applying biological control in greenhouses. She was in the process of completing the writing of the Master's thesis, when the tragic death stopped the young colleague too soon in her tracks. In a very short period of her successful work she published two scientific papers (Hranueli, D. and B. Hranueli: Characterisation and Mapping of Sixteen Newly Isolated Asporogenic Mutants. *Genetika*, 7, 47 – 60, 1975; Šarić, A., Hranueli, T., 1977: Research on Virus Diseases of Vine in the Socialist Republic of Croatia. Proc. Symp. Excoriosis in vine, Mostar, 149 – 151.)*

Ljubo Isaković MSc, (1958), completed the Faculty of Agriculture in Zagreb in 1984 (Master's thesis: "Fungal Diseases of vine shoot with a Special Reference to the *Phomositis viticola* Sacc. Fungus", 1991). He participated in research on scientific projects of "Food" and "Posavina" and on the international project of "Biological Control of Yugoslav and North American Weeds by Insects, Pathogens and Alelopathic Relations/Effects", financed by the Ministry of Agriculture of the USA (USDA). In 1990 he spent one month on a specialisation course at Central Bureau of Fungus Cultures, Baarn, the Netherlands. He conducted tutorials in "Phytopathology with Phytopharmaacy". During his

Dr.sc. Bogdan Korić, (1945.), (magistarski rad: "Utjecaj *Puccinia graminis* f. sp. *tritici* na prinos pšenice u uslovima umjetne infekcije", 1978.; disertacija: "Ispitivanje otpornosti nekih genotipova pšenice – *Triticum estivum* ssp. *vulgare* prema *Septoria nodorum* Berk.", 1985.) – stručnjak za mikoze ratarskog i industrijskog bilja. Od 1972. do 1992. radio je u Institutu za oplemenjivanje i proizvodnju bilja u Botincu kraj Zagreba U postupku oplemenjivanja žitarica radio je na otpornosti na bolesti te je suautor dviju sorata pšenice. Od 1992. do umirovljenja 2010. radio je u Zavodu. Mnogo godina obavljao je zdravstveni i stručni nadzor sjemenskih usjeva strnih žitarica i krmnog bilja. Vrlo aktivno je sudjelovao u prikupljanju podataka za IPP (izvještajno prognozni poslovi). Objavio je više od 150 stručnih i znanstvenih radova i sudjelovao je na mnogim skupovima u Hrvatskoj i nekim u inozemstvu. Predavao je na tečaju za osposobljavanje zaposlenika u poljoprivrednim ljekarnama.

Mr.sc. Ivan Mikec (Petlovec, 1948.- Zagreb, 2010), (magistarski rad: "Fitofarmakološka vrijednost nekih sistemičnih fungicida u suzbijanju krastavosti jabuke (*Venturia inequalis* Cke) Winter", 1983.) – stručnjak za uzročnike bolesti voćaka i vinove loze. Dugi niz godina istraživao je učinkovitost fungicida na voćkama i vinovoj lozi u postupku registracije. Također je ocjenjivao popratne pojave primjene fungicida i određivao različite učinkovitosti fungicida radi preporuke primjene integrirane zaštite bilja bolesti voćaka i vinove loze. Obavljao je zdravstvene pregledе sadnog materijala voćaka i vinove loze. Pratio je pojavu, širenje i davao preporuke suzbijanja novootkrivenih štetnih organizama u Hrvatskoj. Desetak godina vrlo je uspješno obavljao dužnost stručnog voditelja. Sudjelovao je u povjerenstvima za izradu propisa. Predavao je na tečaju za osposobljavanje zaposlenika u poljoprivrednim ljekarnama. Bio je član radne skupine za poglavje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavio je nekoliko desetaka stručnih i znanstvenih publikacija te popularnih članaka, a sudjelovao je na mnogim skupovima u Hrvatskoj i na nekim u inozemstvu. Često je gostovao u Emisiji za selo i poljo-

work at the Plant Protection Institute he published ten papers in co-authorship. By the end of 1991 he had left the Plant Protection Institute and continued working for various companies that represent or produce plant protection products.

The following employees worked at the Institute for a short period of time: Ivan Buturac MSc, Mihovil Stanišić BSc, Davor Batas BSc, Vlatka Lipovac BSc, Dražen Radunić, BSc etc.

Thanks to enthusiasm, persistence, thoroughness and belief in success of all these employees, phytopathology obtained an appropriate status in plant protection and Croatian science which paved the way for successors to advance.

Bogdan Korić PhD, (1945), (Master's thesis: "The Influence of *Puccinia graminis* f. sp. *tritici* on the Wheat Yield under Artificial Infection Conditions", 1978; dissertation: "Testing Resistance of Certain Wheat Genotypes – *Triticum estivum* ssp. *vulgare* against *Septoria nodorum* Berk.", 1985) – an expert in mycoses of arable crops and industrial crops. From 1972 until 1992 he worked in the Institute for Breeding and Production of Field Crops in Botinac near Zagreb. In the procedure of cereal breeding he worked on resistance to diseases and has been a co-author of two wheat varieties. From 1992 until his retirement in 2010 he was working in the Institute. For many years he has been performing the health surveillance and surveillance of quality and characteristics of arable crops for seed production. He was very active in collecting data for REWS (reporting and early warning system). He published over 150 professional and scientific papers and participated in many conferences in Croatia and some abroad. He was also teaching at the course for employees in agricultural pharmacies.

Ivan Mikec MSc (Petlovec, 1948 - Zagreb, 2010), (Master's thesis: "Phyto Pharmacological Value of Certain Systemic Fungicides in the Control of Apple Scab (*Venturia inequalis* Cke) Winter", 1983) – an expert in agents causing diseases of fruit and vine. For a number of years he researched on the efficacy of fungicides on fruit trees and grapevine in the procedure of registration. He also evaluated side effects of fungicides and determined various efficiency degrees of fungicides in order to recommend the application of integrated plant protection fruit and vine diseases. He performed health surveillance of fruit and

privredu Hrvatskog radija dijeleći savjete poljoprivrednim proizvođačima o mjerama zaštite poljoprivrednih kultura od štetnih organizama.

Mr.sc. Željko Tomić, (1963.), (magistarski rad: "Gljivične bolesti šećerne repe s posebnim osvrtom na njihovo suzbijanje", 1993.) – specijalist za identifikaciju gljiva uzročnika bolesti poljoprivrednoga i ukrasnog bilja na sjemenu i u vegetaciji. Istraživao je učinkovitost fungicida za tretiranje sjemena i usjeva ratarskih kultura i industrijskog bilja. Obavlja zdravstveni i stručni nadzor sjemenskih usjeva. Fitopatološku specijalizaciju započeo je u nizozemskom zavodu Središnji ured za gljive (Centraalbureau voor Schimmelcultures), Baarn, 2001. Specijalizaciju na temu *Phytophthora ramorum*-morfologija, izolacija i molekularne tehnike detekcije obavio je u njemačkom istraživačkom centru Federal Biological Research Centre for Agriculture and Forestry, Braunschweig, 2006. te u Službi za zaštitu bilja, Wageningen, Nizozemska, 2007. s proširenjem i na vrste *Phytophthora kernoviae*, *P. lateralis* i *Guignardia citricarpa*. Specijalizirao se i za determinaciju gljivica na sjemenu uključujući *Fusarium* vrste. Bio je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavio je 3 znanstvena, petnaest stručnih i više popularnih članaka, a sudjeluje i na mnogim skupovima u Hrvatskoj. Predaje na tečaju za osposobljavanje zaposlenika u poljoprivrednim ljekarnama.

Mr.sc. Adrijana Novak, (1976.), (magistarski rad: "Morfološke i epidemiološke karakteristike gljivice *Mycovellosiella fulva* (Cooke) Arx – uzročnika baršunaste pljesni lista rajčice", 2008.) – specijalist za determinaciju gljiva uzročnika bolesti povrća i ukrasnog bilja. Fitopatološku specijalizaciju osposobljavanja za dijagnostiku gljivičnih bolesti krumpira i povrća iz rođova *Pythium*, *Phytophthora*, *Phoma*, *Verticillium*, *Alternaria*, *Fusarium*, *Sclerotinia*, *Botrytis*, *Bremia*, *Pseudoperonospora*, obavila je u Institutu za zaštitu bilja i očuvanje tla (Fővárosi Növény-egészségügyi és Talajvédelmi Állomás), Csongrad, Mađarska, 2004. Specijalizaciju s područja dijagnostike *Phytophthora ramorum*, *P. lateralis*,

vine planting material. He monitored appearance, distribution and gave recommendations for control of newly detected harmful organisms in Croatia. He was leading surveys of fire blight, PPV and FD. For about ten years he successfully performed the duty of expert leader of the Institute. He participated in preparation of many regulations. He was also teaching at the course for employees in agricultural pharmacies. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. He published a few tens of professional and scientific publications and popular articles and participated in many conferences in Croatia and some abroad. He often participated on the Croatian radio program for agricultural producers giving advice regarding protection measures against pests on agricultural crops.

Željko Tomić MSc, (1963), (Master's thesis: "Fungal Diseases of Sugar Beet with a Special Reference to Their Control", 1993) – a specialist in fungi identification of agents causing diseases in the seed and vegetation of agricultural and ornamental plants. He researched on the efficacy of fungicides for the treatment of seeds and arable crops. He performs surveillance of crops for seed production. He started his phytopathological specialisation at the Dutch institute of Centraalbureau vor Schimmelcultures, Baarn, in 2001. He completed a specialisation course elaborating the topic of *Phytophthora ramorum*-morphology, isolation and molecular techniques of detection at the German research centre of the Federal Biological Research Centre for Agriculture and Forestry, Braunschweig, in 2006 and at the Plant Protection Service, Wageningen, the Netherlands, in 2007 extending it to the species of *Phytophthora kernoviae*, *P. lateralis* and *Guignardia citricarpa*. He also specialised in fungi determination on seeds including *Fusarium* species. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. He published 3 scientific, fifteen professional and several popular articles and participated in many conferences in Croatia. He is also teaching at the course for employees in agricultural pharmacies.

Adrijana Novak MSc, (1976), (Master's thesis: "Morphological and Epidemiological Characteristics of the *Mycovellosiella fulva*

P. kernoviae, *P. cactorum*, *P. nicotianae*, *P. syringae*, *P. citricola*, *P. cinnamomi*, *Verticillium dahliae*, *V. albo – atrum*, *V. tricorpus*, *V. chlamydosporum*, *V. bulbillosum*, *Guignardia citricarpa*, *Fusarium culmorum*, *F. avenaceum*, *F. oxysporum*, *F. foetens*, *F. verticillioides*, *F. solani*, *F. equiseti*, *Alternaria gaisen*, *A. dianthi*, *A. mali*, *A. solani*, *A. alternata*, *A. petroselini*, *A. citri*, *A. radicina* te upoznavanje protokola za dijagnostiku raka krumpira (*Synchytrium endobioticum*) obavila je u Službi za zaštitu bilja, Wageningen, Nizozemska, 2007. Naprednu specijalizaciju s područja patotipova *C. fulvum* s naglaskom na efektore, rezistentnost na fungicide i patotipove genese te molekularne dijagnostike gljivica (PCR, RT-PCR, Real time PCR) *Synchytrium endobioticum*, *Colletotrichum acutatum* obavila je na Sveučilištu u Wageningenu, Nizozemska, 2010.

Pomagala je pri organizaciji izvještajno-prognoznih poslova. Vodi tečaj za osposobljavanje zaposlenika u poljoprivrednim ljekarnama. Istraživala je učinkovitost fungicida u postupku registracije za povrće. Danas obnaša dužnost rukovoditeljice Odjela za biljno zdravstvo. Bila je član radnih skupina za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor te poglavlje Okoliš u pregovorima o pristupanju EU. Objavila je 2 znanstvena i 2 stručna rada. Član je američkog fitopatološkog društva (APS).

Darko Jelković, dipl ing., (1953.) – stručnjak za bolesti krumpira. Kad je počeo raditi 1981. istraživao je učinkovitost herbicida na korove u postupku registracije za primjenu u Hrvatskoj, a nastavio je istraživati učinkovitost fungicida za primjenu na krumpiru i povrću u postupku registracije. Usavršavao je znanje o stručnom nadzoru sjemenskog krumpira u Zavodu za sjemenarstvo i rasadničarstvo u Osijeku. Vodi programe posebnog nadzora i obavlja zdravstvene i stručne preglede sjemenskoga krumpira. Redovito obavještava proizvođače na skupovima u Hrvatskoj o ovisnosti sjemenske proizvodnje krumpira i bolestima. Predaje na tečaju za osposobljavanje zaposlenika u poljoprivrednim ljekarnama. Objavio je petnaestak stručnih radova.

(Cooke) Arx Fungus – tomato leaf mold“, 2008) – a specialist in fungi determination of agents causing diseases in vegetable and ornamental plants. She had training in identification of fungi of *Pythium*, *Phytophthora*, *Phoma*, *Verticillium*, *Alternaria*, *Fusarium*, *Sclerotinia*, *Botrytis*, *Bremia*, *Pseudoperonospora*, that cause damages on potato and vegetable on two occasions at the Plant Protection and Soil Conservation Service of County, Csongrad, Hungary, in 2004. Specialisation courses in diagnostics of *Phytophthora ramorum*, *P. lateralis*, *P. kernoviae*, *P. cactorum*, *P. nicotianae*, *P. syringae*, *P. citricola*, *P. cinnamomi*, *Verticillium dahliae*, *V. albo – atrum*, *V. tricorpus*, *V. chlamydosporum*, *V. bulbillosum*, *Guignardia citricarpa*, *Fusarium culmorum*, *F. avenaceum*, *F. oxysporum*, *F. foetens*, *F. verticillioides*, *F. solani*, *F. equiseti*, *Alternaria gaisen*, *A. dianthi*, *A. mali*, *A. solani*, *A. alternata*, *A. petroselini*, *A. citri*, *A. radicina* and protocol for diagnostic of Potato wart disease (*Synchytrium endobioticum*) in the Plant Protection Service, Wageningen, the Netherlands, in 2007. She also completed an advanced course regarding pathotypes of *C. fulvum* with an emphasis on effectors, resistance to fungicides and pathotype genes. Also, she was trained in molecular fungi diagnostics (PCR, RT-PCR, Real time PCR) of *Synchytrium endobioticum*, *Colletotrichum acutatum* at the Wageningen University, the Netherlands, in 2010. She assisted in organising the reporting and early warning system and conducts the course in qualifying employees in agricultural pharmacies. She tested the efficacy of fungicides in the procedure of registration for vegetables. Today, she performs the duty of the Manager of the Plant Health Department. She was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. She published 2 scientific and 2 professional papers. She is a member of the American Phytopathological Society (APS).

Darko Jelković BSc, (1953) – an expert in potato diseases. He started working in 1981 on weed control with herbicides for registration and continued testing efficacy of fungicides in the procedure of registration for potato and vegetables. He attended course for surveillance procedure on characteristics of potato seed at Institute for Seed and Seedlings in Osijek. He performs

Mr.sc. **Vesna Kajić**, (1954.), (magistarski rad: "Proširenost ekonomski značajnih virusa krumpira u SR Hrvatskoj", 1990.) – specijalistica za determinaciju virusa i viroida poljoprivrednog bilja. Od dolaska u ZZB radi na određivanju gospodarski važnih virusa (PVY, PLRV, PVA) u sjemenskom krumpiru, sadnom materijalu voćaka (PPV, PNRSV, PDV, ApMV, ACLSV, ASPV, ASGV), vinove loze (GFLV, GVLRaV I, GVLRaV III, GVA) te na drugim kulturama. Također, radi na određivanju karantenskih štetnih virusa (PPV, CTV, TYLCV) i virusa s Alert liste (PepMV), a u novije doba i viroida (PSTVd) na ukrasnom bilju, povrću i krumpiru. Zajedno s mr.sc. Ivanom Križanac uvela je IC-RT-PCR, RT-PCR i PCR metodu za određivanje štetnih organizama. Optimizirala je metodu PCR za određivanje vrste *Bemisia tabaci* i diferencijaciju Q i B soja iste vrste. Priprema uzorke za sekvenciranje te na osnovi sekvene u komparaciji s Ban-kom gena određuje vrste viroida i filogeniju pojedinih virusa. Specijalizirala se u području biljne virologije u mnogim uglednim ustanovama. Specijalizaciju na temu testa ELISA obavila je u Boehringer, Beč, Austrija, 1981. Specijalizaciju s područja virusa krumpira i testa ELISA obavila je u Saveznoj istraživačkoj stanici za poljoprivredu, (Forschungsanstalt für landwirtschaftlichen Pflanzenbau), Zürich, Švicarska, 1994. i u Visokoj stanici (Station de Haute Belgique), Libramont, Belgija, 1995. O virusima i PCR-u, specijalizirala je na Institutu "Ruder Bošković" u Zagrebu, 1998. i na Zavodu za transfuziju krvi u Zagrebu, 1998. Nova saznanja o dijagnostici PPV-a i radu na IC-RT-PCR-u stekla je na PMF-u u Zagrebu, 2004. i 2005. te u Istraživačkom institutu za pomologiju i voćarstvo (Instytutu Sadownictwa i Kwiatnictwa), Skierniewice, Polska, 2005. Rad na Real – time PCR, sekvenciranju, RT-PCR, PCR, izolaciji NK, mehaničkoj inokulaciji test biljaka, cjepljenje u zeleno i elektronsko mikroskopiranje usavršila je u Referentnom nacionalnom laboratoriju za viruse Službe za zaštitu bilja, Wageningen te u Nizozemskoj inspekcijskoj službi za hortikulturu (Stichting Nederlandse Algemene Kwaliteitsdienst Tuinbouw - Naktinbouw), 2007. Izolaciju DNA i RNA, PCR, RFLP, RT-PCR,

surveys regarding harmful organisms on potato, as well as health surveillance, origin, characteristics and estimates amount of potato for seeds. He regularly presents dependence of potato seed production and diseases to farmers and at conferences in Croatia. He is also teaching at the course for employees in agricultural pharmacies. He published about fifteen professional papers.

Vesna Kajić MSc, (1954), (Master's thesis: "Distribution of Economically Important Potato Viruses in the Socialist Republic of Croatia", 1990) – a specialist in virus and viroid determination on agricultural plants. Since she came to the Plant Protection Institute she works on determination of economically important viruses (PVY, PLRV, PVA) in the seed potato, planting fruit material (PPV, PNRSV, PDV, ApMV, ACLSV, ASPV, ASGV), grapevine (GFLV, GVLRaV I, GVLRaV III, GVA) and on other cultures. She works on identifying quarantine harmful viruses (PPV, CTV, TYLCV) as well as leading surveys on PepMV, and PSTVd on ornamental plants, vegetables and potato. Together with Ivana Križanac MSc introduced IC-RT-PCR, RT-PCR and PCR methods for identification of harmful organisms. She optimised the PCR method for species identification of *Bemisia tabaci* and differentiation of Q and B genus of the same type. She prepares samples for sequencing and on the basis of a sequence compared with the Genbank she determines the viroid types and the phylogeny of individual viruses. She had training on performance of ELISA test at the Boehringer, Vienna, Austria, in 1981. She completed a specialisation course in the field of potato viruses and ELISA test at Federal Research Station for Agronomy, Zürich, Switzerland, in 1994 and at the Belgium High Station, Libramont, Belgium, in 1995. She had training on viruses and PCR at the "Ruder Bošković" Institute in Zagreb, in 1998 and at the Blood Transfusion Institute in Zagreb, in 1998. She acquired new knowledge on PPV diagnostics and the work on IC-RT-PCR at the Faculty of Science in Zagreb, in 2004 and 2005 and at the Research Institute of Pomology and Fruticulture, Skierniewice, Poland, in 2005. She completed a specialisation course in DNA and RNA isolation, PCR, RFLP, RT-PCR, Real-Time PCR Southern blot hybridisation, dot blot hybridisation, sequencing and geotypisation by means of a mi-

Real-time PCR Southern blot hibridizacija, dot blot hibridizacija, sekvenciranje i geotipizacija pomoću mikrosatelita obavila je na Institutu "Ruđer Bošković" u Zagrebu, 2005. Specijalizaciju na području PPV, RT-PCR, RT-LAMP, real-time PCR, BioPlex Assay-bead array, gel purifikacija, ligacija, transformacija, kloniranje, analiza sekvenci, Fruit tree Virus Certification and Diagnosis, Grapevine Virus Certification and Diagnosis, QA System and ISO 17 025, Lab Accreditation obavila je u Kanadskoj inspekцији за hrani, Centru za biljno zdravstvo (Canadian Food Inspection Agency; Centre for Plant Health) Sidney, BC, Kanada, 2008. Bila je član radnih skupina za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor te poglavlje Okoliš u pregovorima o pristupanju EU. Bila je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavila je 12 znanstvenih i stručnih radova. Radi na doktorskoj disertaciji naslova: "Raspšrostranjenošt i molekularna raznolikost virusa šarke šljive (*Plum pox virus*) u Hrvatskoj".

Jasna Milanović, dipl.ing., (1980.) – radi kao stručna suradnica u Laboratoriju za virologiju na dijagnostici gospodarskih i karantenskih biljnih virusa te subvirusnih patogena. Specijalizaciju na temu Theoretical Course "RNA Structure and Function" obavila je u Međunarodnom centru za genetski inženjeringu i biotehnologiju (Centro Internazionale di Ingegneria Genetica e Biotecnologia), Trst, Italija, 2009. Studijsko putovanje na temu "Determination of harmful organism Potato Spindle tuber viroid and measures against its spread" obavila je u Središnjem laboratoriju za dijagnostiku štetnih organizama,, Uprave za zaštitu bilja i očuvanje tla (Fővárosi Növény-egészségügyi és Talajvédelmi Állomás) Budimpešta, Mađarska, 2009.

Mr.sc. **Ivana Križanac**, (1976.), (magistarski rad: "Molekularna identifikacija fitoplazmi u voćkama rodova *Prunus*, *Malus* i *Pyrus* u Hrvatskoj", 2009.) – bakteriologinja specijalistica za identifikaciju bakterija i fitoplazmi voćaka, vinove loze, krumpira, rajčice i ukrasnog bilja. Metode za detekciju i identifikaciju karantenskih biljnih bakterija i fi-

crosatellite at "Ruđer Bošković" Institute in Zagreb, in 2005. She attended advanced training on RT-PCR sequencing, RT-PCR, PCR, NA isolation, mechanical inoculation of test plants, green grafting and electronic microscoping at the Plant Protection Service, Wageningen, the Netherlands and the Netherlands Inspection Service for Horticulture (Naktuinbouw), in 2007. She attended advanced course of identification of PPV, RT-PCR, RT-LAMP, real-time PCR, BioPlex Assay-bead array, gel purification, ligation, transformation, cloning, sequence analysis, Fruit Tree Virus Certification and Diagnosis, Grapevine Virus Certification and Diagnosis, QA System and ISO 17 025, Lab Accreditation at the Canadian Food Inspection Agency; Centre for Plant Health Sidney, BC, Canada, in 2008. She was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. She published 12 scientific and expert papers. She is working on the doctoral dissertation titled: "Distribution and Molecular Diversity of the Plum Pox Virus in Croatia". She participates in preparing regulations.

Jasna Milanović BSc, (1980) – works as an expert associate in the Laboratory for Virology on diagnostics of economic and quarantine harmful plant viruses and subviral pathogens. She is employed since 2009 and she is enrolled in the postgraduate doctoral study at the Faculty of Science in Zagreb. She attended course on "RNA Structure and Function" at ICGEB - International Centre for Genetic Engineering and Biotechnology, Trieste, Italy, 2009 and "Determination of Harmful Organism Potato Spindle Tuber Viroid and Measures against Its Spread" at the Central Laboratories for Pest Diagnosis, Directorate of Plant Protection, Soil Conservation and Agri-Environment, Central Agricultural Office, Budapest, Hungary, in 2009.

Ivana Križanac MSc, (1976), (Master's thesis: "Molecular Identification of Phytoplasma in Fruit Trees of *Prunus*, *Malus* and *Pyrus* Genus in Croatia", 2009) – a bacteriologist, specialist in identification of bacteria and phytoplasma of fruit trees, grapevine, potato, tomato and ornamental plants. She attended courses regarding methods in detection and identification of quarantine harmful plant bacteria and phytoplasma at: the

toplazmi je specijalizirala na: Nacionalnom institutu za biologiju u Ljubljani 2002. (*Ralstonia solanacearum*, *Clavibacter michiganensis* subsp. *sepedonicus*, fitoplazme vinove loze), Institutu za zaštitu bilja i očuvanje tla (Fővárosi Növényegészségügyi és Talajvédelmi Állomás) u Budimpešti 2002. i 2003. (fitoplazme voćaka i vinove loze), Laboratoriju za bakteriologiju i očuvanje tla (Bakteriológiai laboratórium és Talajbiológiai laboratórium), u Pečuhu 2003. (*Ralstonia solanacearum*, *Clavibacter michiganensis* subsp. *sepedonicus*, *Erwinia amylovora*), Referentnom nacionalnom laboratoriju za bakteriologiju Službe za zaštitu bilja u Wageningenu 2007. (imunofluorescencija, fluorescentna *in situ* hibridizacija i analiza masnih kiselina za više vrsta fitopatogenih bakterija) i 2010. (fitopatogene bakterije iz roda *Xanthomonas*) te Nacionalnom institutu za istraživanja u poljoprivredi (INRA) u Bordeauxu 2008. (*Multilocus sequence typing* (MLST) fitoplazmi voćaka i tipizacija kukaca – vektora fitoplazmi). Primjenjuje metode na osnovi amplifikacije markera DNA (lančana reakcija polimerazom) i analize polimorfizma restriktivskih fragmenata te druge molekularne metode. U suradnji sa stručnjacima Zavoda i PMF-a prvi put u Hrvatskoj molekularnim metodama potvrdila je nazočnost fitoplazmi uzročnika europskih žutica kostićavog voća, propadanja kruške i zlatne žutice vinove loze. Član je američkog fitopatoloskog društva (APS), međunarodnog društva za hortikulturu (ISHS). Član organizacijskog odbora European Plum pox meeting 2007 u Puli. Sudjelovanje u izradi zakonskih regulativa. Objavila je četiri znanstvena rada te više sažetaka u zbornicima skupova.

Jelena Plavec, dipl.ing., (1981.) – bakteriologinja, stručna suradnica na identifikaciju bakterija i fitoplazmi. Zaposlena od 2009., upisala je poslijediplomski doktorski studij na PMF-u. Specijalizira se za identifikaciju bakterija iz roda *Clavibacter* te je u tu svrhu obavila specijalizaciju s područja dijagnostike bakterija *Clavibacter michiganensis* subsp. *sepedonicus* i *Clavibacter michiganensis* subsp. *michiganensis* Fera (The Food and Environment Research Agency, prije CSL), York, Velika Britanija, 2010 te fitoplazmi u Fitolabu u Budimpešti,

National Institute for Biology in Ljubljana in 2002 (Ralstonia solanacearum, Clavibacter michiganensis subsp. sepedonicus, grapevine phytoplasma), the Institute for Plant Protection and Soil Conservation in Budapest in 2002 and 2003 (fruit tree and grapevine phytoplasma), the Laboratory for Bacteriology and Protection of Soil in Pécs in 2003 (Ralstonia solanacearum, Clavibacter michiganensis subsp. sepedonicus, Erwinia amylovora), the Reference National Laboratory for Bacteriology of the Plant Protection Service in Wageningen in 2007 (immuno-fluorescence, fluorescent in situ hybridisation and analysis of fat acids for several species of phytopathogenic bacteria) and in 2010 (phytopathogenic bacteria from the Xanthomonas genus) and the National Institute for Agricultural Research (INRA) in Bordeaux in 2008 (Multilocus sequence typing (MLST) fruit tree phytoplasma and insect typization – phytoplasma vectors). She started using methods based on DNA marker amplification (polymerase chain reaction) and polymorphism analysis of restriction fragments and other molecular methods. In cooperation with experts from the Institute and the Faculty of Science she confirmed for the first time in Croatia by molecular methods the presence of phytoplasma of the European yellows in stone fruit, pear decline and golden grapevine yellows. She is a member of the American Phytopathological Society (APS), the International Society for Horticulture Science (ISHS). She was a member of the organisation committee of the European Plum Pox meeting in 2007 in Pula. She participates in preparing regulations. She was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. She published 3 scientific papers and several abstracts in the collection of papers from conferences.

Jelena Plavec, BSc, (1981) – a bacteriologist, an expert associate for determination of quarantine harmful plant bacteria including phytoplasma. She is employed since 2009 and she is enrolled in the postgraduate doctoral study at the Faculty of Science in Zagreb. She attended training course in determination of *Clavibacter michiganensis* subsp. *sepedonicus* and *Clavibacter michiganensis* subsp. *michiganensis* bacteria at Agencija za istraživanje hrane i okoliša (The Food and Environment Re-

Mađarska. Objavila je jedan znanstveni rad i jedan sažetak u zborniku skupova.

Dr.sc. **Dario Ivić**, (1977.), (magistarski rad: "Djelotvornost fungicida, patogenost i toksigena aktivnost *Fusarium* vrsta na zrnu pšenice", 2007; disertacija: "Karakterizacija vrsta roda *Fusarium* na sjemenu kultiviranih i samoniklih mahunarki (Fabaceae)", 2010.) – fitopatolog. Od 2002. do 2010. godine radio je na Zavodu za fitopatologiju Agronomskog fakulteta u Zagrebu. Bavio se fitopatogenim gljivama i biljnim mikozama, pri čemu je njegov istraživački rad bio usmjeren na gljive proizvođače mikotoksina, prije svega one iz roda *Fusarium*. Radio je i na gljivičnim bolestima koje se prenose sjemenom uzgajanog bilja, gljivičnim bolestima kukuruza i pšenice, bolestima jabuke i breskve nakon berbe, bolestima jagode te gljivičnim bolestima endemske i zaštićenih samoniklih biljaka u Hrvatskoj. U svrhu specijalizacije iz područja dijagnostike gljiva koje se prenose sjemenom boravio je na Institutu za biljnu patologiju (Istituto Sperimentale per la Patologia Vegetale) u Rimu, Italija, 2004., a determinaciju *Fusarium* vrsta specijalizirao je na Institutu za znanosti o proizvodnji hrane (Istituto di Scienze delle Produzioni Alimentari), Bari, Italija, 2006. U srpnju 2010. odlazi s Agronomskog fakulteta i postaje djelatnik Zavoda za zaštitu bilja. U Zavodu radi na dijagnostici štetnih organizama zdravstvenim pregledima nasada, izvještajno-prognoznim poslovima te programima posebnog nadzora.

Sudjelovao je na brojnim znanstvenim i stručnim skupovima u zemlji i inozemstvu. Član je HDBZ, Hrvatskoga mikrobiološkog društva i Mediteranske fitopatološke unije. Objavio je veći broj znanstvenih i stručnih radova te popularnih članaka.

1.6. Povijest i razvoj herbologije

Čovjek se susreće s korovima, tj. "neželjenim biljnim vrstama na željenom mjestu", još otkako se organizirano počeo baviti biljnom proizvodnjom. Primjenjujući različite mјere, čovjek već 12 000 godina vodi borbu protiv korova. Na osnovi te tvrdnje moglo bi se pretpostaviti da herbologija ili

search Agency), York, Great Britain, in 2010 and phytoplasma u Fitolab in Budapest, Hungary. She published one abstract in the proceedings of papers from conferences.

Dario Ivić PhD, (1977), (Master's thesis: "Efficiency of Fungicides, Pathogenicity and Toxigenic Activity of the *Fusarium* Species in the Wheat Grain", 2007; dissertation: "Characterisation of the *Fusarium* Genus Species in the Seed of Cultivated and Wild Leguminosae (Fabaceae)", 2010) – a phytopathologist. From 2002 to 2010 he worked at the Institute for Phytopathology of the Faculty of Agriculture in Zagreb. He was dealing with phytopathogenic fungi and plant mycoses, whereby his research work was focused on mycotoxin producing fungi, primarily the ones from the *Fusarium* genus. He also worked on fungal diseases transmitted by seed of cultivated plants, fungal diseases of maize and wheat, apple and peach diseases after harvest, strawberry diseases and fungal diseases of endemic and protected wild plants in Croatia. He attended training course in diagnostics of fungi transmitted by seed at the Experimental Institute for Plant Pathology, Rome, Italy, in 2004, and in determination of the *Fusarium* species at the Institute of Food Productions Sciences of Bari, Italy, in 2006. Since July 2010 is employee of the Institute for Plant Protection. At the Institute for Plant Protection he is working in diagnostics of harmful organisms, health surveillance, reporting and early warning system and surveys.

He participated in numerous scientific and professional conferences in Croatia and abroad. He is a member of the CPPS, the Croatian Microbiological Society and the Mediterranean Phytopathological Union. He has published many scientific and professional papers and popular articles.

1.6. History and Development of Herbology

The man meets the weeds, "unwanted plant varieties on a wanted spot", ever since he has started with an organised plant production. Applying various measures, the man has been fighting against the weeds for almost 12 000 years. On the basis of this statement one could assume that herbology or the science

znanost koja se bavi proučavanjem i suzbijanjem korova, u stogodišnjem postojanju Zavoda ima jednako dugu tradiciju kao i poljoprivredna zoologija, entomologija ili fitopatologija. Međutim, nije tako. Mjere borbe protiv korova bile su sastavni dio tehnologije proizvodnje svake poljoprivredne kulture do početka pedesetih godina 20. stoljeća. Tek pronalaskom selektivnih herbicida i istraživanjem njihovih fizikalno-kemijskih i bioloških svojstava, herbologija je službeno postala dijelom zaštite bilja.

Prof. dr.sc. **Josip Kovačević**, (Oriovac, 1910. – Zagreb, 1980.), ima nesumnjivo najveće zasluge za razvoj herbologije kako znanosti općenito, tako i u Zavodu. Diplomirao je na Poljoprivredno-šumarskom fakultetu u Zagrebu. Prvi se u nas temeljito počeo baviti herbologijom, znanošću o korovima, iako je prije svega bio fitocenolog. U početku je proučavao sjeme, njegove nečistoće i primjese i širenje sjemena u prirodi, a poslije se posvetio fitocenološkim i herboškim istraživanjima korovne i livadne vegetacije te korovnih zajednica pojedinih kultura, ponajprije s ekološko-gospodarstvenoga gledišta. Vrlo je plodan pisac. Napisao je više stotina rada, priručnika, knjiga (ukupno 680 bibliografskih jedinica). Iako je službovao u drugim institucijama, sve do odlaska u mirovinu svesrdno je surađivao s herbolozima Zavoda (Ema Groman, J. Kišpatić, V. Seiwerth, S. Keglević, Z. Ostojić). Rezultat njihove suradnje jest objava više knjiga, priručnika i znanstvenih radova iz područja proučavanja i suzbijanja korova. Inicijativom Josipa Kovačevića, a uz potporu ondašnjeg direktora Zavoda M. Panjana i herbologa Zvonimira Ostojića, počelo je 1971. izdavanje znanstvenog časopisa "Fragmenta herbologica Croatica". Tada je "Fragmenta" bila jedan od samo četiriju znanstvenih časopisa u svijetu koji su isključivo objavljivali herboške radove (Weed Science, Weed Research i Zasso Kenkyu – japanski Weed Research). Tiskana na stranim jezicima u obliku separata, kao što i samo ime govori, "Fragmenta" je po zamisli Josipa Kovačevića u početku trebala služiti prije svega za međunarodnu razmjenu s drugim časopisima iz svijeta. Inicijativom nekadašnjega Jugoslavenskog društva za proučavanje i suzbijanje korova, nakon 15 prvih

dealing with research and control of weeds has an equally long tradition in the hundred years of the Institute's existence as the agricultural zoology, entomology or phtypathology. However, it is not so. Measures of fighting against the weeds have been an integral part of the production technology of every agricultural culture until the beginning of the fifties of the 20th century. It is only after the discovery of selective herbicides and the research on their physical, chemical and biological characteristics that herbology became officially a part of plant protection.

Prof. Josip Kovačević PhD, (Oriovac, 1910 – Zagreb, 1980), has undoubtedly the greatest merits for the development of herbology as a science in general, and at the Institute as well. He graduated from the Faculty of Agriculture and Forestry in Zagreb. He was the first one in Croatia to have started dealing with herbology, the science of weeds, although having been first of all a phytocenologist. At the beginning he analysed the seed, its impurities and additives and the distribution of the seed in nature, and afterwards he devoted himself to phytocenological and herbological research on the weed and meadow vegetation and weed association of individual cultures, primarily from the ecological and economic point of view. He is a very productive writer. He wrote several hundreds of papers, handbooks, books (680 bibliographic entries in total). Although he worked in other institutions, until his retirement he wholeheartedly cooperated with the herbologists from the Institute (Ema Groman, J. Kišpatić, V. Seiwerth, S. Keglević, Z. Ostojić). The result of their cooperation is the publication of several books, handbooks and scientific papers in the field of research and control of the weeds. Initiated by Josip Kovačević, and supported by the then Director of the Institute M. Panjan and a herbolologist Zvonimir Ostojić, the scientific magazine titled "Fragmenta herbologica Croatica" started to be published in 1971. "Fragmenta" was then one of only four scientific magazines in the world publishing exclusively herbological papers (Weed Science, Weed Research and Zasso Kenkyu – the Japanese Weed Research). Published in the form of separate prints in foreign languages, as it can be discerned from the name itself, Josip Kovačević conceived "Fragmenta" at the beginning to serve primarily for an international exchange with other magazines of the world. Initiated by the former Yugoslav Society for Research

brojeva, hrvatskom uredništvu pridodani su znanstvenici iz ostalih republika. Časopis mijenja ime u "Fragmenta herbologica Jugoslavica" i postaje službenim glasilom Društva. Pod tim imenom izlazi sve do početka Domovinskog rata, kada mijenja ime u "Fragmenta herbologica", a zatim u "Fragmenta phytomedica et herbologica" te postaje znanstvenim časopisom Hrvatskog društva biljne zaštite. Izlazi i danas.

Prigodom proslave 60 godina postojanja Zavoda, 1969., na Poljoprivrednom fakultetu bilo je "Savjetovanje iz zaštite bilja". Savjetovanju je bilo nazočno više od 200 stručnjaka zaštite bilja iz svih krajeva ondašnje države. Aktualnosti zaštite bilja predstavljene su s 22 izlaganja od kojih su samo tri bila iz herbologije, što zorno oslikava činjenicu da je ta disciplina još uvijek bila na početku svojeg razvoja. Sedamdesetih, a naročito osamdesetih godina 20. st., herbologija doživljava iznimno brz razvoj. Istražuje se mnogo novih herbicida i regulatora rasta u različitim poljoprivrednim kulturama. Samo 26 aktivnih tvari herbicida bilo je registrirano 1970., već 68 aktivnih tvari herbicida 1980., a čak 95 aktivnih tvari herbicida 1990. Broj herbicidnih pripravaka u prosjeku je bio tri puta veći. Donošenjem 1986. "Pravilnika o obveznom zdravstvenom pregledu usjeva i objekata, sjemena i sadnog materijala poljoprivrednog i šumskog bilja ("Narodne novine", br. 53/91.)," su prvi put opširnije obuhvaćeni i korovi.

U to vrijeme veoma je izražena potreba da se steceno znanje i rezultati istraživanja mnogo novih herbicida primijene u proizvodnji. Intenzivnom suradnjom s brojnim poljoprivrednim organizacijama (kombinatima), predavanjima, održavanjem seminara i objavljivanjem radova i članaka u časopisima u tome se u potpunosti uspijeva. Sukladno s promjenama zakonskih propisa 1982. došlo je i do reforme visokog obrazovanja na Fakultetu. Prvi put uvodi se smjer Zaštite bilja u kojem, uza stručnjake drugih organizacijskih jedinica ZZB-a, u izvođenju nastave sudjeluju i stručnjaci Odjela za herbologiju. Važan doprinos razvoju herbologije dala je i prof. dr.sc. **Nada Hulina** (1939.). Iako agrobotaničarka, od početka uvođenja smjera Zaštita bilja izvodi nastavu na kolegiju Korovi. Uz veći broj znanstvenih i stručnih radova o korovima, rezultat njezine

and Control of Weeds, after the first 15 issues, scientists from other republics joined the Croatian editorial staff. The magazine changes the name into "Fragmenta herbologica Jugoslavica" and becomes an official gazette of the Society. It has been published under this name until the beginning of the Croatian War of Independence, when it changes the name into "Fragmenta herbologica", and then into "Fragmenta phytomedica et herbologica" thus becoming a scientific magazine of the CPPS. It is being published still today.

On the occasion of celebrating 60 years of the Institute, in 1969, the "Plant Protection Conference" was held at the Faculty of Agriculture. The Conference was attended by over 200 experts in plant protection from all over the former Yugoslavia. Actualities of plant protection were displayed in 22 presentations, only three of which were from the field of herbology, which vividly illustrates the fact that this discipline was still at the beginning of its development. During the 70s and in particular the 80s of the 20th century herbology experiences an exceptionally rapid development. Many new herbicides and growth regulators are analysed in various agricultural cultures. Only 26 active substances of herbicides were registered in 1970, as many as 68 active substances of herbicides in 1980, and even 95 active substances of herbicides in 1990. The number of herbicide preparations was thrice as many on the average. The adoption in 1986 of the "Ordinance on Mandatory Health Surveillance of Agricultural and Forestry Crops and Premises for Seed and Planting Material" (OG 53/91) included for the first time a more detailed account of the weeds.

At that time there was a strong need to apply the acquired knowledge and research results of many new herbicides in production. It was fully achieved by intensive cooperation with numerous agricultural organisations (combined companies), lectures, holding seminars and publishing papers and articles in magazines. In line with the changes of regulations in 1982 there was a reform in high education at the Faculty. For the first time there was introduced the study of Plant Protection where, beside experts from other organisational units of the Plant Protection Institutes, there were also experts from the Department for Herbology who participated in classes. An important contribution to the development of herbology was made also by Prof. Nada Hulina PhD

djelatnosti iz područja herbologije jest i sveučilišni udžbenik "Korovi", tiskan 1988.

Prof. dr.sc. **Katarina Dubravec**, (1933.), koja je bila uključena u nastavu poljoprivredne botanike za studente raznih smjerova na Poljoprivrednom fakultetu, bavila se istraživanjima regulatora rasta, a rezultati su korišteni pri dobivanju dopuštenja za promet. **Valentina Gaži Baskova** (Namangan, Rusija, 1913. – Zagreb, 1992.), predavala je poljoprivrednu botaniku na Agronomskom fakultetu i istraživala je korovsku floru livada i pašnjaka.

Ema Groman, dipl.ing., (Stari Banovci, 1908 – Rijeka, 1976) godine 1951. postavila je prve pokuse s ciljem provjere biološkog učinka novootkrivenih hormonskih herbicida. U početku je radila kao fitopatolog, ali nakon specijalizacije u BBA-u (Njemačka) specijalizirala je metode za istraživanja herbicida te se do umirovljenja bavi herbološkim istraživanjima. Uvela je službeno istraživanje herbicida radi dobivanja dopuštenja za promet. Istraživala je hormonske 2,4-D i MCPA herbicide u strnim žitaricama i u kukuruzu, a kasnije 2,4,5-T, prvi herbicid namijenjen suzbijanju drvenastih krova (10 radova). Krajem pedesetih godina 20. stoljeća, samo tri godine nakon što je otkriven, postavlja pokuse sa simazinom u kukuruzu, vinogradima i voćnjacima. Prva je na prostorima bivše države uvela biotest-metode za dokazivanje ostataka herbicida u tlu. Istraživala je promjenu korovne flore pod utjecajem široke primjene herbicida. zajedno s prof. dr. Josipom Kovačevićem proučavala je fenološke faze razvoja napasne pridošlice *Ambrosia artemisiifolia*. Svojim radom pridonijela je da se uspostave temelji današnje herbologije u ZZB-u.

Stjepan Keglević, dipl.ing., (1925.), već tada dokazani stručnjak zaštite bilja, dolazi na mjesto Eme Groman nakon njezina odlaska u mirovinu. Radio je na istraživanjima herbicida za dobivanje dozvole za promet. Nakon što je 1949. diplomirao na Poljoprivredno-šumarskom fakultetu u Zagrebu, usavršavao se u području primjenjene entomologije u Zagrebu, 1949. – 1950., te iz zaštite bilja i biljne karantene na University of Minnesota u Minneapolisu i u Plant Quarantine Serviceu

(1939). Although an agrobotanist, ever since the study of Plant Protection has been introduced she lectures on the Weeds course. In addition to a number of scientific and professional papers on the weeds, the result of her activity in the field of herbology is also the textbook titled "Weeds", printed in 1988.

Prof. **Katarina Dubravec** PhD, (1933), who was involved in the agricultural botany courses for students at the Faculty of Agriculture, was dealing with research on growth regulators, and the results were used in order to obtain approval for placing on the market. **Valentina Gaži Baskova** (Namangan, Russia, 1913 – Zagreb, 1992), was teaching Agricultural Botany at the Agricultural Faculty and researched on the weed flora of meadows and pastures.

Ema Groman, BSc, (Stari Banovci, 1908 – Rijeka, 1976) established the first tests in 1951 with the purpose to check the biological efficacy of newly detected hormone herbicides. At the beginning she worked as a phytopathologist, but after specialisation at the BBA (Germany) she completed a training course in the methods of research on herbicides dealing with herbological research until her retirement. She introduced official research on herbicides in order to obtain approvals for placing on the market. She researched on hormone 2,4-D and MCPA herbicides in cereals and in maize, and afterwards 2,4,5-T, the first herbicide intended for control of wooden weeds (10 papers). By the end of the 50s of the 20th century, only three years after it was discovered, she sets up tests with simazine in corn, vineyards and orchards. She was the first one on the territory of the former country to have introduced biotest-methods to prove herbicide residues in soil. She studied the change of weed flora under the influence of wide application of herbicides. Together with Prof. Josip Kovačević PhD she studied fenological development stages of invasive species called *Ambrosia artemisiifolia*. With her work she contributed to the establishment of the foundations of the present herbology at the Institute for Plant Protection.

Stjepan Keglević, BSc, (1925), already then a proven expert in plant protection, comes to the position of Ema Groman after she was retired. He worked on herbicides research to obtain approval for placing on the market. After he had graduated from the Faculty of Agriculture and Forestry in Zagreb in 1949, he perfected his

u New Yorku, 1958. – 1959. Bio je upravitelj Fitosanitetske stanice u Varaždinu od 1951. do 1954. Od 1955. do umirovljenja radi u Ministarstvu poljoprivrede NRH, najprije kao referent, zatim savjetnik te kao republički inspektor za zaštitu bilja. Za boravku u ZZB-u (od 1963. do 1965.) istraživao je herbicidne pripravke za primjenu u soji, suncokretu, strnim žitaricama i kukuruzu. Objavio je više od 400 članaka iz područja zaštite bilja, od kojih pet o rezultatima istraživanja herbicida dok je radio u ZZB-u. Na dužnost u Ministarstvo poljoprivrede Stjepan Keglević odlazi u svibnju 1966.

Nikola Gjeldum, dipl.ing., (1938.), diplomirao je na Poljoprivrednom fakultetu u Zagrebu 1965., a u ZZB dolazi 1966. na mjesto herbologa, gdje postavlja poljske pokuse s herbicidima radi određivanja biološke učinkovitosti u postupku dobivanja dopuštenja za promet. U to vrijeme dozvolu za promet dobili su herbicidi na osnovi aktivnih tvari trifluralin, MCPP, fenmedifam, metobromuron, kloroksuron. Rezultate istraživanja iznosio je na stručnim i znanstvenim skupovima. Aktivno je sudjelovao na Seminaru o herbicidima koji je održan u veljači 1967. na Poljoprivrednom fakultetu u Zagrebu, a nazočno je bilo oko 130 poljoprivrednih stručnjaka s "terena". Objavio je pet radova o djelotvornosti herbicida u povrtnim kulturama, duhanu, kukuruzu i strnim žitaricama.

Tih, šezdesetih, godina intenzivno su prof. dr.sc. Josip Kišpatić i Velimir Seiwerth, dipl.ing., istraživali učinkovitost herbicida u Zavodu za fitopatologiju na Agronomskom fakultetu

Prof. dr. **Josip Kišpatić**, (Osijek, 1917. – Zagreb, 1994.), prije svega se bavio poljoprivrednom i šumarskom fitopatologijom, gdje je dosegnuo maksimum, ali je proučavao i korove važnijih poljoprivrednih kultura (šećerne repe, strnih žitarica, akvatičnih i hidromelioracijskih sustava, željezničkih pruga, zeljastih i drvenastih vrsta) te korove u šumarstvu i šumarskim rasadnicima. Izučavao je mehanizme djelovanja fungicida, a kasnije i herbicida. Napisao je više priručnika, skripata i udžbenika o korovima i herbicidima, kao npr. "Herbicidi i njihova primjena u poljoprivredi", Zagreb, 1967., "Priručnik za poznavanje i suzbijanje korovne flore u našim hidromeli-

knowledge in the field of applied entomology in Zagreb, 1949 – 1950, and of plant protection and plant quarantine at the University of Minnesota in Minneapolis and at the Plant Quarantine Service in New York, 1958 – 1959. He was the manager of the Phytosanitary Station in Varaždin from 1951 to 1954. From 1955 until retirement he works at the Ministry of Agriculture of the People's Republic of Croatia, first as a clerk, later as an advisor and then as a republic inspector for plant protection. While he was at the Institute for Plant Protection (from 1963 to 1965) he researched on herbicide preparations to be applied in soya, sunflower, cereals and maize. He published over 400 articles in the field of plant protection, five of which were dealing with the result of herbicides research while he worked at the Institute for Plant Protection. Stjepan Keglević left in May 1966 to assume the duty in the Ministry of Agriculture.

Nikola Gjeldum, BSc, (1938), graduated from the Faculty of Agriculture in Zagreb 1965, and came to the Institute for Plant Protection in 1966 to the position of a herbologist, where he set up field tests with herbicides in order to identify biological efficiency in the procedure of obtaining the approval for placing on the market. At that time the approval for placing on the market was granted to herbicides on the basis of active substances trifluralin, MCPP, phenmedipharm, metobromuron, chloroxuron. He presented the research results on professional and scientific conferences. He actively participated in the Seminar on Herbicides held in February 1967 at the Faculty of Agriculture in Zagreb, attended by approximately 130 agricultural experts from the "field". He published five papers on the efficacy of herbicides in vegetable cultures, tobacco, maize and cereals.

In these years, the sixties, Prof. Josip Kišpatić PhD and Velimir Seiwerth, BSc, intensively researched on the efficacy of herbicides at the Institute for Phytopathology of the Faculty of Agriculture.

Prof. **Josip Kišpatić** PhD, (Osijek, 1917 – Zagreb, 1994), was primarily dealing with agricultural and forestry phytopathology, where he reached the maximum, but he also researched on the weeds of important agricultural cultures (sugar beet, cereals, aquatic and hydro-melioration systems, railways, herbaceous and wooden species) and the weeds in forestry and forest nurseries. He

oracijskim sustavima” (suautori J. Kovačević i V. Seiwerth), Zagreb, 1973., “Korovi i herbicidi – poznavanje i suzbijanje” (u suradnji s J. Kovačevićem i V. Seiwerthom), Zagreb, 1969. Zaslužan je za uvođenje i primjenu herbicida u šećernoj repi. zajedno s Velimirom Seiwerthom uveo je primjenu herbicida na željezničkim prugama na području Hrvatske, Slovenije i BiH te suzbijanje drvenastih korova u šumarstvu, u šumarskim rasadnicima i akvatičnim sustavima. Iz područja herboljije napisao je više od 40 bibliografskih jedinica.

Velimir Seiwerth, dipl.ing., (1924.), umirovljen je 1988. Zbog rata i poslijeratnih zbivanja upisao je Poljoprivredni fakultet tek 1951. Diplomirao je 1957., a zatim se zapošljava u Zavodu za fitopatologiju, gdje je i do tada bio honorarni zaposlenik. Kao stručni suradnik, kasnije viši stručni suradnik, uz fitopatološke bavio se i herboškim poslovima. Postavljao je brojne poljske pokuse širom Hrvatske s herbicidima (i fungicidima) u zaštiti ratarskih kultura, krmnih kultura, povrćarstvu, šumarskim rasadnicima, voćnjacima i vinogradima. Posebno je zaslužan za uvođenje mjera totalnog suzbijanja korova na željezničkim prugama. Pohađao je Međunarodni tečaj herbologije u Heidelbergu (SR Njemačka) 1973. Prve rezultate istraživanja učinkovitosti herbicida (simazin u kukuruzu) objavio je 1960. Nakon toga intenzivno radi na uvođenju kemijskih mjeri borbe protiv korova u mnogim kulturama. Samo tijekom 60-ih godina 20. st. objavio je 23 rada o herbicidima. U suautorstvu s J. Kovačevićem i J. Kišpatićem napisao je više knjiga i priručnika o korovima i herbicidima, ukupno više od 50 bibliografskih jedinica.

Prof. dr.sc. **Zvonimir Ostojić**, (1941.), zaposlen je od 1969. u Zavodu i radi na istraživanjima novih herbicida za dobivanje dopuštenja za promet. (magistarski rad: “Ispitivanje fitotoksičnosti nekih insekticida koji se koriste za tretiranje”, 1976.; disertacija: “Fitoformakološka vrijednost etofumesata kao herbicida za šećernu repu”, 1983.). Stažira u Vrtlarskom kombinatu Žitnjak u Zagrebu. U vrijeme njegova dolaska u Zavod, Odjel za proučavanje i suzbijanje korova još nije bio osnovan, pa je bio raspoređen u Odjel

researched on mechanisms of the effect of fungicides, and afterwards herbicides as well. He wrote several manuals, scripts and textbooks on weeds and herbicides, such as “Herbicides and Their Application in Agriculture”, Zagreb, 1967, “Manual for Understanding and Control of Weed Flora in Croatian Hydro-Melioration Systems” (co-authors are J. Kovačević and V. Seiwerth), Zagreb, 1973, “Weeds and Herbicides – Understanding and Control” (in cooperation with J. Kovačević and V. Seiwerth), Zagreb, 1969. He takes the merit for the introduction and application of herbicides in sugar beet. Together with Velimir Seiwerth he introduced the application of herbicides on railways on the territory of Croatia, Slovenia and Bosnia and Herzegovina and the control of wooden weeds in forestry, in forest nurseries and aquatic systems. He wrote over 40 bibliographic entries in the field of herbology.

Velimir Seiwerth, BSc, (1924), was retired in 1988. Because of the war and the post war scene he enrolled in the Faculty of Agriculture as late as in 1951. He graduated in 1957, and then he was employed at the Department for Phytopathology, where he has been a part-time employee by then. As an expert associate, afterwards a senior expert associate, in addition to phytopathological he was also dealing with herbological activities. He kept setting up numerous field tests throughout Croatia with herbicides (and fungicides) in protection of farming cultures, fodder cultures, vegetable growing, forest plant nurseries, orchards and vineyards. He takes a special merit for the introduction of measures for total control of weeds on railways. He attended the International Course in Herbology in Heidelberg, Germany in 1973. He published the first research results of the efficacy of herbicides (simazine in maize) in 1960. After that he intensively worked on the introduction of chemical measures to fight against weeds in many cultures. Only during the 60s of the 20th century he published 23 papers on herbicides. As a co-author with J. Kovačević and J. Kišpatić he wrote several books and manuals on weeds and herbicides, over 50 bibliographic entries in total.

Prof. **Zvonimir Ostojić** PhD, (1941), has been employed with the Institute since 1969 and working on the research on new herbicides to obtain approval for placing on the market. (Master's thesis: “Testing of Phytotoxicity of Certain Insecticides Used for Treatment”, 1976;

za fitofarmaciju. Proučava suzbijanje korova kao kompetitora u poljoprivrednim kulturama, utjecaj herbicida na okoliš, ponašanje herbicida u tlu i vodi, primjenu herbicida i dr. Voditelj je mnogih disertacija i magistarskih radova, uključujući i stručnjaka Zavoda. Nakon integracije Zavoda s Fakultetom poljoprivrednih znanosti 1978., osnovan je prvi put Odjel za proučavanje i suzbijanje korova, a za predstojnika je bio izabran Zvonimir Ostojić koji na toj dužnosti, uz prekid od 1984. do 1988., ostaje sve do 1992. jer odlazi na Agronomski fakultet u Zagrebu na kojem je kasnije izabran za profesora herbologije. Bibliografija radova obuhvaća 298 bibliografskih jedinica (knjige, skripte, studije, priručnici, znanstveni i stručni radovi) iz područja herbologije, fitofarmacije, aplikacije herbicida, ekotoksikologije i zakonskih propisa.

Mr.sc. Veljko Lodeta, (1947.), radio je u Odjelu za proučavanje i suzbijanje korova od 1978. jer je zbog opsežna i zahtjevna posla bilo potrebno zaposliti nove istraživače. Prije zapošljavanja u Zavodu dvije godine radio je u komunalnom poduzeću Parkovi Varaždin u Varaždinu. Glavno područje njegova istraživanja su bili korovi i njihovo suzbijanje u industrijskom bilju (soja, sunčokret, šećerna repa), voćnjacima i vinogradima, strnim žitaricama, nekim okopavinama te na livadama i pašnjacima, u šumama, na rekreativnim površinama, na kanalima, ribnjacima, ali i ostalim ratarskim i povrćarskim kulturama. (magistarski rad: "Efikasnost, selektivnost i perzistentnost herbicida klorsulfuron u pšenici" 1989.). Radio je na istraživanju i predistraživanju herbicidnih pripravaka u različitim poljoprivrednim kulturama radi dohvatanja dopuštenja za promet. Bavi se istraživanjima pojave i širenja invazivnih stranih korovnih vrsta, kao i mogućnostima njihova suzbijanja. Bio je vrlo aktivna u prikupljanju podataka za IPP. Objavio je 3 znanstvena rada te 47 stručnih i popularnih članaka. Umirovljen je 2010. godine. Predavao je na tečaju za zaposlenike u poljoprivrednim ljekarnama te je sudjelovao na mnogim skupovima u Hrvatskoj i nekim u inozemstvu.

dissertation: "*Phyto-Pharmacological Value of Ethofumesate as Herbicide for Sugar Beet*", 1983). He trains at the gardening company "Žitnjak" in Zagreb. At the time of his arrival to the Institute the Department for Research and Control of Weeds has not yet been established, so that he was assigned to the Department for Phytopharmacy. He studied control of weeds as a competitor in agricultural cultures, influence of herbicides on the environment, behaviour of herbicides in soil and water, application of herbicides etc. He tutors many dissertations and Master's theses, including experts from the Institute. After the integration of the Institute and the Faculty of Agricultural Sciences in 1978, it was for the first time that the Department for Research and Control of Weeds was established, and Zvonimir Ostojić was elected Head thereof remaining at this position, excluding the interruption period from 1984 to 1988, until 1992 because he left to the Faculty of Agriculture in Zagreb where he was later elected professor of herbology. Bibliography of papers includes 298 bibliographic entries (books, scripts, studies and manuals, scientific and professional papers) in the field of herbology, phytopharmacy, the application of herbicides, ecotoxicology and legal regulations.

Veljko Lodeta MSc, (1947), has worked at the Department for Research and Control of Weeds since 1978 because due to comprehensive and demanding work it was necessary to employ new researchers. Before employment with the Institute he worked for two years at the municipal company of "Varaždin Parks" in Varaždin. The main area of his research were the weeds and their control in soybean, sunflower, sugar beet, orchards and vineyards, cereals certain barrows and on meadows and pastures, in forests, on recreational surfaces, on channels, fish ponds, but also other arable crops and vegetables. (Master's thesis: "Efficacy, Selectivity and Persistence of Herbicide Chlorsulphuron in Wheat" 1989). He studied efficacy of herbicide preparations in various agricultural cultures in order to obtain approval for placing on the market. He dealt with research on the appearance and outspread of invasive alien weed species, as well as the possibilities of their control. He was very active in collecting data for REWS. He published 3 scientific papers and 47 professional and popular articles. He was retired in 2010. He was also teaching at

Mr.sc. **Zvonimir Flegar**, (1950.), radij je od 1985. do umirovljenja 2010., uz četverogodišnji prekid (1989. – 1992.) u Zavodu. Neko vrijeme (1976. – 1980. i 1989. – 1992.) radio je u Kemijskoj industriji Radonja (danasa Herbos) iz Siska i u Općini Sisak od 1980. do 1985. U Zavodu je radio na službenom istraživanju i predistraživanju herbicidnih pripravaka u različitim poljoprivrednim kulturama radi dobivanja dopuštenja za promet. Bavi se biološkim testovima. Proučava mogućnosti racionalne primjene herbicida (magistarski rad: "Utjecaj primjene smanjene količine vode na efikasnost i selektivnost nekih herbicida", 1990.). Izučava rezistentnost biotipova ekonomski najvažnijih korovnih vrsta na herbicide. Često je savjetovao proizvođače o suzbijanju korova u poljoprivrednim kulturama, osobito kukuruzu i krumpiru, a sudjeluje u istraživanjima invazivnih korovnih vrsta. Bio je vrlo aktivan u prikupljanju podataka za IPP. Zadnjih godina sudjeluje u ocjeni dokumentacije učinkovitosti herbicida u procesu registracije SZB-a. Bio je član radne skupine za poglavje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavio je 5 znanstvenih, 11 stručnih i više popularnih članaka. Predavao je na tečaju za zaposlenike u poljoprivrednim ljekarnama te je sudjelovao na mnogim skupovima u Hrvatskoj.

Mr.sc. **Denis Novak**, (1967.), radio je u Odjelu za herbologiju u razdoblju od 1990. do 2001., (magistarski rad: "Suzbijanje korovne vrste *Aperaspica-venti* (L.) P. B. u ozimoj pšenici i ječmu", 2000.). Glavno područje istraživanja bilo je usmjereni na suzbijanje korova strnih žitarica. Bibliografski opus obuhvaća tridesetak bibliografskih jedinica.

Mr.sc. **Nenad Novak**, (1976.), zaposlen je u Zavodu od 2002. do danas. Uz istraživanja herbicidnih pripravaka za izdavanje dopuštenja za promet u Hrvatskoj, posljednjih godina bavi se ocjenom dokumentacije ponašanja sredstava za zaštitu bilja u okolišu kao i alelopatskim odnosima između korova i kultura, (magistarski rad: "Alelopatski utjecaj europskog mračnjaka – *Abutilon theophrasti* Med. na neke poljoprivredne kulture", 2007.). Glavno područje istraživanja jesu korovi i njihovo suzbijanje u strnim žita-

the course for employees in agricultural pharmacies and participated in many conferences in Croatia and some abroad.

Zvonimir Flegar MSc, (1950), has been working at the Institute since 1985 until retirement in 2010 except for a four-year interruption period (1989 – 1992). For some time (1976 – 1980 and 1989 – 1992) he worked at the Chemical Industry Radonja (Herbos today) in Sisak and at the Sisak Municipality from 1980 to 1985. At the Institute he studied efficacy of herbicide preparations in various agricultural cultures in order to obtain approval for placing on the market. He deals with biological tests. He researched on the possibility of the rational application of herbicides (Master's thesis: "The Influence of Applying Reduced Water Amount on the Efficacy and Selectivity of Certain Herbicides", 1990). He researched on the resistance of biotypes of economically most important weed species to herbicides. He often gave recommendations to agricultural producers regarding control of weeds in various agricultural cultures, particularly maize and potato, and participates in the research on invasive alien weed species. He was very active in collecting data for REWS. In the last few years he participated in the evaluation of documentation on herbicide efficacy in the process of PPP registration. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. He published 5 scientific, 11 professional and a number of popular articles. He was also teaching at the course for employees in agricultural pharmacies and participated in many conferences in Croatia.

Denis Novak MSc, (1967), worked at the Department for Herbology in the period from 1990 to 2001, (Master's thesis: "Control of the Weed Species *Aperaspica-venti* (L.) P. B. in Winter Wheat and Barley", 2000). The main research area was focused on the control of weeds in arable crops. Bibliographic opus includes about thirty bibliographic entries.

Nenad Novak MSc, (1976), has been employed with the Institute since 2002 until today. In addition to the research on herbicide preparations to obtain approval for placing on the market in the last few years he deals with evaluating the documentation on the behaviour of plant protection products in the environment as well as with allelopathic relations between weeds and cultures, (Master's thesis: "Allelopathic Influence of the velvetleaf

ricama, uljanoj repici, voćnjacima i vinogradima. Također, sudjeluje u istraživanjima pojave i širenja invazivnih stranih korovnih vrsta kao i mogućnostima njihova suzbijanja. Upisao je poslijediplomski doktorski studij na Agronomskom fakultetu, 2009. Bio je član radne skupine za poglavlje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavio je 1 znanstveni i 3 stručna rada. Predaje na tečaju za zaposlenike u poljoprivrednim ljekarnama te sudjeluje na mnogim skupovima u Hrvatskoj i nekima u inozemstvu.

1.7. Povijest zaštite uskladištenih poljoprivrednih proizvoda

Istraživanja na području zaštite uskladištenih proizvoda (ZUPP) traju već šezdeset godina. U Zavodu intenzivna istraživanja sa skladišnim štetnicima počinju dolaskom **Blanke Arčanin**, dipl.ing. i dr.sc. **Moise Danona**. Bitna su njihova istraživanja u silosima i skladištima u Hrvatskoj, čime su započele opširnije spoznaje o važnosti i vrstama te raširenosti štetnika na žitaricama. Nastavljujući rad Danona, posebice na području istraživanja faune u skladištima od 1971. do 1974., Zlatko Korunić (1941.) je odredio 98 vrsta različitih člankonožaca (kukaca, grinja i pseudoškorpiona) u skladišnim objektima u 31 mjestu u Hrvatskoj, tijekom kojih je pronašao i četiri nove vrste, uključujući, tada, karentenskog štetnika *Trogoderma granarium*. Bio je istraživač na projektu Međuodnos grinja i gljiva na uskladištenim žitaricama te Učinkovitost inertnih prašiva, patogena insekata, temperature i vlage na skladišne štetnike te glavni istraživač na projektu Suzbijanje kukaca na uskladištenoj soji. Od 1993. u Kanadi istražuje učinkovitost dijatomejske zemlje na skladišne štetnike. Tu je istraživao i razvio nekoliko niskotoksičnih prirodnih insekticida. Objavio je više od 150 radova u različitim hrvatskim i međunarodnim časopisima. Organizira seminar o dezinfekciji, dezinsekciji i deratizaciji te zaštiti uskladištenih poljoprivrednih proizvoda od 1993.

– *Abutilon theophrasti Med. on Certain Agricultural Cultures*, 2007). The weeds and their control in arable crops, oilseed rape, orchards and vineyards are the main research area. Furthermore, he participates in research on the appearance and outspread of invasive alien weed species as well as the possibilities of their control. He enrolled in the postgraduate doctoral study at the Faculty of Agriculture, in 2009. He was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. He published 1 scientific and 3 professional papers. He is also teaching at the course for employees in agricultural pharmacies and participates in many conferences in Croatia and abroad.

1.7. History of Stored Agricultural Products Protection

Research in the field of stored agricultural products protection (ZUPP/SAPP) has been conducted for sixty years now. Intensive research on storage pests starts at the Institute upon arrival of **Blanka Arčanin** BSc and **Moise Danon** PhD. Their research in silos and storages in Croatia is significant, which marked the start of a comprehensive knowledge of the importance and species as well as the outspread of pests in cereals. In continuation to the work of Danon, particularly in the field of fauna research in storages from 1971 to 1974, Zlatko Korunić PhD identified 98 species of various arthropods (insects, mites and pseudoscorpions) in storage facilities in 31 places in Croatia, during which he detected four new species more, including, then, the quarantine pest *Trogoderma granarium*. As researcher he was involved in projects Mutual Relationships between Mites and Fungi of Stored Cereals, Effectiveness against Stored-Product Insects of Inert Dusts, Insect Pathogens, Temperature and Humidity and as main researcher in the project Control of Insect Infestation of Stored Soybean. He studies efficacy of diatomaceous earth on stored product pests in Canada since 1993 where he had developed several natural low toxicity insecticides. He published more than 150 papers in different Croatian and international journals. He is an organiser of Croatian Seminar on Disin-

Velik istraživački doprinos u zaštiti uskladištenih proizvoda dala je dr.sc. Darka Hamel. Suzbijanje skladišnih štetnika u području zaštite uskladištenih poljoprivrednih proizvoda mijenja se tijekom posljednjih desetak godina. Rezultat promjena očituje se u postupnom smanjivanju broja do tada korištenih insekticida i pojavi manje opasnih i manje toksičnih ekološki prihvatljivih insekticida. Naglasak je na sve češćoj uporabi raznih bioloških i fizikalnih mjera, poput primjene modificirane atmosfere, bioloških sredstava za zaštitu bilja, niske temperature, topline, dijatomejske zemlje, ionizacijskoga zračenja i raznih kombinacija te sve više na uporabi kemijskih supstancija koje su veoma malo ili zanemarivo toksične za sisavce (regulatori rasta insekata, patogeni insekata, biljni proizvodi) ili malo štetne za okoliš.

Velik doprinos upoznavanju faune skladišta, uza Zlatko Korunića, dale su Vera Lušin i Neda Pagliarini određivanjem vrsta grinja nazočnih u našim skladištima. Zlatko Korunić i Milan Maceljski pridonijeli su spoznaji o determinaciji kukuruznog žiška (*Sitophilus zeamais*). Danas se pregledima skladišta i uzoraka uskladištenih poljoprivrednih proizvoda prate mjesta pojave i vrste kukaca na uskladištenim poljoprivrednim proizvodima.

1.8. Povijest zaštite bilja u zaštićenim prostorima

Prva iskustva o zaštiti bilja u zaštićenim prostorima stjecana su šezdesetih godina 20. stoljeća.

Vera Lušin, dipl.ing., obavljanjem zdravstvenih pregleda sadnog materijala ukrasnog bilja, kao izvanredna dijagnostičarka biljnih bolesti, dala je velik doprinos poznavanju štetne flore na ukrasnom bilju i grmlju u Hrvatskoj. Među njenim brojnim istraživanjima bile su i gljivične bolesti povrća i ukrasnog bilja, pa je tako otkrila prve zaraze s bijelim hrđom (*Puccinia horiana*) na krizantemama. Uz nju su stjecali svoja znanja o zaštiti ukrasnog bilja u staklenicima: fitopatolog prof. dr.sc. Bogdan Cvjetković i entomologinja i akarologinja mr.sc. **Neda Pagliarini** (1939.) od proljeća 1972.,

fection, Disinfestation, Deratization and Protection of Stored Agricultural Products since 1993.

A great contribution to the research on stored products protection was made by Darka Hamel PhD. The control of storage pests in the field of stored agricultural products protection has been changing during the last ten years. The result of changes is reflected in gradual reduction in the number of insecticides used so far and the appearance of less dangerous and less toxic environmentally acceptable insecticides. The emphasis is on the more and more frequent use of various biological and physical measures, like the application of modified atmosphere, biological plant protection products, low temperatures, heat, diatomaceous earth, ionization radiation and different combination thereof and all the more on the use of chemical substances slightly or ignorably toxic to mammals (insect growth regulators, insect pathogens, plant products) or slightly harmful to the environment.

*A great contribution to the knowledge of storage fauna, in addition to Zlatko Korunić, was made by Vera Lušin and Neda Pagliarini by identifying the mite species in our storages. Zlatko Korunić and Milan Maceljski contributed to the knowledge of corn weevil determination (*Sitophilus zeamais*). Today, inspections of storages and stored agricultural products samples are carried out to monitor the places of insect appearance and species on stored agricultural products.*

1.8. History of Plant Protection in Greenhouses

The first experience in plant protection in greenhouses was acquired in the 60s of the 20th century.

Vera Lušin, BSc, by conducting health surveillance of planting material of decorative plants, as an extraordinary diagnostician of plant diseases, made a great contribution to the knowledge of harmful flora on ornamental plants and shrubs in Croatia. Among her numerous research works there were also fungal diseases of vegetable and ornamental plants, so she detected that way the first infections with white rust (*Puccinia horiana*) on chrysanthemums. There were other experts at her side gaining

(magistarski rad: "Dinamika populacije faune u antropogenom smeđem tlu područja Kvarnera s posebnim osvrtom na Collembola i Acarina", 1970.). U početku istraživala je na projektu Međuodnos između grinja i gljiva, a nakon toga radila je na zaštiti povrća i ukrasnog bilja na poljoprivrednim površinama na otvorenom i u zaštićenim prostorima. Objavila je više od stotinu stručnih i znanstvenih radova te mnogo popularnih članaka. Tijekom mnogo godina odgovara na pitanja proizvođača u Gospodarskom listu te u prilogu Vrt u Večernjem listu. U su-autorstvu napisala je mnoga knjiga o zaštiti povrća i cvijeća. Održala je mnoga predavanja na skupovima u Hrvatskoj.

Najviše podataka o pojavi štetnih organizama u zaštićenim prostorima stručnjaci Zavoda prikupljali su surađujući s proizvođačima. Važni su bili i ugovori s proizvođačima ukrasnog bilja i povrća u zaštićenim prostorima i na poljoprivrednim površinama na otvorenom o preporukama za suzbijanje štetnih organizama. U proizvodnji povrća i ukrasnog bilja u zaštićenim prostorima nađeni su cvjetni štitasti moljac (*Trialeurodes vaporariorum*) i koprivina grinja (*Tetranychus urticae*).

Početkom travnja 1977. Neda Pagliarini odredila je novog štetnika, lisnog minera (*Liriomyza trifolii*) na sadnicama gerbera. Mnogo tretiranja potrebnih za suzbijanje cvjetnoga štitastog moljca, koprivine grinje te *Liriomyza trifolii* na povrću kao i otrovnost pripravaka za zaštitu ponukalo je Nedu Pagliarini da se posveti proučavanju bioloških metoda za suzbijanje štetnika u zaštićenom prostoru. Nakon studijskog boravka u institutu Glasshouse Crops Research Institute u Littlehamptonu, u Engleskoj 1982., na njezin je poticaj u rano proljeće 1983. uvezena prva količina predatorske grinje *Phytoseulus persimilis*, predatorka koprivine grinje *Tetranychus urticae* iz Engleske, u svrhu razmnožavanja predatorka i njegove introdukcije.

Dr.sc. **Mladen Šimala** od dolaska u Zavod, 1989., počeo je s pregledima cvijeća i povrća u zaštićenim prostorima te je ubrzo u staklenicima u Lipiku na krizantemama pronašao novog štetnika u Hrvatskoj, kalifornijski trips *Frankliniella occidentalis* (Perg.). Krajem 1994. mr.sc. Neda Pagliarini od-

knowledge of plant protection of ornamentals in greenhouses: a phytopathologist Prof. Bogdan Cvjetković PhD and an entomologist and acarologist Neda Pagliarini MSc (1939) from the spring 1972, (Master's thesis: "Dynamics of Fauna Population in Anthropogenic Brown Soil of the Kvarner Territory with a Special Reference to Collembola and Acarina", 1970). At the beginning she was involved in the project Mutual Relationships between Mites and Fungi and after she worked on protection of vegetables and ornamental plants in the open fields and greenhouses. She published more than hundred papers. For many years she is writing in "Farmers Magazine" answering on farmer's questions and in the special supplement "Garden" of the "Evening Newspaper". She was a co-author in many books on protection of vegetables and flowers. She had many presentations on conferences in Croatia.

*The most data on the appearance of harmful organisms in greenhouses have been collected by experts from the Institute in cooperation with producers. Important were also the contracts with producers of ornamental plants and vegetable in greenhouses and in the open field on recommendations for control of harmful organisms. In production of vegetable and ornamental plants in greenhouses there were found glasshouse whitefly (*Trialeurodes vaporariorum*) and red spider mite (*Tetranychus urticae*).*

*At the beginning of April 1977 Neda Pagliarini identified a new pest, leaf miner (*Liriomyza trifolii*) on gerbera seedlings. Many treatments necessary to control glasshouse whitefly, red spider mite and *Liriomyza trifolii* on vegetable as well as the toxicity of PPP moved Neda Pagliarini to dedicate herself to the research on biological methods for pest control in protected facilities. After her study trip to the Glasshouse Crops Research Institute in Littlehampton, England in 1982, she initiated in the early spring 1983 for the first lot of predator mite *Phytoseulus persimilis*, predator red spider mite (*Tetranychus urticae*) to be imported from England, in order to breed predators and introduce them.*

*Mladen Šimala PhD, since he came to the Institute, in 1989, has started inspecting flowers and vegetable in greenhouses and soon found a new pest for Croatia on chrysanthemums in greenhouses in Lipik, the Californian trips *Frankliniella occidentalis**

lazi u mirovinu, no i dalje se bavi zaštitom bilja u zaštićenom prostoru i sudjeluje s referatima na skupovima. Godine 2003. otkriva na surfinijama malog cvrčka (*Hauptidia distinguenda*), novog vrlo polifagnog štetnika kojeg naziva cvjetni cvrčak.

Praćenje populacije štetnih organizama u zaštićenim prostorima omogućilo je i istraživanja učinkovitosti sredstava za zaštitu bilja. Od 1974. u pokušima za predistraživanja i u postupku za registraciju bilo je niz novih akaricida i insekticida.

1.9. Izvještajno-prognozni poslovi tijekom povijesti

S izvještajno-prognoznim poslovima (IPP) u Hrvatskoj započinje se gotovo prije 160 godina. Od tada njihov razvoj prolazi različite faze. Naziv, način postojanja, izvođenja i organizacije više je puta mijenjan tijekom postojanja. IPP se prije nazivao IPS – izvještajno-prognozna služba, pa se u literaturi vrlo često pojavljuje taj naziv. Slijedi povjesni prikaz nastanka i razvoja tih poslova.

Još davne godine 1842. povremeno je pisao "Gospodarski list" o pregledavanju poljoprivrednih kultura i šumskih sastojina radi uočavanja pojave biljnih bolesti i štetnika, koje su obavljale stotine tisuća seljaka i namještenika na vlastelinskim imanjima. Tim se problemom bavio čak i Hrvatski sabor 1860. Usljed razvoja poljoprivrede i cjelokupnoga gospodarstva u drugoj polovici 19. stoljeća došlo je do organizacije sustavnog promatranja biljnih neprijatelja iz biljnoga i životinjskog carstva. Ta je dužnost dodijeljena kraljevskim zemaljskim kulturnim vijećnicima. Njih je prvi imenovao ban Ivan Mažuranić, 26. studenog 1876. U aktu o osnivanju Instituta za jadranske kulture u Splitu 1891., kao jedna od najvažnijih zadaća, navedeno je praćenje pojave štetnih organizama. Godine 1891. hrvatski ban Khuen Hedervary uvodi obveznu dostavu mjesečnih izvještaja o stanju usjeva na propisanim obrascima. Obrasce popunjavaju županije i šalju ih u Kraljevski zemaljski statistički ured. Izvjestitelji su kraljevski zemaljski kulturni vijećnici kojih primjerice u 1898. ima 386. Izvješća dostavljaju i tajnici gospodarskih podružnica Hrvatsko-slavonskoga

(Perg.). By the end of 1994 Neda Pagliarini MSc was retired, but keeps on dealing with plant protection in greenhouses participating in conferences with presentations. In 2003 she detects a little cricket on surfinias (*Hauptidia distinguenda*), a new very polyphagus pest she names flower cricket.

The monitoring of harmful organism population in greenhouses enabled the research on the efficacy of plant protection products. Since 1974 efficacy of new acaricides and insecticides was studied.

1.9. Reporting and Early Warning System in the History

Reporting and early warning system (REWS) in Croatia have started as early as almost 160 years ago. Their development undergoes different stages ever since. The name, the way of existence, performance and organisation have been changed on several occasions during existence. REWS was earlier called reporting and forecasting service (RFS), so that very often this name appears in literature. There follows a historical overview of the genesis and development of these activities.

As long ago as in 1842 "Gospodarski list" (Farmers Magazine) wrote occasionally on the inspection of agricultural cultures and forest in order to perceive the appearance of plant diseases and pests, conducted by hundreds of thousands of farmers and employees on noblemen's estates. This problem was dealt with even by the Croatian Parliament in 1860. Due to the development of agriculture and the entire economy in the second half of the 19th century systematic observation of plant enemies from the plant and animal kingdom was organised. This duty was assigned to royal national cultural counsellors. They were first appointed by Governor Ivan Mažuranić, on 26 November 1876. The establishment act of the Institute for Adriatic Crops in Split in 1891, among the most important tasks mentioned was monitoring of the appearance of harmful organisms. In 1891, in Croatia, Governor Khuen Hedervary introduced mandatory delivery of monthly reports on the status of crops on prescribed forms. Forms are being filled in by the counties and sent to the

gospodarskog društva. Tako u 1898. javljaju o jakoj pojavi plamenjače na ranim sortama krumpira na području Dugog Sela i štetama na kasnom krumpiru od grčica u Slunju. Jabuke su «pišive», pa narod pravi jabukovaču. No detaljniji podaci su zagubljeni.

Osnivanjem Entomološke sekcije, 1909., prof. dr.sc. Antun Korlević započinje s prikupljanjem podatka o šteticima. Podatak o pojavi biljnih bolesti prikupljao je prof. dr. Vladimir Škorić te njegovom zaslugom raspolažemo podacima iz 1919. o nekim biljnim bolestima. Prof. dr.sc. Željko Kovačević 1931. godine daje prijedlog o organizaciji zaštite kulturnog bilja, unutar koje je naznačeno mnogo elemenata koji su sastavni dio kasnije organizirane izvještajno-prognoze službe. S organiziranim radom na prikupljanju podataka započeo je prof. dr.sc. Željko Kovačević koji je vodio kartoteku u Zavodu za zaštitu bilja s podacima o pojavi štetnika i bolesti bilja od 1932. Godine 1938. objavljuje izvješće "Pojava štetnika i bolesti na kulturnom bilju u Savskoj banovini i Vrbovskoj banovini u 1936. g." na 17 stranica.

U Hrvatskoj su izvještajno-prognostični poslovi uspostavljeni 1948. g. kao tadašnja obavještajna služba, a organizirala ju je Uprava za zaštitu bilja Ministarstva poljoprivrede. U ovu službu bila su uklopljena kotarska poljoprivredna povjereništva, poljoprivredne škole i državna dobra. U početku je bilo velikih poteškoća, jer se na terenu teško nalazilo stručnih kadrova. Zbog toga je Uprava za zaštitu bilja Ministarstva poljoprivrede prvih godina primala vrlo mali broj izvješća, koja su sadržavala mali broj podataka o pojavi štetnika i bolesti bilja. Do 1950. izvješća su se dostavlja bez određenog obrasca, pa su oduzimala puno vremena izvjestiteljima. Te godine izvještajno-prognostične poslove preuzima Institut za zaštitu bilja od Ministarstva poljoprivrede. Institut izrađuje obrazac za izvještajnu službu u koje su se unosili podaci o najvažnijim štetnim organizmima i, zapravo, tada počinje pravi rad te službe. U tom su obrascu, uz klimatske prilike, najprije navedeni polifagni štetnici, a zatim štetnici i bolesti prema glavnim poljoprivrednim kulturama, za koje se traže podaci. Uza svakog štetnika ili bolest bilja, naznačeno je vri-

Royal National Office of Statistics. Reporters are royal national cultural counsellors counting for example 386 in 1898. Reports are being delivered also by secretaries of economic branch-offices of the Croatian-Slavonian Economic Society. Thus in 1898 they report on severe appearance of blight on early varieties of potato around Dugo Selo and damages on late potato incurred by larvae of Melolontha melolontha in Slunj. Apples are “crummy”, so people are making applejack. However, detailed data got lost.

Upon establishment of the Entomological Section, in 1909, Prof. Antun Korlević PhD started collecting the data on pests. Data on the appearance of plant diseases were collected by Prof. Vladimir Škorić PhD who took the merit that we dispose of the data from 1919 on certain plant diseases. Prof. Željko Kovačević PhD puts forward a proposal in 1931 on the organisation of cultural plant protection, including many elements making an integral part of the reporting and forecasting service organised later. Organised work on data collection was started by Prof. Željko Kovačević PhD who kept the files at the Institute for Plant Protection with the data on the appearance of pests and plant diseases since 1932. In 1938 he published the report titled “The Appearance of Pests and Diseases on Cultural Plants in Savska banovina (county) and Vrbovska banovina (county) in 1936” on 17 pages.

In Croatia, reporting and early warning system were established in 1948 as the information service then, and it was organised by the Administration of Plant Protection of the Ministry of Agriculture. This service included district agricultural committees, agricultural schools and national estates. At the beginning there were great difficulties, because it was hard to find professional staff out in the field. This was the reason why the Administration of Plant Protection of the Ministry of Agriculture received only a few reports during the first years containing not many data on the appearance of pests and plant diseases. Until 1950 reports were delivered without a specific template, so that they took a lot of time to reporters. That year the reporting and early warning system were assumed by the Institute for Plant Protection from the Ministry of Agriculture. The Institute prepared the template for the reporting service to fill in the data on the most important harmful organisms and, actually, it is then

jeme pojave radi bolje orijentacije izvjestitelja. Fitosanitetske stanice počele su se osnivati 1950., baveći se pregledom terena. U okviru izvještajnih poslova također su prikupljale podatke o pojavi, rasprostranjenosti i jačini napada štetnih organizama. Formiranjem poljoprivrednih stanica, fitosanitetske stanice uključene su većim dijelom u njihov rad kao poseban Odjel za zaštitu bilja. U godinama koje su slijedile, obrasci su se nadopunjavali s novim bolestima i štetnicima prema prilikama na terenu. Na temelju dobivenih podataka u Zavodu za zaštitu bilja vodila se kartoteka o pojavi bolesti i štetnika u Hrvatskoj. Godine 1951. izneseni su podaci od stotinjak izvjestitelja za 72 štetna organizma, te su dane i zemljopisne karte proširenja krumpirove zlatice i kalifornijske štitaste uši za 1950.

U 1952. organiziranje ovih poslova preuzimaju fitosanitetske stanice kojih je bilo 5 u Hrvatskoj, a centralnu evidenciju vodi Zavod za zaštitu bilja. Dotadašnji relativno malen uspjeh izvještajno-prognoznih poslova ležao je u loše sastavljenim obrascima u kojima su bile naznačene samo najvažnije bolesti i štetnici. Izvještaji su se dostavljali s vrlo malim brojem podataka. Razlog tome je bio što je na terenu vladalo pomanjkanje stručnog kadra, a isto tako izvjestitelji s terena nisu dobivali honorar.

Maceljski je 1957. prikazao djelovanje izvještajno-prognoznih poslova u drugim europskim zemljama. Kod nas predlaže osnivanje središnje službe upozoravanja. Također, sugerira zadatke, pri čemu težište daje na fitosanitetske i poljoprivredne stanice, sa središtem u Zagrebu. Već tada predlaže da nakon početne pomoći države dio financiranja preuzimaju korisnici usluga. Iste godine dr.sc. G. Pivardaje prikaz četverogodišnjeg iskustava suzbijanja cerkospore šećerne repe s područja fitosanitetske stanice Osijek. Kišpatić također 1957. piše o antiperonospornoj službi i ukazuje na njenu vrijednost, kao i potrebu širenja na našim prostorima.

Već 1958. su u stručnom časopisu *Biljna zaštita* objavljeni podatci o izvještajnim poslovima zaštite bilja u Hrvatskoj za proteklu 1957. godinu, pod naslovom "Rasprostranjenost i stupanj napada biljnih bolesti i štetnika na području NRH u 1957. prema mjestima izvjestitelja" (slika 10.).

*that the real work of this service begun. In this template, in addition to climate conditions, first there were listed polyphagous pests, and then pests and diseases according to the main agricultural cultures which the data were requested for. Next to every pest or plant disease, there was indicated the time of appearance for better orientation of reporters. Phytosanitary stations started to be established in 1950, dealing with the field inspection. Within reporting activities, they also collected the data on the appearance, distribution and intensity of attack by harmful organisms. By establishing agricultural stations, phytosanitary stations got involved largely in their work as a separate Plant Protection Department. In the years to follow, templates were updated with new diseases and pests according to the circumstances in the field. On the basis of the obtained data there were card files kept at the Institute for Plant Protection on the appearance of diseases and pests in Croatia. In 1951 there were presented the data from about a hundred reporters on 72 harmful organisms, and there were also given geographical maps on the expansion of Colorado beetle (*Leptinotarsa decemlineata*) and San Jose (*Quadraspisidiotus perniciosus*) for 1950.*

In 1952 the organisation of these activities was assumed by phytosanitary stations of which there were 5 in total in Croatia, and central records are being kept by the Institute for Plant Protection. A relatively small success achieved by reporting and early warning system so far lied in poorly designed templates indicating only the most important diseases and pests. Reports were delivered with a very few data. The reason was that there was a lack of professional staff involved in these activities, and reporters did not receive any fee.

*In 1957 Maceljski showed the operation of reporting and early warning system in other European countries. In Croatia, he proposed to establish the central alerting service. Furthermore, he suggested the tasks, focusing on phytosanitary and agricultural stations, seated in Zagreb. As early as then he suggested for service users to assume a part of financing after the starting help provided by the state. In the same year G. Pivar PhD, gives an overview of the four-year experience in control of leaf spot on sugar beet *Cercospora beticola* from the area of phytosanitary station Osijek.*



Slika 10. Naslovnica časopisa Biljna zaštita, 1957.

Figure 10 Cover sheet of the "Plant Protection" magazine, 1957

To su izvješće sastavili stručnjaci Zavoda za zaštitu bilja. Objavljeni su podaci za 12 karantenskih i 74 druga štetna organizma. U tome je sudjelovalo 50 stalnih izvjestitelja. Od tada se redovito, svake godine, sve do 1976. objavljaju takvi podaci u *Biljnoj zaštiti* (najčešće u broju od veljače). U izradbi svih izvješća sudjeluje i republički inspektor za zaštitu bilja Stjepan Keglević, dipl.ing. Objavljivanje tih podataka financiralo je republičko ministarstvo poljoprivrede i šumarstva.

Godine 1960. prvi put se registriraju za nekoliko gospodarski važnih bolesti i štetnika datumi njihovih prvih pojava i na temelju toga su se odredili pravilni rokovi suzbijanja, i to za fitoftoru krumpira, krumpirovu zlaticu, plamenjaču vinove loze i neke štetnike i bolesti jabuke i kruške.

Izvješće za 1967. g. obuhvaća već 204 štetna organizma, a kod svake kulture uvodi poglavlje o mjerama suzbijanja. Te se godine bilježi i pojava korova te poseban opseg njihova suzbijanja, uz navođenje naziva primijenjenih herbicida. Tih godina u izradi izvješća sudjeluju i stručnjaci splitskog Instituta za jadranske kulture. Broj izvjestitelja se ustalio na oko 80, a broj štetnih organizama na oko 200. Evidencija primjene sredstava vodi se po gospodarstvima koji dostavljaju podatke.

Godine 1977. u izvješću za 1976. sudjeluje 59 izvjestitelja koji daju podatke za 250 štetnih organizama. Po prvi put se donose obavijesti o virusnim i mikoplazmatskim bolestima, zatim podaci o štetnicima ukrasnog bilja s područja Zagreba te podaci o zdravstvenom stanju i provedenim zaštitnim

J. Kišpatić PhD, also wrote in 1957 on antiperonospora service and points to its value, as well as to the need of expansion on the territory of Croatia.

As early as in 1958 the professional magazine called *Plant Protection* published the data on reporting activities of plant protection in Croatia for the previous year of 1957, titled "The Distribution and the Degree of Plant Diseases and Pests Attack on the Territory of the People's Republic of Croatia in 1957 by the Reporters' Locations" (fig. 10).

This report was prepared by the experts from the Institute for Plant Protection. There were published the data for 12 quarantine and 74 other harmful organisms. 50 resident reporters participated herein. Since then, such data are being published in *Plant Protection* magazine (most frequently in the February issue) regularly, every year, until 1976. The republic inspector for plant protection, Stjepan Keglević BSc, participated also in the preparation of all reports. The publishing of these data is financed by the republic Ministry of Agriculture and Forestry.

In 1960 it was the first time that the dates of the first appearance of several economically important diseases and pests were registered and on the basis thereof proper terms for control were determined, for potato blight, Colorado beetle, grapevine blight and certain pests and diseases of apple and pear.

The 1967 report contains already 204 harmful organisms, and with each culture it introduces a chapter on control measures. This was the year of registering also the appearance of weeds and a special scope of their control, indicating the names of herbicide products applied hereto. These years, experts from the Split Institute for Adriatic Crops participate also in the preparation of reports. The number of reporters stabilized on about 80 and the number of harmful organisms on about 200. The data on product application are being registered by farms that deliver the data.

In 1977 there are 59 reporters participating in the 1976 report who provided the data on 250 harmful organisms. It was the first time that the information on virus and mycoplasmic diseases were brought, then the data on pests of ornamental plants from the area of Zagreb and the data on health status and protection measures implemented on fruit and grapevine reproduction material. It was

mjerama na voćnom i loznom reproduksijskom materijalu. Posebice se navode podatci o brojnim korovima. Ističu se podaci 18 najvećih poljoprivrednih organizacija, ne samo o stanju već i o mjerama suzbijanja. Pri tome se navode tretirane površine, postotak (%) tih površina od ukupnih te vrsta i doza sredstva.

Godine 1978. Republički komitet za poljoprivredu i šumarstvo SRH izdaje rješenje kojim Institut za zaštitu bilja u Zagrebu proglašava republičkim centrom izvještajno-prognoznih poslova. Od te godine podatci izvještajno-prognoznih poslova u Hrvatskoj se uklapaju u zajedničke poslove za cijelu Jugoslaviju te se objavljuju u časopisu *Glasnik zaštite bilja* u Zagrebu (slika 11.), koji je nastao spajanjem časopisa *Biljne zaštite* i *Biljnog lekara*. Pri prikazu svakog štetnog organizma, izdvojeno se prikazuje stanje u pojedinim republikama, pa tako i u Hrvatskoj. Daje se i prikaz štetnih organizama koji se pojavljuju u šumama. U Institutu za zaštitu bilja i dalje je vođena kartoteka štetnih organizama. Bilježili su se podaci o bolestima, štetnicima i korovima u obrascu. Obrasci su bili izrađeni na temelju Pravilnika o načinu dostave izvještaja i podataka o pojavi i poduzetim mjerama za sprječavanje širenja biljnih bolesti i štetočina (SL 61/77). Za bolesti i štetnike svake godine su se upisivali sljedeći podaci (koji su jednom na mjesec pristizali s terena i na kraju godine su se sažimali i upisivali u kartoteku): datum pojave, mjesto i općina, površina ili proizvod (ukupno, napadnuto, tretirano), intenzitet napada, vrsta aplikacije, mjere suzbijanja (primijenjeno sredstvo za zaštitu bilja, doza ili koncentracija, broj tretiranja), stupanj šteta i nepovoljno djelovanje pesticida na biljke, životinje, ljude i okoliš. Za korove se vodila kartoteka na drukčiji način. Nisu se specificirale vrste korova koje se tretiraju, već se bilježilo tretiranje herbicidima po kulturama s takoder svim navedenim podacima kao i kod bolesti i štetnika.

Ove poslove vodi tada Jasmina Igrc, dipl.ing., koja 1983. postaje odgovornom voditeljicom za cijelu Hrvatsku. Izvještajne poslove i dalje vodi izravno jedan centar - Institut za zaštitu bilja, koji ima i ulogu regionalnog centra dok su prognozne poslove vodila i 3 regionalna centra: Poljoprivredni fakultet

particularly that the data on numerous weeds are being provided. The data of 18 largest agricultural organisations are being emphasized, not only on the status of pests but the control measures as well. Treated surfaces are given thereby, the percentage (%) of these surfaces in the total surface area and the product type and dose.

In 1978 the Republic Committee for Agriculture and Forestry of the Socialist Republic of Croatia issues a decision proclaiming the Institute for Plant Protection in Zagreb the Republic Centre for Reporting and Early Warning System. As of this year the data of reporting and early warning system in Croatia are incorporated in the shared activities for the entire Yugoslavia and published in the Plant Protection Herald in Zagreb (fig. 11), composed of two magazines: Plant Protection and Plant Doctor. With a description of every harmful organism, there was a separate overview of the status in an individual republic, thus in Croatia as well. There was also an overview of harmful organisms appearing in forests. The Institute for Plant Protection continued to keep card files on harmful organisms. There were registered the data on diseases, pests and weeds filled in the templates. The templates were designed on the basis of the Ordinance on the Way of Delivering Reports and Data on the Appearance and Measures Undertaken to Control the Outspread of Plant Diseases and Pests (SL/Official Gazette 61/77). Every year, the following data were entered regarding diseases and pests (that were received monthly and at the end of the year they were summarized and entered in the card files): the



Slika 11. Naslovica časopisa
Glasnik zaštite bilja, 1978.

Figure 11 Cover sheet of the "Plant Protection Herald" magazine, 1978

u Osijeku, Poljoprivredni institut u Osijeku te Institut za jadranske kulture u Splitu. Metodike po kojima će se provoditi opažanje i prognoza štetnih organizama područni prognostični centri dostavljali su osim svojim prognoznim mjestima i Republičkom centru u Zagrebu. U ratarstvu se prognoziralo 15 štetnih organizama i to: 11 štetnika (sovice pozemljuše u kukuruzu, lisne sovice u šećernoj repi, buhači na šećernoj repi, lisne uši u šećernoj repi, poljski glodavci, repičin sjajnik, pipe uljane repice, buhače uljane repice, krumpirova zlatica, duhanov trips i sovice pozemljuše u šećernoj repi) i 4 bolesti (cerkospora šećerne repe, pepelnica pšenice i ječma, rinhosporium ječma i fitoftora krumpira). U voćarstvu je prognozirano 7 organizama i to: 5 štetnika (jabučni savijač, crveni voćni pauk, trešnjina muha, maslinova muha i maslinov moljac) i 2 bolesti (fuzikladij i pjegavost lista višnje). U vinogradarstvu su prognozirana dva organizma i to jedan štetnik (grožđani moljci) i jedna bolest (peronospora).

Posljednji put objavljuje se pregled "Stanja biljnih bolesti i štetnika u SFRJ u 1987." u broju 12/1988. Glasnika zaštite bilja. Ovaj se prikaz objavljuje sa zakašnjenjem i u skraćenom obliku. Taj se prikaz stanja u 1986. g. može smatrati posljednjim kompletnim prikazom. U tom izvješću navedeni su podaci za 519 štetnih organizama, od čega je 289 bolesti i 230 štetnika. Od 1986. g. ne objavljuju se podatci ni za SFRJ, niti za Hrvatsku.

Uočivši da izvješća SFRJ ne prikazuju važne podatke o opsegu i primjeni sredstava za zaštitu bilja na društvenom sektor, Republički komitet za poljoprivredu i šumarstvo SRH izdaje posebno "Prikaz kemijskih mjera suzbijanja bolesti, štetnika i korova na društvenim poljoprivrednim površinama u Hrvatskoj." tzv. «zelene knjižice» (1978.-1989.) Prva takva knjižica je imala opseg 40 stranica (slika 12.). U njoj je prikaz vremenskih prilika te godine i popis 80 izvjestitelja te službe. Nadalje su za svaku važniju mjeru zaštite bilja (suzbijanje korova, kukaca, gljiva) podaci svrstani po tvrtkama pokazujući tretiranu površinu, udjel te površine u ukupnoj površini, vrsti i dozi ili koncentraciji sredstava.

Tijekom 1990., pa i dijelom 1991.g. pristižu izvješća s terena, no više se ne nalaze sredstva za njihovo objavljivanje. Tome

date of appearance, location and municipality, surface area or product (in total, attacked, treated), the intensity of attack, the type of application, control measures (applied PPP, dose or concentration, number of treatments), the degree of damages and adverse effect of pesticides on plants, animals, people and environment. Card files regarding weeds were kept in a different way. There were not specified the types of the treated weeds, but there were registered treatments with herbicides by crops containing also all the mentioned data as with diseases and pests.

These activities are managed then by Jasminka Igrc, BSc, who becomes a manager in 1983 responsible for the entire Croatia. Reporting activities are still managed directly by one centre – the Institute for Plant Protection that performed also the activity of regional centre, whereas early warning system were also managed by another 3 regional centres: Faculty of Agriculture in Osijek, Institute of Agriculture in Osijek and Institute for Adriatic Crops in Split. Methodology of observing and forecasting harmful organisms was delivered by forecasting centres both to their forecasting locations and the Republic Centre in Zagreb. 15 harmful organisms were monitored and used in forecasting: 11 pests (Agrotis sp. in maize, Mamestridae sp. in sugar beet, Chaetocnema tibialis on sugar beet, leaf aphids on sugar beet, field rodents, Meligethes aeneus, oilseed rape weevils, Psylliodes chrysocephala, Leptinotarsa decemlineata, Thrips tabaci and Agrotis sp. in sugar beet) and 4 diseases (Cercospora beticola, Erysiphe graminis, Rhinohosporium secalis and Phytophthora infestans). 7 organisms were forecast in orchards: 5 pests (Cydia pomonella, Panonychus ulmi, Ragoletis cerasi, Bactrocera and Pryce oleae) and 2 fungi (Venturia spp., Blumeriella jaapii). Two organisms were forecast in viticulture: one pest (Lobesia botrana) and one fungus (Plasmopara viticola).

An overview of the "Status of Plant Diseases and Pests in SFRY in 1987" is published for the last time in the issue No. 12/1988 of the Plant Protection Herald. This overview is published with a delay and abbreviated. This overview of the 1986 status can be considered to be the last complete overview. This report provide the data on 519 harmful organisms, 289 of which are diseases and 230 pests. As of 1986 there are no data published either for SFRY, or Croatia.



Slika 12. Tako zvana zelena knjižica
Figure 12 The so called "green booklet"

pridonosi odlazak dvije ključne osobe IPP Hrvatske: dr.sc. Jasminke Igrc Barčić voditeljice IPP za Hrvatsku i odlazak u mirovinu dugogodišnjeg republičkog inspektora zaštite bilja dipl.ing. Stjepana Keglevića koji je bio animator ove službe i nalazio sredstva za tiskanje podataka. Konačan udarac IPP tijekom 1992.g. zadaje neobjašnjivo ukidanje finansijske potpore (čak i stavke) IPP-u proračunu Ministarstva poljoprivrede i šumarstva RH, pa prestaje svaki rad u Institutu, središtu tih poslova tih poslova

U razdoblju od 1992.g. do 2000.g. nema centralno organiziranih IPP u Hrvatskoj. Tek 1998. po prvi put su dodijeljena manja sredstva iz proračuna Zavodu za zaštitu bilja, koji u manjem opsegu otpočinje s ovom djelatnošću, ali ne na centralnoj razini već samo u vidu pomoći nekim županijama. No prije toga su neke županije uvidjele potrebu IPP-a i priše njihovom organiziranju i pokretanju, poglavito Međimurska županija. Tijekom 1999. djelatnici podružnica HZPSS u 10 županija prate pomoću mjernih uređaja (CDA-Agra i Methos) klimatske uvjete za razvoj gljivičnih bolesti: *Plasmopara viticola*, *Venturia inequalis* i *Phytophtora infestans*. Na području 16 županija pomoću feromonskih olfaktornih i hranidbenih mamaca prati se populacija 14 gospodarski značajnih štetnika. Nastavak razvoja i provođenja IPP-a u Hrvatskoj prikazan je u sklopu poglavlja 2.2. Poslovi Zavoda za zaštitu bilja danas.

The Republic Committee for Agriculture and Forestry of Croatia issues "Overview of Chemical Control Measures of Diseases, Pests and Weeds on State Agricultural Plots in Croatia" the so called "green booklet" (1978-1989). The first such booklet had 40 pages (fig. 12). It contained an overview of weather conditions of that year and the list of 80 reporters of this service. Furthermore, the data on each important plant protection measure (weed control, insect control, fungi control) were sorted by companies, showing treated surface, share of this surface in the total surface, the product type and dose or concentration.

In the course of 1990, partly even 1991, reports are received from the reporters, but there are no more resources available for their publication. This resulted from two key persons leaving the reporting and early warning system of Croatia REWS: Jasmina Igrc Barčić PhD REWS manager for Croatia and a retirement of a long-time republic plant protection inspector Stjepan Keglević BSc who was the animator of this service and found resources to print the data. The final strike to REWS during 1992 was delivered by MAF by inexplicable cancelling of financial support (even the budget item) to REWS, so that these activities in the Institute, the centre of these are completely terminated.

In the period from 1992 to 2000 there were no centrally organised reporting and early warning system in Croatia. It is only in 1998 that minor resources were allocated for the first time from the budget to the Institute for Plant Protection that starts with this activity to a lesser extent, however not on the central level but only as an aid to certain counties. But before that, certain counties have perceived the need of REWS and started organising and initiating them, particularly the Međimurje County. In the course of 1999, employees from branch-offices of the CAEI in 10 counties monitor by measuring instruments (CDA-Agra and Methos) climate conditions for the development of fungal diseases: *Plasmopara viticola*, *Venturia inequalis* and *Phytophtora infestans*. On the territory of 16 counties there is monitored the population of 14 economically important pests by means of pheromone olfactory and nutritional baits. The continuation of the development and implementation of RAF in Croatia is presented within chapter 2.2. Activities of the Institute for Plant Protection Today.

1.10. Registracija i kontrola sredstava za zaštitu bilja

Registracija sredstava za zaštitu bilja (SZB)

U razdoblju 1909. – 1919. samo su sumpor i modra galica bili u prometu. Prvi popis s desetak sredstava za zaštitu bilja, insekticida i fungicida, bio je objavljen 1927., a 1930.-ih popis se povećao na 19 SZB. Nakon Drugoga svjetskog rata povećava se proizvodnja i uporaba SZB kod nas i u svijetu. Prva istraživanja učinkovitosti SZB spominju se dvadesetih godina dvadesetog stoljeća, a nastavljaju se do 2008. postavljanjem pokusa u prirodnim i kontroliranim uvjetima staklenika i laboratorija. Istraživanja su bila podijeljena na predistraživanja, službena biološka istraživanja i zatim proširenje primjene te revizije dopuštenja. Važna je bila suradnja s proizvođačima SZB i zastupnicima proizvođača u svrhu poboljšanja primjene SZB iz njihova proizvodnog programa.

Istraživanja sa SZB obuhvaćala su:

- biološka predistraživanja i istraživanja SZB za stalno ili privremeno dopuštenje za promet, revizije, dopune ili izmjene postojećih dopuštenja te provjere učinkovitosti registriranih SZB na različite štetne organizme na otvorenom i u zaštićenim prostorima te skladištima u prirodnim i kontroliranim uvjetima postavljanja pokusa,
- davanje preporuka za rokove i načine primjene (uredaji za primjenu s tla i iz zraka, količine vode, split metoda i dr.),
- popratne učinke SZB na štetne organizme koji nisu bili cilj istraživanja, bilježenje utjecaja na korisne i neciljane organizme (osjetljivost kultivara, fitotoksičnost, promjene u ekosustavima, biodiverzitet),
- učinkovitost SZB korištenjem subletalnih i subnormalnih doza i koncentracija,
- pojavu, proširenje i zastupljenost rezistentnosti kukaca, grinja, gljiva i korova, na pojedine aktivne tvari ili kemijске skupine,
- suvremene metode aplikacije u funkciji povećanja učinkovitosti ili smanjenja potrebnih količina primjene (primjena sa

1.10. Registration and Control of Plant Protection Products

Registration of Plant Protection Products (PPP)

In the period of 1909 – 1919 only sulphur and Bordeaux mixture were marketed. The first list containing about ten plant protection products, insecticides and fungicides, was published in 1927, and in the 1930's the list was increased to 19 PPP. After the Second World War there is an increase in production and use of PPP in Croatia and in the world. The first research on the efficacy of PPP is mentioned in the twenties of the twenties century, and it continues until 2008 by setting up experiments in natural and controlled conditions of greenhouses and laboratories. Research was divided into pre-research, official biological research and then the extension of application and approval revision. It was important to cooperate with PPP manufacturers and their representatives in order to improve the application of PPP from their production programme.

Research on PPP included:

- Biological pre-research and research on PPP for permanent or temporary approval for placing on the market, revisions or amendments to the existing approvals and verifications as to the efficiency of registered PPPs for various harmful organisms out in the open field and in greenhouses and storages in natural and controlled conditions of setting up the experiments;
- Giving recommendations regarding the terms and methods of application (equipment for application from the ground and from the air, water quantities, split method etc.);
- Side-effects of PPP on harmful organisms that were not the objective of research, registering the effects on useful and non-target organisms (susceptibility of varieties, phyto-toxicity, changes in eco-systems, biodiversity);
- The efficiency of PPP by using sublethal and subnormal doses and concentrations;
- The appearance, outspread and representation of resistance of insects, mites, fungi and weeds, to individual active ingredients or chemical groups;

- smanjenim količinama vode, tretiranje u redove, tretiranje dijela površine ili kulture, tretiranje sjemena ili gomolja);
- poboljšanje aplikacije sredstava za zaštitu bilja, a posebno herbicida da bi se dosegla razina u agrotehnički razvijenijim zemljama Europe, jer se usavršene formulacije najmodernejih aktivnih tvari primjenjuju relativno primitivnom i rastrošnom tehnikom. Potrebno je obavljati istraživanja i uvoditi takve tehnike aplikacije koje će smanjiti gubitke i na taj način omogućiti smanjenje ukupno primijenjenih količina sredstava za zaštitu bilja;
 - kompatibilnosti različitih kombinacija sredstava za zaštitu bilja te njihov utjecaj na djelotvornost (moguće pojave antagonizma) i selektivnost zbog racionalnije primjene;
 - primjenu bioloških i biotehničkih insekticida (atraktanti, repelenti, feromoni, regulatori razvoja, biološka sredstva, alternativna sredstva i dr.);
 - ponašanja herbicida u tlu i bilju biotestovima u polju i stakleniku;
 - uvodenje metoda integrirane i ekološki prihvatljive zaštite koje se baziraju na poštivanju pragova tolerantnosti i korištenju kemijskih sredstava, samo kada je nužno (Zvonimir Ostojić, Jasmina Igrc Barčić).

Izvješća o rezultatima istraživanja učinkovitosti i fizikalno-kemijskih analiza s prijedlogom primjene dostavljana su Komisiji za zaštitu bilja, čijom je odlukom SZB dobio dopuštenje za uporabu. Sukladno prilagodbi naših propisa sa stečevinom EU-a, od 2008. sredstva za zaštitu bilja registriraju se u skladu s novim propisima, usklađenim s direktivama EU-a. Za taj novi način registracije, u Hrvatskoj, ne istražuje se ni učinkovitost niti fizikalno-kemijska svojstva, već se ocjenjuje dostavljena dokumentacija za SZB po jedinstvenim načelima, a obuhvaća fizikalno-kemijska svojstva, ponašanje u okolišu, ekotoksikologiju, izloženost primjenitelja, ostatke sredstava za zaštitu bilja (rezidue) i učinkovitost. Da bi mogli obavljati te poslove, stručnjaci su prošli obuku u Zagrebu i Yorku. Svoja znanja stjecali su u sklopu projekata CARDS 2002, CARDS 2004 i IPA 2007,

- *Modern methods of application in the function of increasing the efficiency or reducing necessary doses or concentrations (application with reduced water quantities, treatment in rows, treatment of one part of the plot or culture, treatment of seed or tubers);*
- *Improvement of the application of plant protection products, particularly herbicides in order to achieve the level in agro-technically more developed countries of Europe, because improved formulations of the most modern active substances are being applied by a relatively primitive and dissipating technique. It is necessary to perform research and introduce such application techniques to reduce losses and thus enable the reduction of applied quantities of plant protection products in total;*
- *Compatibilities between various combinations of plant protection products and their impact on the efficiency (possible appearance of antagonism) and selectivity for the purpose of more rational application;*
- *Application of biological and biotechnical insecticide (attractants, repellents, pheromones, growth regulators, biological products, alternative products etc.);*
- *Behaviour of herbicides in soil and plants by bio tests in the field and in a greenhouse;*
- *Introduction of integrated and environmentally friendly protection methods based on the observance of tolerance thresholds and usage of chemical products, only when necessary (Zvonimir Ostojić, Jasmina Igrc Barčić).*

Reports on the results of efficiency research and physical and chemical analyses with an application proposal have been delivered to the Plant Protection Commission. According to that decision Ministry of Agriculture issued approval for placing on the market. In line with adjusting the Croatian regulations with EU acquis, from 2008 plant protection products are being registered in accordance with the new regulations harmonised with EU directives. For this new way of registration, in Croatia, it is not either efficacy or physical and chemical characteristics that are being researched on, but it is the delivered documentation on PPP that is being evaluated by uniform principles, and it comprises physical and chemical char-

od stručnjaka iz Ujedinjenog kraljevstva koji rade na istim poslovima.

Posao koordinacije ocjenjivanja dokumentacije SZB-a osmisnila je **Gorana Peček**, dipl.ing. te ga obavljala od 2008. do 2010. Od prosinca 2010. obnaša dužnost rukovoditeljice Odjela za sredstva za zaštitu bilja. Ujedno se specijalizirala i za ocjenjivanje fizikalno-kemijskih svojstava sredstava za zaštitu bilja sljedećim specijalizacijama: usavršavanje za ocjenjivanje iz područja fizikalno-kemijskih svojstava u svrhu registracije sredstava za zaštitu bilja prema jedinstvenim načelima u skladu s EU Direktivom 91/414/EEC, 2008., usavršavanja iz područja ponašanja pesticida u okolišu, 2008., mnogim radionicama u sklopu projekta CARDS 2004, vezanim za novi sustav registracije sredstava za zaštitu bilja, 2008. Osim toga, sudjelovala je na mnogim radionicama koje je organizirao TAIEX i CEUREG, vezano za prilagođavanje standardima EU-a iz područja sredstava za zaštitu bilja i sustavu registracije kemikalija u EU-u. Bila je član radne skupine za poglavje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU.

Dr.sc. **Iva Pavlinić Prokurica**, (1974.), (magisterski rad: "Okratoksin A u ječmu, zemljopisna i moguća etiološka povezanost s endemskom nefropatijom"; disertacija: "Praćenje nastanka N-nitrozamina u hrani životinjskog podrijetla") – specijalistica za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja ostataka sredstva. Ocjenu dokumentacije specijalizirala je u Zagrebu, Hrvatska, 2005., 2008., 2009. i 2010. i u Yorku, Ujedinjeno Kraljevstvo, 2006., pod vodstvom stručnjaka iz Uprave za nadzor kemikalija. Sudjelovala je na studijskom putovanju u Ujedinjeno Kraljevstvo, vezano za procjenu rizika od ostatka pesticida u sklopu programa USAID te je u sklopu tog programa sudjelovala kao jedan od predavača na radionici vezanoj uz ostatke pesticida, 2006. Član je Znanstvenog odbora za SZB i njihove ostatke Hrvatske agencije za hranu. Bila je član radne skupine za poglavje Sigurnost hrane, veterinarstvo i fitosanitarni nadzor u pregovorima o pristupanju EU. Objavila je dva znanstvena rada i jedan sažetak u zborniku međunarodnoga kongresa.

acteristics, fate and behaviour in the environment, eco-toxicology, operator exposure, residues and efficiency of plant protection products. In order to be able to perform these activities, experts have completed training courses in Zagreb, Croatia and York, United Kingdom. They have acquired their knowledge within the projects CARDS 2002, CARDS 2004 and IPA 2007, from experts coming from the United Kingdom who work on the same jobs.

The coordination of the PPP documentation evaluation has been conceived and performed from 2008 to 2010 by Gorana Peček BSc. As of December 2010 she performs the duty of the Manager of the Plant Protection Products Department. At the same time she completed the following specialisation courses in evaluating physical and chemical characteristics of plant protection products: improving evaluation skills in the field of physical and chemical characteristics for the purpose of plant protection products registration according to uniform principles EU-Directive 91/414/EEC, in 2008, improving in the field of pesticide behaviour in the environment, in 2008, many workshops within the project CARDS 2004, related to the new system of plant protection products registration, in 2008. In addition hereto, she participated in many workshops organised by TAIEX and CEUREG, related to the adjustment to EU-standards in the field of plant protection products and the registration system of chemicals in EU. She was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU.

Iva Pavlinić Prokurica PhD, (1974), (Master's thesis: "Ochratoxin A in Barley, Geographical and Potential Etiological Connection with Endemic Nephropathy"; dissertation: "Monitoring of N-Nitrosamin Genesis in the Food of Animal Origin") – a specialist in evaluation of documentation regarding residues of plant protection products. She completed several training courses in documentation evaluation in Zagreb, Croatia, in 2005, 2008, 2009 and 2010 and in York, United Kingdom, in 2006, led by experts from the Chemicals Regulation Directorate. She participated in the study trip to the United Kingdom, related to the risk assessment of pesticide residues within the USAID programme where she participated in the workshop regarding pesticide residues as one of the lecturers, in 2006. She

Dr.sc. Ivone Jakaša, (magistarski rad: "Determination of chiral metabolites of styrene in biological material"; disertacija: "Dermal absorption of chemicals through normal and compromised skin") – kratko vrijeme radila je kao specijalistica za fizikalno-kemijska svojstva sredstava za zaštitu bilja.

Ana Mrnjavić, dipl.ing. (1981.) – stručnjak za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja ekotoksikologije. Ocjenu dokumentacije stručno usavršavanje je obavila u Zagrebu, Hrvatska 2008., 2009. i 2010. i Yorku, Ujedinjeno Kraljevstvo, 2008., pod vodstvom stručnjaka iz Uprave za nadzor kemikalija. Sudjelovala je u radionicama u sklopu projekta CARDS 2004 vezano za Direktivu 91/414/EEC i njenu primjenu te radionicama i seminarima o vođenju projekata, dobroj dokumentacijskoj praksi i sustavima kvalitete. Upisala je poslijediplomski doktorski studij na Biološkom odsjeku Prirodoslovno-matematičkog fakulteta, 2009. Od travnja 2010. obnaša dužnost rukovoditeljice Odsjeka za ocjenu sredstva za zaštitu bilja te radi kao tehnički koordinator ocjenjivača u ZZB-u.

Dubravka Somogyi, dipl.ing., (1982.) – stručnjak za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja ostataka sredstva. Ocjenu dokumentacije specijalizirala je u Zagrebu, Hrvatska 2009. i 2010. i u Yorku, Ujedinjeno Kraljevstvo 2010. pod vodstvom stručnjaka iz Uprave za nadzor kemikalija. Sudjelovala je u radionicama u sklopu projekta CARDS 2004 vezano za Direktivu 91/414/EEC i njenu primjenu. Upisala je poslijediplomski doktorski studij na Fakultetu kemijskog inženjerstva i tehnologije, 2009.

Maja Poldrugač, dipl.ing., (1983.) – stručnjak za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja fizikalno-kemijskih svojstava. Ocjenu dokumentacije specijalizirala je u Yorku, Ujedinjeno Kraljevstvo, 2009. i 2010. te u Zagrebu, Hrvatska, 2010., pod vodstvom stručnjaka iz Uprave za nadzor kemikalija. Sudjelovala je u radionicama u sklopu projekta CARDS 2004 vezano za Direktivu 91/414/EEC i njenu primjenu. Upisala je poslijediplomski doktorski studij na Kemijskom odsjeku Prirodoslovno-matematičkog fakulteta, 2009.

is a member of the Scientific Board for PPP and Their Residues of the Croatian Food Agency. She was a member of the Working Group for the Chapter Food Safety, Veterinary and Phytosanitary Policy in the negotiations for accession to the EU. She published two scientific papers and one abstract in the proceedings of an international congress.

Ivone Jakaša PhD, (Master's thesis: "Determination of Chiral Metabolites of Styrene in Biological Material"; dissertation: "Dermal Absorption of Chemicals through Normal and Compromised Skin") – for a short period of time, she worked as a specialist in physical and chemical characteristics of plant protection products.

Ana Mrnjavić, BSc (1981) – an expert in documentation evaluation of plant protection products regarding eco-toxicology. She completed several training courses in documentation evaluation in Zagreb, Croatia, in 2008, 2009 and 2010 and in York, United Kingdom, in 2008, led by experts from the Chemicals Regulation Directorate. She participated in workshops within the project CARDS 2004 related to the Directive 91/414/EEC and its application and workshops and seminars on project management, good documentation practice and quality systems. She enrolled in the postgraduate doctoral study at the Biological Section of the Faculty of Science, in 2009. As of April 2010 she performs the duty of the Manager of the Plant Protection Products Evaluation Section and works as a technical coordinator of assessors at the IPP.

Dubravka Somogyi, BSc, (1982) – an expert in documentation evaluation of plant protection products regarding product residues. She completed several training courses in documentation evaluation in Zagreb, Croatia in 2009 and 2010 and in York, United Kingdom, in 2010 led by experts from the Chemicals Regulation Directorate. She participated in workshops within the project CARDS 2004 related to the Directive 91/414/EEC and its application. She enrolled in the postgraduate doctoral study at the Faculty of Chemical Engineering and Technology, in 2009.

Maja Poldrugač, BSc, (1983) – an expert in documentation evaluation of plant protection products regarding physical and chemical characteristics. She completed a training course in documentation evaluation in York, United Kingdom, in 2009 and 2010 and in Zagreb, Croatia, in 2010, led by experts from the Chemicals

Dr.sc. Marija Jozić, (1977.) - stručnjak je za fizikalno-kemij-ska svojstva sredstava za zaštitu bilja. Ocjenu dokumentacije specijalizirala je u Zagrebu, Hrvatska, 2010., pod vodstvom stručnjaka iz Uprave za nadzor kemikalija.

Maja Kravarščan, dipl.ing., (1983.) - stručnjak za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja eko-toxikologije i učinkovitosti. Ocjenu dokumentacije iz oba područja specijalizirala je u Zagrebu, Hrvatska, 2010., a u svezi ekotoksikologije u Yorku, Ujedinjeno Kraljevstvo 2010. pod vodstvom stručnjaka iz Uprave za nadzor kemikalija. Upisala je poslijediplomski doktorski studij na Agronomskom fakultetu, 2009. Od svibnja 2010. počinje raditi na invazivnim korovnim vrstama u Hrvatskoj.

Nataša Nikl, dipl.ing., (1981.) – stručnjak za ocjenjivanje dokumentacije sredstava za zaštitu bilja iz područja ponašanja u okolišu. Ocjenu dokumentacije specijalizirala je u Zagrebu, Hrvatska, 2009. i 2010. te u Yorku, Ujedinjeno Kraljevstvo 2010. pod vodstvom stručnjaka iz Uprave za nadzor kemikalija. Sudjelovala je u radionicama u sklopu projekta CARDS 2004 vezano za Direktivu 91/414/EEC i njenu primjenu. Sudjelovala je na seminarima iz validacije u analitičkoj kemiji, 2009. Ospozobljena je za rad na HPLC-u i GC-MS uređaju, 2009. Također je sudjelovala i na radionicama održanim u sklopu Konzultacijskog procesa za ekološku mrežu NATURA 2000 i jačanju kapaciteta za primjenu zakonodavstva EU-a o zaštiti prirode i okoliša u poljoprivredi. Upisala je poslijediplomski doktorski studij na Fakultetu kemijskog inženjerstva i tehnologije, 2009.

Mr.sc. Nenad Novak, (1976.), primarni posao mu je herbologija, no također je i specijalist za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja ponašanja u okolišu. Ocjenu dokumentacije specijalizirao je u Zagrebu, Hrvatska, 2005., 2008., 2009. i 2010. te Yorku, Ujedinjeno Kraljevstvo, 2006. i 2008., pod vodstvom stručnjaka iz Uprave za nadzor kemikalija.

Dokumentaciju iz područja učinkovitosti SZB-a ocjenjuje nekoliko stručnjaka:

Regulation Directorate. She participated in workshops within the project CARDS 2004 related to the Directive 91/414/EEC and its application. She enrolled in the postgraduate doctoral study at the Chemistry Section of the Faculty of Science, in 2009.

Marija Jozić PhD, (1977) – (*dissertation: Rapid Test Methods to Assess Heavy Metal in Soil: Development and Comparison with Reference Methods, 2008*) *an expert in physical and chemical characteristics of plant protection products. She was trained in documentation evaluation in Zagreb, Croatia in 2010 led by experts from the Chemicals Regulation Directorate.*

Maja Kravarščan, BSc, (1983) – *an expert in documentation evaluation of plant protection products regarding eco-toxicology and efficiency. She completed a training course in both fields in Zagreb, Croatia, in 2010, and regarding ecotoxicology in York, United Kingdom in 2010, led by experts from the Chemicals Regulation Directorate. She enrolled in the postgraduate doctoral study at the Faculty of Agriculture, in 2009. As of May 2010 she starts working on invasive alien weed species in Croatia.*

Nataša Nikl, BSc, (1981) – *an expert in documentation evaluation of plant protection products regarding fate and behaviour in the environment. She completed a training course in documentation evaluation in Zagreb, Croatia, in 2009 and in York, United Kingdom, in 2010, led by experts from the Chemicals Regulation Directorate. She participated in workshops within the project CARDS 2004 related to the Directive 91/414/EEC and its application. She participated in seminars of validation in analytical chemistry, in 2009. She is qualified to work on HPLC and GC-MS instruments, in 2009. She also participated in workshops held within the Consulting Process for the Environmental Network NATURA 2000 and Capacity Building for Application of EU-Legislation on the Protection of Nature and Environment in Agriculture. She enrolled in the postgraduate doctoral study at the Faculty of Chemical Engineering and Technology, in 2009.*

Nenad Novak MSc, (1976) – *herbology is his primary job, but he is also trained for documentation evaluation of plant protection products regarding fate and behaviour in the environment. He completed several training courses in documentation evaluation in Zagreb, Croatia, in 2005, 2008 and 2009 and in*

dr.sc. **Mladen Šimala**, (1963.), – specijalist za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja učinkovitosti. Ocjenu dokumentacije specijalizirao je u Zagrebu, Hrvatska, 2005., 2006. i 2008. i Yorku, Ujedinjeno Kraljevstvo, 2006., pod vodstvom stručnjaka iz Uprave za nadzor kemikalija.

mr.sc. **Adrijana Novak**, (1976.), – specjalistica za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja učinkovitosti. Ocjenu dokumentacije specijalizirala je u Zagrebu, Hrvatska, 2005., 2006., 2007., 2008. i 2010., pod vodstvom stručnjaka iz Uprave za nadzor kemikalija.

mr.sc. **Zvonimir Flegar**, (1950.), – specijalist je za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja učinkovitosti.

dr.sc. **Darka Hamel**, (1956 – specjalistica za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja ekotoksi-kologije i učinkovitosti. Ocjenu dokumentacije specijalizirala je u Zagrebu, Hrvatska, 2006. i 2010. pod vodstvom stručnjaka iz Uprave za nadzor kemikalija.

dr.sc. **Dario Ivić**, (1977.), 2010.) – specijalist je za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja učinkovitosti.

mr.sc. **Željko Tomić**, (1963.), jedini specijalist u ZZB za ocjenjivanje dokumentacije sredstva za zaštitu bilja iz područja izloženosti primjenitelja. Ocjenu dokumentacije specijalizirao je u Zagrebu, Hrvatska, 2008. i Yorku, Ujedinjeno Kraljevstvo, 2008., pod vodstvom stručnjaka iz Uprave za nadzor kemikalija.

Kontrola sredstva za zaštitu bilja

Alenka Regan, dipl.ing., (Celje, 1919. – Zagreb, 1989.), osnovala je laboratorij za sredstva za zaštitu bilja 1953. U početku je istraživala alkaloide ljekovitog bilja i uvela metode koje je dugi niz godina koristila farmaceutska industrija za proizvodnju ili ispitivanje kakvoće alkaloida. Nakon toga posvetila se uvođenju SZB-a u uporabu u nas. Za registraciju SZB-a bilo je potrebno, uz kemijske analize, dati i mišljenje o razgradnji, toleranci, karenci i dr. Objavila je desetak bibliografskih jedinica, a prva rad o analitičkim metodama SZB-a. Dala je

York, United Kingdom, in 2006 and 2008, led by experts from the Chemicals Regulation Directorate.

Documentation in the field of PPP efficacy is being evaluated by several experts:

Mladen Šimala PhD, (1963) – entomology is his primary job but he is also trained for documentation evaluation of plant protection products regarding efficacy. He completed several training courses in documentation evaluation in Zagreb, Croatia, in 2005, 2006 and 2008 and in York, United Kingdom, in 2006, led by experts from the Chemicals Regulation Directorate.

Adrijana Novak MSc, (1976) – phytopatology is her primary job but she is also trained for documentation evaluation of plant protection products regarding efficacy. She completed several training courses in documentation evaluation in Zagreb, Croatia, in 2005, 2006, 2007, 2008 and 2010, led by experts from the Chemicals Regulation Directorate.

Zvonimir Flegar MSc, (1950) – herbology is his primary job, but he is also trained for documentation evaluation of plant protection products regarding efficacy.

Darka Hamel PhD, (1956) – entomology is her primary job but she is also trained for documentation evaluation of plant protection products regarding eco-toxicology and efficacy. She completed several training courses in documentation evaluation in Zagreb, Croatia, in 2006 and 2010 led by experts from the Chemicals Regulation Directorate.

Dario Ivić PhD, (1977) – phytopatology is his primary job but he is also trained for documentation evaluation of plant protection products regarding efficacy.

Željko Tomić MSc, (1963) – phytopatology is his primary job but he is also trained as the only specialist at the PPI in documentation evaluation of plant protection products regarding operator's exposure. He completed several training courses in documentation evaluation in Zagreb, Croatia, in 2008 and in York, United Kingdom, in 2008, led by experts from the Chemicals Regulation Directorate.

Control of Plant Protection Products

Alenka Regan, BSc, (Celje, 1919 – Zagreb, 1989), established a laboratory for plant protection products in 1953. At the beginning

modifikacije nekih postojećih metoda na osnovi čega su upotpunjeni normativi u tadašnjim propisima o SZB-u. Načinila je prvu tablicu miješanja SZB-a u nas.

Radom nastavlja mr.sc. **Goran Hrlec**, (1946.), (magistarski rad: "Sintetske studije sulfon amida 1,3,5 triazinskog reda" na Tehnološkom fakultetu 1982.) koji radi u Zavodu od 1973. Do umirovljenja 2008. uz njega od 1976. radi **Ana Kremer**, dipl.ing. (1945.) koja je objavila desetak bibliografskih jedinica. U laboratoriju su se već od samog početka određivale količine aktivne tvari u SZB-a odabirom najprikladnijih metoda analize. Ubrzo je uočena potreba i fizikalnih analiza. Donošenjem "Pravilnika o kontroli sredstava za zaštitu bilja" (1955.) podvrgavaju se kontroli sva sredstva za zaštitu bilja za koja se tražilo dopuštenje za stavljanje u promet (fizikalno-kemijske analize te biološka istraživanja učinkovitosti na štetne organizme i praćenje popratnih pojava pokusima u laboratoriju i na poljoprivrednim površinama). Spoznajom važnosti tolerance i karence SZB-a od 1967. proširuje se istraživanja na analize ostataka i razgradnju u biljnem materijalu, životinjama i tlu koja se obavljaju do 2008. Na osnovi višegodišnjih istraživanja predlagane su i vrijednosti MDK, važne pri stavljanju poljoprivrednih proizvoda u promet te je izrađen "Pravilnik o MDK-u". Zbog opasnosti koje su prijetile podzemnim i nadzemnim vodama od onečišćenja sa sredstvima za zaštitu bilja, pratili su se njihovi ostaci u vodama, ali i tlu. Tijekom 56 godina postojanja laboratorija obavljeno je više od 100.000 analiza. Goran Hrlec dokazao se izvrsnim poznavanjem SZB-a te je kao priznati stručnjak sudjelovao, gotovo cijeli radni vijek, u radu Komisije za sredstva za zaštitu bilja, koja je donosila odluke o dopuštenjima za promet SZB-a. U svojem radu posebno se zalagao za uklanjanje iz uporabe SZB-a koja su imala negativan učinak na ljudsko zdravlje ili okoliš. Objavio je više od 100 stručnih i znanstvenih radova te popularnih članaka. Sudjelovao je pri izradi većine propisa u svezi SZB-a. I danas se u laboratoriju obavljaju fizikalno-kemijske analize SZB-a radi određivanja njihove ispravnosti u prometu koje dostavljaju inspektorji, tvrtke i drugi zainteresirani.

she studied alkaloids of medicinal plants and introduced methods used for many years by pharmaceutical industry for the production or testing of alkaloid quality. After that she dedicated herself to the introduction of PPP to be used in Croatia. For registration of PPP it was necessary, in addition to chemical analyses, to provide also an opinion on decomposition, tolerance, waiting period etc. She published about ten bibliographic entries, and was the first one to publish the paper on analytical methods of PPP. She provided modification of certain present methods, which laid foundation to complete the regulations in the former regulations on PPP. She created the first table of mixing of PPP in Croatia.

The work was continued by Goran Hrlec MSc, (1946), (Master's thesis: "Sintetic studies of 1,3,5 triazine sulfon amid row" at the Faculty of Technology, 1982.) who worked at the Institute since 1973 until retirement in 2008. Next to him worked Ana Kremer, BSc (1945) since 1976 until her retirement in 2002 who published about ten bibliographic entries. Ever since the very beginning active substance quantities were determined in PPP in the laboratory by choosing the most appropriate analysis methods. Soon, the need of physical analyses was perceived as well. Upon passing the "Regulations on the Control of Plant Protection Products" (1955) all the plant protection products applying for marketing approvals have been submitted to the control (physical and chemical analyses and biological research on the efficacy to harmful organisms and monitoring of side-effects through tests in the laboratory and on agricultural surfaces). Having realised the importance of tolerance and waiting period of PPP as of 1967 the research is expanded to the analyses of residues and decomposition in plant material, animals and soil being performed until 2008. On the basis of perennial research there have been proposed also the MRL values, important with marketing of agricultural products and therefore the "Regulations on MRL" have been prepared. Due to the hazard threatening to underground and surface waters from pollution by plant protection products their residues in waters and soil as well have been monitored. Over 100,000 analyses were performed in the course of 56 years of the laboratory's existence. Goran Hrlec proved to have excellent knowledge of PPP and as a recognised expert he participated, almost during his entire working life in the work of

Sredstva za zaštitu bilja analiziraju: **Gorana Peček**, dipl. ing., (1974.) – specijalistica za fizikalno–kemijske analize. U Zavodu je zaposlena od 2000. godine te cijelo vrijeme radi na fizikalno – kemijskim analizama i provodi programe postregistracijske kontrole SZB-a. Usavršavala se iz područja postregistracijske kontrole te iz područja planiranja praćenja kvalitete formulacija sredstava za zaštitu bilja, 2008. Objavila je jedan znanstveni rad i 5 stručnih radova;

dr.sc. **Iva Pavlinić Prokurica**, (1974.), - od 2004. do 2008. provodila je programe postregistracijske kontrole SZB-a te provodila fizikalno-kemijske analize SZB-a u svrhu registracije i kontrole. Tijekom 2007. godine pohađala je trening za rad na uređajima HPLC i GC-MS, a godine 2010. seminar iz osnova rada, razvoja metoda i rješavanja problema na uređaju LC i LC-MS;

dr.sc. **Ivone Jakaša**, od 2007. do 2008. provodila je programe postregistracijske kontrole SZB-a te radila fizikalno-kemijske analize SZB-a u svrhu registracije i kontrole. Objavila je 11 znanstvenih radova i jedan sažetak u zbornicima skupova;

dr.sc. **Marija Jozić**, (1977.), (disertacija: Rapid test methods to assess heavy metal in soil: development and comparison with reference methods, 2008.) – stručnjak za kontrolu SZB-a. Usavršavala se iz analitičke kemije, kemije okoliša, studija tla, podzemnih i površinskih voda, ocjene utjecaja na okoliš.

Maja Poldručić, dipl.ing. i **Dubravka Somogyi**, dipl.ing. obavljale su kromatografske analize u svrhu postregistracijske kontrole kratko vrijeme tijekom 2009. godine. Tijekom 2009. i 2010. pohađale su trening za rad i razvoj metoda na uređajima HPLC i GC-MS.

the Plant Protection Products Commission that passed decisions on PPP marketing approvals. In his work he particularly advocated the elimination of PPP from use that had a negative effect on human health or the environment. He published over 100 professional and scientific papers and popular articles. He participated in preparing the majority of regulations regarding PPP. Even today, there are physical and chemical analyses of PPP performed in the laboratory in order to define their marketing validity delivered by inspectors, companies and other interested parties.

Plant protection products are being analysed by: Gorana Peček, BSc, (1974) – a specialist in physical and chemical analyses. She is employed with the Institute since 2000 and works all the time on physical and chemical analyses and carries out programmes of post-registration control of PPP. She improved her knowledge in the field of post-registration control and in the field of planning the quality monitoring of the formulations of plant protection products, in 2008. She published one scientific paper and 5 professional papers;

Iva Pavlinić Prokurica PhD, (1974) – from 2004 to 2008 she carried out programmes of post-registration control of PPP and performed physical and chemical analyses of PPP for the purpose of registration and control. During 2007 she attended a training course for the operation on HPLC and GC-MS instruments, and in 2010 a seminar in the elements of operation, development of methods and solution of problems on LC and LC-MS instruments;

Ivone Jakaša PhD, from 2007 to 2008 she carried out programmes of post-registration control of PPP and performed physical and chemical analyses of PPP for the purpose of registration and control. She published 11 scientific papers and one abstract in the proceedings from conference;

Marija Jozić PhD, (1977) – an expert in PPP control. She improved her knowledge in analytical chemistry, chemistry of the environment, soil study, underground and surface waters, evaluation of impacts on the environment.

Maja Poldručić, BSc and Dubravka Somogyi, BSc performed chromatographic analyses for the purpose of post-registration control for a short period during 2009. In the course of 2009 and 2010 they attended training courses for the operation and development of methods on HPLC and GC-MS instruments.

2. Zavod za zaštitu bilja danas

Zakonom o osnivanju Hrvatskog centra za poljoprivredu, hranu i selo (NN 25/09), Zavod za zaštitu bilja postao je njegovom ustrojstvenom jedinicom od 1. srpnja 2009. Ustrojstvom Centra uspostavljena je organizacijska shema Zavoda, koja je već bila u pripremi nekoliko godina, u skladu s opisom poslova koje obavlja Zavod na temelju Zakona o biljnom zdravstvu (NN 75/05), Zakona o sredstvima za zaštitu bilja (NN 70/05) te mnogobrojnim pripadajućim propisima.

Kako je Zavod institucija s dugogodišnjom tradicijom te je i u prošlosti uspješno prolazio reorganizacijske procese, tako je i sada ulaskom u Centar nastavio uspješno obavljati iste poslove kao i za vrijeme dok je poslovao kao samostalna ustanova. U to se svakako ubraja sudjelovanje Zavoda u prilagodbi procesa u fitosanitarnom području u poglavljiju 12. Sigurnost hrane, veterinarstvo i fitosanitarni nadzor, pregovora o pristupanju EU-u. U sklopu ovog poglavlja pravila EU-a obuhvaćaju pitanja kao što su: kvaliteta sjemena, sredstva za zaštitu bilja, štetni organizmi i životinjska prehrana. Najveći dio poslova Zavoda izravno je vezan na poglavlje 12. pregovora o pristupanju EU-u. Ulaskom RH u EU, velika većina sadašnjih poslova i dalje će biti obveza u okviru djelatnosti Zavoda, što je i praksa u svim zemljama EU-a.

Zavod ima zadaću razvijati modernu, inovativnu, konkurenčnu i ekološki prihvatljivu zaštitu bilja, usuglašenu s institucionalnim i pravnim okvirom Europske unije i Republike Hrvatske, što će u konačnici osigurati proizvodnju zdravstveno ispravne hrane.

Preuzimanjem propisa EU-a te fitosanitarnih standarda koji služe za praktičnu primjenu odredaba propisa na terenu, zahtjevi za kontinuiranim usvajanjem novih znanja i vještina stručnjaka Zavoda stalno rastu. Uz to stalno unapređenje sofisticirane tehnologije, laboratorijskih uređaja, nove metode determinacije, kompleksne softverske aplikacije, podrazumijevaju kontinuirano ulaganje u izobrazbu stručnjaka Zavoda za zaštitu bilja, da bi mogli slijediti svjet-

2. *Institute for Plant Protection Today*

Pursuant to the Establishment Act of the Croatian Centre for Agriculture, Food and Rural Affairs (Official Gazette 25/09), the Institute for Plant Protection became its organisational unit from 1 July 2009. The organisation of the Centre has established the organisational scheme of the Institute, which has been prepared for several years, in accordance with the description of activities performed by the Institute pursuant to the Plant Health Act (OG 75/05), the Plant Protection Products Act (OG 70/05) and numerous related ordinances and orders.

Since the Institute is an institution of a long-term tradition having undergone reorganizational processes successfully in the past as well, it continued performing the same activities successfully now upon joining the Centre as it did while being active as an independent institution. This certainly includes the participation of the Institute in the adjustment of processes in the phytosanitary area in chapter 12 Food Safety, Veterinary and Phytosanitary Policy, as a part of EU accession negotiations. EU regulations include the following issues within this chapter such as: seed quality, plant protection products, harmful organisms and veterinary. The majority of activities of the Institute are directly related to chapter 12 of EU accession negotiations. Upon joining of the Republic of Croatia to the EU, a large part of present activities will remain the obligation within the activities of the Institute, which is a practice in all EU countries.

The Institute has the task to develop modern, innovative, competitive and environmentally friendly plant protection, coordinated with the institutional and legal frame of the European Union and the Republic of Croatia, which will ensure production of good quality food.

Upon assumption of EU regulations and phytosanitary standards serving for the provisions to be applied in practice, the requirements for experts from the Institute to continuously acquire new knowledge and skills are constantly increasing. In addition hereto, con-

ske trendove i pružati ciljanim skupinama odgovarajuće stručne usluge.

Zbog toga se u Zavodu nastavila tradicija znanstvenoga i stručnog napretka svakog stručnjaka stjecanjem magistarskih i doktorskih zvanja te specijalizacija iz djelokruga rada u europskim i svjetski priznatim institucijama, koja se njeguje već dugi niz godina. U ovom trenutku u Zavodu je zaposleno 36 djelatnika. Od toga je 7 doktora znanosti, 7 magistara znanosti, 12 diplomiranih inženjera, 1 inženjer, s naglaskom da se dvanaestoro od spomenutih stručnjaka nalazi na doktorskom studiju te devetero tehničkoga i administrativnog osoblja.

2.1. Zavod za zaštitu bilja kao ustrojstvena jedinica Hrvatskog centra za poljoprivrednu, hranu i selo

Temeljem Zakona o osnivanju Hrvatskog centra za poljoprivrednu, hranu i selo (NN 25/09) Centar je započeo s radom 1. srpnja 2009. Osnivač Centra je Republika Hrvatska, a prava i dužnosti osnivača obavlja Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja. Centrom upravlja Upravno vijeće koje čine predsjednik i četiri člana. Centar zastupa i predstavlja ravnatelj Centra.

Na temelju članka 16. stavka 2. Zakona i Odluke o pripajanju, postojeće institucije: Zavod za voćarstvo, Zavod za tlo, Zavod za zaštitu bilja u poljoprivredi i šumarstvu Republike Hrvatske, Hrvatski zavod za vinogradarstvo i vinarstvo te ustanova Stanica za južne kulture Dubrovnik prestale su poslovati kao samostalne pravne osobe s 30. lipnjem 2009. i nastavile su s radom s 1. srpnjem 2009. kao ustrojstvene jedinice Centra. Centru se je 1.12.2010. pridružio i Zavod za sjemenarstvo i rasadničarstvo.

Takvim objedinjavanjem postojećih institucija u jednu osnuže se inicijalna kadrovska, sadržajna i infrastrukturna osnova rada Centra, postižu racionalizacije u smislu objedinjavanja i reduciranja fiksnih troškova neophodnih za funkcioniranje svake institucije pojedinačno, povećava se efikasnost u radu

stant enhancement of sophisticated technology, laboratory instruments, new determination methods, complex software applications, imply continuous investment in the education of experts from the Institute for Plant Protection, so that they can follow world trends and provide adequate professional services to target groups.

Therefore, the Institute continued with the tradition of scientific and professional progress of every expert by acquiring Master's and doctoral degrees and completing specialisation courses in the field of work at the institutions recognised in Europe and around the world, which has been fostered for a large number of years now. There are 36 workers employed with the Institute at this moment, out of which there are 7 Doctors of Science, 7 Masters of Science and 12 graduate engineers and 1 engineer. It needs to be emphasised that twelve of the aforementioned experts are currently attending doctoral study and there are nine employees belonging to technical and administration staff.

2.1. Institute for Plant Protection as an Organisational Unit of the Croatian Centre for Agriculture, Food and Rural Affairs

Pursuant to the Establishment Act of the Croatian Centre for Agriculture, Food and Rural Affairs (OG 25/09) the Centre started operating on 1 July 2009. The Centre was established by the Republic of Croatia, and the rights and obligations of the founder are executed by the Ministry of Agriculture, Fishery and Rural Development. The Centre is managed by the Management Council consisting of the President and four members and represented by the Director of the Centre.

Based on Article 16 paragraph 2 of the Act and the Decision on Merging the following institutions ceased to operate as independent legal persons on 30 June 2009 and continued operating as of 1 July 2009 as organisational units of the Centre: Institute for Fruits, Institute for Soil, Institute for Plant Protection in Agriculture and Forestry of the Republic of Croatia, Croatian Institute for Viticulture and Enology and the institution Station

priključenih zavoda, te se zavodi koji su locirani regionalno ujedinjuju u zajedničkom stvaranju podloga za kreiranje poljoprivredne politike i politike ruralnog razvoja. Upravo objedinjavanjem laboratorijskih, ljudskih i ostalih resursa omogućit će se krajnjim korisnicima, proizvodčima najbolja moguća razina usluge.

Novi način poslovanja olakšava i potiče procese prilagodbe, rasta i razvoja poljoprivrednog sektora i cjelokupnog ruralnog prostora u odnosu na izazove globalizacije te prehrambene, ekološke i klimatske izazove. Zavod za zaštitu bilja dobio je mogućnost opremanja i nadogradnje postojećih dijagnostičkih laboratoriјa te je započet proces uvođenja akreditacijskih metoda laboratorijskih analiza što je neophodno za kvalitetno obavljanje poslova na području biljnog zdravstva. Osim toga, ustrojstvom Centra uspostavljena je organizacijska shema Zavoda, koja je već bila u pripremi nekoliko godina, u skladu s opisom poslova koje obavlja Zavod na temelju Zakona o biljnom zdravstvu (NN 75/05), Zakona o sredstvima za zaštitu bilja (NN 70/05) te mnogobrojnim pripadajućim propisima.

Nova organizacija poslovanja svakako je pridonijela boljoj suradnji između ustrojstvenih jedinica Centra te omogućila brži protok informacija, neophodnih za postizanje široke multidisciplinarnosti djelovanja Centra kao jedinstvene ustanove, što je bila i jedna od namjera prilikom njegova osnivanja.

for Southern Cultivars Dubrovnik. The Institute for Seeds and Seedlings joined the Centre on 1 December 2010.

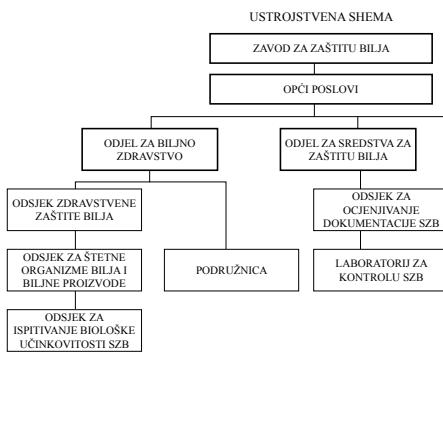
Such consolidation of the existing institutions into one centre makes the initial operation basis of the Centre stronger in terms of personnel and infrastructure; rationalizations are being achieved in terms of consolidation and reduction of fixed costs needed for functioning of every institution individually; working efficiency of associated institutes is being increased and regionally located institutes are joined in common creation of bases to the agricultural and rural development policy. The consolidation of laboratory, human and other resources will enable the best possible service to end users and manufacturers.

The new way of operation facilitates and encourages processes of adjustment, growth and development of agricultural sector and the entire rural area in relation to the challenges of globalisation and food, environmental and climate challenges. Institute for Plant Protection got an opportunity to equip and upgrade the existing diagnostic laboratories; a process of introducing laboratory accreditation has been activated, which is indispensable for quality operation in the field of plant health activities. Furthermore, the structure of the Centre established the organisation scheme of the Institute, which has been prepared for several years, in compliance with the description of activities performed by the Institute pursuant to the Plant Health Act (Official Gazette/NN 75/05), the Plant Protection Products Act (Official Gazette/NN 70/05) and many related regulations.

The new organisation of business certainly contributed to better cooperation between organisation units of the Centre and enabled faster information flow, which was one of the intentions of its establishment.

2.2. Ustrojstvo Zavoda za zaštitu bilja

U ustrojstvenoj shemi Zavoda (shema 1.) postoje tri odjela s pripadajućim odsjecima. To su Odjel za biljno zdravstvo, Odjel za sredstva za zaštitu bilja i Odjel za dijagnostiku.



Shema 1. Ustrojstvena shema Zavoda

2.3. Poslovi Zavoda za zaštitu bilja

U Zavodu za zaštitu bilja obavljaju se poslovi sukladno Međunarodnoj konvenciji o zaštiti bilja iz 1992., (FAO, Rim, 1992.), odredbama EPPO-a (European Plant Protection Organization), Zakonu o biljnem zdravstvu (NN 75/05) i Zakonu o sredstvima za zaštitu bilja (NN 70/05), njihovim pratećim propisima te pozitivnim propisima Europske unije, OECD-a, FAO-a, WHO-a.

Osnovna svrha rada Zavoda je zaštita poljoprivrednih kultura od štetnih organizama bilja u Republici Hrvatskoj, koja u prvom redu obuhvaća sprječavanje odnosno smanjivanje gubitaka priroda u poljoprivrednoj proizvodnji, uzrokovano

2.2. Organisation of the Institute for Plant Protection

The organisational chart of the Institute (chart 1) contains three departments with the related sections. These are: Plant Health Department, Plant Protection Products Department and Diagnostics Department.

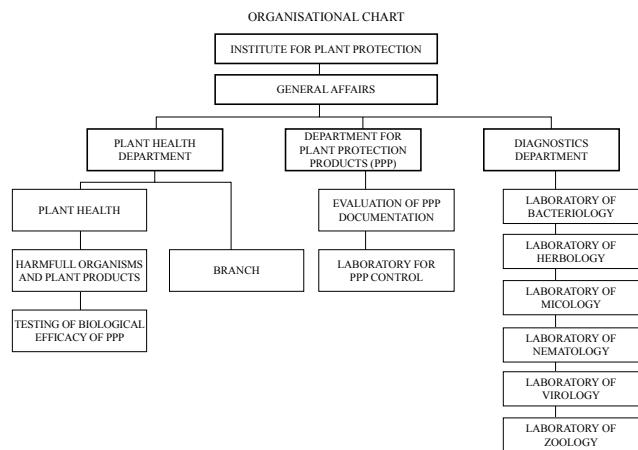


Chart 1. Organisational chart of the Institute

2.3. Activities of the Institute for Plant Protection

Institute for Plant Protection performs activities in line with the International Plant Protection Convention from 1992, (FAO, Rome, 1992), EPPO provisions (European Plant Protection Organisation), Plant Health Act (NN 75/05) and Plant Protection Products Act (NN 70/05), their related regulations and positive regulations of the European Union, OECD, FAO, WHO.

The basic purpose of the work of the Institute is to protect agricultural crops from harmful plant organisms in the Republic of Croatia, which primarily comprises the prevention or the reduction of yield losses in the agricultural production, caused by

nekim od štetnih organizama, provođenjem različitih fitosanitarnih mjerama. To se nastoji postići sustavnim praćenjem zdravstvenog stanja bilja radi otkrivanja gospodarskih i karentenskih štetnih organizama i provođenje mjera zaštite te stručno osposobljavanje i usavršavanje subjekata, uključenih u poslove zaštite bilja.

Svakako treba istaknuti ulogu Zavoda u pružanju znanstvene i stručne potpore nadležnoj upravi u području biljnog zdravstva, dijagnostike i postupku registracije sredstava za zaštitu bilja.

Unatrag nekoliko godina, zbog potrebe za usklađivanjem s EU-om, povećan je opseg i promijenjena je struktura poslova koje obavlja Zavod. Usljed sveukupne gospodarske situacije u zemlji, ograničeno je raspolaganje ljudskim i materijalnim resursima. Zbog toga su zavodski stručnjaci primorani na multidisciplinarnost u smislu obavljanja poslova u više odjela i odsjeka.

2.3.1. Opći poslovi – ured predstojnika

U Uredu za opće poslove predstojnik organizira i koordinira rad Zavoda. Nadgleda i sudjeluje pri izradi godišnjeg plana i programa rada, vodi brigu o pravodobnom izvršenju radnih zadataka, izrađuje izvješća, prati odredbe postojećih zakona i pravilnika iz djelokruga rada i sudjeluje u njihovoj primjeni.

Tu se obavljaju i poslovi prijepisa, kopiranja, primanja telefonskih poziva i drugih poruka, vođenja evidencije o prispjeloj pošti, vođenja urudžbenog zapisnika i Upisnika predmeta upravnog postupka Zavoda, vođenja evidencije o prisutnosti na radu, pisanja dopisa, zapisnika, poziva, putnih naloga, arhiviranja spisa, fakturiranja likvidiranja putnih i ostalih računa, adresiranja i kuvertiranja dokumenata i slično.

U Uredu za opće poslove rade: dr.sc. Tatjana Masten Milek – v.d. predstojnica, Branka Schauperl – stručna referentica, Martina Peroš – stručna referentica i Mirjana Rangelov-spremačica. (slika 13., 14., 15., 16)

certain harmful organisms, by implementing various phytosanitary measures. This is intended to be achieved by systematic monitoring of plant health in order to detect economically and quarantine harmful organisms and by implementing protection measures and professionally qualifying and improving the subjects involved in plant protection activities.

It needs to be emphasised that the Institute plays an important role in providing scientific and professional support to the responsible authorities regarding plant health, diagnostics and the registration procedure of plant protection products.

In the last few years, due to the need to adjust to the EU, the scope of activities performed by the Institute has been expanded and their structure changed. Due to the entire economic situation in the country, the disposal of human and material resources has been limited. Therefore, the Institute's experts are forced to apply multidisciplinary approach in terms of performing the activities at several departments and sections.

2.3.1. General Affairs – Head Office

The operation of the Institute is organised and coordinated by its Head in the General Affairs Office. The Head supervises and participates in preparing the annual plan and programme of work, takes care of timely performance of working tasks, prepares reports, monitors the provisions of the present acts and regulations from the related field of work and participates in their implementation.

The activities performed here include transcriptions, copying, receiving telephone calls and other messages, keeping records on received mail, keeping reception protocol and the Administration Procedures Register of the Institute, keeping records on the presence at work, writing letters, protocols, calls, travel orders, record archiving, invoicing/settling travel and other invoices, addressing and enveloping documents and so on.

The following employees work in the General Affairs Office: Tatjana Masten Milek PhD – Acting Head, Branka Schauperl – expert officer, Martina Peroš – expert officer and Mirjana Rangelov – cleaning lady. (fig. 13, 14, 15, 16)



Slika 13. v.d. predstojnica dr.sc. Tatjana Masten Milek

Figure 13 Acting Head Tatjana Masten Milek Ph.D

2.3.2. Odjel za biljno zdravstvo

U Odjelu za biljno zdravstvo obavljaju se sljedeći poslovi:

- sustavno praćenje i nadzor sjemenskih usjeva, presadnica povrća i cvijeća, sadnog materijala voćaka, vinove loze i ukrasnog bilja, izdavanje biljnih putovnica, edukacija ovlaštenih posjednika bilja o izdavanju biljnih putovnica, edukacija fitosanitarnih inspektora o štetnim organizmima i tržnih proizvođača o zdravstvenoj zaštiti bilja;
- provođenje izvještajno-prognoznih poslova (IPP);
- sudjelovanje u provođenju programa posebnog nadzora (PPN);
- podučavanje posjednika bilja, pružatelja usluga i drugih sudionika uključenih u poslove zdravstvene zaštite bilja o štetnim organizmima, fitosanitarnim mjerama i načinu obavljanja pojedinih poslova iz područja biljnoga zdravstva;
- sudjelovanje u stručnom usavršavanju fitosanitarnih inspektora, osposobljavanje zaposlenika u poljoprivrednim ljekarnama i korisnika sredstava za zaštitu bilja, educiranje djelatnika HZPSS-a.



Slika 14. Administrativni referent Branka Schauperl

Figure 14 Expert officer Branka Schauperl



Slika 15. Administrativni referent Martina Peroš i tehnički suradnik Mladen Ljubić

Figure 15 Expert officer Martina Peroš and technical associate Mladen Ljubić



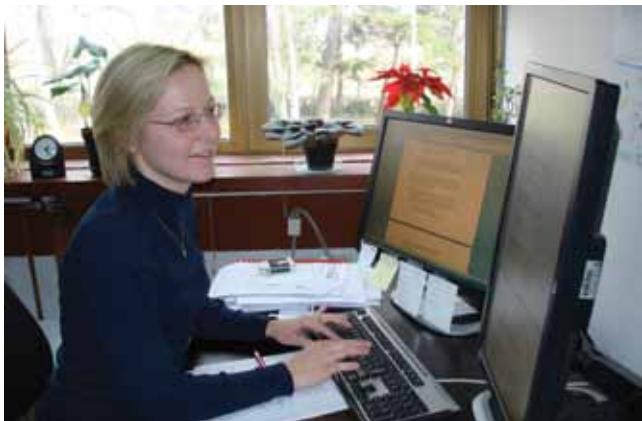
Slika 16. Spremačica Mirjana Rangelov

Figure 16 Cleaning lady Mirjana Rangelov

2.3.2. Plant Health Department

Plant Health Department performs the following activities:

- *Monitoring and surveillance of the crops for seed production, vegetable and flowers, fruit, grapevine and ornamental seedlings, issuing of plant passports, education of licensed plant owners on issuing of plant passports, education of phytosanitary inspectors about harmful organisms and market producers on plant health protection;*
- *Implementation of reporting and early warning system (REWS);*
- *Participation in the implementation of surveys;*
- *Education of plant owners, service providers and other participants involved in the activities of plant health about harmful*



Slika 17. mr.sc. Adrijana Novak – rukovoditelj odjela za biljno zdravstvo
Figure 17 Adrijana Novak MSc – Head of the Plant Health Department

Multidisciplinarnost poslova stručnjaka Zavoda najviše se očituje u Odjelu za biljno zdravstvo. Odjelom rukovodi mr.sc. Adrijana Novak. U provođenju poslova ovog Odjela sudjeluje većina stručnjaka: dr.sc. Mario Bjeliš, dr.sc. Željko Budinščak, dr.sc. Darka Hamel, dr.sc. Dario Ivić, dr.sc. Tatjana Masten Milek, dr.sc. Mladen Šimala, mr.sc. Vesna Kajić, mr.sc. Ivana Križanac, mr.sc. Nenad Novak, mr.sc. Ivan Poje, mr.sc. Željko Tomić, mr.sc. Andrija Vukadin, Darko Jelković, dipl.ing., Smiljan Kraljević, dipl.ing., Tamara Rehak, dipl.ing. te tehnički suradnici: Mladen Ljubić, Stjepan Jakopanec i Tvrtnko Mikec.

2.3.2.1. Izvještajno-prognozni poslovi (IPP), (2001.–2009.)

Voditeljica programa: dr.sc. Tatjana Masten Milek i **suradnici:** dr.sc. Mario Bjeliš, dr.sc. Željko Budinščak, dr.sc. Darka Hamel, dr.sc. Bogdan Korić, dr.sc. Mladen Šimala, mr.sc. Zvonimir Flegar, mr.sc. Vesna Kajić, mr.sc. Ivana Križanac, mr.sc. Veljko Lodeta, mr.sc. Ivan Mikec, mr.sc. Radoslav Masten, mr.sc. Adrijana Novak, mr.sc. Nenad Novak, mr.sc. Ivan Poje, mr.sc. Željko Tomić, mr.sc. Andrija Vukadin, Darko Jelković, dipl.ing.

organisms, phytosanitary measures and methods regarding plant health;

- *Participation in professional improvement of phytosanitary inspectors, training of employees in agricultural pharmacies and users of plant protection products, education of the CAEI employees.*

Multidisciplinary approach to the activities of the experts from the Institute is mostly reflected in the Plant Health Department. The Department is managed by Adriana Novak MSc. The majority of experts participate in performing the activities of this Department: Mario Bjeliš PhD, Željko Budinščak PhD, Darka Hamel PhD, Dario Ivić PhD, Tatjana Masten Milek PhD, Mladen Šimala PhD, Vesna Kajić MSc, Ivana Križanac MSc, Nenad Novak MSc, Ivan Poje MSc, Željko Tomić MSc, Andrija Vukadin MSc, Darko Jelković, BSc, Smiljan Kraljević, BSc, Tamara Rehak, BSc and technical associates: Mladen Ljubić, Stjepan Jakopanec and Tvrtnko Mikec.



Slika 18. Tamara Rehak dipl.ing. – viši stručni savjetnik

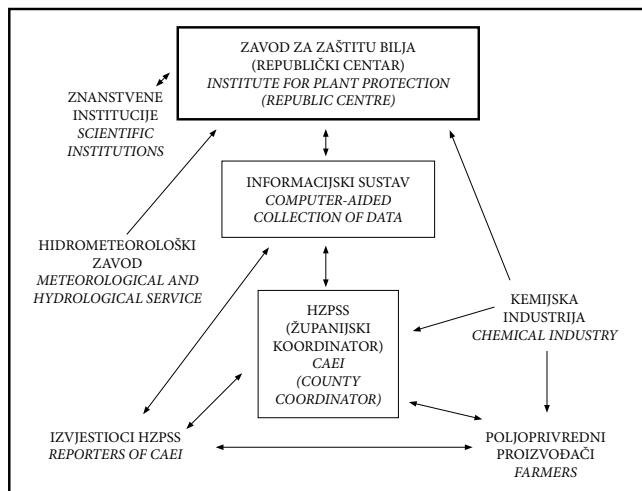
Figure 18 Tamara Rehak BSc – senior expert advisor

2.3.2.1. Reporting and early warning system (REWS), (2001–2009)

Programme manager: Tatjana Masten Milek PhD and **associates:** Mario Bjeliš PhD, Željko Budinščak PhD, Darka Hamel PhD, Bogdan Korić PhD, Mladen Šimala PhD, Zvonimir Flegar MSc, Vesna Kajić MSc, Ivana Križanac MSc, Veljko Lodeta MSc, Ivan Mikec MSc, Radoslav Masten MSc, Adrijana Novak MSc, Nenad Novak MSc, Ivan Poje MSc, Željko Tomić MSc, Andrija Vukadin MSc, Darko Jelković, BSc.

Izvještajno-prognozni poslovi u Hrvatskoj nisu se provodili u razdoblju od 1990. do 2000. Nakon više od 10 godina neprovođenja IPP-a, 2001. Zavod dobiva finansijska sredstva za njih te pristupa revitalizaciji ovih poslova.

Izvještajnim poslovima sustavno se prati i registrira dinamika pojave, štete i mjere suzbijanja određenih štetnih organizama, njihov intenzitet napada, proširenje te negativne posljedice tretiranja sa sredstvima za zaštitu bilja.



Shema 2. Organizacijska shema izvještajnih poslova

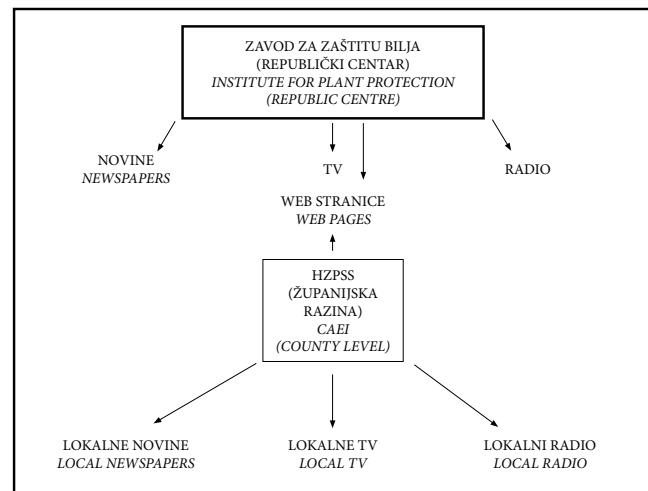
Chart 2 Organisational chart of reporting service

Poslovi su centralizirani, tj. Zavod je republički centar koji u računalnom programu prikuplja podatke od izvjestitelja s terena. Izvjestitelji na terenu djelatnici su HZPSS i stručnjaci Zavoda, koji unose podatke u računalni program. Broj izvjestitelja mijenja se od godine do godine te se u prosjeku kreće oko 40. Zavod ima stručnjaka za organizaciju rada IPP-a i vođenje baze podataka s područja entomologije, fitopatologije i herbologije (shema 2.). Do travnja 2010. to je bila dr.sc. Tatjana Masten Milek, a otad tu dužnost preuzima mr.sc. Nenad Novak.

U bazi informacijskog sustava za unos opažačkih podataka upisano je u ovom trenutku 690 vrsta štetnih organizama.

Reporting and early warning system in Croatia were not performed in the period from 1990 to 2000. After more than 10 years of non-performance of REWS, in 2001 the Institute is granted financial resources for it and starts revitalising these activities.

Reporting activities monitor and register the dynamics of appearance, damage and control measures of certain harmful organisms, their intensity of attack, spread and negative effects of treatment with plant protection products.



Shema 3. Organizacijska shema prognoznih poslova

Chart 3 Organisational chart of early warning system

The activities are centralised. The Institute is a republic centre with computer-aided collection of data by reporters from different places. Reporters are employees of the CAEI and experts from the Institute, who enter the data in the computer programme. The number of reporters varies from year to year remaining round about 40 on the average. The Institute has an expert for the organisation of REWS and keeping databases from the field of entomology, phytopathology and herbology (chart 2.). It was Tatjana Masten Milek PhD until April 2010, and since then this duty has been assumed by Nenad Novak MSc.

Osim baze podataka o štetnim organizmima, postoji i baza podataka o registriranim sredstvima za zaštitu bilja i aktivnim tvarima u Hrvatskoj. Obje baze revidiraju se svake godine.

Stručnjaci Zavoda obavljaju edukaciju izvjestitelja u svrhu poboljšanja obavljanja izvještajnih i prognoznih poslova, održavaju predavanja za poljoprivredne proizvođače, organiziraju stručna predavanja, dolaze po pozivu izvjestitelja na terenu, prate pojavu štetnih organizama na terenu, obavljaju i determinacije uzoraka s terena. Po potrebi surađuju sa znanstvenim institucijama u zemlji i inozemstvu.

Prognozne poslove usmjerava, objedinjuje i prati Zavod za zaštitu bilja. Prognoze na državnoj razini daje Zavod, a na regionalnoj razini HZPSS.

Izvještajnim poslovima prikupljaju se podatci potrebni za izradu prognoze. Za to su potrebni podatci o pojavi i intenzitetu napada štetnih organizama, mjerama suzbijanja štetnih organizama, rokovima i načinu suzbijanja (slika 18.). Prognozne poslove usmjerava, objedinjuje i prati Zavod. Dok su izvještajni poslovi organizirani isključivo centralizirano, prognozni poslovi organizirani su regionalno, na razini županija. Na republičkoj razini Zavod objavljuje prognoze i upozorenja u javnim medijima (HRT, HR, stručni poljoprivredni časopisi, www.hcphs.hr) dok na regionalnoj razini, HZPSS obavlja te poslove na regionalnim televizijama, radijskim postajama, lokalnom tisku te na www.hzpss.hr (shema 3.).

Svrha IPP-a je pravodobno, pravilno, učinkovito i rentabilno provođenje mjera zaštite bilja u praksi na osnovi podataka sustavnog praćenja pojave i kretanja štetnih organizama. Cilj je sprječavanje i smanjivanje gubitaka priroda u poljoprivrednoj proizvodnji, uzrokovanoj štetnim organizmima, različitim mjerama.

IPP se provodi u voćnjacima i vinogradima, ratarskim kulturama i industrijskom bilju, povrću i ukrasnom bilju, kulturama u zaštićenim prostorima, ukrasnom drveću, grmlju i divljoj flori te uskladištenim poljoprivrednim proizvodima. Nadzor se provodi vizualnim pregledima (slika 20), prikupljanjem uzoraka biljnog materijala, ulovom na ljepljive ploče (slika 19.), ulovom na feromone, ulovom na

At this moment there are 690 species of harmful organisms entered in the information system observing database. In addition to the database of harmful organisms, there is a database of registered plant protection products and active substances in Croatia. Both bases are being revised every year.

Experts from the Institute perform education of reporters in order to enhance the reporting and early warning system, hold lectures for agricultural producers, organise professional lectures, arrive upon invitation from a reporter, monitor the appearance of harmful organisms on plants and plant products, perform also determinations of samples. They cooperate with scientific institutions in Croatia and abroad as necessary.

Forecasting activites are governed, consolidated and monitored by the Institute for Plant Protection. Forecasts on the national level are provided by the Institute, and on the regional level by CAEI.

Reporting activities help collect the data necessary to prepare forecasts. This requires the data on the appearance and intensity of attack by harmful organisms, control measures of harmful organisms, terms and methods of control (fig. 18). Early warning system are governed, consolidated and monitored by the Institute. While reporting activities are organised exclusively on a central basis, early warning system are organised regionally, on the level of counties. On the republic level the Institute gives forecasts and alerts in public media (Croatian Radio and Television, professional agricultural magazines, www.hcphs.hr) whereas on a regional level the CAEI performs these activities on regional televisions, radio stations, local press and on www.hzpss.hr (chart 3).

The purpose of REWS is to timely, properly, efficiently and economically implement plant protection measures in practice on the basis of the systematic monitoring data on the appearance and circulation of harmful organisms. The aim is to prevent and reduce yield losses in agricultural production, caused by harmful organisms, using various measures.

REWS are performed in orchards and vineyards, arable crops and industrial crops, vegetable and ornamental plants, cultures in greenhouses, ornamental trees, shrubs and wild flora and on stored agricultural products. Monitoring is performed by visual inspections (fig. 20), sample collection of plant material, catching

razne atraktante, metodom otresanja, izradom mikroskopskih preparata, mikroskopskom determinacijom prema odgovarajućim ključevima ili skalama, DAS i tas ELISA-om itd., po potrebi PCR-om.

U devetogodišnjem provođenju IPP-a (tablica 4.) upisano je 12 964 izvješća, objavljeno je 553 prognoza na republičkoj razini i 13 772 prognoze na regionalnoj razini. Održano je 179 predavanja za izobrazbu izvjestitelja i poljoprivrednih proizvođača te stručnih predavanja.

Broj	Godina						Ukupno
	2001.	2002.	2003.	2004.	2005.	2006.	
Upisana izvješća	-*	55	1563	1886	1874	1874	
Prognoza na republičkoj razini	3	2029	55	57	32	19	
Prognoza na regionalnoj razini	14	1051	24	704	1418	12	
Održana stručna predavanja	179	13772	179	1418	1418	12612	
							12964

* u 2001. još nije bio razvijen računalni program za unos opažačkih podataka

Tablica 4. Rezultati devetogodišnjeg provođenja IPP-a (2001.–2009.)



Slika 19. Žute ljepljive ploče za praćenje bijelih mušica

Figure 19 Yellow sticky traps for whiteflies monitoring

on sticky plates (fig. 19), catching on pheromone traps, catching on various attractants, by bathing method (Klopfmethode), by making microscopic slides, microscopic determination according to adequate keys, DAS and tas ELISA if necessary PCR, etc.,

In the course of the nine-year implementation of REWS (Table 4) 12 964 reports have been entered, 553 forecasts have been published on the republic level and 13 772 forecasts on a regional level. 179 lectures have been held for the education of reporters and agricultural producers and professional lectures.

Number	Year						Total
	2001.	2002.	2003.	2004.	2005.	2006.	
<i>Entered reports</i>	-*	55	1563	1886	1874	1874	
<i>Forecast on the republic level</i>	3	2029	55	57	32	19	
<i>Forecast on the regional level</i>	14	1051	24	704	1418	12612	
<i>Professional lectures held</i>	179	13772	179	1418	1418	12612	
							12964

* In 2001 the computer programme for observing data to be entered has not been developed yet

Table 4 Results of nine-year implementation of REWS (2001–2009)



Slika 20. Vizualni pregled stanja korova u krumpiru – mr.sc. Nenad Novak

Figure 20 Visual inspection of potato weeds – Nenad Novak MSc

2.3.2.2. Programi posebnog nadzora (PPN)

Programi posebnog nadzora (PPN) ostvaruju se sukladno Zakonu o biljnom zdravstvu (NN 75/05), članku 14. To je službeni postupak sustavnog prikupljanja i čuvanja podataka o nazočnosti štetnih organizama, koji uključuje inspekcijske preglede, praćenje zdravstvenog stanja bilja i sustavno istraživanje nad zaraženim, ugroženim i nezaraženim područjima. Način provođenja, nositelje i izvoditelje programa posebnog nadzora određuje ministar godišnjim programom, na prijedlog čelnika nadležne uprave. Odabir štetnih organizama osniva se na rezultatima protekle godine i direktivama u EU ili EPPO statusu (Europska i Mediteranska organizacija za zaštitu bilja) te statusu ili interesu Hrvatske. Na kraju svake kalendarske godine sastavlja se izvješće o obavljenim poslovima u sklopu PPN-a. Slijede sažetci programa posebnog nadzora.

Duhanov štitasti moljac – *Bemisia tabaci* (Gennadius) (2001. – 2009.) – voditelj: dr.sc. Mladen Šimala i suradnici: dr.sc. Tatjana Masten Milek, mr.sc. Vesna Kajić

Duhanov štitasti moljac pratio se od 2001. do 2002. u sklopu programa posebnog nadzora, a nakon toga od 2003. do 2009. u sklopu IPP-a. Od 2002. paralelno se prati i Tomato Yellow Leaf Curl Virus (TYLCV), koji se prema dosadašnjim saznanjima prenosi jedino vektorom *Bemisia tabaci*.

Duhanov štitasti moljac polifagan je štetnik za kojeg je utvrđeno da napada više od 500 biljnih vrsta. U Europi je udomaćen poglavito u zemljama Mediterana, gdje predstavlja velik problem, naročito u uzgoju povrća i ukrasnog bilja u zaštićenom prostoru, posebice rajčice, paprike, krastavca, božićne zvijezde i gerbere. Štete na biljkama uzrokuju odrasli razvojni oblici (slika 21.) i ličinke koji se hrane sisanjem na naličju listova biljaka domaćina, uslijed čega se na listovima pojavljuju klorotične pjege, žućenje, medna rosa i gljive čađavice. Nadalje, duhanov štitasti moljac prenosi i mnoge biljne viruse. Najznačajnija virusna bolest, čiji vektor je ovaj štetnik, svakako je Tomato yellow leaf curl virus (TYLCV). Karantenski štetnik *Bemisia tabaci* u Hrvatskoj je prvi put pronađen 2000. godine na nekoliko kulturnih i korovskih biljnih vrsta u zaštićenom

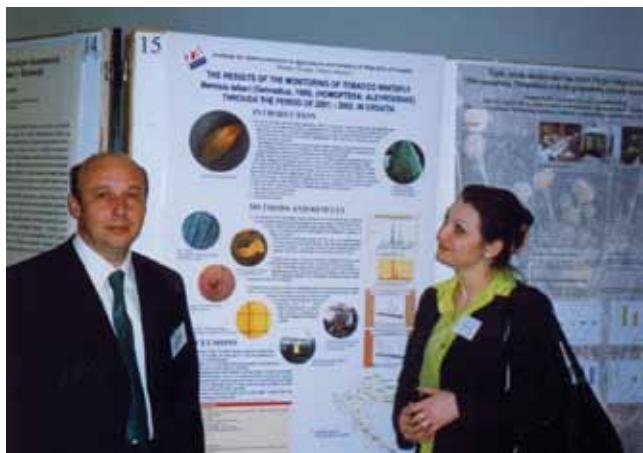
2.3.2.2. Survey

Surveys are carried out pursuant to the Plant Health Act (NN 75/05), Article 14. This is an official procedure of systematic collection and keeping the data on the presence of harmful organisms, including inspection examinations, plant health monitoring and systematic research on infected, endangered and non-infected areas. The implementation method, managers and conductors of the survey, are defined by the minister in an annual programme, proposed by the leader of responsible authorities. The selection of harmful organisms is based on the results from the previous year and directives in EU or EPPO status and the status or interest of Croatia. At the end of every calendar year the report is prepared on the activities performed within survey. Abstracts of surveys are given in the text to follow.

Tobacco whitefly - *Bemisia tabaci* (Gennadius) (2001 – 2009) – coordinator: Mladen Šimala PhD and associates: Tatjana Masten Milek PhD, Mario Bjeliš PhD, Vesna Kajić MSc

*Tobacco whitefly was monitored from 2001 to 2002 within a survey, and then from 2003 until 2009 within REWS. Since 2002 there is a parallel monitoring of Tomato Yellow Leaf Curl Virus (TYLCV) as well, transmitted according to the knowledge so far only by the *Bemisia tabaci* vector.*

*Tobacco whitefly is a polyphagous pest identified to attack over 500 plant species. In Europe it is naturalised mainly in the Mediterranean countries, where it represents a huge problem, especially in vegetable and ornamental plants growing in greenhouses, particularly potato, paprika, cucumber, Poinsettia (Christmas star) and gerbera. Damage to plants is caused by adult (fig. 21) and larvae fed by sucking on leaf underside of host plants, which causes the appearance of chlorotic spots, yellowing, honeydew and black sooty mold. Furthermore, tobacco whitefly transmits many plant viruses as well. The most important virus disease, the vector of which is this pest, is certainly the Tomato yellow leaf curl virus (TYLCV). The quarantine pest *Bemisia tabaci* in Croatia was detected for the first time in 2000 on several cultural and weed plant species in greenhouses and in the open field on the ter-*



Slika 21. Poster prezentacija o duhanovom štitastom moljcu – *Bemisia tabaci*
 Figure 21 Poster presentation on tobacco whitefly – *Bemisia tabaci*

Godina	Broj lokacija	Broj vizualnih pregleda	Broj analiza	Broj pozitivnih lab. analiza
2001.	12	12	149	27
2002.	16	16	154	30
2003.	5	5	142	23
2004.	11	11	31	17
2005.	14	14	31	7
2006.	18	18	32	4
2007.	7	7	28	10
2008.	13	13	21	13
2009.	15	15	25	10
Ukupno	111	111	613	141

Tablica 5. Pregled broja lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza za duhanovog štitastog moljca za razdoblje 2001.–2009.

prostoru i na otvorenom na području od Trogira do Omiša, a danas je proširen u svim djelovima zemlje. Rezultati u sklopu programa praćenja duhanovog štitastog moljca dobiveni su na



Slika 22. Plakat o duhanovom štitastom moljcu – *Bemisia tabaci*
 Figure 22 Poster on tobacco whitefly – *Bemisia tabaci*

Year	Number of locations	Number of visual inspections	Number of analyses	Number of positive lab. analyses
2001	12	12	149	27
2002	16	16	154	30
2003	5	5	142	23
2004	11	11	31	17
2005	14	14	31	7
2006	18	18	32	4
2007	7	7	28	10
2008	13	13	21	13
2009	15	15	25	10
Total	111	111	613	141

Table 5 Overview of the number of locations, visual inspections, samples taken and positive laboratory analyses for the tobacco whitefly for the period 2001–2009

ritory from Trogir to Omiš whereas today is spread everywhere in the country. The results within the tobacco whitefly survey were obtained on the basis of visual inspections, inspections of yellow

temelju vizualnih pregleda, pregleda žutih ljepljivih ploča, prikupljanja i pregleda uzoraka biljnog materijala sa sesilnim razvojnim stupnjevima štitastog moljca te mikroskopskom analizom prema ključevima Martin (1987.) i Martin et al. (2000.). Kako bi se javnost upoznala s ovim štetnikom, izrađen je plakat (slika 22.). Rezultati ovog programa posebnog nadzora prikazani su u tablici 5. Analiza uzoraka imaga duhanovog štitastog moljca, kao vektora TYLCV na njegovu prisutnost (tablica 6.), provedena je testom PCR i RAPD PCR. Istim testovima određeni su B i Q biotipovi vrste *B. tabaci*. Detekcija TYLCV-a u listovima rajčice provedena je metodama DAS-ELISA i tas ELISA, pokazavši da TYLCV nije bio niti u jednom uzorku listova rajčice. Potvrđeno je da za sada u Hrvatskoj nema ove vrlo opasne virusne bolesti rajčice.

Godina	Broj lokacija	Broj vizualnih pregleda	Broj analiza	Broj pozitivnih lab. analiza
2001.*	0	0	0	0
2002.	13	13	52	0
2003.	10	10	45	0
2004.	19	19	196	0
2005.	18	18	196	0
2006.	18	18	91	0
2007.	5	5	101	0
2008.	5	5	103	0
2009.	2	3	82	0
Ukupno	90	91	866	0

* 2001. još se nije provodilo praćenje TYLCV

Tablica 6. Pregled broja lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza za TYLCV za razdoblje 2001.–2009.

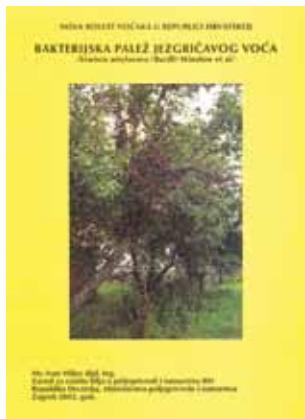
*sticky plates, collection and inspection of plant material samples with sessile development stages of whitefly and microscopic analysis according to the keys by Martin (1987) and Martin et al. (2000). A poster was designed (fig. 22) in order to make the public acquainted with this pest. The results of this survey are shown in table 5. The analysis of samples of tobacco whitefly imago, as the TYLCV vector for its presence (table 6), was conducted by PCR and RAPD PCR tests. The same tests were used to define B and Q biotypes of the *B. tabaci* species. Detection of TYLCV in tomato leaves was carried out by DAS-ELISA and tas ELISA methods, having shown that none of tomato leaf samples was positive in terms of TYLCV presence. It was confirmed that for the time being this very dangerous tomato virus disease is not present in Croatia.*

Year	Number of locations	Number of visual inspections	Number of analyses	Number of positive lab. analyses
2001 *	0	0	0	0
2002	13	13	52	0
2003	10	10	45	0
2004	19	19	196	0
2005	18	18	196	0
2006	18	18	91	0
2007	5	5	101	0
2008	5	5	103	0
2009	2	3	82	0
Total	90	91	866	0

* 2001. još se nije provodilo praćenje TYLCV

Table 6 Overview of the number of locations, visual inspections, samples taken and positive laboratory analyses for TYLCV for the period 2001–2009

Bakterijska palež - *Erwinia amylovora* (Burill) Winslow et al. (2001. – 2009.) – voditelj programa: mr.sc. Ivan Mikec i **suradnica:** mr.sc. Ivana Križanac



Slika 23. Prva brošura o bakterijskoj paleži jezgričavog voća

Figure 23. First brochure on fire blight

Bakterijska palež jedna je od najštetnijih bakterija koja napada gotovo sve vrste potporodica *Pomoidea* (porodica: *Rosaceae*). Prisutna je na svim kontinentima, a prva pojava u Hrvatskoj je zabilježena 1995. Zahvaljujući kontinuiranom praćenju i poduzetim mjerama eradicacije, bakterijska se palež u Hrvatskoj vrlo sporo širi te još uvijek nije prisutna u županijama Gorskog kotara, Like, Istre, Hrvatskog primorja i Dalmacije.

Programom posebnog nadzora od 2002. godine kontinuirano se prati pojava i širenje bakterijske paleži u Hrvatskoj. Nadzor se do 2001. godine obavljao u suradnji s Agronomskim fakultetom Sveučilišta u Zagrebu. Pojava bolesti se pratila više puta godišnje od svibnja do prosinca i to u pet fitosanitarnih koridora, na granicama zaraženih i nezaraženih županija unutar Hrvatske te na granicama sa susjednim zemljama (Slovenija, Mađarska, BiH i Srbija). Izdane su dvije brošure o bakterijskoj paleži (slika 23., slika 24.) Rezultati od 2002. do 2009. prikazani su u tablici 7.

Fire blight - *Erwinia amylovora* (Burill) Winslow et al. (2001 – 2009) – coordinator: Ivan Mikec MSc and **associate:** Ivana Križanac MSc



Slika 24. Druga brošura o bakterijskoj paleži jezgričavog voća

Figure 24. Second brochure on fire blight

Fire blight is one of the most harmful bacteria attacking almost all the Pomoidea subfamily species (family: Rosaceae). It is present on all continents, and first appearance in Croatia was recorded in 1995. Continuous monitoring and measures undertaken to eradicate, fire blight in Croatia slowed down spreading and it is still not present in the Gorski Kotar, Lika, Istria and along the coastal area.

The survey since 2002 includes continuous monitoring of the appearance and spread of fire blight in Croatia. Until 2001 the survey was performed in cooperation with the Faculty of Agriculture of the University in Zagreb. The spread of diseases was monitored several times a year from May to December in five phytosanitary corridors, on the borders between infected and non-infected counties within Croatia and on borders with neighbouring countries (Slovenia, Hungary, Bosnia and Herzegovina and Serbia). Two brochures were issued on fire blight (fig. 23, fig. 24). The results from 2002 until 2009 are given in table 7.

Godina	Broj uzetih uzoraka	Broj pozitivnih lab. analiza
2002.	25	0
2003.	50	3
2004.	22	4
2005.	22	7
2006.	13	2
2007.	29	6
2008.	20	0
2009.	5	3
Ukupno	186	25

Tablica 7. Pregled broja uzetih uzoraka i pozitivnih laboratorijskih analiza na bakterijsku palež u razdoblju 2002.–2009.

Smeđa trulež krumpira – *Ralstonia solanacearum* (Smith) Yabuuchi et al. i prstenasta trulež gomolja krumpira – *Clavibacter michiganensis* ssp. *sepedonicus* (2001. – 2009.) – voditelj programa: Darko Jelković, dipl.ing. i suradnica: mr.sc. Ivana Križanac.

Smeda trulež krumpira – *Ralstonia solanacearum* i prstenasta trulež gomolja krumpira – *Clavibacter michiganensis* ssp. *sepedonicus* bolesti su rasprostranjene u susjed-

Year	Number of samples taken	Number of positive lab. analyses
2002	25	0
2003	50	3
2004	22	4
2005	22	7
2006	13	2
2007	29	6
2008	20	0
2009	5	3
Total	186	25

Table 7 Overview of the number of samples taken and positive laboratory analyses on fire blight for the period 2002–2009

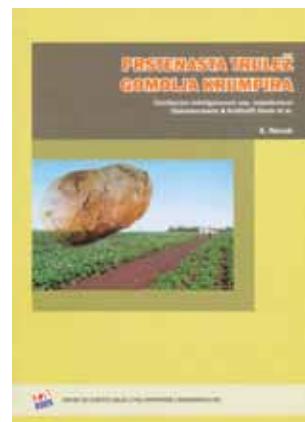
Potato brown rot – *Ralstonia solanacearum* (Smith) Yabuuchi et al. and potato ring rot – *Clavibacter michiganensis* ssp. *sepedonicus* (2001 – 2009) – coordinator: Darko Jelković BSc and associate: Ivana Križanac MSc.

Potato brown rot – *Ralstonia solanacearum* and potato ring rot – *Clavibacter michiganensis* ssp. *sepedonicus* are diseases spread in the neighbouring countries and in the countries which the potato is imported from so that their appearance and



Slika 25. Brošura o smeđoj truleži i prstenastoj truleži gomolja krumpira

Figure 25. Brochure on potato brown rot and potato ring rot



Slika 26. Brošura o prstenastoj truleži gomolja krumpira

Figure 26 Brochure on potato ring rot

Godina	Broj županija	Broj lokacija	Broj vizualnih pregleda	Broj uzetih uzoraka	Broj poz. lab. analiza
2001.	10	27	27	27	0
2002.	14	70	70	70	0
2003.	14	86	86	86	0
2004.	18	92	166	205	0
2005.	18	96	189	250	0
2006.	14	89	89	208	0
2007.	14	107	73	71	0
2008.	14	195	195	195	0
2009.	13	134	213	146	0
Ukupno		896	1108	1258	0

Tablica 8. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na smedu trulež krumpira i prstenastu trulež gomolja krumpira za razdoblje 2001.–2009.

nim državama i u državama iz kojih uvozimo krumpir te njihovu pojavu i širenje u Hrvatskoj moramo spriječiti da štete ne bi bile velike.

Ralstonia solanacearum tipičan je polifag koji napada više od 200 biljnih vrsta kao što su npr. krumpir, rajčica, paprika, duhan i druge vrste iz porodica *Solanaceae*, *Compositae*, *Eufobiaceae*. Nazočnost bakterije dokazana je u mnogim europskim zemljama, a za nas su važne zemlje iz kojih uvozimo sjemenski krumpir: Belgija, Njemačka, Mađarska, Nizozemska, Španjolska i Engleska.

Clavibacter michiganensis ssp. *sepedonicus* uzročnik je jedne od najopasnijih bakterijskih bolesti krumpira. Nazočna je u Njemačkoj, Danskoj, Švedskoj, Norveškoj, Francuskoj, Grčkoj, Španjolskoj, Finskoj i Nizozemskoj, a postoje i sumnje da je ima i u Austriji, Švicarskoj, Belgiji i Velikoj Britaniji. Simptomi su prikazani u brošurama o prepoznavanju ovih dviju bolesti (slika 25. i slika 26.)

Nadzorom nad nasadima krumpira i rajčice u najvažnijim područjima njihova uzgoja, uzimanjem uzoraka i laboratorijskom analizom dokazuje se prisutnost bakterije *Ralstonia*

Year	Number of counties	Number of locations	Number of visual inspections	Number of samples taken	Number of positive lab. analyses
2001	10	27	27	27	0
2002	14	70	70	70	0
2003	14	86	86	86	0
2004	18	92	166	205	0
2005	18	96	189	250	0
2006	14	89	89	208	0
2007	14	107	73	71	0
2008	14	195	195	195	0
2009	13	134	213	146	0
Total		896	1108	1258	0

Table 8 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on potato brown rot and potato ring rot for the period 2001–2009

spread in Croatia have to be prevented to reduce the damage to the lowest extent possible.

Ralstonia solanacearum is a typical polyphagous bacteria attacking over 200 plant species such as e.g. potato, tomato, paprika, tobacco and other species from the families Solanaceae, Compositae, Eufobiaceae. The presence of the bacteria was proven in many European countries, and the countries which the seed potato is imported from are important for Croatia as well, like: Belgium, Germany, Hungary, the Netherlands, Spain and England.

Clavibacter michiganensis ssp. *sepedonicus* is the agent of one of the most dangerous bacterial potato diseases. It is present in Germany, Denmark, Sweden, Norway, France, Greece, Spain, Finland and the Netherlands, and it is suspected to be present in Austria, Switzerland, Belgium and Great Britain as well. Symptoms are presented in the brochures on recognising these two diseases (fig. 25 and fig. 26).

The surveillance of potato and tomato plantations in the most important areas of their growing, taking the samples and laboratory analyses are performed to prove the absence/presence of the

solanacearum (Smith) Yabuuchi et al. i *Clavibacter michiganensis* ssp. *sepedonicus*.

Laboratorijske analize obavljene su u laboratoriju za bakteriologiju Zavoda i laboratoriju Zavoda za fitopatologiju Agronomskog fakulteta metodom (IF) imunoflorescence i ELISA testom. U analiziranim uzorcima nisu pronađene bakterije (tablica 8.).

Kukuruzna zlatica – *Diabrotica virgifera virgifera* Le Conte (2001.–2009.) – voditelj programa: mr.sc. Ivan Poje

Kukuruzna zlatica proširila se iz Sjeverne Amerike u Europu. Prvi nalazi u Evropi bili su 1991. U Hrvatskoj je prvi puta zabilježena 1995. u Vukovarsko-srijemskoj županiji. Već 2008. pronađena je u zapadnom dijelu Hrvatske. U nekim godinama u monokulturi kukuruza uzrokuje gospodarske štete.

Proširena je u nama susjednim zemljama te u Slovačkoj, Češkoj, Austriji, Poljskoj, Ukrajini, Rumunjskoj i Bugarskoj. Program posebnog nadzora nad kukuruznom zlaticom provodio je Zavod za poljoprivrednu zoologiju Agronomskog fakulteta u Zagrebu u razdoblju 2001. – 2006. Zavod u suradnji s fitosanitarnom inspekциjom samostalno provodi program od 2007. Laboratorijske analize obavljene su u laboratoriju za zoologiju

bacteria *Ralstonia solanacearum* (Smith) Yabuuchi et al. and *Clavibacter michiganensis* ssp. *sepedonicus*.

Laboratory analyses were conducted in the laboratory for bacteriology at the Institute and the laboratory of the Institute for Phytopathology at the Faculty of Agriculture by the (IF) imunoflorescence method and the ELISA test. Bacteria were not found in the analysed samples (table 8).

Western corn rootworm – *Diabrotica virgifera virgifera* Le Conte (2001–2009) – coordinator: Ivan Poje MSc

Western corn rootworm spread from the North America to Europe. The first findings in Europe originate from 1991. In Croatia it was first recorded in 1995 in the Vukovar-Srijem County. As early as in 2008 it was found in the western part of Croatia. It caused economic damages to the maize monoculture in some years.

It is spread in the neighbouring countries with Croatia and in the Slovak Republic, the Czech Republic, Austria, Poland, Ukraine, Romania and Bulgaria. The survey of Western corn rootworm programme was conducted by the Department for Agricultural Zoology at the Faculty of Agriculture in Zagreb in the period 2001 – 2006. The Institute in cooperation with phytosanitary inspection

Godina	Broj županija	Broj lokacija	Broj lovnih klopki
2001.	11	148	80
2002.	11	140	86
2003.	13	121	90
2004.	13	59	38
2005.	13	55	38
2006.	13	31	37
2007.	8	31	47
2008.	12	37	109
2009.	8	23	27
Ukupno		645	258

Tablica 9. Pregled broja županija, lokacija i ulova u lovnim klopkama za kukuruznu zlaticu u razdoblju 2001.–2009.

Year	Number of counties	Number of locations	Number of catching traps
2001	11	148	80
2002	11	140	86
2003	13	121	90
2004	13	59	38
2005	13	55	38
2006	13	31	37
2007	8	31	47
2008	12	37	109
2009	8	23	27
Total		645	258

Table 9 Overview of the number of counties, locations and catches in traps on western corn rootworm for the period 2001–2009

Zavoda za zaštitu bilja i laboratoriju Zavoda za entomologiju Agronomskog fakulteta. Rezultati analiza nalaze su u tablici 9.

Fitoplazme vinove loze i vektori – Flavescence dorée (2002.-2009.) – voditelji programa: mr.sc. Ivan Mikec i dr.sc. Željko Budinščak i **suradnik:** mr.sc. Ivana Križanac

Program posebnog nadzora fitoplazmoza vinove loze provodi se od 2002. godine i tijekom tog razdoblja programom je obuhvaćena vinova loza i kukci vektori. U Republici Hrvatskoj proširene su fitoplazme Bois noir i Aster yellows, a fitoplazma Flavescence doree po prvi put utvrđena je 2009. godine na vinovoj lozi u Vivodini. Fitoplazme vinove loze šire se zaraženim sadnim materijalom, kukcima vektorima i korovima. Simptomi fitoplazmi vinove loze prikazani su u brošuri Fitoplazme vinove loze (slika 27). Rezultati analiza

Godina	Broj županija	Broj lokacija	Broj vizualnih pregleda	Br. uzoraka loze i korova	Br. poz. lab. analizaloze i korova	Broj uzoraka vektora	Br. poz. lab. analiza vektora
2002.	14	27	33	30 B	19 BF	-	-
2003.	14	25	56	39 B	29 BF	-	-
2004.	14	26	52	42 B 18 K	40 BF 13 KF	11	9
2005.	13	14	48	10 B 15 K	6 BF 4 KF	9	2
2006.	5	5	14	7 B	1 BF	3	1
2007.	3	7	20	13 B	10 BF	-	-
2008.	4	8	15	21 B	15 BF	-	-
2009.	5	13	63	35 B	18 BF 1 BFD	34	-
Ukupno	125	301	230	156	57	12	

B – uzorak vinove loze; K – uzorak korovnih vrsta iz vinograda; BF – pozitivne laboratorijske analize uzoraka vinove loze na fitoplazme iz skupina 16 Srl i XII (Aster yellows, Bois noir); BFD – pozitivne laboratorijske analize uzoraka vinove loze na fitoplazmu Flavescence doree (skupina 16 SrV); KF – pozitivne laboratorijske analize uzoraka korova iz vinograda iz skupina 16 Srl i XII

Tablica 10. Pregled broja županja, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na fitoplazme za razdoblje 2002.-2009.

has been conducting the programme independently since 2007. Laboratory analyses were made in the laboratory for Zoology at the Institute for Plant Protection and the laboratory of the Department for Agricultural Zoology at the Faculty of Agriculture. The results of analyses are given in table 9.

Grapevine phytoplasma and vectors – Flavescence dorée (2002-2009) – coordinators: Ivan Mikec MSc and Željko Budinščak PhD and **associate:** Ivana Križanac MSc

The survey of grapevine phytoplasma has been conducted since 2002 and it included sampling of grapevine and vector insects. Bois noir and Aster yellows phytoplasma are spread in the Republic of Croatia, and Flavescence dorée phytoplasma was first detected in 2009 on grapevine in Vivodina. Grapevine phytoplasma are spread through infected planting material,

Year	Number of counties	Number of locations	Number of visual inspections	No. of fruit samples taken	No. of pos. lab. analyses of fruits*	No. of vector samples taken	No. of pos. lab. analyses of vectors*
2002	14	27	33	30 B	19 BF	-	-
2003	14	25	56	39 B	29 BF	-	-
2004	14	26	52	42 B 18 K	40 BF 13 KF	11	9
2005	13	14	48	10 B 15 K	6 BF 4 KF	9	2
2006	5	5	14	7 B	1 BF	3	1
2007	3	7	20	13 B	10 BF	-	-
2008	4	8	15	21 B	15 BF	-	-
2009	5	13	63	35 B	18 BF 1 BFD	34	-
Total	125	301	230	156	57	12	

B – grapevine sample; K – weed species samples from vineyards; BF – positive laboratory analyses of grapevine samples for phytoplasma from groups 16 Srl and XII (Aster yellows, Bois noir); BFD – positive laboratory analyses of grapevine samples for Flavescence dorée phytoplasma (group 16 SrV); KF – positive laboratory analyses of weed samples from vineyards from groups 16 Srl and XII

Table 10 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses for phytoplasma for the period 2002–2009

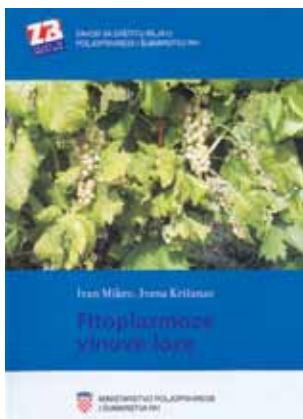
Godina	Broj županija	Broj lokacija	Br. vizualnih pregleda	Broj uzetih uzoraka voćki	Br. pozitivnih lab. analiza voćki*	Broj uzetih uzoraka vektora	Br. pozitivnih lab. analiza vektora*
2003.	2	2	4	2	2	-	-
2004.	15	29	58	67	30	9	8
2005.	4	5	10	9	3	6	0
Ukupno	21	36	72	78	35	15	8

*pozitivne laboratorijske analize uzoraka voćaka i vektora na fitoplazme iz skupina 16 SrX (X-A Apple proliferation, X-B European stone fruit yellows, X-C Pear decline) i 16 SrI i XII (Aster yellows, Bois noir)

Tablica 11. Zbirni pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na fitoplazme za razdoblje 2003.–2005.

nalaze su u tablici 10. u kojoj je prikazan broj županija, lokacija, vizualnih pregleda, uzetih uzoraka te broj pozitivnih laboratorijskih analiza u razdoblju od 2002. do 2009.

U 2003., 2004. i 2005. godini osim nadzora vinove loze provodio se i nadzor fitoplazmi u voćkama i njihovim vektorima, kukcima iz roda *Cacopsylla*. U Hrvatskoj su prisutne fitoplazme uzročnici propadanja kruške i europskih žutica koštičavog voća, a njihova prisutnost je dokazana i u kukcima vektorima. O fitoplazmama voćaka također je izdana brošura. Rezultati su prikazani u tablici 11.



Slika 26. Brošura o fitoplazmama vinove loze

Figure 26. Brochure on grapevine phytoplasma

Year	Number of counties	Number of locations	Number of visual inspections	No. of fruit samples taken	No. of pos. lab. analyses of fruits*	No. of vector samples taken	No. of pos. lab. analyses of vectors*
2003	2	2	4	2	2	-	-
2004	15	29	58	67	30	9	8
2005	4	5	10	9	3	6	0
Total	21	36	72	78	35	15	8

*Positive laboratory analyses of fruit and vector samples for phytoplasma from groups 16 SrX (X-A Apple proliferation, X-B European stone fruit yellows, X-C Pear decline) and 16 SrI and XII (Aster yellows, Bois noir)

Table 11 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses for phytoplasma for the period 2003–2005

vector insects and weeds. Symptoms of grapevine phytoplasma are shown in the brochure on grapevine phytoplasma. The results of analyses are given in table 10 presenting the number of counties, locations, visual inspections, samples taken and the number of positive laboratory analyses in the period from 2002 until 2009.

In 2003, 2004 and 2005, in addition to grapevine survey there was carried out phytoplasma survey in fruits and their vectors, insects from *Cacopsylla* genus. Phytoplasma pear decline and European yellows of stone fruits are present in Croatia, and their presence was proven in vector insects as well. There is a brochure issued also on fruit phytoplasma. The results are presented in table 11.

Rak krumpira – *Synchytrium endobioticum* (Schilberszky)
Percival (2002. – 2009.) – voditelj programa: Darko Jelković,
dipl.ing. i suradnica: mr.sc. Adrijana Novak

Rak krumpira nazočan je u većini europskih zemalja. Zbog velikih šteta, koje uzrokuje ovaj štetni organizam, provode se karantenske, administrativne i kemijske mјere sprječavanja njegova širenja i udomaćivanja u najvažnijim područjima proizvodnje krumpira. Proizvodnja sjemenskoga krumpira u Hrvatskoj relativno je mala pa se uvozi, prije svega iz Nizozemske, Njemačke i drugih zemalja u kojima je rak krumpira nazočan.

U Hrvatskoj rak krumpira bio je nađen u okolini Žumberka 1955., no zaraza je iskorijenjena i u posljednjih pedeset godina nisu otkriveni novi slučajevi. Zaraženi gomolji istrunu već u tlu, a štetni organizam ostaje aktivan u tlu i do 30 godina. Osim krumpira, *Synchytrium endobioticum* napada rajčicu i neke korovske vrste iz porodice *Solanaceae*.

Vizualne preglede merkantilnoga krumpira i uzimanje uzoraka obavljuju fitosanitarni inspektori tijekom vadjenja krumpira, dok vizualne preglede i uzorkovanje sjemenskoga krumpira obavljavaju djelatnici Zavoda, radi određivanja moguće nazočnosti štetnog organizma.

Godina	Broj županija	Broj lokacija	Broj viz. pregleda	Br. uzetih uzoraka	Br. poz.lab. analiza
2002.	14	45	45	45	0
2003.	14	86	86	86	0
2004.	11	32	32	64	0
2005.	10	27	27	60	0
2006.	14	32	32	64	0
2007.	9	22	60	56	0
2008.	9	20	59	26	0
2009.	12	66	44	71	0
Ukupno		330	385	472	0

Tablica 12. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na rak krumpira za razdoblje 2002.–2009.

Potato wart disease – *Synchytrium endobioticum* (Schilberszky)
Percival (2002 – 2009) – coordinator: Darko Jelković, BSc
and associate: Adrijana Novak MSc

Potato wart disease is present in the majority of European countries. Because of great damages caused by this harmful organism, quarantine, administrative and chemical control measures are implemented against its spread and naturalisation in the most important areas of potato production. The production of seed potato in Croatia is a relatively small one so that it is imported, primarily from the Netherlands, Germany and other countries where the potato cancer is present.

*In Croatia the potato cancer was found around Žumberak in 1955, but the infection was eradicated and in the last fifty years no new cases were detected. Infected tubers rot already in soil, and a harmful organism remains active in soil up to 30 years. In addition to potato, *Synchytrium endobioticum* attacks tomato and certain weed species from the Solanaceae family.*

Visual inspections of potato for consumption and sampling are performed by phytosanitary inspectors during digging up of potatoes, whereas visual inspections and sampling of seed potato are performed by employees from the Institute, in order to detect potential presence of a harmful organism.

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2002	14	45	45	45	0
2003	14	86	86	86	0
2004	11	32	32	64	0
2005	10	27	27	60	0
2006	14	32	32	64	0
2007	9	22	60	56	0
2008	9	20	59	26	0
2009	12	66	44	71	0
Total		330	385	472	0

Table 12 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on potato wart disease for the period 2002–2009

Uzorci gomolja krumpira uzimaju se u vrijeme vađenja krumpira za mikološke analize u laboratoriju. Radi određivanja nazočnosti gljive *Synchytrium endobioticum* od 2002. do 2009. analizirana su 472 uzorka krumpira. Rezultati analiza nalaze su u tablici 12.

Pregledima i analizama nije pronađen *Synchytrium endobioticum*.

Karantenske vrste štetnika povrća i cvijeća u zaštićenim prostorima palmov trips - *Thrips palmi* (Karny), *Liriomyza sativae* (Blanchard) i graškov lisni miner - *Liriomyza huidobrensis* (Blanchard)(2003. – 2005.) – **voditelj:** dr.sc. Mladen Šimala i **suradnica:** dr.sc. Tatjana Masten Milek

Thrips palmi široko je rasprostranjen u Aziji, Središnjoj Americi i Karibima te u nekim dijelovima Sjeverne i Južne Amerike, Afrike i Oceanije. Iako je to kozmopolitska vrsta, u državama regije EPPO-a nije rasprostranjen. Nekoliko puta nađen je u Nizozemskoj no uspešno je eradiciran. Gospodarski važne biljke domaćini u staklenicima su mu: paprika, krastavac, krizantema, ciklama, fikus i orhideja. Odrasli oblici i ličinke čine štete na biljkama sisanjem biljnih sokova na listu, stabljici, cvjetu i plodovima te se na napadnutim organima pojavljuje srebrolikost. Na jako napadnutim biljkama pojavljuju se znakovi kloroze, kržljavost listova i terminalnih izbojaka te ožiljci na plodovima i njihova deformacija. Osim izravnih šteta, ova vrsta tripsa uzrokuje i neizravne štete prenošenjem biljnih viroza od kojih su neke i karantenske (Watermelon silver mottle tospovirus).

Liriomyza sativae nazočana je u nekim dijelovima Azije, Afrike, Sjeverne, Središnje i Južne Amerike te Oceanije, a prvi put je nađena u Turskoj 2003. Ovaj štetnik preferira biljke domaćine iz porodica Solanaceae i Leguminosae, ali također napada biljke iz sedam drugih porodica. Nađen je na lucerni, *Amaranthus* spp., *Aster* spp., patlidžanu, paprici, celeru, krastavcu, *Cucurbita pepo*, *Dahlia* spp., mahunarkama, *Lathyrus* spp., dinji, grašku, *Phaseolus lunatus*, grahu, krumpiru, rajčici, *Tropaeolum* spp. i *Vigna* spp.

*Potato tuber samples are taken at the time of digging up of potatoes for mycological analyses in the laboratory. In order to detect the presence of the *Synchytrium endobioticum*, 472 potato samples were analysed from 2002 until 2009. The results of analyses are given in table 12.*

Synchytrium endobioticum has not been found by inspections and analyses.

Quarantine species of vegetable and flower pests in greenhouses palm trips - *Thrips palmi* (Karny), *Liriomyza sativae* (Blanchard) and green pea leaf miner - *Liriomyza huidobrensis* (Blanchard) (2003 – 2005) – **coordinator:** Mladen Šimala PhD and **associate:** Tatjana Masten Milek PhD

Thrips palmi is widely spread in Asia, the Central America and the Caribbean and in certain parts of the North and South America, Africa and Oceania. Although it is a cosmopolitan species, it is not spread in the countries of the EPPO-region. It was found in the Netherlands several times but it was successfully eradicated. Its economically important host plants in greenhouses are: paprika, cucumber, chrysanthemum, cyclamen, rubber plant and orchid. Adult forms and larvae incur damage to plants by sucking plant juices on leaf, stem, flower and fruit causing silvery scars. On highly attacked plants there appear the signs of chlorosis, plant growth can be deformed and heavily scarred and scars on fruits and their deformation can appear. Apart from direct damage, this trips species causes indirect damage as well by transmitting plant viruses some of which are quarantine ones (Watermelon silver mottle tospovirus).

Liriomyza sativae is present in certain parts of Asia, Africa, North, the Central and South America and Oceania, and it was first found in Turkey in 2003. This pest prefers host plants from the families Solanaceae and Leguminosae, but it also attacks plants from seven other families. It was found on alfa alfa, *Amaranthus* spp., *Aster* spp., aubergines, paprika, celery, cucumber, *Cucurbita pepo*, *Dahlia* spp., pulses, *Lathyrus* spp., melon, green pea, *Phaseolus lunatus*, beans, potato, tomato, *Tropaeolum* spp. and *Vigna* spp.

Liriomyza huidobrensis within the EPPO-region is present in several countries on a limited territory (Austria, Belgium, the Czech Republic, France, Croatia, Italy, Israel, Malta, the Netherlands, Poland,

Liriomyza huidobrensis unutar regije EPPO-a nazočna je u nekoliko država na ograničenom području (Austrija, Belgija, Republika Česka, Francuska, Hrvatska, Italija, Izrael, Malta, Nizozemska, Poljska, Portugal, Turska i Velika Britanija), a rasprostranjena je na čitavom području Cipra, Grčke i Španjolske. U Republici Hrvatskoj štetnik je prvi put nađen 2002. U Europi važan je štetnik mnogih vrsta povrća i krizanteme, jaglaca te *Verbena* spp. Vrsta je postala daleko važniji štetnik od uobičajene *Liriomyza trifolii* i u EPPO-regiji je već važan štetnik salate, graha, krastavca, celera i tikve. Nakon rasprostranjenja u sredozemnim državama, pojavljuje se i na biljkama uzgajanim na otvorenom (npr. salati i cikli). Vrsta *L. huidobrensis* polifagan je štetnik za kojeg je određeno da napada biljke iz najmanje 14 porodica, pri čemu ne preferira posebno ni jednu od njih. Najznačajnije biljke domaćini graškovoga lisnog minera su paprika, krastavac, dinja, salata, celer, rajčica, grah, krizantema i *Verbena* hibridi.

Štete na biljkama i kod *L. sativae* i kod *L. huidobrensis* uzrokuju ličinke bušenjem hodnika u listovima tzv. "mine" i lisnim peteljkama. Time je smanjena fotosinteza napadnutih biljaka, budući da je klorofil koji sadrže stanice uništen, rast je usporen, a jače oštećeni listovi otpadaju. Mine su obično bijele boje s vlažnim crnim i suhim smeđim dijelovima. One su pravilno vijugave, gusto isprepletene i nepravilna oblika, a proširuju se rastom ličinke. Dodatna oštećenja na listovima čine ženke štetnika ubodima radi hrانjenja ili odlaganja jaja. Štete, simptomi i biologija karantenskih štetnika u zaštićenim prostorima opisane su u odgovarajućoj brošuri (slika 30.)

Rezultati programa dobiveni su na temelju vizualnih pregleda biljaka radi određivanja nazočnosti mina, primjene vizualnih mamaca (žute ljepljive ploče) postavljanjem u zaštićenom objektu iznad vrhova biljaka za određivanje pojave odraslih razvojnih stupnjeva muha lisnih minera, vizualnih pregleda biljaka i prikupljanje odraslih razvojnih stupnjeva tripsa s listova, cvjetova, izbojaka ili plodova biljaka, na kojima su vidljivi znakovi napada štetnika te mikroskopske determinacije vrste uz korištenje relevantnih ključeva i primjene vizualnih mamaca (plave i žute ljepljive ploče) vješanjem u zaštićenom

Portugal, Turkey and Great Britain), and it is spread throughout the territory of Cyprus, Greece and Spain. In the Republic of Croatia the pest was first found in 2002. In Europe it is an important pest of many vegetable species and chrysanthemum, primrose and *Verbena* spp. The species has become far more important pest than the common *Liriomyza trifolii* and in the EPPO-region it is already an important pest of salad, beans, cucumber, celery and pumpkin. Having spread in the Mediterranean countries, it appears also on plants grown out in the field (e.g. salad and red beet). The *L. huidobrensis* species is a polyphagous pest identified to attack plants from at least 14 families, whereby it prefers none of them especially. The most important host plants of the green pea leaf miner are paprika, cucumber, melon, salad, celery, tomato, beans, chrysanthemum and *Verbena* hybrids.

Damages to plants with both *L. sativae* and *L. huidobrensis* are incurred by larvae drilling holes in leaves the so-called "mines" and leaf stems. This reduces photosynthesis of attacked plants, since chlorophyll contained in cells is destroyed, growth is slowed down, and highly damaged leaves fall off. Mines are usually white with wet black and dry brown parts. They are shapely serpentine, thickly woven and irregularly formed, and they widen up with the growth of larvae. Additional damage to leaves is caused by female pests picking them for feeding or laying eggs. Damages, symptoms and biology of quarantine pests in greenhouses are described in a respective brochure (photo 30).



Slika 27. Brošura o karantenskim štetnicima u zaštićenim prostorima

Figure 27 Brochure on quarantine pests in greenhouses

Godina	Broj lokacija	Broj viz. pregleda	Broj analiza	Broj poz. lab. analiza
2003.	59	59	67	0
2004.	52	52	61	0
2005.	47	47	44	0
Ukupno	158	158	172	0

Tablica 13. Pregled broja lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza za *Thrips palmi* za razdoblje 2003.–2005.

Godina	Broj lokacija	Broj viz. pregleda	Broj analiza	Broj poz. lab. analiza
2003.	59	59	150	0
2004.	52	52	78	0
2005.	47	47	45	0
Ukupno	158	158	273	0

Tablica 14. Pregled broja lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza za *Liriomyza sativae* za razdoblje 2003.–2005.

Godina	Broj lokacija	Broj viz. pregleda	Broj analiza	Broj poz. lab. analiza
2003.	59	59	150	7
2004.	52	52	78	3
2005.	47	47	45	3
Ukupno	158	158	273	13

Tablica 15. Pregled broja lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza za *Liriomyza huidobrensis* za razdoblje 2003.–2005.

objektu iznad vrhova biljaka za određivanje pojave odraslih razvojnih stupnjeva tripsa, važnih za laboratorijsku determinaciju vrste. U tablicama 13., 14. i 15. dani su rezultati programa iz kojih je vidljivo da *L. sativae* i *T. palmi* nisu prisutni u Hrvatskoj, dok je prisutnost *L. huidobrensis* potvrđena s 13 pozitivnih analiza.

Year	No. of locations	No. of visual inspections	No. of analyses	No. of positive lab. analyses
2003	59	59	67	0
2004	52	52	61	0
2005	47	47	44	0
Total	158	158	172	0

Table 13 Overview of the number of locations, visual inspections, samples taken and positive laboratory analyses for *Thrips palmi* for the period 2003–2005

Year	No. of locations	No. of visual inspections	No. of analyses	No. of positive lab. analyses
2003	59	59	150	0
2004	52	52	78	0
2005	47	47	45	0
Total	158	158	273	0

Table 14 Overview of the number of locations, visual inspections, samples taken and positive laboratory analyses for *Liriomyza sativae* for the period 2003–2005

Year	No. of locations	No. of visual inspections	No. of analyses	No. of positive lab. analyses
2003	59	59	150	7
2004	52	52	78	3
2005	47	47	45	3
Total	158	158	273	13

Table 15 Overview of the number of locations, visual inspections, samples taken and positive laboratory analyses for *Liriomyza huidobrensis* for the period 2003–2005

Results of survey are obtained on the basis of visual inspections of plants in order to detect the presence of mines, implementation of visual baits (yellow and blue sticky plates) by setting them up in greenhouses above plants in order to determine the appearance of adults of leaf miner, visual inspections of plants and collection of adults of trips from plant leaves, flowers, scions or fruits, showing the signs of attacks by pests and microscopic determination of species using relevant keys. The tables 13, 14 and 15 provide programme results showing that *L. sativae* and *T. palmi* are not present in Croatia, whereas the presence of *L. huidobrensis* was confirmed with 13 positive analyses.

Krumpirove cistolike nematode *Globodera rostochiensis* (Wollenweber) Behrens i *Globodera pallida* (Stone) Behrens (2004. – 2008.) – voditelj programa: mr.sc. Ivan Poje

Program posebnog nadzora nad krumpirovim cistolikim nematodama provodi se u suradnji sa Zavodom za poljoprivrednu zoologiju Agronomskog fakulteta u Zagrebu od 2002., a od 2005. ZZB samostalno radi na programu. Od 2006. su radnici na programu stručnjaci su fitosanitarne inspekcije MPRRR-a. Cilj je programa posebnog nadzora određivanje areala rasprostranjenosti krumpirovih cistolikih nematoda u područjima proizvodnje sjemenskoga i konzumnoga krumplira, prikupljanje i laboratorijska analiza uzorka tla, vizualni pregledi krumpira tijekom vegetacije te istraživanja patotipova na uzorcima izoliranih cista. Testovi patotipova rađeni su na institutu AGES u Beču.

Tijekom vegetacijske sezone obavljaju se vizualni pregledi krumpira u polju. Prikupljanje uzorka tla propisanom metodikom (od 500 do 750 ml tla) obavlja se istodobno s vizualnim pregledima, a uzorci biljaka i tla laboratorijski se analiziraju u nematološkom laboratoriju Zavoda. Slike 31. i 32. prikazuju ciste krumpirovih cistolikih nematoda. Iz suhozraćenih uzorka tla ciste se izdvoje metodom flotacije (Fenwick). Nakon izdvajanja iz zaraženih uzorka ciste se determiniraju prema morfološkim obilježjima u skladu s EPPO Diagnostic protocols for regulated pests – *Globodera rostochiensis* and *Globodera pallida*, PM 7/40.

Zaraza s *Globodera rostochiensis* nađena je u županijama: Zagrebačkoj, Varaždinskoj i Međimurskoj godine 2004., u Varaždinskoj i Međimurskoj županiji 2005. i 2006., u Primorsko-goranskoj županiji 2007., a u Primorsko-goranskoj, Varaždinskoj i Međimurskoj županiji u 2008. Samo na lokalitetu Ivanovec u Međimurskoj županiji morfološkom determinacijom u jednom uzorku nađena je vrlo mala populacija vrste *Globodera pallida* 2004.

U uzorcima cisti *Globodera rostochiensis* prikupljenim u Međimurskoj županiji tijekom 2003. i 2004. determinirani su patotipovi R01 u 29 uzorka, a R02 i R03 u jednom, patotip R01 u pet uzorka u Međimurskoj, Varaždinskoj i Zagrebačkoj

Golden potato cyst-nematode – *Globodera rostochiensis* (Wollenweber) Behrens and pale potato cyst-nematode - *Globodera pallida* (Stone) Behrens (2004 – 2008) – coordinator: Ivan Poje MSc

The survey of potato cyst-nematodes has been conducted in co-operation with the Department for Agricultural Zoology at the Faculty of Agriculture in Zagreb since 2002, and since 2005 the REWS has been working on the programme independently. Ever since 2006 phytosanitary inspection experts of the MAFRD are associates on the programme. The objective of the survey to identify the area of potato cyst-nematodes spreading in the production areas of seed potato and potato for consumption, to collect and make laboratory analysis of soil samples, visual inspections of potato during vegetation and research on pathotypes isolated from cysts. Tests of pathotypes were made at the AGES institute in Vienna.

During vegetation season visual inspections of potato are performed out in the field. Soil samples are being collected in a prescribed method (500 to 750 ml of soil) simultaneously with visual inspections, and plant and soil samples are analysed in the nematological laboratory of the Institute. On photos 31 and 32 shown are cysts of potato cyst-nematodes. Cysts are extracted from dry-air soil samples by flotation method (Fenwick). Upon extraction from infected samples cysts are determined according to morphological characteristics in compliance with EPPO Diagnostic protocols for regulated pests – *Globodera rostochiensis* and *Globodera pallida*, PM 7/40.

Infection with *Globodera rostochiensis* was found in the Zagreb, Varaždin and Međimurje County in 2004, in Varaždin and Međimurje County in 2005 and 2006, in Primorje-Gorski Kotar County in 2007, and in Primorje-Gorski Kotar, Varaždin and Međimurje County in 2008. It is only on the locality Ivanovec in Međimurje County that it was found a very small population of the *Globodera pallida* species by morphological determination in one sample in 2004.

In *Globodera rostochiensis* cyst samples collected in Međimurje County during 2003 and 2004 pathotypes R01 were determined in 29 samples, and R02 and R03 in one, pathotype R01 in five samples in Međimurje, Varaždin and Zagreb County during

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2002.	15	176	-	3775	171
2003.	17	204	-	3000	32
2004.	7	36	-	1500	253
2005.	10	24	-	650	64
2006.	10	60	-	943	12
2007.	8	54	83	350	5
2008.	8	114	112	533	108
2009.	9	32	113	566	64
Ukupno		700	308	11 317	709

Tablica 16. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na krumpirove cistolike nematode za razdoblje 2002.–2009.

županiji tijekom 2004. i 2005., patotip R01 u dva uzorka u Međimurskoj i Varaždinskoj tijekom 2006., Primorsko-goranskoj županiji tijekom 2006. i 2007. te patotip R01 u tri uzorka u Primorsko-goranskoj županiji u 2008.

Rezultati analiza tla nalaze su u tablici 16., u kojoj je prikazan ukupan broj županija, lokacija, vizualnih pregleda, uzetih uzoraka te broj pozitivnih laboratorijskih analiza u razdoblju od 2002. do 2009.

Pepino mosaic virus (PepMV) (2004.–2009.) – voditeljica programa: mr.sc. Vesna Kajic

Pepino mosaic virus (PepMV) spada u skupinu POTEX virusa. Prvi put je nađen 1974. u Peruu na vrsti *Solanum muricatum*. Jones i suradnici opisali su ga 1980. Postoji mogućnost da su domaćini tog virusa i druge vrste iz porodice Solanaceae, a posebno krumpir. O ovom virusu izdana je brošura koja je prikazana na slici 33. PepMV je virus iz Južne Amerike, potpuno stran našem ekosustavu pa ako se udomaći, može biti štetniji nego u zemlji podrijetla. U Europi je prvi put zabilježen 1999. na rajčici u staklenicima u Nizozemskoj i Velikoj Britaniji. Nazočan je u Francuskoj, Njemačkoj, Italiji, Španjolskoj, Finskoj, Austriji, Belgiji, Bugarskoj, Poljskoj, Danskoj, Irskoj, Norveškoj, Švedskoj, Maroku te SAD-u i Kanadi.

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2002	15	176	-	3775	171
2003	17	204	-	3000	32
2004	7	36	-	1500	253
2005	10	24	-	650	64
2006	10	60	-	943	12
2007	8	54	83	350	5
2008	8	114	112	533	108
2009	9	32	113	566	64
Total		700	308	11 317	709

Table 16 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on potato cyst-nematodes for the period 2002–2009

2004 and 2005, pathotype R01 in two samples in Međimurje and Varaždin during 2006, Primorje-Gorski Kotar County during 2006 and 2007 and pathotype R01 in three samples in Primorje-Gorski Kotar County in 2008.

Soil analysis results are given in table 16, presenting the total number of counties, locations, visual inspections, samples taken and the number of positive laboratory analyses in the period from 2002 until 2009.

Pepino mosaic virus (PepMV) (2004–2009) – coordinator: Vesna Kajic MSC; associate: Adrijana Novak MSc

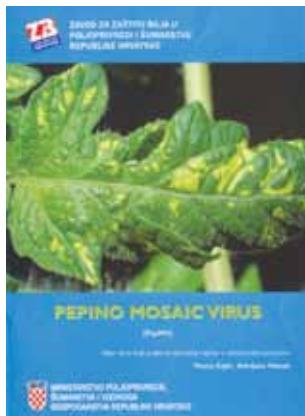
Pepino mosaic virus (PepMV) belongs to the group of POTEX viruses. It was first found in 1974 in Peru on the *Solanum muricatum* species. Jones and associates described it in 1980. There is a possibility that hosts of this virus are other species from the Solanaceae family, and particularly potato. There is a brochure, shown on photo 33, issued about this virus. PepMV is a virus from South America, completely strange to the Croatian eco-system, so that if it should naturalise, it can be more harmful than in the country of its origin. In Europe it was first recorded in 1999 on tomato in greenhouses in the Netherlands and Great Britain. It is present in France, Germany, Italy, Spain, Finland, Austria, Belgium, Bulgaria, Poland, Denmark, Ireland, Norway, Sweden, Morocco and the USA and Canada.

Laboratorijske analize obavljene su u laboratoriju za virologiju Zavoda metodama DAS-ELISA i tas ELISA–om. Rezultati analiza nalaze su u tablici 17.

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2004.	7	21	35	168	0
2005.	7	25	35	176	0
2006.	9	31	45	210	0
2007.	11	41	30	150	0
2008.	10	19	25	138	0
2009.	9	37	25	223	0
Ukupno		174	195	1065	0

Tablica 17. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na Pepino mosaic virus za razdoblje 2004.–2009.

Od 2007. optimiziran je i stavljen u uporabu molekularni test IC-RT-PCR. U našim proizvodnim nasadima rajčice u zaštićenom prostoru do 2009. nije određena nazočnost PepMV-a.



Slika 28. Brošura o pepino mosaic virusu

Figure 28 Brochure on pepino mosaic virus

Laboratory analyses were made in the laboratory for virology at the Institute by DAS-ELISA and tas ELISA–methods. Analysis results are given in table 17.

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2004	7	21	35	168	0
2005	7	25	35	176	0
2006	9	31	45	210	0
2007	11	41	30	150	0
2008	10	19	25	138	0
2009	9	37	25	223	0
Total		174	195	1065	0

Table 17 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on Pepino mosaic virus for the period 2004–2009

Molecular test IC-RT-PCR has been optimised and put into use since 2007. In the Croatian tomato production plantations in protected facilities until 2009 the presence of PepMV has not been detected.

Venuće i sušenje hortikulturnog bilja - *Phytophthora ramorum* (Werres et al.) (2004.–2009.) – voditelj programa: mr.sc. Andrija Vukadin i **suradnik:** mr.sc. Željko Tomić

Phytophthora ramorum je gljivicama sličan organizam iz roda *Phytophthora*. Uzročnik je brzog odumiranja i propadanja hrastova u Kaliforniji (engl. «Sudden Oak Death» ili SOD). Na području EPPO regije *P. ramorum* nađena je u Belgiji, Danskoj, Finskoj, Francuskoj, Njemačkoj, Irskoj, Italiji, Nizozemskoj, Norveškoj, Poljskoj, Sloveniji, Španjolskoj, Švicarskoj, Švedskoj i Ujedinjenom Kraljevstvu na vrstama iz roda *Viburnum* i *Rhododendron*, koje su i u našem programu glavni predmet istraživanja. Patogen ima širok krug domaćina među biljnim vrstama, od kojih su posebno osjetljive vrste iz rodova *Camellia*, *Rhododendron*, *Syringa*, *Viburnum*.

Program posebnog nadzora *Phytophthora ramorum* provodi se od 2004. tijekom vegetacijske sezone (od travnja do kraja studenog) u suradnji s fitosanitarnom inspekцијом MPRRR-a. Obavljeni su vizualni pregledi rasadnika, vrtnih centara, parkova i privatnih vrtova. Nadzorom nad biljnim vrstama koje se uvoze želi se pravodobno otkriti moguća zaraza bilja u pošiljci i poduzeti mjere iskorjenjivanja i sprječavanja širenja štetnog organizma. Uzorci se uzimaju prema protokolu EPPO (04/10702) i u najkraćem roku se dostavljaju laboratoriju za mikologiju Zavoda na analizu. Rezultati analiza nalaze su u tablici 18.

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2004.	11	22	30	56	0
2005.	9	16	23	38	0
2006.	11	22	22	26	0
2007.	10	15	24	39	2
2008.	10	23	38	40	0
2009.	13	29	56	46	2
Ukupno		127	193	245	4

Tablica 18. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na venuće i sušenje hortikulturnog biljaza razdoblje 2004.–2009.

Sudden oak death - *Phytophthora ramorum* (Werres et al.) (2004–2009) – coordinator: Andrija Vukadin MSc and associate: Željko Tomić MSc

Phytophthora ramorum is a fungus-like organism from the *Phytophthora* genus. It causes rapid dying and degradation of oaks in California ("Sudden Oak Death" or SOD). On the territory of the EPPO region *P. ramorum* was found in Belgium, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Poland, Slovenia, Spain, Switzerland, Sweden and United Kingdom on the species from the *Viburnum* and *Rhododendron* genera, which are the main subject of survey. The pathogen has a wide circle of hosts among plant species, among which species from *Camellia*, *Rhododendron*, *Syringa* and *Viburnum* genera are especially susceptible.

The survey of *Phytophthora ramorum* has been conducted since 2004 during vegetation season (from April until the end of November) in cooperation with the phytosanitary inspection of the MAFRD. Plant nurseries, garden centres, parks and private gardens have been visually inspected. The surveillance of imported plant species is performed to detect on time potential plant infection in the shipment and to undertake the measures of eradication and prevention of spreading of harmful organism. Samples are taken according to the EPPO protocol (04/10702) and delivered in the shortest possible time to the laboratory for mycology of the Institute for analysis. Analysis results are given in table 18.

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2004	11	22	30	56	0
2005	9	16	23	38	0
2006	11	22	22	26	0
2007	10	15	24	39	2
2008	10	23	38	40	0
2009	13	29	56	46	2
Total		127	193	245	4

Table 18 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on sudden oak death for the period 2004–2009

U razdoblju od 2004. do 2009. analizirano je 245 uzoraka vrsta iz rodova *Rhododendron*, *Syringa*, *Viburnum*, *Camelia*, *Pieris*, *Nerium* i *Photinia*. Prvi pozitivni nalaz ovoga štetnog organizma zabilježen je 2007. godine, gdje su od ukupno 39 analiziranih uzorka dva bila pozitivna. Također je 2009. potvrđen u dva uzorka od ukupno 46 analiziranih (slika 35.). Svi do sada pozitivni nalazi potvrđeni su na uzorcima uzetim sa sadnica rododendrona.

Sredozemna voćna muha – *Ceratitis capitata* (Wiedemann) (2001.–2004.) – voditelj programa: dr.sc. Vladimir Pelicarić i suradnici: dr.sc. Mario Bjeliš i Dražen Radunić, dipl.ing.

Ceratitis capitata podrijetlom je iz tropske Afrike, a proširila se u mediteranskim zemljama Europe i Azije, u Središnjoj i Južnoj Americi te u toplijim predjelima Sjeverne Amerike, Aziji i Australiji. Štetnik je rasprostranjen na velikom dijelu obalnog područja, gdje su zbog velikog broja biljnih vrsta domaćina i klimatskih uvjeta, povoljni uvjeti za razvoj.

Sredozemna voćna muha pronađena je na području Dubrovačko-neretvanske, Splitsko-dalmatinske i Šibensko-kninske županije. Ovaj štetni organizam proširen je na području doline rijeke Neretve gdje su najveće plantaže citrusa u Hrvatskoj. Istraživana je učinkovitost insekticida iz grupe neonikotinoida i naturalita.

Na samom početku provođenja PPN-a sredozemna voćna muha, izdana je brošura (slika 36.).

Sredozemna voćna muha – *Ceratitis capitata* (Wiedemann) i mogućnost suzbijanja metodom SIT (sterile insect technique) (2004. – 2011.) – voditelj programa: dr.sc. Mario Bjeliš

Uvodi se tehnika SIT kao metoda suzbijanja *C. capitata* u dolini Neretve, koja je označena kao područje od posebnog značenja. Program sprječavanja širenja i suzbijanja inicirao je i nadzirao MPRRR, a nastavljen je i proširen na nacionalni FAO/IAEA program tehničke suradnje CRO 5002 "Feasibility study for the suppression of the Mediterranean fly by integrating the Sterile Insect Technique on an area-wide basis in the Neretva valley" za razdoblje 2007./2008., a za razdoblje 2009./2011. na regionalni FAO/IAEA program u dolini Neretve zajedno s BiH, RER 5014

In the period from 2004 until 2009 245 samples were analysed from the Rhododendron, Syringa, Viburnum, Camelia, Pieris, Nerium and Photinia genera. The first positive findings of this harmful organism were recorded in 2007, when two out of 39 analysed samples in total were positive. Also in 2009 it was confirmed in two out of 46 analysed samples (photo 35). All of the positive findings confirmed were found on samples taken from rhododendron seedlings.

Mediterranean fruit fly – *Ceratitis capitata* (Wiedemann) (2001–2004) – coordinator: Vladimir Pelicarić PhD and associates: Mario Bjeliš PhD and Dražen Radunić BSc

Ceratitis capitata originates from tropical Africa, and it spread in the Mediterranean countries of Europe and Asia, in the Central and South America and in warmer parts of the North America, Asia and Australia. The pest is spread on a wide part of the coastal area, where there are favourable conditions for development due to a large number of host plant species and climate conditions.

The harmful organism is identified to be geographically spread throughout the territory of the Dubrovnik-Neretva, Split-Dalmatia and a part of Šibenik-Knin County. The pest is present also on the territory of the Neretva valley, the Croatian largest citrus plantation area. Research was conducted regarding biological efficacy of insecticides from the group of neonicotinoids and naturalites.

The brochure (photo 36) was issued at the very beginning of the implementation of the Mediterranean fruit fly survey.

Mediterranean fruit fly – *Ceratitis capitata* (Wiedemann) and the suppression possibility by the SIT method (sterile insect technique) (2005–2011) – coordinator: Mario Bjeliš PhD, associates: Dražen Radunić BSc, Ivana Marušić Eng.

SIT is introduced as a control method of *C. capitata* in the Neretva valley, indicated as the area of a special importance. The spread and control was initiated and monitored by the MAFRD, and then continued and expanded to the national FAO/IAEA programme of technical cooperation CRO 5002 "Feasibility Study for the Suppression of the Mediterranean Fly by Inte-



Slika 29. Faunističko istraživanje muha iz porodice Tephritidae – dr.sc. Mario Bjeliš

Figure 29 Faunistic investigation of Tephritisid flies – Mario Bjeliš PhD

Godina	Broj županija	Broj lokacija	Br. uzetih uzoraka	Br. poz. lab. analiza
2004.	3	11	500	500
2005.*	0	0	0	0
2006.	5	4	28	28
2007.	6	13	62	49
2008.	6	17	90	54
2009.	5	13	23	12
Ukupno		58	703	643

*radena je priprema za provođenje programa u 2006.

Tablica 19. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na sredozemnu voćnu muhu za razdoblje 2004.–2009.



Slika 30. Brošura o sredozemnoj voćnoj muhi

Figure 30 Brochure on Mediterranean fruit fly

Year	Number of counties	Number of locations	No. of samples taken	No. of pos. lab. analyses
2004	3	11	500	500
2005 *	0	0	0	0
2006	5	4	28	28
2007	6	13	62	49
2008	6	17	90	54
2009	5	13	23	12
Total		58	703	643

*Preparations were made for the survey in 2006

Table 19 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on mediterranean fruit fly for the period 2004–2009

grating the Sterile Insect Technique on an Area-Wide Basis in the Neretva Valley” for the period 2007/2008, and for the period 2009/2011 to the regional FAO/IAEA programme in the Neretva valley together with Bosnia and Herzegovina, RER 5014 “Suppressing the Mediterranean Fly by Integrating the Sterile Insect Technique on an Area-Wide Basis in the Neretva Valley”. Research was conducted on new kinds of attractants for males and females and traps to monitor the appearance and control of the harmful organism.

“Suppressing the Mediterranean fly by integrating the Sterile insect Technique on an area-wide basis in the Neretva valley”.

Laboratorijske analize obavljene su u laboratoriju za zoologiju Zavoda. Rezultati analiza nalaze su u tablici 19.

U razdoblju od 2010. do 2011. godine provest će se pilot-program uvođenja tehnike SIT na području doline Neretve, na oko 1000 ha. U tu svrhu, u tjednim intervalima će se oslobođat će se sterilne jedinke.

Virus šarke šljive – Plum pox virus (PPV) – (2004.–2008.)

– voditelj programa: mr.sc. Ivan Mikec i **suradnica:** mr.sc. Vesna Kajić

PPV spada u skupinu POTY-virusa. Domaćini su razne vrste koštičavog voća. Smanjuje urod i kakvoću voća od 20 do 80%. Prenosi se neperzistentno, lisnim ušima, mehanički i vegetativnim umnažanjem sadnog materijala. Virus ima različite sojeve s obzirom na test biljke, serologiju i detekciju hibridizacijom nukleinske kiseline. Dosadašnji testovi su pokazali da je PPV kod nas šire rasprostranjen na šljivi i to u kontinentalnom dijelu Hrvatske. Rasprostranjen je u Europi, a nazočan u Aziji, Egiptu, Čileu te ima nekih naznaka o nazočnosti na Novom Zelandu i SAD-u. Simptomi PPV-a pojavljuju se na listovima, plodovima i koštici. Prilikom pregleda potrebno je obratiti pozornost na njihovu pojavu na navedenim organima biljke. PPV detaljno je opisan u brošuri (slika 31.).

Određivanje nazočnosti PPV-a u biljnem materijalu obavljeno je DAS-ELISA-om, tas ELISA-om te IC-RT-PCR-om, RT-PCR-om i RFLP-om u laboratoriju za virologiju Zavoda z zaštitu bilja. Molekularne analize od 2004. do 2006. na nazočnost ovog virusa obavljene su u suradnji s djelatnicima virološkog laboratorija PMF-a u Zagrebu.

Godina 2004. – Od koštičavih vrsta voćaka testirano je 367 uzoraka metodom DAS-ELISA i tas ELISA i 50 uzoraka testiranih IC-RT-PCR-om. U svim istraživanim hrvatskim županijama pronađen je M-soj na šljivi, breskvi, nektarini, trešnji i *P. myrabolana*. D-soj nađen je na breskvi i *P. myrabolana* u Istri i Međimurju.

Laboratory analyses were made in the laboratory for zoology of the Institute. Analysis results are given in table 19.

In the period from 2010 to 2011 the pilot-programme of SIT introduction shall be carried out on the territory of the Neretva valley, on approximately 1000 ha. For this purpose, sterile males shall be released in weekly intervals.

Plum pox virus – (PPV) – (2004–2008) – coordinator: Ivan Mikec MSc and associate: Vesna Kajić MSc

PPV belongs to the group of POTY-viruses. Hosts are different varieties of stone fruit. It reduces the yield and quality of fruit by 20 to 80%. It is transmitted non-persistently, through leaf lice, mechanically and by vegetative reproduction of planting material. Virus has different strains considering the plant test, serology and detection by nucleic acid hybridisation. Former tests have shown that PPV in Croatia is widely spread on the plum mostly in its continental part. It is spread in Europe and present in Asia, Egypt and Chile and there are some indications on the presence on the New Zealand and the USA. PPV symptoms appear on leaves, fruits and stones. When inspecting, it is necessary to pay attention to their appearance on the mentioned plant organs. PPV is described in detail in the brochure (fig. 31).

The presence of PPV in the plant material was determined by DAS-ELISA, tas ELISA and IC-RT-PCR, RT-PCR and RFLP in the laboratory for virology of the Institute for Plant Protection. Molecular analyses from 2004 until 2006 for presence of this virus were made in cooperation with employees of the virological laboratory at the Faculty of Science in Zagreb.

Year 2004 – 367 samples of stone fruit species were tested by DAS-ELISA and tas ELISA and 50 samples by IC-RT-PCR. In all of the researched Croatian counties M-strain was found on plum, peach, nectarine, cherry and *P. myrabolana*. D-strain was found on peach and *P. myrabolana* in Istria and Međimurje.

Year 2005 – 106 out of 476 samples, had more or less expressed symptoms, and only 52 thereof were positive for PPV by serological enzymatic method. 25 out of 370 samples without any symptoms were positive by serological enzymatic method. 8 out of 14 samples tested by IC-RT-PCR had symptoms, and PPV was

Godina 2005. – Od ukupno 476 uzoraka, 106 je imalo više ili manje izražene simptome, a samo 52 su bila pozitivna serološko-enzimskom metodom na PPV. Od 370 uzoraka bez simptoma pozitivnih je serološko enzimatskom metodom bilo 25. Od 14 uzoraka testiranih IC-RT-PCR-om 8 je imalo simptome, a PPV je dokazan u 7 uzorka. Od ostalih 6 uzoraka bez simptoma, 4 su bila pozitivna na PPV. Od 36 uzoraka testiranih RT-PCR-om 24 su imala simptome, a PPV je dokazan u 3 uzorka. Od ostalih 12 uzoraka bez simptoma niti jedan nije bio pozitivan na PPV. RFLP je rađen s Rsa I i Alu I u 15 uzoraka te je M soj dokazan u 13, a D soj u 4 uzorka. Određena je nazočnost D-soja (mD3 mD5).

Godina 2006. – Od 55 uzoraka šljiva prikupljenih s 8 mjesta (11 voćnjaka) metodom ELISA, 42 uzorka su bila pozitivna. Molekularnim testom na inokuliranim biljkama *Nicotiana benthamiana* sa specifičnim «početnicama» P1PM dokazan je M soj. Rec. soj nije dokazan. Od 15 uzoraka trešnje i 1 uzorka višnje iz 3 mjesta, serološko-enzimatskim testom nazočnost PPV-a nije dokazana retestiranjem.

Godina 2007. – Određivanje nazočnosti PPV-a u biljnog materijalu obavljeno je laboratorijskim analizama DAS – ELISA i IC -RT-PCR-om Rec. soj. Od ukupno 10 plodova uzorka šljive sa simptomima nalik simptomima koje uzrokuje PPV, serološko-enzimatskom metodom utvrđeno je da je 6 uzorka pozitivno (60 %) na PPV. IC-RT-PCR-om testirano je 10 plodova šljiva. Univerzalnim početnicama P1P2 pozitivno je bilo 6 uzorka. Sa specifičnim početnicama P1PMu u 6 uzorka dokazan je M soj PPV-a, a početnicom P1D-a u 3 uzorka dokazan je D soj. Rec soj mD5mM3 dokazan je u 2 uzorka.

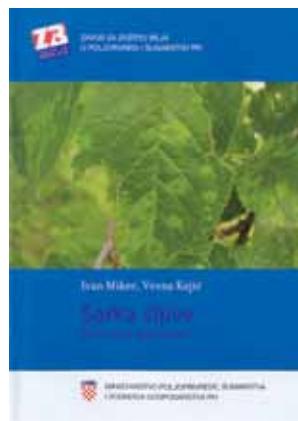
Godina 2008. – Nastavljena su istraživanja Rec. sojeva i na osnovi kompariranja sekvenci određivanje podrijetla u Hrvatskoj.

proven in 7 samples. 4 out of 6 remaining samples without any symptoms were positive for PPV. 24 out of 36 samples tested by RT-PCR 24 had symptoms, and PPV was proven in 3 samples. None of the remaining 12 samples without any symptoms was positive for PPV. RFLP was performed with Rsa I and Alu I in 15 samples whereby M strain was proven in 13, and D strain in 4 samples. The presence of D-strain was determined (mD3 mD5).

Year 2006 – 42 out of 55 plum samples collected from 8 spots (11 orchards) by ELISA method were positive. M strain was proven by molecular test on inoculated plants *Nicotiana benthamiana* with specific primers P1PM. Rec. strain was not proven. Out of 15 samples of cherry and 1 sample of sour cherry from 3 spots, repeated serological - enzymatic tests did not prove the presence of PPV.

Year 2007 – The presence of PPV in plant material was determined by laboratory analyses DAS – ELISA and IC -RT-PCR Rec. strain. 6 (60 %) out of 10 samples of plum fruit in total with symptoms like the PPV causing symptoms were determined by serological enzymatic method to be positive for PPV. 10 plum fruits were tested by IC-RT-PCR. 6 samples were positive by universal primers P1P2. M strain of PPV was proven in 6 samples by specific primers P1PMu, and D strain was proven in 3 samples by primer P1D. Rec strain mD5mM3 was proven in 2 samples.

Year 2008 – Research on Rec. strains were continued and based on comparing the sequences designated was origin in Croatia.



Slika 31. Brošura o šarki šljive

Figure 31 Brochure on plum pox virus

Orahova muha – *Rhagoletis completa* Cressen (Diptera) (2004. – 2005.) – voditelj programa: dr.sc. Željko Budinščak i suradnici: mr.sc. Radoslav Masten, dr.sc. Vladimir Pelicarić, dr.sc. Mario Bjeliš

Rasprostranjena je u sjevernoj Italiji, Švicarskoj, Njemačkoj i Sloveniji. U Hrvatskoj je prvi put nađena 2004. u Istarskoj županiji i Primorsko-goranskoj županiji. Orahova muha čini štete, dakako, na orahu (slika 38.), a može napasti breskvu i nektarinu.

Program posebnog nadzora *R. completa* proveden je u 13 županija na 35 lokaliteta. Potvrđen je nalaz 2004. i 2005. u Istarskoj županiji na 11 lokaliteta i u Primorsko-goranskoj županiji na 5 lokaliteta. Orahova muha proširila se po čitavoj Istarskoj županiji, a najbrojniji ulov zabilježen je u Škudelinu uz granicu sa Slovenijom. Rezultati su prikazani u tablici 20.

Godina	Broj županija	Broj lokacija	Br. vizualnih pregleda	Br. poz. nalaza
2004.	12	30	120	109
2005.	13	35	140	78
Ukupno		75	260	187

Tablica 20. Pregled broja županija, lokacija, vizualnih pregleda i pozitivnih nalaza za razdoblje 2004.–2005.

Pojava, rasprostranjivanje i sprječavanje širenja virusa tristeza (Citrus tristeza virus) u Hrvatskoj (2004.–2006.) – voditelj programa: mr.sc. Ivan Mikec i suradnice: mr.sc. Vesna Kajić, dr.sc. Silvija Černi i dr.sc. Dijana Škorić.

Prva istraživanja nazočnosti virusa Citrus tristeza bila su unutar programa Karantenske štetočinje na citrus vrstama 2004. i 2005., a 2006. je samostalni program. Istraživanjima je dokazana proširenost CTV-a u uzgojnim područjima citrusa u Hrvatskoj. Nazočnost CTV-a dokazana je u reprodukcionskome sadnome materijalu (sadnice i matična stabla pupova). Virus se širi s CTV-om zaraženih stabala na zdrava stabla lisnim ušima (*Toxoptera citri* i *Aphis gossypii*). Na veće udaljenosti bolest se prenosi zaraženim sadnim materijalom. Postoje različiti sojevi CTV-a koji se razlikuju i po agresivnosti.

Walnut husk fly – *Rhagoletis completa* Cressen (Diptera) (2004 – 2005) – coordinator: Željko Budinščak PhD, associates: Radoslav Masten MSc, Vladimir Pelicarić PhD, Mario Bjeliš PhD

It is spread in northern Italy, Switzerland, Germany and Slovenia. In Croatia it was first found in 2004 in the Istria County and Primorje-Gorski Kotar County. Walnut husk fly causes damages, of course, to the nut (photo 38), and it can attack peach and nectarine.

*The special survey programme of *R. completa* was carried out in 13 counties on 35 localities. Findings were confirmed in 2004 and 2005 in the Istria County on 11 localities and in Primorje-Gorski Kotar County on 5 localities. The walnut husk fly spread throughout the Istria County, and the most numerous catch was recorded in Škudelin along the border with Slovenia. Analysis results are given in table 20.*

Year	Number of counties	Number of locations	No. of visual inspections	No. of pos. lab. analyses
2004	12	30	120	109
2005	13	35	140	78
Total		75	260	187

Table 20 Overview of the number of counties, locations, visual inspections and positive findings for the period 2004–2005

Appearance, spread and control of tristeza virus (Citrus tristeza virus) in Croatia (2004–2006) – coordinator: Ivan Mikec MSc and associates: Vesna Kajić MSc, Silvija Černi PhD and Dijana Škorić PhD

*The first research on the presence of the Citrus tristeza virus was within the survey called Quarantine Pests on Citrus Varieties in 2004 and 2005, and in 2006 it is an independent survey. The research proved the outspread of CTV in citrus plantation areas in Croatia. The presence of CTV was proven in reproduction planting material (seedlings and mother plants of scions). Virus is spread through CTV of infected trees onto healthy trees via leaf lice (*Toxoptera citri* and *Aphis gossypii*). The disease is transmitted to greater distances through infected planting material. There are various strains of CTV differing in aggressiveness as well.*

Analiza uzoraka na CTV obavljena je sukladno protokolu "EPPO Standard diagnostic protocol for regulated pests PM 7/31 Citrus tristeza closterovirus". Serološko-enzimatskom metodom DAS-ELISA analizirano je 60 uzoraka.

Serološkim analizama uzoraka citrusa na nazočnost CTV-a od 2004. do 2006. utvrđena je zaraza rodnih stabala mandarina približno 70%. U nekim matičnjacima mandarina zaraženost je bila i do 100%, što potkrepljuje jaku zarazu u proizvodnim nasadima. Rezultati dobiveni DAS-ELISA testom potvrđeni su i metodom RT-PCR. Distribucija CTV-a ovisi o vrstama citrusa. Slabija je zastupljenost CTV-a na grejp-u i klementini, dok je najjača na mandarini. Na gorkoj naranči nije određena nazočnost CTV-a.

Karantenske štetočinje na citrus vrstama: južnoafrički trips citrusa (*Scirtothrips aurantii* Faure), crni štitasti moljac citrusa (*Aleurocanthus woglumi* Ashby), breskvinu muha (*Bactrocera zonata* Saund.) i mediteranska voćna muha (*Ceratitis capitata* Wied.), Citrus tristeza closterovirus (CTV) – tristeza i rak citrusa (*Xanthomonas axonopodis* pv. *citri*) (2004.–2005.) – voditeljica programa: dr.sc. Tatjana Masten Milek i sur.

Program "Karantenske štetočinje na citrus vrstama" ostvaren je u tri potprograma: "Scirtothrips aurantii - južnoafrički trips citrusa i Aleurocanthus woglumi - crni štitasti moljac citrusa" kojeg su ostvarili dr.sc. Tatjana Masten i dr.sc. Mladen Šimala, zatim "Bactrocera zonata- breskvinu muha", "Ceratitis capitata - sredozemna voćna muha" u realizaciji dr.sc. Marija Bjeliša, dr.sc. Vladimira Pelicarića i Dražena Radunića, dipl. ing., te "Citrus tristeza closterovirus – tristeza" i "Xantomonas axonopodis pv. citri - rak citrusa" u realizaciji mr.sc. Ivana Mikeca, mr.sc. Vesne Kajić i mr.sc. Ivane Križanac.

S. aurantii podrijetlom je iz Afrike. U regiji EPPO zabilježen je samo u Egiptu, a jednom je spriječen ulazak u Nizozemsku. U Aziji je nađen u Jemenu, a nema podataka o njegovoj nazočnosti na američkom i australskom kontinentu. Osobito je poznat kao štetnik *Citrus spp.*, a može se naći i na vinovoj lozi.

The analysis of samples for CTV was made in compliance with the "EPPO Standard Diagnostic Protocol for Regulated Pests PM 7/31 Citrus tristeza closterovirus". 60 samples were analysed by serological enzymatic method DAS-ELISA.

Serological analyses of citrus samples for the presence of CTV from 2004 until 2006 approximately 70% of fruitful mandarin trees were identified to be infected. In certain mother plants of mandarins the infection degree was even up to 100%, which substantiates strong infection in production plantations. The results obtained by the DAS-ELISA test were also confirmed by the RT-PCR method. The distribution of CTV depends on citrus varieties. CTV is represented to a lower extent on pineapples and clementine, whereas to the highest on mandarin. The presence of CTV was not determined on bitter orange.

Quarantine pests on citrus varieties: South-African citrus trips (*Scirtothrips aurantii* Faure), citrus blackfly (*Aleurocanthus woglumi* Ashby), peach fruit fly (*Bactrocera zonata* Saund.) and Mediterranean fruit fly (*Ceratitis capitata* Wied.), Citrus tristeza closterovirus (CTV) – and citrus cancer (*Xanthomonas axonopodis* pv. *citri*) (2004–2005) - coordinator: Tatjana Masten Milek PhD and associates.

The survey titled "Quarantine Pests on Citrus Species" was implemented in three sub-surveys: "Scirtothrips aurantii – South-African citrus trips and Aleurocanthus woglumi - citrus blackfly citrusa" carried out by Tatjana Masten PhD and Mladen Šimala PhD, then "Bactrocera zonata- Peach Fly", "Ceratitis capitata – Mediterranean Fruit Fly" carried out by Mario Bjeliš PhD, Vladimir Pelicarić PhD and Dražen Radunić, BSc, and "Citrus tristeza closterovirus – tristeza" and "Xantomonas axonopodis pv. citri – citrus cancer" carried out by Ivan Mikec MSc, Vesna Kajić MSc and Ivana Križanac MSc.

S. aurantii originates from Africa. In the EPPO region it is recorded only in Egypt, and once it was prevented to enter the Netherlands. In Asia it was found in Yemen, and there are no data on its presence on the American and Australian continent. It is particularly known as the Citrus spp. pest, and it can be found on grapevine as well.

Štetni organizam	Broj lokacija		Broj analiza		Nalazi	
	2004.	2005.	2004.	2005.	2004.	2005.
<i>S. aurantii</i>	21	29	50	65	0	0
<i>A. woglumi</i>	21	29	10	71	0	0
* <i>B. zonata</i>	12	–	48	–	0	–
CTV	4	7	0	100	0	67%
<i>X. axonopodis</i> pv. citri	4	7	0	10	0	0
Ukupno	62	72	108	246		

* Štetnik je bio uvršten u program praćenja samo u 2004. U godini 2005. su u sklopu ovog programa umjesto *Bactrocera zonata* praćeni uvjeti za realizaciju primjene SIT kod *Ceratitis capitata* na dvije lokacije na kojima se u 2006. provedlo ispuštanje sterilnih muha

Tablica 21. Broj pregledanih lokaliteta, broj analiza, vrijeme pregleda i nalazi za karantenske štetočinje u 2004. i 2005.

A. woglumi je nazočan u Aziji (Hong Kong, Kina, Kambodža, Koreja, Malezija, Pakistan, Tajland), Africi (Kenija, Južnoafrička Republika, Tanzanija, Uganda, Zimbabwe) i nekim dijelovima Sjeverne i Južne Amerike te Australije. Glavni domaćini su mu citrusi, iako napada i avokado, vinova lozu, mango, krušku, papaju i ružu. Potencijalni domaćini u regiji EPPO su: *Citrus* spp. s mogućnošću udomaćenja i na drugim drvenastim biljkama u južnom dijelu regije.

Bactrocera zonata - breskvina muha je jedna od najopasnijih štetnih vrsta iz roda *Bactrocera*. Potječe iz područja indijskog poluotoka i Indonezije. Njeni domaćini su breskva i drugo koštuničavo voće, agrumi, smokva, vrste iz porodica *Cucurbitaceae*, *Pomaceae* itd.

Ceratitis capitata – sredozemna voćna muha je jedna od najopasnijih štetnih vrsta porodice Tephritidae. Potječe iz područja zapadne i središnje Afrike. Njeni domaćini su breskva i drugo koštuničavo voće, agrumi, smokva, vrste iz porodica *Cucurbitaceae*, *Pomaceae* itd.

Citrus tristeza closterovirus (CTV) - tristeza je vrlo destruktivan virus citrusa, jer uzrokuje uginuće većine citrusnih vrsta, ali ne limuna. Proširena je u svim zemljama Mediterana i širom svijeta, gdje se uzgajaju citrusi (Azija, Afrika, Sjeverna Amerika, Južna Amerika).

Harmful organism	No. of locations		No. of analyses		Findings	
	2004	2005	2004	2005	2004	2005
<i>S. aurantii</i>	21	29	50	65	0	0
<i>A. woglumi</i>	21	29	10	71	0	0
* <i>B. zonata</i>	12	–	48	–	0	–
CTV	4	7	0	100	0	67%
<i>X. axonopodis</i> pv. citri	4	7	0	10	0	0
Total	62	72	108	246		

* The pest was included in the monitoring programme only in 2004. In 2005 the conditions for the implementation of the SIT method with *Ceratitis capitata* on two locations where sterile flies were released in 2006 were monitored within this survey instead of *Bactrocera zonata*

Table 21 The number of inspected localities, number of analyses, time of inspection and findings in on quarantine harmful organisms 2004 and 2005

A. woglumi is present in Asia (Hong Kong, China, Cambodia, Korea, Malaysia, Pakistan and Thailand), Africa (Kenya, South Africa, Tanzania, Uganda and Zimbabwe) and certain parts of the North and South America and Australia. Its main hosts are citrus, although it also attacks avocado, grapevine, mango, pear, papaya and rose. Its potential hosts in the EPPO region are: *Citrus* spp. with the possibility to naturalise on other tree plants in the southern part of the region.

Bactrocera zonata – peach fly is one of the most dangerous harmful species from the *Bactrocera* genus. It originates from the territory of the Indian peninsula and Indonesia. Its hosts are peach and other stone fruits, citrus, fig, varieties from the Cucurbitaceae and Pomaceae families etc.

Ceratitis capitata – Mediterranean fruit fly is one of the most dangerous harmful species of the Tephritidae family. It originates from the territory of the western and central Africa. Its hosts are peach and other stone fruit, citrus, fig, species from the Cucurbitaceae and Pomaceae families etc.

Citrus tristeza closterovirus (CTV) - tristeza is a very destructive citrus virus, because it causes the death of infected trees, except for lemon. It is spread throughout the Mediterranean countries and worldwide, wherever citrus is grown (Asia, Africa, the North America and South America).

Xantomonas axonopodis pv. *citri* - rak citrusa napada sve vrste citrusa (naranča grejp, gorka naranča). Bakterija nije nazočna u Evropi, no nazočna je u Aziji, Africi, Sjevernoj, Južnoj i Središnjoj Americi i Oceaniji.

U sklopu ovog programa korištene su sljedeće metodike praćenja i determinacije: vizualni pregledi, metode otresanja, primjena vizualnih i mirisnih mamaca, mikroskopske determinacije, ELISA-test i laboratorijska analiza izolacijom na hranjivim podlogama NDA i YDCA i serološkim metodama. U tablici 21. prikazani su rezultati provođenja programa.

Borova nematoda – *Bursaphelenchus xylophilus* (2005.–2009.) – voditelj: mr.sc. Andrija Vukadin i **suradnik:** mr.sc. Ivan Poje

Bursaphelenchus xylophilus – borova nematoda najvažniji je šumski štetni organizam u Japanu, a proširio se u Kinu, Koreju i Tajvan. Potječe iz Sjeverne Amerike (Kanada, SAD, Meksiko), a uvezena je borovim trupcima u Japan početkom 20. stoljeća. *Bursaphelenchus xylophilus* pronađen je 1999. u Portugalu na boru *Pinus pinaster*, koji je česta vrsta i u hrvatskim šumama. Borovi iz roda *Pinus* spp. navode se u literaturi kao najpri-



Slika 32. Vektor borove nematode – *Monochamus* sp.

Figure 32 Vector of pine wood nematode – *Monochamus* sp.

Xantomonas axonopodis pv. *citri* – citrus cancer attacks all citrus species (orange, grape, bitter orange). The bacterium is not present in Europe, but it is present in Asia, Africa, the North, the South and the Central America and Oceania.

The following methods of monitoring and determination were used within this programme: visual inspections, beating method, application of visual and lure baits, microscopic determination, ELISA-test and laboratory analysis by isolation on NDA and YDCA substrate and by serological methods. Table 21 shows the results obtained during the survey.

Pine wood nematode – *Bursaphelenchus xylophilus* (2005.–2009.) – coordinator: Andrija Vukadin MSc and **associate:** Ivan Poje MSc

Bursaphelenchus xylophilus – pine wood nematode is the most important forest harmful organism in Japan, and it has spread to China, Korea and Taiwan. It originates from the North America (Canada, USA, Mexico), and was imported with pine chucks to Japan at the beginning of the 20th century. *Bursaphelenchus xylophilus* was found in 1999 in Portugal on the pine - *Pinus pinaster*, which is a frequent species in the Croatian forests as well. Pines



Slika 33. Uzimanje uzoraka za borovu nematodu – mr.sc. Andrija Vukadin

Figure 33 Collecting samples of pine wood nematode – Andrija Vukadin MSc

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2005.	10	15	15	21	0
2006.	9	15	15	15	0
2007.	9	14	14	32	0
2008.	9	14	14	44	0
2009.	7	15	15	48	0
Ukupno		73	73	160	0

Tablica 22. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na borovu nematodu za razdoblje 2005.–2009.

hvatljiviji domaćini borove nematode, koja napada i vrste iz roda *Abies*, *Chamaecyparis*, *Cedrus*, *Larix* i *Pseudotsuga*, čiji je udio znatan u flori Hrvatske. Glavni su vektori borove nematode, prema podatcima iz literature, insekti iz porodica *Cerambicidae*, *Buprestidae* i *Curculionidae*. Jedan od glavnih vektora borove nematode *Monochamus* prikazan je na slici 32. Uzimanje uzoraka na borovu nematodu slika 33.

Laboratorijske analize obavljene su u laboratoriju za nematologiju Zavoda. Rezultati analiza nalaze su u tablici 22.

Rezultati laboratorijskih analiza pokazuju nenazočnost borove nematode u razdoblju 2005.–2009., iako je vektor, *Monochamus* spp. nazočan u našim borovim šumama.

Kestenova osa šiškarica – *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera, Cynipidae) (2006.-2009.) – voditelj programa: dr.sc. Željko Budinčak

Kestenova osa šiškarica – *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera, Cynipidae) novi je i trenutačno jedan od najopasnijih štetnika pitomog kestena – *Castanea sativa* u Europi, a biljke domaćini su joj: japanski kesten – *Castanea crenata*, američki kesten – *Castanea dentata* i kineski kesten – *Castanea mollissima*. Kestenova osa šiškarica podrijetlom je iz Kine, od kuda je prenesena najvjerojatnije sa zaraženim sadnicama u Japan i Ameriku. U Europi je nađena prvi put 2002. u Italiji (Piemonte), a zatim u Francuskoj (Bretanja). U

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2005	10	15	15	21	0
2006	9	15	15	15	0
2007	9	14	14	32	0
2008	9	14	14	44	0
2009	7	15	15	48	0
Total		73	73	160	0

Table 22 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on pine wood nematode for the period 2005–2009

from the *Pinus* spp. genus are cited in literature as the most acceptable hosts of pine nematode, that attacks also the species from the *Abies*, *Chamaecyparis*, *Cedrus*, *Larix* i *Pseudotsuga* genera, having a significant share in the flora of Croatia. The main vectors of pine wood nematode, according to the literature, are insects from the *Cerambicidae*, *Buprestidae* and *Curculionidae* families. One of the main vectors of pine wood nematode *Monochamus* is shown on fig. 32. Taking samples for pine nematode are shown on fig. 33.

Laboratory analyses were made in the laboratory for nematology of the Institute. Analysis results are given in table 22.

The results of laboratory analyses show absence of pine wood nematode in the period 2005–2009, although the vector, *Monochamus* spp. is present in the Croatian pine forests.

Oriental chestnut gall wasp – *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera, Cynipidae) (2006-2009) – coordinator: Željko Budinčak PhD

Oriental chestnut gall wasp – *Dryocosmus kuriphilus* Yasumatsu (Hymenoptera, Cynipidae) is a new and currently one of the most dangerous pests of the European chestnut – *Castanea sativa* in Europe, and its host plants are: Japanese chestnut – *Castanea crenata*, American chestnut – *Castanea dentata* and Chinese chestnut – *Castanea mollissima*. Oriental chestnut gall wasp originates from China and then probably transmitted through infected seedlings to Japan and America. In Europe it was first found in 2002 in Italy (Piemonte), and then in France (Bretagne). In spring

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2006.	7	33	33	0	0
2007.	12	42	43	0	0
2008.	10	15	15	0	0
2009.	9	15	16	0	0
Ukupno		105	107	0	0

Tablica 23. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na kestenovu osu šiškaricu za razdoblje 2006.–2009.

proljeće 2005. nađena je i u Sloveniji na sadnicama pitomoga kestena, uvezenog iz rasadnika u Italiji (Piemonte).

Laboratorijske analize obavljene su u laboratoriju za zoologiju Zavoda. Rezultati analiza nalaze su u tablici 23.

Invazivne strane korovne vrste u Republici Hrvatskoj (2007.–2009.) – voditelj programa: mr.sc. Veljko Lodeta i **suradnici:** mr.sc. Nenad Novak i mr.sc. Zvonimir Flegar

Invazivne strane vrste korovnih biljaka pridošlica namjerno su ili nenamjerno unesene u područja izvan njihova prirodnog staništa. Na novom staništu brzo se i agresivno šire te izravno utječu na biološku raznolikost, mijenjaju okoliš, štete poljoprivrednim, šumskim i vodenim biljnim zajednicama.

EPPO u okviru IPPC-a i Europske strategije o invazivnim vrstama pridošlicama (Bernska konvencija) razvio je strategiju suradnje širom Europe sa svrhom zaštite od invazivnih vrsta pridošlica. Te su vrste ocijenjene kao važna prijetnja za biljno

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2006	7	33	33	0	0
2007	12	42	43	0	0
2008	10	15	15	0	0
2009	9	15	16	0	0
Total		105	107	0	0

Table 23 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on oriental chestnut gall wasp for the period 2006–2009

2005 it was found also in Slovenia on seedlings of European chestnut imported from a plant nursery in Italy (Piemonte).

Laboratory analyses were made in the laboratory for zoology of the Institute. Analysis results are given in table 23.

Invasive alien weed species in the Republic of Croatia (2007–2009) – coordinator: Veljko Lodeta MSc and **associates:** Nenad Novak MSc and Zvonimir Flegar MSc

Invasive alien species of the weed newcomer plants are deliberately or accidentally brought into the areas outside of their natural habitat. They spread rapidly and aggressively on the new habitat directly influencing the biodiversity, changing the environment, causing damage to agricultural, forest and water plant communities.

Within IPPC and the European Strategy on Invasive Alien Species (Bern Convention) EPPO developed a strategy of co-operation throughout Europe with the purpose of protection



Slika 34. *Ambrosia artemisiifolia* u ječmu

Figure 34 *Ambrosia artemisiifolia* in barley



Slika 35. *Fallopia japonica* uz kanal

Figure 35 *Fallopia japonica* next to a waterway

zdravstvo, okoliš i biološku raznolikost. EPPO preporučuje zemljama, ugroženim tim vrstama, provođenje mjera kojima će se spriječiti njihovo unošenje i širenje te način gospodarenja nepoželjnim populacijama.

U godini 2007. započeo je program sustavnog praćenja invazivnih stranih biljnih vrsta u Hrvatskoj. Istraživanja su provedena na poljoprivrednim, ruderalnim, šumskim i vodenim površinama. Pronađene su sljedeće vrste: *Ailanthus altissima* (Mill) Sw., *Ambrosia artemisiifolia* L. (slika 34.), *Amorpha fruticosa* L., *Bidens frondosa* L., *Buddleja davidii* Franch., *Cortaderia selloana* (Schultes & Schultes fil.), *Helianthus tuberosus* L., *Impatiens glandulifera* Royal, *Lupinus polyphyllus* Lindl., *Reynoutria (Fallopia) japonica* (Houtt) Rounce Decr. (slika 35.), *Solidago canadensis* L., *Solidago gigantea* Ait. Procijenjena je rasprostranjenost nađenih invazivnih vrsta te stupanj ugroženosti uzgajanih biljaka i zavičajnih vrsta od navedenih korova. Predložene su mjere suzbijanja i sprječavanja širenja. Determinaciju uzorka obavljena je u laboratoriju za herbologiju Zavoda, a potvrda determinacije obavljena je u Zavodu za botaniku Prirodoslovno-matematičkog fakulteta u Zagrebu.

Azijska strizibuba – *Anoplophora chinensis* (2008.–2009.)

– voditelj programa: mr.sc. Andrija Vukadin

Azijska strizibuba *Anoplophora chinensis* (Forster), poznatija je iz stručne literature pod nazivom citrus longhorn beetle (CLB). Područja su joj rasprostranjenosti: Kina, Japan, Republika Koreja, Vijetnam, Tajvan, Indonezija, Filipini i Malezija. Polifagna je vrsta i dolazi na vrstama iz rodova: *Acer*, *Aesculus*, *Albizia*, *Alnus*, *Betula*, *Carpinus*, *Casuarina*, *Citrus*, *Corylus*, *Cotoneaster*, *Crataegus*, *Cryptomeria*, *Fagus*, *Ficus*, *Fraxinus*, *Hibiscus*, *Lagerstroemia*, *Litchi*, *Mallotus*, *Malus*, *Melia*, *Morus*, *Platanus*, *Populus*, *Prunus*, *Pyrus*, *Quercus*, *Rosa*, *Salix*, *Sophora* i *Ulmus*.

Anoplophora chinensis prvi je put pronađena u Hrvatskoj 2007. u rasadniku MBM-a u Turnju u Zadarskoj županiji. Budući da su mnogi domaćini azijske strizibube zastupljeni u našim šumskim ekosustavima, iznimno je važno

against invasive alien species. These species are assessed to be an important threat to the plant health, the environment and biodiversity. EPPO recommends that the countries endangered by these species, implement the measures to prevent their introduction and outspread and the way of managing unwanted populations.

The survey of invasive alien plant species in Croatia started in 2007. Research was conducted on agricultural, ruderal, forest and water sites. There were found the following species: *Ailanthus altissima* (Mill) Sw., *Ambrosia artemisiifolia* L. (fig. 34.), *Amorpha fruticosa* L., *Bidens frondosa* L., *Buddleja davidii* Franch., *Cortaderia selloana* (Schultes & Schultes fil.), *Helianthus tuberosus* L., *Impatiens glandulifera* Royal, *Lupinus polyphyllus* Lindl., *Reynoutria (Fallopia) japonica* (Houtt) Rounce Decr. (fig. 35.), *Solidago canadensis* L., *Solidago gigantea* Ait. An estimate was made of the outspread of invasive alien species found and a degree of cultivated plants and native land species being endangered from the aforementioned weeds. The control and prevention measures were suggested. Samples were determined in the laboratory for herbology of the Institute, and the determination was confirmed in the Institute for Botany at the Faculty of Science in Zagreb.

Citrus longhorn beetle – *Anoplophora chinensis* (2008–2009)

– coordinator: Andrija Vukadin MSc

Citrus longhorn beetle *Anoplophora chinensis* (Forster) is spread in: China, Japan, Republic Korea, Vietnam, Taiwan, Indonesia, the Philippines and Malaysia. It is a polyphagous species appearing on the species from the following genera: *Acer*, *Aesculus*, *Albizia*, *Alnus*, *Betula*, *Carpinus*, *Casuarina*, *Citrus*, *Corylus*, *Cotoneaster*, *Crataegus*, *Cryptomeria*, *Fagus*, *Ficus*, *Fraxinus*, *Hibiscus*, *Lagerstroemia*, *Litchi*, *Mallotus*, *Malus*, *Melia*, *Morus*, *Platanus*, *Populus*, *Prunus*, *Pyrus*, *Quercus*, *Rosa*, *Salix*, *Sophora* and *Ulmus*.

Anoplophora chinensis was first found in Croatia in 2007 in the plant nursery of MBM in Turanj in the Zadar County. Since many hosts of *Anoplophora chinensis* are represented in the Croatian forest eco-systems, it is extremely important to

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2008.	9	22	36	38	29
2009.	9	22	36	42	38
Ukupno		44	72	80	67

Tablica 24. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na azijsku strizibubu za razdoblje 2008.–2009.



Slika 36. Azijska strizibuba
Figure 36 Citrus longhorn beetle

istraživanje toga štetnog organizma u našim uvjetima. Slika 36. prikazuje ovog štetnika.

Laboratorijske analize obavljene su u laboratoriju za zoologiju Zavoda. Obavljena je determinacija na osnovi morfoloških značajki strizibuba. Rezultati analiza nalaze su u tablici 24.

Sjevernoamerička trešnjina muha – *Rhagoletis cingulata* Loew (Diptera, Tephritidae) (2008.-2009.) – voditelj programa: dr.sc. Mario Bjeliš

Rhagoletis cingulata je nearktička vrsta podrijetlom s područja Sjeverne Amerike. U Europi je nazočnost ove vrste prvi put utvrđena 1983. godine u Švicarskoj, a kasnije na području Njemačke 1993. i Nizozemske 2001. godine. Nazočnost sjevernoameričke trešnjine muhe je utvrđena u Hrvatskoj tijekom 2005. godine, u Splitu, a nalazi su potvrđeni molekularnim metodama 2006. nazočnost štetnog organizma kasnije je određena na lokalitetu Baćina u Dubrovačko-neretvanskoj županiji. *R. cingulata* kao i vrsta *R. cerasi*, uzrokuje crvljivost plodova višnje, *Prunus cerasus* L. i trešnje *Prunus avium* L (slika 37.). U suradnji s Po-

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2008	9	22	36	38	29
2009	9	22	36	42	38
Total		44	72	80	67

Table 24 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on citrus longhorn beetle for the period 2008–2009

research on this harmful organism in the Croatian conditions. fig. 36 shows this pest.

Laboratory analyses were made in the laboratory for zoology of the Institute. Determination was conducted on the basis of morphological characteristics of beetles. Analysis results are given in table 24.

North American cherry fruit fly – *Rhagoletis cingulata* Loew (Diptera, Tephritidae) (2008-2009) – coordinator: Mario Bjeliš PhD, and associates: Dražen Radunić BSc, Ivana Marušić Eng.



Slika 37. Sjevernoamerička trešnjina muha

Figure 37 North American cherry fruit fly

Rhagoletis cingulata is a non-Arctic species originating from the territory of the North America. In Europe the presence of this species was first confirmed in 1983 in Switzerland, and later on the territory of Germany in 1993 and of the Netherlands in 2001. The presence of the North-American cherry fly was determined in Croatia during 2005, in Split, and the findings were confirmed by molecular methods in 2006. The presence of the pest was later determined on the locality Baćina in the Dubrovnik-Neretva County. Both *R. cingulata* and *R. cerasi* are the cause of maggoty sour cherry fruits, *Prunus cerasus* L. and cherry - *Prunus avium* L

Ijoprivredno šumarskim institutom iz Nove Gorice istraživani su hranidbeni atraktanti, nekoliko vrsta lovki za pronaalaženje monitoring i suzbijanje ovog štetnog organizma.

Laboratorijske analize obavljene su u laboratoriju za zoologiju Zavoda. Rezultati analiza nalaze su u tablici 25.

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2008.	11	28	35+47	69 plodova 74 lovki	2
2009.	13	34	31+30	34 plodova 43 lovki	0
Ukupno		62	143	220	2

Tablica 25. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na sjevernoameričku trešnjinu muhu za razdoblje 2008.–2009.

Smolasti rak bora – *Gibberella circinata* Nirenberg & O'Donell (2009) – voditelj programa: mr.sc. Željko Tomić

Gljiva *Gibberella circinata* (anamorf *Fusarium circinatum* Nirenberg & O'Donnell) jedan je od najvažnijih uzročnika bolesti bora u svijetu. Prvi put je zabilježena kao uzročnik "smolastog raka bora" (pine pitch canker) na jugoistoku SAD-a 1946. g., a ubrzo i na Haitiju (1953.). Nakon epidemije koja se dogodila 1986. g. u Kaliforniji, ova se bolest relativno brzo širi (Japan, Meksiko, Južna Afrika, Čile, Španjolska i Italija) i postaje važan problem, prije svega u rasadnicima i plantažnim šumama bora, ali i u javnim parkovima i vrtovima (Italija).

Laboratorijske analize obavljene su u laboratoriju za mikologiju Zavoda. Rezultati analiza nalaze su u tablici 26.

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2009.	7	21	29	38	0
Ukupno		21	29	38	0

Tablica 26. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na smolasti rak bora u 2009.

(fig. 37). In cooperation with Agriculture and Forestry Institute Nova Gorica, research on nutritive attractants was conducted and several kinds of traps for detection, monitoring and control.

Laboratory analyses were made in the laboratory for zoology of the Institute. Analysis results are given in table 25.

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2008	11	28	35+47	69 fruits 74 traps	2
2009	13	34	31+30	34 fruits 43 traps	0
Total		62	143	220	2

Table 25 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on North American cherry fruit fly for the period 2008–2009

Pitch canker of pine – *Gibberella circinata* Nirenberg & O'Donell (2009) – coordinator: Željko Tomić MSc

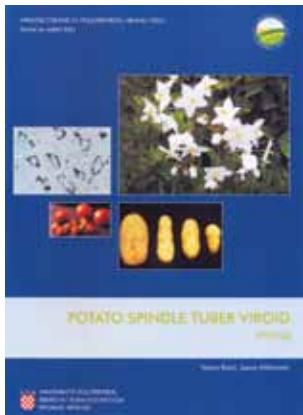
The *Gibberella circinata* fungus (anamorph *Fusarium circinatum* Nirenberg & O'Donnell) is one of the most important pine agents causing diseases in the world. It was first recorded as the "pitch canker of pine" agent at the southeast of the USA in 1946, and soon on Haiti too (1953). After the 1986 epidemic in California, this disease spreads relatively quickly (Japan, Mexico, South Africa, Chile, Spain and Italy) and becomes an important problem, primarily in plant nurseries and pine forest plantations, but also in public parks and gardens (Italy).

Laboratory analyses were made in the laboratory for mycology of the Institute. Analysis results are given in table 26.

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2009	7	21	29	38	0
Total		21	29	38	0

Table 26 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on pitch canker of pine in 2009

Bolest vretenastog gomolja krumpira – Potato spindle tuber viroid (PSTVd), (2009.) – voditeljica programa: mr.sc. Vesna Kajić



Slika 38. Brošura o bolesti vretenastog gomolja krumpira

Figure 38 Brochure on Potato spindle tuber viroid

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2009.	6	11	35	56	5
Ukupno		11	35	56	5

Tablica 27. Pregled broja županija, lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na bolest vretenastog gomolja krumpira u 2009.

PSTVd je viroid i spada u porodicu *Pospiviroidae*. Gospodarske štete uzrokuje na krumpiru i rajčici. Nađen je na nekoliko kontinenata: Sjeverna Amerika, Južna Amerika, Azija, Afrika i Australija (Oceanija). U prošlosti je bio nađen na krumpiru u Francuskoj i Škotskoj te u Nizozemskoj na rajčici. Poslije su i neke druge zemlje EU-a potvrdile te nalaze na svom teritoriju. Slovenija je PSTVd našla prvi put 2006. godine na vrsti *Brugmansia (Datura) suaveolens* podrijetlom iz vrtlarije u Nizozemskoj. Suzbijanje i eradicacija provedeni su u Poljskoj ali nisu poznati konačni rezultati Problematika PSTDVd-a obrađena je u objavljenoj brošuri (slika 38.). PSTVd je prisutan u Republici

Potato spindle tuber viroid (PSTVd), (2009) – coordinator: Vesna Kajić MSc

PSTVd is a viroid and belongs to the *Pospiviroidae* family. It causes economic damage to potato and tomato. It is found on several continents: the North America, the South America, Asia, Africa and Australia (Oceania). In the past it was found on potato in France and Scotland and in the Netherlands on tomato. Some other EU-countries also confirmed afterwards these findings on their territory. Slovenia first found PSTVd in 2006 on the *Brugmansia (Datura) suaveolens* species originating from a garden centre in the Netherlands. Control and eradication measures have been performed in Poland but final results are not yet known. PSTDVd problem issues are elaborated in the published brochure (fig. 38). PSTVd is present in the Republic of Croatia, and it was detected in 2009 within survey on *Solanum jasminoides Paxton* and *Solanum rantonnetii Carr. ex Lesc.*

Laboratory analyses were made in the laboratory for virology of the Institute. Analysis results are given in table 27.

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2009	6	11	35	56	5
Total		11	35	56	5

Table 27 Overview of the number of counties, locations, visual inspections, samples taken and positive laboratory analyses on potato spindle tuber viroid in 2009.

Hrvatskoj, a otkriven je 2009. u okviru PPN-a na *Solanum jasminoides* Paxton i *Solanum rantonnetii* Carr. ex Lesc.

Laboratorijske analize obavljene su u laboratoriju za virologiju Zavoda. Rezultati analiza nalaze su u tablici 27.

Crvena palmina pipa – *Rhynchophorus ferrugineus* (Olivier) (2009.) – voditeljica programa: dr.sc. Tatjana Masten Milek i **suradnik:** dr.sc. Mladen Šimala

Crvena palmina pipa *Rhynchophorus ferrugineus* je gospodarski vrlo velik štetnik na palmama iz porodice Asteraceae. On uzrokuje njihovo postupno propadanje koje dovodi do potpunog uvjenčića biljaka domaćina. Procjenjuje se da je u Hrvatskoj zasađeno više od milijun palmi. Većina njih nalazi se u mediteranskom dijelu naše zemlje. Najčešće biljke domaćini ovog štetnika, koje kod nas susrećemo, su: *Phoenix canariensis* (kanarska datulja), *Trachycarpus fortunei* (visoka žumara), *Washingtonia filifera* (končasta palma ili kalifornijska lepezasta palma) i *Chamaerops humilis* (niska žumara).

Godina	Broj županija	Broj lokacija	Br. viz. pregleda	Br. uzetih uzoraka	Br. poz. lab. analiza
2009.	7	27	53	1	0
Ukupno		27	53	1	0

Tablica 28. Pregled broja lokacija, vizualnih pregleda, uzetih uzoraka i pozitivnih laboratorijskih analiza na crvenu palminu pipu u 2009.

Štetnik potječe iz južne Azije i Melanezije, gdje čini velike štete na kokosovoj palmi. Otuda se proširio prema zapadu velikom brzinom sredinom osamdesetih godina 20. st. Na području EPPO regije pojavio se 1992. u Egiptu. Nakon toga, 1994. g. u Italiji i Španjolskoj, 1999. u Izraelu i Jordanu, 2005. u Turskoj i 2006. na Cipru, u Grčkoj i Francuskoj, 2008. u Maroku te 2009. u Sloveniji (Portorož). Budući da su palme u mediteranskom dijelu Hrvatske zastupljene gotovo u svakom parku, botaničkom vrtu, arboretumu, u brojnim vrtovima te ukrašavaju mnoga šetališta, a poznato je da se one masovno uvoze u našu zemlju (i iz zemalja u kojima je crvena palmina

Red palm weevil – *Rhynchophorus ferrugineus* (Olivier) (2009) – coordinator: Tatjana Masten Milek PhD and associate: Mladen Šimala PhD



Slika 39. Brošura o crvenoj palminoj pipi

Figure 39 Brochure on Red palm weevil

Year	No. of counties	No. of locations	No. of visual inspections	No. of samples taken	No. of pos. lab. analyses
2009	7	27	53	1	0
Total		27	53	1	0

Table 28 Overview of the number of locations, visual inspections, samples taken and positive laboratory analyses on red palm weevil in 2009

Red palm weevil Rhynchophorus ferrugineus is economically important pest on palms from the Asteraceae family. It causes their gradual degradation bringing to the complete death of host plants. Over a million of palms are estimated to be planted in Croatia. The majority can be found in the Mediterranean part of Croatia. The most frequent host plants of this pest, which can be met in Croatia, are: Phoenix canariensis (the Canary Island date palm), Trachycarpus fortunei (windmill/chusan palm), Washingtonia filifera (Californian fan/cotton palm or petticoat palm) and Chamaerops humilis (hardy/European fan palm).

pipa već prisutna), potrebno je pratiti i utvrditi postojeće stanje s crvenom palminom pipom. Program se provodi vizualnim pregledima biljaka domaćina te postavljanjem ferotrapova. Na velike štete koje može uzrokovati ovaj štetnik upozorenje je brošurom (slika 39.) i plakatom o crvenoj palmonoj pipi. Rezultati su prikazani u tablici 28.

2.3.2.3. Tečaj za osposobljavanje zaposlenika u poljoprivrednim ljekarnama

Sukladno Pravilniku o uvjetima kojima moraju uđovoljavati pravne osobe koje obavljaju promet sredstvima za zaštitu bilja na veliko i malo te o načinu i postupku osposobljavanja zaposlenika koji čuvaju i izdaju sredstva za zaštitu bilja (NN 40/96) kao i njegovim pripadajućim izmjenama i dopunama, Zavod još od 1997. provodi tečajeve za osposobljavanje zaposlenika u poljoprivrednim ljekarnama. Poljoprivredne ljekarne vrlo su važan sektor zaštite bilja u Hrvatskoj, jer izravno savjetima utječe na povećanje znanja poljoprivrednika. Može se ustvrditi



Slika 40. Ispitna komisija na tečaju: dr.sc. Bogdan Korić, dr.sc. Tatjana Masten Milek, mr.sc. Andrija Vukadin

Figure 40 Test commission: Bogdan Korić PhD, Tatjana Masten Milek PhD, Andrija Vukadin MSc

The pest originates from the South Asia and Melanesia, where it causes huge damage to coconut palm. From there it rapidly spread westwards in the mid eighties of the 20th century. On the territory of the EPPO region it appeared in 1992 in Egypt. Thereafter, in 1994 in Italy and Spain, in 1999 in Israel and Jordan, in 2005 in Turkey and in 2006 on Cyprus, in Greece and France, in 2008 in Morocco and in 2009 in Slovenia (Portorož). Since palms in the Mediterranean part of Croatia are represented in almost every park, botanical garden, arboretum, in numerous gardens and decorate many promenades, and they are known to be largely imported to Croatia (also from the countries with the red palm weevil already present), it is necessary to monitor and identify the present status with the red palm weevil. The programme is carried out by visual inspections of host plants and by setting up pherotrap. The brochure (fig. 39) and the poster on the red palm weevil warn of the huge damage that can be incurred by this pest. Analysis results are given in table 28.

2.3.2.3. Training Course for Agricultural Chemist Employees

According to the Regulations on the Requirements to Be Met by the Legal Entities Marketing the Plant Protection Products, in Wholesale and Retail, and the Method and Procedure for Training of Employees Who Keep and Issue Plant Protection Products (Official Gazette 40/96) as well as their related amendments, the Institute conducts training courses for agricultural chemist employees since 1997. Agricultural chemists represent a very important sector of the plant protection in Croatia, because they affect the knowledge growth among the farmers by direct advice. It can be said that retail sale of the plant protection products via the net of agricultural chemists i.e. agricultural chemists in Croatia, has so far assured professional sale and is partly meritorious that heavy mistakes and accidents during the application of those products did not happen. Due to insufficient knowledge about plant protection products among the majority of users, many agricultural chemists successfully performed the role of some kind of a private agricultural extension institute in the segment of chemical plant protection.

da je do sada maloprodaja sredstava za zaštitu bilja putem mreže poljoprivrednih ljekarni odnosno poljoprivrednih ljekarni u Hrvatskoj, osigurala stručnu prodaju i dijelom je zaslužna što nije došlo do velikih pogrešaka i nesreća pri primjeni tih sredstava. Zbog nedovoljnog poznавanja sredstava za zaštitu bilja velike većine korisnika tih sredstava, mnoge su poljoprivredne ljekarne uspješno izvršile ulogu neke vrste privatne poljoprivredne savjetodavne službe u segmentu kemijske zaštite bilja.

Tijekom 12 godina Zavod je održao ukupno 70 tečajeva za osposobljavanje zaposlenika u poljoprivrednim ljekarnama, nakon kojih zaposlenici moraju položiti ispit (slika 40.). Osnovni tečaj je položilo 1177, a tečaj obnove znanja nakon 5 godina - 435 zaposlenika u poljoprivrednim ljekarnama. Zavod je izdao i 1757 trajnih iskaznica djelatnicima koji imaju pravo na njih. U tablici 29. prikazani su rezultati dosadašnjeg provođenja tečaja.

Godina	1. put izdane iskaznice (čl.21)	Obnovljene iskaznice (čl.21)	Trajne iskaznice (čl.23)	Broj održanih tečajeva 1. put	Broj održanih tečajeva obnova
1997.	660	0	329	24	0
1998.	100	0	71	5	0
1999.	6	0	47	0	0
2000.	33	0	84	2	0
2001.	40	0	89	2	0
2002.	51	113	294	4	6
2003.	88	70	128	5	4
2004.	56	29	97	3	1
2005.	31	2	142	2	0
2006.	25	19	113	1	1
2007.	46	37	161	2	1
2008.	15	124	93	1	4
2009.	26	41	109	1	1
Ukupno	1177	435	1757	52	18

Tablica 29. Broj iskaznica izdanih prvi put, obnovljenih i trajnih iskaznica, broj održanih tečajeva od 1997. do 2009.

During 12 years the Institute held 70 training courses for agricultural chemist employees in total, after which they had to pass the exam (fig. 40). 1177 employees passed the basic course and 435 agricultural chemist employees passed the course of knowledge renewal after 5 years. The Institute issued also 1757 permanent cards to employees entitled thereto. Table 29 presents the results of the courses held so far.

Year	Cards issued for the first time (Article 21)	Renewed cards (Article 21)	Permanent cards (Article 23)	Number of courses held (first time)	Number of courses held (renewed)
1997	660	0	329	24	0
1998	100	0	71	5	0
1999	6	0	47	0	0
2000	33	0	84	2	0
2001	40	0	89	2	0
2002	51	113	294	4	6
2003	88	70	128	5	4
2004	56	29	97	3	1
2005	31	2	142	2	0
2006	25	19	113	1	1
2007	46	37	161	2	1
2008	15	124	93	1	4
2009	26	41	109	1	1
Total	1177	435	1757	52	18

Table 29 Number of cards issued for the first time, renewed and permanent cards, number of courses held from 1997 until 2009

2.3.3. Odjel za sredstva za zaštitu bilja

- Odjelu za sredstva za zaštitu bilja obavlja sljedeće poslove:
- ocjenjivanje dokumentacije učinkovitosti, ostataka, ekotoksikoloških svojstava, ponašanja u okolišu, fizikalno- kemijskih svojstava i izloženosti primjenitelja sredstava za zaštitu bilja po jedinstvenim načelima (NN 16/10, NN 53/06);
 - analiziranje sredstava za zaštitu bilja u prometu (post-registracijska kontrola) prema godišnjem programu MPRRR-a i analiziranje sredstava za zaštitu bilja koja su dostavili inspektori ili stranke;
 - definiranje i procjenjivanje rizika o maksimalno dopuštenim koncentracijama ostataka sredstava za zaštitu bilja (u suradnji s Hrvatskom agencijom za hranu).

Odjelom rukovodi Gorana Peček, dipl.ing.

Republika Hrvatska je propise u području sredstava za zaštitu bilja (SZB) uskladila s pravnom stečevinom EU-a i to s Direktivom Vijeća 91/414/EEC i svim ostalim direktivama i odlukama iz tog područja. U području SZB-a namjera je prije svega unaprijediti nacionalni sustav registracije SZB-a, urediti stavljanje na



Slika 41. Gorana Peček dipl.ing. – rukovoditelj odjela SZB

Figure 41 Gorana Peček BSc – head of the PPP Department

2.3.3. Plant Protection Products Department

The Plant Protection Products Department manages:

- *assessment of the efficacy documentation, residues, ecotoxicology, environmental behaviour, physical and chemical characteristics and operator exposure to plant protection products by uniform principles (Official Gazette 16/10, Official Gazette 53/06);*
- *analyses of plant protection products on the market (post-registration control) according to the annual programme of the MAFRD and analysis of plant protection products delivered by inspectors, or by clients on personal requests;*
- *definition and risk assessment of maximum allowable concentration of residues of plant protection products (in cooperation with the Croatian Food Agency).*

Department is managed by Gorana Peček BSc.

The Republic of Croatia has aligned its legislation in the field of plant protection products (PPP) with the EU acquis, Council Directive 91/414/EEC and with all the other directives and decisions in this area. In the PPP area the primary intention is to upgrade the national system of PPP registration, organise their placing on the market and put their use under supervision. Only the procedure that would establish a reliable and scientifically based criteria for the application of PPP prescribed in a clear and consistent manner and applicable in the same way as in all EU member states, may provide local producers with the conditions to produce quality food in an economical and environmentally sustainable manner.

One of the most common and almost inevitable ways of the implementation of the health care of plants and plant products against harmful organisms and of the improvement of agricultural production is the use of PPP. However, in addition to positive effects, PPP many of which belong to dangerous chemicals can have adverse effects on crop production, and their use may have negative impact on human and animal health and the environment. Therefore, all countries, including the Republic of Croatia, strictly regulate the conditions

tržište i staviti pod nadzor njihovu uporabu. Samo onaj postupak kojim se utvrđuju pouzdani i znanstveno utemeljeni kriteriji za primjenu SZB-a, propisani na jasan i konzistentan način te primjenjiv na isti način kao i u svim državama članicama EU-a, može osigurati domaćim proizvođačima uvjete za proizvodnju kvalitetne hrane na ekonomičan i ekološki održiv način.

Jedan od najučestalijih i gotovo neizbjježnih načina provedbe zdravstvene zaštite bilja i biljnih proizvoda od štetnih organiza i unaprjeđenja poljoprivredne proizvodnje jest uporaba SZB-a. Međutim, pored pozitivnih učinaka, SZB-i od kojih mnogi spadaju u opasne kemikalije mogu imati i nepovoljne učinke na proizvodnju bilja, a njihova uporaba može negativno utjecati na zdravlje ljudi i životinja te na okoliš. Stoga sve države, pa tako i Republika Hrvatska, strogo propisuju uvjete za proizvodnju i promet SZB-a, što podrazumijeva registraciju, skladištenje, prodaju i uporabu sredstava za zaštitu bilja.

Radi kvalitetne provedbe tih aktivnosti prijevo je potrebno nastaviti s dalnjim jačanjem kapaciteta stručnjaka Zavoda za zaštitu bilja putem treninga i radionica za ocjenjivače dokumentacije za registraciju sredstava za zaštitu bilja, te treninga i radionica za laboratorijsko osoblje Zavoda za zaštitu bilja.

2.3.3.1. Odsjek za ocjenjivanje dokumentacije u postupku registracije SZB

Države članice Europske unije provode nacionalni postupak registracije sredstava, uvažavajući pritom zajednička jedinstvena načela o uvjetima i postupcima za registraciju sredstava, koja se utvrđuju na razini EU-a.

Stavljanje na tržište SZB-a dopušteno je tek nakon obavljene procjene učinkovitosti i rizika za zdravlje ljudi, životinja te utjecaja na okoliš. Procjena se obavlja na temelju dokumentacije koja sadrži rezultate znanstvenih i stručnih istraživanja u sljedećim područjima: identitet i fizikalno-kemijska svojstva aktivnih tvari i pripravaka, učinkovitost, ekotoksikologija, poнаšanje u okolišu, ostaci pesticida u hrani i hrani za životinje, toksikologija sisavaca i izloženost primjenitelja, radnika i drugih nazočnih osoba.

of production and market of PPP, which implies registration, storage, sale and use of plant protection products.

In order to ensure the quality implementation of these activities, it is essential to continue the capacity strengthening of experts from the Institute for Plant Protection through trainings and workshops for documentation assessors for the registration of plant protection products, and training and workshops for laboratory staff of the Institute for Plant Protection.

2.3.3.1. PPP Documentation Evaluation Section in the Registration Process

European Union member states implement a national registration process of plant protection products, respecting the common principles of the conditions and procedures for the registration of PPP, which are set out on the EU level.

PPP are allowed to be put on the market upon the conducted efficacy evaluation and evaluation of risks to human and animal health and impact on the environment. The evaluation is done based on the documentation which contains results of scientific and expert research in the areas of: identity and physical and chemical features of active substances and preparations, efficacy, ecotoxicology, behaviour in the environment, residues of pesticides in the food and in the animal food, mammal toxicology and exposure of the applier, employees and other persons present.

In order to protect human and animal health and prevent harmful effects on the environment, particularly on the ground waters, evaluation of active substances and PPP preparations is being conducted, as well as their regular repeated evaluation, taking into consideration the development of science and new technologies as well as the experiences based on the actual usage of plant protection products and the effect of certain active substances.

In order to ensure a sufficient number of effective plant protection products for all necessary applications and to shorten the time to register these products as well as to reduce the costs of registration, the EU member states can recognise PPP registra-

Radi zaštite zdravlja ljudi i životinja i sprječavanja štetnog utjecaja na okoliš, a posebice utjecaja na podzemne vode, provodi se ocjenjivanje aktivnih tvari i pripravaka SZB-a te njihovo redovito ponovno ocjenjivanje, uzimajući pritom u obzir razvoj znanosti i novih tehnologija te iskustva koja se temelje na stvarnoj uporabi sredstava za zaštitu bilja i utjecaju određenih aktivnih tvari.

U svrhu osiguranja dovoljnog broja učinkovitih sredstava za zaštitu bilja za sve potrebne primjene i skraćivanja vremena za registraciju tih sredstava kao i smanjivanja troškova registracije, države članice EU-a mogu priznati registracije SZB-a drugih država članica, ako su usporedivi fitosanitarni i klimatski uvjeti te uvjeti poljoprivredne proizvodnje. Radi toga je uspostavljen standardizirani sustav za uzajamno obaveješćivanje među državama članicama i razmjena podataka i informacija, nužnih za registraciju sredstva za zaštitu bilja.

Načinjen je program ponovne ocjene (re-registracije) svih sredstava za zaštitu bilja u Hrvatskoj, koja sadrže aktivne tvari uvrštene na Prilog I. Direktive Vijeća 91/414/EEC, prema ko-

tion of other member states if their plant health and climatic conditions are comparable as well as the conditions of agricultural production. A standardized system for mutual notification and exchanging data and information necessary for registration of plant protection products among member countries has been therefore established.

A program of re-registration of all plant protection products in Croatia has been made. These are the PPP which contain active substances included in Annex I to Council Directive 91/414/EEC, according to which the products are divided into eight groups, with a deadline set for submission of required documentation to the MAFRD.

The aforementioned tasks are being carried out in the Plant Protection Products Documentation Evaluation Section managed by Ana Mrnjavčić BSc. Specialists engaged in the documentation evaluation of plant protection products are: Željko Budinšćak PhD, Darka Hamel PhD, Dario Ivić PhD, Marija Jozić PhD, Mladen Šimala PhD, Zvonimir Flegar MSc, Adrijana Novak MSc, Nenad Novak MSc, Ivan Poje MSc, Željko Tomić MSc, Maja



Slika 42. Ana Mrnjavčić dipl.ing.
– ocjena dokumentacije s
područja ekotoksikologije

Figure 42 Ana Mrnjavčić BSc –
evaluation of ecotoxicology
documentation



Slika 44. Maja Kravarščan dipl.ing.
– ocjena dokumentacije s
područja ekotoksikologije

Figure 44 Maja Kravarščan BSc –
evaluation of ecotoxicology
documentation



Slika 43. dr.sc. Iva Pavlinić Prokurica PhD
– ocjena dokumentacije s
područja ostataka

Figure 43 Iva Pavlinić Prokurica PhD –
evaluation of residue
documentation



Slika 45. Maja Poldrugač dipl.ing.
– ocjena dokumentacije
fizikalno kemijskih
svojstava

Figure 45 Maja Poldrugač BSc –
evaluation of identity
and physical-chemical
properties of PPP



Slika 46. Nataša Nikl dipl.ing. – ocjena dokumentacije s područja ponašanja i zadržavanja u okolišu
Figure 46 Nataša Nikl BSc – evaluation of fate and behaviour documentation



Slika 48. Dubravka Somogyi dipl.ing. – ocjena dokumentacije s područja ostataka
Figure 48 Dubravka Somogyi BSc – evaluation of pesticide residue documentation



Slika 47. Sara Dolores Podnar – vođenje evidencije o dokumentaciji za ocjenu SZB
Figure 47 Sara Dolores Podnar – keeping records of PPP evaluation documentation



Slika 49. dr.sc. Marija Jozić analiza SZB u programu postregistracijske kontrole
Figure 49 Marija Jozić PhD analyses of PPP in post-registration control

jem su registrirana ta sredstva razvrstana u osam skupina, s određenim rokom za dostavu potrebne dokumentacije u MPRRR.

Navedeni poslovi, obavljaju se u Odsjeku za ocjenjivanje dokumentacije SZB, kojim rukovodi Ana Mrnjavčić, dipl.ing. U ocjeni dokumentacije SZB sudjeluju stručnjaci: dr.sc. Željko Budinčak, dr.sc. Darka Hamel, dr.sc. Dario Ivić, dr.sc. Marija Jozić, dr.sc. Mladen Šimala, mr.sc. Zvonimir Flegar, mr.sc. Adrijana Novak, mr.sc. Nenad Novak, mr.sc. Ivan Poje, mr.sc. Željko Tomić, Maja Kravarščan, dipl.ing., Ana Mrnjavčić, dipl.ing., Nataša Nikl, dipl.ing., Gorana Peček, dipl.ing., Maja Poldručić, dipl.ing., Dubravka Somogyi, dipl.ing. Tehnički suradnik u ovom Odsjeku je je Sara Dolores Podnar.

2.3.3.2. Laboratorij za kontrolu sredstava za zaštitu bilja

Nacionalni program postregistracijske kontrole SZB-a i Nacionalni program praćenja (monitoringa) ostataka pesticida u i na proizvodima biljnog podrijetla, počeli su 2007. godine na temelju

Kravarščan BSc, Ana Mrnjavčić BSc, Nataša Nikl BSc, Gorana Peček BSc, Maja Poldručić BSc and Dubravka Somogyi BSc. Sara Dolores Podnar is a technical associate in this Section.

2.3.3.2. Plant Protection Products Control Laboratory

National Programme for Post-Registration Control of PPPs and the National Monitoring Programme of Pesticide Residues, in and on the Products of Plant Origin, started in 2007 based on the provisions of the Plant Protection Products Act. The purpose of the Programme for Post-Registration Control is the validity inspection of registered plant protection products based on the selected active substances, in order to verify if their physical and chemical properties comply with the registration decision issued. Post-Registration Control Programme includes different active substances in different years. Laboratory analysis of PPP samples is carried out by the Institute for Plant Protection. Laboratory is managed by Gorana Peček BSc. Marija Jozić PhD also par-



Slika 50. Iris Šimala – priprema uzorka u programu post-registracijske kontrole SZB

Figure 50 Iris Šimala – sample preparation in PPP postregistration control

odredaba Zakona o sredstvima za zaštitu bilja. Svrha Programa postregistracijske kontrole je provjera ispravnosti registriranih sredstava za zaštitu bilja na osnovi odabranih aktivnih tvari s ciljem provjere jesu li njihova fizikalno-kemijska svojstva sukladna s rješenjem o registraciji. Program postregistracijske kontrole u različitim godinama obuhvaća druge aktivne tvari. Laboratorijsku analizu uzorka SZB-a obavlja Zavod za zaštitu bilja. Laboratorijem rukovodi Gorana Peček, dipl.ing. a u poslovima laboratorija sudjeluje i dr.sc. Marija Jozić te tehnička suradnica Iris Šimala

2.3.4. Odjel za dijagnostiku

U Odjelu za dijagnostiku obavljaju se poslovi dijagnostike (determinacije):

- u uzorcima bilja, biljnim proizvodima, tlu, vodi i drugim nadziranim predmetima radi određivanja nazočnosti primarno karantenskih štetnih organizama u sklopu programa posebnog nadzora, kao i gospodarski važnih štetnih organizama u okviru izvještajno-prognoznih poslova;
- analiziraju se inspekcijski uzorci kao i uzorci koje su do stavile stranke.

U odjelu za dijagnostiku ti poslovi se obavljaju u: laboratoriju za bakteriologiju, laboratoriju za herbologiju, laboratoriju za mikologiju, laboratoriju za nematologiju, laboratoriju za virologiju i laboratoriju za zoologiju. Odjelom rukovodi dr.sc. Mladen Šimala (slika 51.).

ticipates in the work of this laboratory together with a technical associate Iris Šimala.

2.3.4. Diagnostics Department

Diagnostics (determination) tasks are being conducted in the Diagnostics Department:

- *in plant samples, plant products, soil, water and other monitored subjects in order to determine the presence of primary quarantine harmful organisms within surveys, as well as economically important harmful organisms within reporting and early warning system;*

- *samples brought by inspectors and by clients are analysed.*

In the Diagnostics Department these activities are being performed in: laboratory for bacteriology, laboratory for herbology, laboratory for mycology, laboratory for nematology, laboratory for virology and laboratory for zoology. Department is being managed by Mladen Šimala PhD (fig. 51).



Slika 51 dr.sc. Mladen Šimala – rukovoditelj odjela za dijagnostiku

Figure 51 Mladen Šimala PhD – head of the Diagnostics Department

2.3.4.1. Dijagnostički laboratorijski Zavoda danas

U Zavodu ima šest dijagnostičkih laboratorija. Rad tih laboratorijskih temelji se na radu istovrsnih laboratorijskih u prošlosti.

Laboratorij za bakteriologiju

U ovom se laboratoriju testira bilje, biljni materijal i vode za navodnjavanje na prisutnost fitopatogenih bakterija. Obavlja se detekcija i identifikacija karantenskih biljnih bakterija, uzročnika smeđe truleži gomolja krumpira - *Ralstonia solanacearum* i prstenaste truleži gomolja krumpira - *Clavibacter michiganensis* subsp. *sepedonicus* te bakterijske paleži jezgričavih voćaka - *Erwinia amylovora*; obavlja se detekcija i identifikacija fitoplazmi, uzročnika žutica vinove loze i voćaka, ali i njihova detekcija u kukcima koji su prenositelji tih bolesti. Među gospodarski važnim uzročnicima bakterioza mogu se izdvojiti: *Agrobacterium tumefaciens*, *Agrobacterium vitis* i *Pseudomonas savastanoi*. Testira se uvozni krumpir radi



Slika 52. mr.sc. Ivana Križanac – priprema uzorka za bakteriološku analizu

Figure 52 Ivana Križanac MSc – preparation of sample for bacteriological analysis



Slika 53. Jelena Plavec dipl.ing.

Figure 53 Jelena Plavec BSc

2.3.4.1. Diagnostic Laboratories of the Institute Today

The Institute has six diagnostic laboratories. The work of these laboratories is based on the work of the equivalent laboratories in the past.

Laboratory for bacteriology

*Plants, plant materials and irrigation water are being tested for the presence of plant pathogenic bacteria in this laboratory. The laboratory conducts detection and identification of plant quarantine bacteria, causal agent of brown rot of potato - *Ralstonia solanacearum*, ring rot of potato - *Clavibacter michiganensis* subsp. *sepedonicus* and fire blight - *Erwinia amylovora*; detection and identification of phytoplasmas, agents causing grapevine and fruit yellows, but also their detection in insects which represent vectors of these diseases. Among the economically important agents causing bacterial diseases are: *Agrobacterium tumefaciens*, *Agrobacterium vitis* and *Pseudomonas savastanoi*. Imported potato is being tested to determine possible ring rot of potato. In addition to classical microbiological methods, such as growth of bacterial cultures on selective nutrient media, biochemical and enzymatic tests, as well as serological methods are being used in the laboratory (immunofluorescence tests with antibodies specific for each type) and methods based on amplification of specific DNA markers (Polymerase Chain Reaction) and restriction fragment polymorphism analysis.*



Slika 54. Jozo Zadro i Tvrtnko Mikec – priprema krumpira za bakteriološke analize

Figure 54 Jozo Zadro i Tvrtnko Mikec – preparation of potato for bacteriological analysis

određivanja prstenaste truleži. Uz klasične mikrobiološke metode, kao što su uzgoj bakterijskih kultura na selektivnim hranjivim podlogama te biokemijski i enzimatski testovi, u laboratoriju se koriste i serološke metode (test imunofluorescencije s antitijelima specifičima za pojedinu vrstu) te metode zasnovane na amplifikaciji specifičnih markera DNA (lančana reakcija polimerazom) i analizi polimorfizma restriktičkih fragmenata.

U laboratoriju rade: mr.sc. Ivana Križanac – rukovoditeljica laboratorija (koja obnaša i dužnost predstavnika za kvalitetu), Jelena Plavec, dipl.ing. i tehnički suradnici: Jozo Zadro i Tvrtko Mikec (slike 52., 53., 54.).

Laboratorij za herbologiju

U laboratoriju se determiniraju gospodarski važni korovi i invazivne vrste korova, provjerava se rezistentnost korova na herbicide (slike 55., 56., 57.), istražuje se alelopatička interakcija korova i invazivnih stranih korovnih vrsta u svrhu pronalaska nekemijskih metoda suzbijanja korova. Uzorke dostavlja fitosanitarna inspekcija, pravne i fizičke osobe te stručnjaci HZPSS-a ili Zavoda za zaštitu bilja. Determinacija korova obavља se verificiranim klasičnim metodama na osnovi morfoloških značajki korova uz pomoć ključeva ili protokola EPPO.

U laboratoriju rade: mr.sc. Nenad Novak, Maja Kravarščan dipl.ing. i tehnički suradnik Tvrtko Mikec.



Slika 55. Očitavanje pokusa rezistentnosti – mr.sc. Nenad Novak, Jozo Zadro, mr.sc. Zvonimir Flegar
Figure 55 Reading resistance trial – Nenad Novak MSc, Jozo Zadro, Zvonimir Flegar MSc

Specialists who work in the laboratory are Ivana Križanac MSc – laboratory manager (also Quality Manager officiate), Jelena Plavec BSc and technical associates Jozo Zadro and Tvrtko Mikec (fig. 52, 53, 64).

Laboratory for herbology

Economically important weeds and invasive alienweed species are determined in the laboratory, with checking weed resistance to herbicides (fig. 55, 56, 57), researching allelopathic interaction between weed and invasive alien weed species in order to find non-chemical methods of weed control. The samples are being delivered by the phytosanitary inspection, legal and natural entities and the specialists of the CAEI or the Institute for Plant Protection. Weed determination is verified by classical methods based on morphological features of weeds by using keys or EPPO protocols.

Employees of the laboratory are Nenad Novak MSc, Maja Kravarščan BSc and technical associate Tvrtko Mikec.



Slika 56. Postavljanje pokusa rezistentnosti

Figure 56 Setting resistance trial



Slika 57. Pokus alelopatija – stavljanje sjemenki u Petrijevku

Figure 57 Allelopathic interaction – placing seed in petrie dish

Laboratorij za mikologiju

U mikološkom laboratoriju analiziraju se uzorci bilja. Određuju se gospodarski i karantenski važne štetne vrste gljiva. Analiziraju se uzorci sjemena, biljaka ratarskih kultura i industrijskog bilja, kao i uzorci iz rasadnika voćaka, vinove loze, ukrasnog bilja, presadnica povrća i krumpira te uzorci prikupljeni u šumskim sastojinama crnogorice. Analiziraju se i uzorci prikupljeni tijekom vizualnih pregleda nasada i objekata u okviru obavljanja izvještajno-prognoznih poslova i zdravstvenih pregleda rasadnika bilja. Uzorke dostavlja fitosanitarna inspekcija, pravne i fizičke osobe te stručnjaci HZPSS-a ili Zavoda za zaštitu bilja. Determinacija uzročnika bolesti do vrste provodi se na osnovi morfoloških značajki prema relevantnim ključevima i postojećih protokola EPPO. U slučaju nalaza štetnog organizma (karantenskog) izolat se šalje u referentne laboratorije u EU radi potvrde determinacije.



Slika 58. mr.sc. Željko Tomić – rukovoditelj laboratorija za mikologiju

Figure 58 Željko Tomić MSc – Head of laboratory for mycology

U godini 2010. pristupilo se adaptaciji i prenamjeni postojećeg prostora stare biblioteke na adresi Svetosimunska 25 u Zagrebu te opremanju opremom prijeko potrebnom za obavljanje dijagnostičkih poslova u području mikologije. Nabavljena je vodena kupelj i laboratorijski namještaj.

U laboratoriju rade: mr.sc. Željko Tomić – rukovoditelj laboratorija, mr.sc. Adrijana Novak, dr.sc. Dario Ivić i tehnički suradnik Borislav Levatić (slike 58., 59.).

Laboratorij za nematologiju

U nematološkom laboratoriju analiziraju se uzorci tla, bilja i ostalih nadziranih predmeta na nazočnost biljnoperazitskih ne-

Laboratory for mycology

Plant samples are being tested in the laboratory for mycology. Economic and quarantine important harmful species of fungi are being determined. Samples of seeds, of arable crops and industrial crops as well as the samples from nurseries of fruit trees, grapevine, ornamental plants, seedlings of vegetables and potatoes and samples collected in forest stands of conifers. Also, samples collected during the visual inspection of crops and facilities within the reporting and early warning system and health inspections of the nurseries. The samples are being delivered by the phytosanitary inspection, legal and natural entities and the specialists of the CAEI or the Institute for Plant Protection. Determination of pathogens to the species is conducted on the basis of morphological features of the relevant keys and the existing EPPO protocols. In case of discovery of harmful organisms (quarantine) isolates are sent to the EU reference laboratories for confirmation of determination.



Slika 59. Boris Levatić – priprema podloga za mikološke analize

Figure 59 Boris Levatić – substrate for mycological analyses

The adaptation and conversion of existing space at the old library in Svetosimunska 25 in Zagreb and furnishing with the equipment needed to perform diagnostic tasks in the field of mycology began in 2010. The water bath and laboratory furniture was supplied.

Employees of the laboratory are Željko Tomić MSc – laboratory manager, Adrijana Novak MSc, Dario Ivić PhD and a technical associate Borislav Levatić (fig. 58, 59).

Laboratory for nematology

Soil, plant and other surveyed subject samples are being analysed for the presence of plant parasite nematodes. Along with

matoda. Uz gospodarski vrlo štetne vrste određuju se i karantenske važne štetne vrste nematoda. Analiziraju se uzorci tla iz rasadnika voćaka, vinove loze, ukrasnog bilja i uzorci uzeti na površinama prije proizvodnje sjemenskoga krumpira te drvenog materijala za pakiranje i uzoraka prikupljenih u šumskim sastojinama crnogorce. Uzorke dostavlja fitosanitarna inspekcija, pravne i fizičke osobe ili stručnjaci Zavoda. Prate se europski i svjetski trendovi i standardi analiziranja uzorka. Nakon izolacije nematoda iz uzorka, slobodnoživuće i cistolike nematode morfološki se determiniraju do vrste kao što je uobičajeno. Za potvrdu determinacije karantenski štetnih vrsta uzorci su do 2008. bili slani u europske referentne laboratorije. Krajem 2008. nabavljeno je sve potrebno za molekularne analize (RFLP – PCR) koje obavljamo sami. Time se potvrđuje sigurnost nalaza. Još uvijek ne možemo sami određivati patotipove krumpirovih cistolikih nematoda, nego se to za nas određuje u AGES-ovu institutu u Beču. U godini 2010. adaptiran je postojeći prostor na adresi Rim 98 u Zagrebu te je nabavljena dodatna neophodna oprema za kvalitetnije dijagnostiranje u području nematologije. Nabavljena je sljedeća oprema i namještaj: radni stol za pripremu uzorka, podstolni ormarić i laboratorijski mikroskop Olympus, kada od nehrđajućeg čelika za ispiranje uzorka, venecijaneri te novi stolovi u prostoriji za mikroskopiranje. Pristupilo se i akreditaciji metoda analize tla na krumpirove cistolike nematode. Dosad je pripremljen Priručnik za kvalitetu te prateći postupci koji detaljnije opisuju procese po pojedinim točkama Norme ISO 17025. U tijeku je uvođenje kompjutorskog programa za evidenciju i zaprimanje uzorka.

U laboratoriju radi mr.sc. Ivan Poje-rukovoditelj laboratorija i tehnički suradnik Stjepan Jakopanec (slike 60., 61.).



Slika 60. mr.sc. Ivan Poje – nematološka dijagnostika

Figure 60 Ivan Poje MSc – nematological diagnostics

the economically harmful species, also the quarantine significant species of nematodes are determined. Samples of soil from fruit, grapevine and ornamental plants nurseries are analysed, as well as the samples taken from the surfaces prior to the seed potato production, wood packaging material and samples collected in forest stands of conifers. The samples are being delivered by the phytosanitary inspection, legal and natural entities or Institute specialists. European and world trends and standards of sample analysis are being followed. After the isolation of the nematodes from the samples, free-living and cyst nematodes are morphologically determined to the species as it is customary. Up to 2008 the samples were sent to European reference laboratories for determination confirmation. In late 2008 everything needed to perform molecular analysis by ourselves (RFLP – PCR) was supplied. Thus, the safety of findings can be assured. We are still not able to identify pathotypes of potato cyst nematodes by ourselves, so it is being done at the AGES Institute in Vienna. In 2010 the premises in Rim 98 in Zagreb were renovated and additional equipment for better nematology diagnostics was supplied: a desk for the preparation of samples, blade box, Olympus laboratory microscope, a tub for washing the samples made of stainless steel, blinds and new desks in the microscopy room. Accreditating the method of soil analysis on potato cyst nematode has started. So far, a quality manual was prepared as well as the following procedures which, in more detail, describe processes according to ISO 17025 Norm. Implementation of the computer program for filing and official receiving of samples is pending.

Employees of the laboratory are Ivan Poje MSc – laboratory manager and a technical associate Stjepan Jakopanec (fig. 60,61).



Slika 61. Stjepan Jakopanec – priprema nematoloških uzorka

Figure 61 Stjepan Jakopanec – preparation of nematological samples

Laboratorij za virologiju

U tom laboratoriju, u Svetosimunskoj 25, analiziraju se uzorci bilja. Određuju se gospodarski i karantenski važne štetne vrste virusa. Analiziraju se uzorci voćaka, vinove loze, ukrašnog bilja, povrća i krumpira, prikupljeni tijekom vizualnih pregleda nasada i objekata u okviru obavljanja izvještajno-prognoznih poslova i zdravstvenih pregleda rasadnika bilja. Uzorke bilja iz uvoza (šljiva, breskva, marelica, trešnja i višnja na PPV) i domaće proizvodnje, zatim sjemenske i merkantilne proizvodnje te sadni materijal dostavljaju: fitosanitarna inspekcija, pravne i fizičke osobe te stručnjaci HZPSS-a ili Zavoda. Počevši od godine 2003., analiziraju se uzorci radi određivanja nazočnosti karantenski važnih: PepMV, TYLCV, PPV, CTV i PSTVd te gospodarski važnih: GFLV, GVLR-a V I i III i GVA u vinovoj lozi i u štitastim ušima te triju sojeva: BYDV, PAV, MAV i RPV u lisnim ušima radi određivanja potencijalne infektivnosti vektora. Molekularna metoda za analizu nazočnosti virusa u sjemenskom, sadnom materijalu i vektorima te analize vrste i dvaju biotipova insekata obavljaju se od 2007. Determinacija viroida u biljnem materijalu započela je 2009.

U laboratoriju rade: mr.sc. Vesna Kajić, Jasna Milanović, dipl.ing. i tehnički suradnik Mladen Ljubić (slike 62., 63.).



Slika 62. mr.sc. Vesna Kajić – amplifikacija – RT-PCR
Figure 62 Vesna Kajić MSc – amplification – RT-PCR

Laboratory for virology

In this laboratory, in Svetosimunska 25, plant samples are being analysed. Economical and quarantine important harmful viruses are determined. Fruit, grapevine, ornamental plants, vegetables and potato samples are analysed, collected during the visual inspection of crops and facilities within the reporting and early warning system and health surveillance of the nurseries. Plant samples from imports (plums, peaches, apricots and cherries for PPV), domestic production, seed and commercial production and planting material are delivered by the phytosanitary inspection, legal and natural entities and the specialists of the CAEI or the Institute for Plant Protection. Since 2003 samples are analysed to determine the presence of quarantine viruses: PepMV, TYLCV, PPV, CTV and PSTVd (viroid) and economically important viruses: GFLV, GLRaV-1 and GLRaV-3 and GVA in grapevine and scale insects as well as the three strains of BYDV, PAV, MAV and RPV in aphids in order to determine potential infectivity of the vectors. Molecular methods to determine the presence of viruses in seed, plant material and vectors, as well as the species analysis and two insect biotypes of analysis are being preformed since 2007. Determination of viroids in plant material started in 2009.

Employees of the laboratory are Vesna Kajić MSc, Jasna Milanović BSc and a technical associate Mladen Ljubić (fig. 62, 63).



Slika 63. Jasna Milanović dipl.ing.
Figure 63 Jasna Milanović BSc

Laboratorij za zoologiju

U laboratoriju za zoologiju analiziraju se uzorci bilja i ostalih nadziranih predmeta radi detekcije i identifikacije gospodarski i karantenski važnih štetnih kukaca, grinja, puževa i glodavaca. Uzorke dostavljaju fitosanitarna inspekcija,

Laboratory for zoology

In the laboratory for zoology plant and other surveyed subject samples are analysed in order to detect and identify economically and quarantine important insects, maggots, snails and rodents. The samples are being delivered by the phytosanitary

pravne i fizičke osobe te stručnjaci HZPSS-a ili stručnjaci Zavoda. Analiziraju se i uzorci prikupljeni tijekom vizualnih pregleda nasada i objekata u okviru obavljanja izvještajno-prognoznih poslova i zdravstvenih pregleda rasadnika bilja. U sklopu programa posebnog nadzora analiziraju se uzorci radi određivanja određenih vrsta kukaca koji pripadaju redovima Thysanoptera, Hemiptera, Hymenoptera, Coleoptera, Lepidoptera i Diptera. Također se determiniraju kukci koji uzrokuju štete na uskladištenim poljoprivrednim proizvodima. Determinacija kukaca obavlja se verificiranim klasičnim entomološkim metodama na osnovi morfoloških značajki kukaca, uz pomoć relevantnih ključeva ili protokola EPPO.

Entomološki laboratorij posjeduje entomološke zbirke Aleyrodidae (1250 trajnih preparata – 33 različite vrste), Coccoidea (1342 trajna preparata – 90 različitih vrsta) i Thysanoptera (600 trajnih preparata – 40 različitih vrsta) (slike 64., 65) koje se sustavno nadopunjaju i održavaju. U podružnici u Solinu postoji i zbirka Tephritidae (1104 trajna uzorka – 46 vrsta) te ostale vrste Diptera (153 trajna uzorka – 45 vrsta iz 24 porodice).

inspection, legal and natural entities and the specialists of the CAEI or the Institute for Plant Protection. The samples are collected during the visual inspection of crops and facilities within the reporting and early warning system and health inspections of the nurseries. Within the survey, samples are tested in order to determine specific insect species belonging to orders of Thysanoptera, Hemiptera, Hymenoptera, Coleoptera, Lepidoptera and Diptera. Insects that cause damage to stored agricultural products are also determined. Determination of insects is being done by the verified classical entomology methods based on the morphological features of the relevant keys and the existing EPPO protocols.

Entomology laboratory is in possession of entomology collection of Aleyrodidae (1250 permanent preparations - 33 different species), Coccoidea (1342 permanent preparations - 90 different species) and Thysanoptera (600 permanent preparations - 40 different species) (fig. 64, 65) which are systematically maintained and supplemented. In Solin there is a collection of Tephritidae (1104 permanent samples - 46 species) and other Diptera species (153 permanent samples - 45 species from 24 families).



Slika 64. Dio entomološke zbirke Zavoda

Figure 64 Part of entomological collection



Slika 65. Trajni mikroskopski preparati štitastih uši

Figure 65 Permanent slides of scale insects

U 2010. adaptiran je i prenamijenjen dio postojećeg prostora stare biblioteke na adresi Svetosimunska 25, u svrhu obavljanja dijagnostičkih poslova u području zoologije.

U laboratoriju rade dr.sc. Željko Budinščak – rukovoditelj laboratorija (slika 66.): dr.sc. Mladen Šimala, dr.sc. Tatjana Masten Milek, dr.sc. Mario Bjeliš, dr.sc. Darka Hamel (slika 67.), mr.sc. Andrija Vukadin i tehnički suradnici Mladen Ljubić i Stjepan Jakopanec.



Slika 66. Rukovoditelj laboratorija zoologije – dr.sc. Željko Budinščak

Figure 66 Head of laboratory for zoology – Željko Budinščak PhD

Laboratorij za kontrolu zdravstvenog stanja sadnog materijala

U godini 2010. opremljen je i adaptiran postojeći objekt u zagrebačkoj Ulici Rim 98, za analize na gospodarski važne virusne na vinovoj lozi, voćkama i sjemenskom krumpiru. Nabavljena je potrebna oprema i namještaj za obavljanje dijagnostičkih poslova u području virologije gospodarski važnih virusa: ispirać mikrotitar ploča i preša za lišće, gomolje i klice, konektor i dispenzor, Walk in komora, homogenizator, vrećice, mini elektroforeza, električne grijalice vode, laboratorijski namještaj, venecijaneri, termoakumulacijske peći,



Slika 68. dr.sc. Dario Ivić – rukovoditelj laboratorija

Figure 68 Dario Ivić PhD – head of laboratory

In 2010 premises of the old library were redone and renovated in Svetosimunska 25 in Zagreb with the purpose of performing diagnostics in zoology.

Employees of the laboratory are Željko Budinščak PhD – laboratory manager (fig. 66), Mladen Šimala PhD, Tatjana Masten Milek PhD, Mario Bjeliš PhD, Darka Hamel PhD (fig. 67), Andrija Vukadin MSc and technical associates Mladen Ljubić and Stjepan Jakopanec.



Slika 67. dr.sc. Darka Hamel – presijavanje skladišnih štetnika

Figure 67 Darka Hamel PhD – sieving of stored product pests

Laboratory for planting material control

In 2010 the premises in Rim 98 in Zagreb were equipped and renovated for performing virological analysis: economically important viruses in grapevine, fruit trees and seed potato. Equipment and furniture necessary for performing diagnostics in the area of economically important viruses was supplied: microtiter plate washer; leaf, germ and tuber press with connector and dispenser; walk-in chamber; homogenizer; extraction bags; mini electrophoresis; electrical water heater; laboratory furniture, drapes, thermal heaters; air-conditioners; mini centrifuge; freezers; Vortex and Eppendorf pipettes.



Slika 69. Tina Fazinić dipl.ing.

Figure 69 Tina Fazinić BSc

klima- uređaj, mikrocentrifuga, ledenice, Vortex i Eppendorf mikropipete.

U laboratoriju rade rukovoditelj laboratorija dr.sc. Dario Ivić te stručni suradnici Tina Fazinić, dipl.ing. i Krešimir Skočić, eng. (slike 68., 69., 70.).

2.3.5. Stručna suradnja i projekti

Zavod za zaštitu bilja oduvijek je pridavao pažnju znanstvenom i stručnom napretku svakog stručnjaka kroz njihovo stjecanje magistarskih i doktorskih zvanja te specijalizacijame iz djelokruga rada u europskim i svjetski priznatim institucijama.

Tijekom mnogobrojnih specijalizacija stručnjaka Zavoda u zemlji i inozemstvu, kao i razmjenom znanja i rezultata istraživanja, uspostavljena je suradnja s velikim brojem stručnjaka iz eminentnih ustanova što je doprinijelo i doprinosi kvaliteti Zavoda.

Neke od tih institucija i organizacija su: Plant Protection Service, Wageningen, Nizozemska; Wageningen University, Wageningen, Nizozemska; Universita di Padova, Dipartimento Agronomia Ambientale e Produzioni Vegetali – Entomologia, Italija; The Ohio State University, Columbus, SAD; Natural History Museum, London, Velika Britanija; Muséum d'histoire naturelle de la Ville de Genève, Ženeva, Švicarska; Royal Museum for Central Africa, Tervuren, Belgija; Europska organizacija za zaštitu bilja - EPPO, Pariz, Francuska; Hrvatsko društvo biljne zaštite, Pesticide Safety Directorate - PSD, York, Velika Britanija; Međunarodna agencija za atomsku energiju – IAEA, Beč, Austrija, AGES Institut Beč, Austrija, (Laboratorij nematologiju); The National Laboratory for the Protection of Plants (LNPV), Angers, Cedex, Francuska; Neiker-Tecnalia Akreditirani laboratorij za karantenski štetne organizme, Forest Protection Department, Vitoria-Gasteiz, Španjolska; University of Molise, Campobasso, Italija; Universita degli studi di Napoli „Federico II“, Dipartimento di Entomologia e Zoologia Agraria Filippo Silvestri“, Portici, Italija; Phitolab diagnostic – Budimpešta, Mađarska; INRA UMR GDPP - Bordeaux, Francuska; Kmetijsko Gozdarski Zavod



Slika 70. Krešimir Skočić eng.
Figure 70 Krešimir Skočić Eng

Dario Ivić PhD is the laboratory manager and Tina Fazinić BSc and Krešimir Skočić Eng are employees of the laboratory (fig. 68, 69, 70).

2.3.5. Scientific cooperation and Projects

The Institute for Plant Protection has always paid attention of scientific and professional progress of each specialist through their acquiring of Master's and Doctoral degrees and specializations in acknowledged institutions in Europe and in the world.

During numerous specializations of the experts of the Institute, in Croatia and abroad, as well as with the exchange of knowledge and research results, cooperation has been established with a large number of experts from renowned institutions. This also contributed and contributes to the quality of the Institute.

Some of the institutions are: Plant Protection Service, Wageningen, The Netherlands; Wageningen University, Wageningen, The Netherlands; Universita di Padova, Dipartimento Agronomia Ambientale e Produzioni Vegetali – Entomologia, Italia; The Ohio State University, Columbus, USA; Natural History Museum, London, UK; Natural History Museum, (Muséum d'histoire naturelle de la Ville de Genève) Geneve, Switzerland, Royal Museum for Central Africa, Tervuren, Belgium, European Plant Protection Organization EPPO, Paris, France; Croatian Society of Plant Protection, Pesticides Safety Directorate, York, UK; International Atomic Energy Agency- IAEA, Vienna, Austria, AGES Institute Vienna, Austria, (Laboratory for nematology); The National Laboratory for the Protection of Plants (LNPV), Angers, Cedex, France; Neiker-Tecnalia Accredited

Nova Gorica, Nova Gorica, Slovenija; Biotehniška fakulteta, Inštitut za fitomedicino, Ljubljana, Slovenija; Fitosanitarna uprava Republike Slovenije, Ljubljana, Slovenia; KIS – Oddelek za varstvo rastlin, Nematološki laboratorij, Ljubljana, Slovenija; Botanical garden Faculty of science, Zagreb; Hrvatski prirodoslovni muzej, Zagreb; Agronomsky fakultet u Zagrebu, Zagreb; Poljoprivredni fakultet u Osijeku, Osijek; Hrvatski prirodoslovni muzej, Zagreb; Laboratorij za molekularnu mikrobiologiju - Biološki odsjek Prirodoslovno-matematičkog fakulteta, Šumarski fakultet u Zagrebu; Hrvatski šumarski institut, Jastrebarsko; Hrvatski zavod za poljoprivrednu savjetodavnu službu – sada Hrvatska poljoprivredna komora i dr.

Kao rezultat suradnje stručnjaka Zavoda sa stranim i domaćim uglednim ustanovama i stručnjacima u području zaštite bilja proizašli su brojni projekti kao što su: "Poboljšavanje učinaka sterilnih mužjaka u projektima tehnike sterilnih insekata voćne muhe. 12855 Ro, FAO/IAEA" (2005.–2009.); "Zaštita izvornosti ekstra djevičanskog maslinovog ulja sorte Oblica - Zlatna oblica. Zajednica uljara i maslinara Hrvatske" (2006.–2009.); "Studija izvodljivosti za suzbijanje mediteranske voćne muhe primjenom tehnike sterilnih insekata na širem području doline Neretve. CRO 5002, FAO/IAEA TCP (2007.–2008.)"; "Ekološki prihvatljiva tehnologija uzgoja povrća u krškim područjima" (2007. – 2009.); hrvatsko-mađarskoi bilateralni projekt "Uloga samoniklih biljaka u epidemiologiji žutica vinove loze" (2009. – 2011.) te „Integrirana zaštita od fitoplazmi u različitim kulturama“ (2009. – 2013.). Kao dva najznačajnija projekta, treba istaknuti "Uvođenje tehnike sterilnih kukaca (Sterile Insect Technique-SIT) za suzbijanje sredozemne voćne muhe Ceratitis capitata W. u dolini Neretve" i IPA 2007 "Daljnje jačanje kapaciteta u području sredstava za zaštitu bilja i ostataka pesticida (SZB)".

laboratory for quarantine harmful organisms, Forest Protection Department, Vitoria-Gasteiz, Spain; University of Molise, Campobasso, Italia; Universita degli studi di Napoli „Federico II“, Dipartimento di Entomologia e Zoologia Agraria Filippo Silvestri, Portici, Italia; Phytolab diagnostic – Budapest, Hungary; INRA UMR GDPP - Bordeaux, France; Kmetijsko Gozdarski Zavod Nova Gorica, Nova Gorica, Slovenia; Biotehniška fakulteta, Inštitut za fitomedicino, Ljubljana, Slovenia; Botanical garden Faculty of science, Zagreb; Natural History Museum of Croatia, Zagreb; Faculty of Agriculture in Zagreb, Zagreb; Faculty of Agriculture in Osijek, Osijek; Laboratory for molecular microbiology – Faculty of Science; Faculty for Forestry in Zagreb; Croatian Forestry Institute, Jastrebarsko; Extension Service of Croatia – now Croatian Chamber of Agriculture etc.

As a result of the Institutes specialists intensive cooperation with foreign and domestic distinguished institutions and experts in the field of plant protection, numerous projects were realized, such as: Improving Sterile Males Performances in Fruit Fly SIT Projects. 12855 Ro, FAO/IAEA, (2005–2009); Protected Geographical Indication of Extra Virgin Olive Oil Made of the Oblica Variety - Zlatna oblica. Olive and Olive Oil Growers and Producers Association of Croatia, (2006–2009); Feasibility Study for the Suppression of the Mediterranean Fruit Fly by Integrating the Sterile Insect Technique on Area-Wide Basis in the Neretva Valley. CRO 5002, FAO/IAEA TCP, (2007–2008); Ecologically Acceptable Vegetable Production in Karst Regions, (2007–2009); Bilateral CRO-HU Se&T project: The role of wild plant species in the epidemiology of grapevine phytoplasmoses, (2007–2011); COST action FA 0807: Integrated Management of Phytoplasma Epidemics in Different Crop Systems (2008–2011). Two of the most important international projects are "Implementation of Sterile Insect Technique (Sterile Insect Technique - SIT) in Order to Control the Mediterranean Fruit Fly Ceratitis capitata W. in the Neretva River Valley" and IPA 2007 "Further Strengthening of Capacities in the Field of Plant Protection Products and Pesticide Residues (PPP)".

2.3.5.1. "Uvođenje tehnike sterilnih kukaca (Sterile Insect Technique-SIT) za suzbijanje sredozemne voćne muhe *Ceratitis capitata* W. u dolini Neretve"

Voditelj projekta: dr.sc. Mario Bjeliš (2007.–2011.) i suradnici: Dražen Radunić, dipl.ing., Luka Popović, dipl.ing., Ivana Marušić, ing., Drago Doko, dipl.ing., Stipe Petričević, dipl.ing. i mr.sc. Perica Bulić

Sredozemna voćna muha – *Ceratitis capitata* Wied. (Diptera, Tephritidae), najznačajniji je gospodarski štetnik kulтивiranih voćnih vrsta koje se uzgajaju na području doline Neretve, poglavito smokve, marelice, breskve, nektarine, šljive i mandarine. Uzrokuje crvljivost plodova svojih domaćina, a procijenjeno je da izravne štete, koje uzrokuje na mandarini, iznose više od 2 milijuna kuna na godinu.

Dodatac problem predstavlja suzbijanje upotrebom sredstava za zaštitu bilja jer se prskanje provodi u vrijeme kada muha polaže jaja u plod, što se podudara s vremenom zrenja i berbe plodova. Od ukupnog uroda mandarine 25–27.000 tona na godinu izvezе se u zemlje regije i EU-a. Značajan izvoz neretvanske mandarine u zemlje Evropske unije podrazumijeva plasman plodova bez ostataka pesticida pa je MPRRR, prepoznавши ovaj problem, inicirao program praćenja pojave i provođenja mjera za sprječavanje širenja i suzbijanje ovog štetnika. Od 2000. godine provode se istraživanja o njegovoj rasprostranjenosti primjenom različitih metoda za praćenje, upotrebom lovki i atraktanata. Istraživana je učinkovitost insekticidnih i biotehničkih metoda suzbijanja te su educirani proizvođači o osnovama biologije i metodama suzbijanja tog štetnika.

U suradnji s FAO/IAEA-om u okviru dvaju projekata tehničke suradnje (CRO 5002: Feasibility study of medfly suppression by integrating sterile insect technique in the Neretva river valley 2007/2008 i RER 5014: Suppressing the mediterranean fruit fly by integrating sterile insect technique in the Neretva river valley 2009/2011), započeto je s pripremama za provođenje ovog programa, što uključuje izradu ekonomске i tehničke studije

2.3.5.1. "Implementation of Sterile Insect Technique (SIT) in Order to Control the Mediterranean Fruit Fly *Ceratitis capitata* W. in the Neretva River Valley"

Team leader: Mario Bjeliš PhD (2007–2011) and associates: Dražen Radunić BSc, Luka Popović BSc, Ivana Marušić Eng, Drago Doko BSc, Stipe Petričević BSc and Perica Bulić MSc.

Mediterranean fruit fly – *Ceratitis capitata* Wied. (Diptera, Tephritidae) is the most significant economical pest of the cultivated fruit species that are being cultivated in the Neretva river valley, particularly figs, apricots, peaches, nectarines, plums and mandarins. It causes fruit damage of its hosts and it was estimated that direct damages incurred to the mandarins are more than 2 million kunas per year.

Using plant protection products in the pest control represents additional problem because the spraying is being done at the time when the fly lays eggs in fruit, which matches the ripening and harvest time. Out of the whole production, 25 - 27.000 tons of mandarins per year are being exported to the region and the EU countries. Export of the Neretva river valley mandarin to the EU countries implies fruit placement without any pesticide residues. MAFRD recognised this problem and initiated a program for monitoring of appearance and conducting the measures to prevent the spread and to control this pest. Research on its distribution is being done since 2000 with enforcing different tracking methods by the use of traps and attractants. Efficacy of insecticide and biotechnical methods of control was under research and the producers were educated about the biology and pest control methods.

In cooperation with the FAO/IAEA within two projects of technical cooperation (CRO 5002: Feasibility Study of Medfly Suppression by Integrating Sterile Insect Technique in the Neretva River Valley 2007/2008 and RER 5014: Suppressing the Mediterranean Fruit Fly by Integrating Sterile Insect Technique in the Neretva River Valley 2009/2011), preparations for the implementation of this program have started, which includes

provodljivosti metode, edukaciju i trening djelatnika, opremanje specifičnom opremom i nabavku sterilnih populacija.

Prva istraživanja primjene ove metode provedena su tijekom 2008./2009. godine kao dio projekta IAEA Coordinated Research Project: *Improving sterile male performances in fruit fly sterile insect technique programmes, 2005./2009.*, dok su ispuštanja u svrhu suzbijanja na većim površinama započela u travnju 2010. godine.

Od 2010. godine provodi se program suzbijanja ovog štetnika primjenom tehnike SIT u dolini Neretve, na ukupno 1.000 ha, smještenih uz lijevu i desnu obalu male Neretve (350 ha) i lokitetu "Vidrice" (650 ha). Ovo područje karakterizira uzgoj ranih sorata mandarine, ali i značajne površine zasadene su i drugim domaćinima ovog štetnika, poglavito marelice, breskve i smokve.

Kapitalnom investicijom MPRRR-a u Opuzenu je izgrađen i opremljen objekt površine 130 m², za prijem, razvoj, pakiranje i pripremu sterilnih kukaca za oslobođanje u voćnjacima. U objektu su prostorije s mogućnošću stvaranja kontroliranih uvjeta vlažnosti, temperature i provjetravanja, potrebnih za razvoj steriliziranih kukuljica i odraslih muha do dana spolne zrelosti. Tu je i prostor s opremom za provedbu kontrole kvalitete uvezenih sterilnih kukuljica (brojač kukuljica, specifična vaga, pleksiglas kavezi i druga oprema), gdje se svaka pošiljka provjerava nizom obveznih testova, zatim prostori s fluorescentnim mikroskopom i fluorescentnim lampama za razlikovanje sterilnih od prirodnih populacija.

Objekt u Opuzenu je kapaciteta 20 milijuna kukuljica na tjedan, što je dovoljno za provođenje programa suzbijanja na cijelom uzgojnom području doline Neretve. Od sredine travnja 2010. godine dvaput na tjedan se iz tvornice Bio-Fly, Izrael, dopremaju se pošiljke po 950.000 kukuljica steriliziranih kukuljica sredozemne voćne muhe. Nakon razvoja odraslih jedinki, koji traje oko pet dana, sterilni mužjaci se dvaput na tjedan oslobođaju na području općina Opuzen i Slivno (mjesta Vlaka, Crepina, Trn, Otok, Mihalj, Lučina, Tuštevac, Lovorje i Pižinovac te na području Vidrice). Oslobođanje se provodi s tla otvaranjem papirnatih vrećica iz vozila u pokretu te ulaskom u nepristupačne voćnjake. U tijeku je i testiranje prototipa uređaja za automatsko oslobođanje pothlađenih odraslih jedinki, koji je konstruiran i montiran na autoprikolicu.

making economical and technical conductivity studies, education and training of the employees, equipping with specific equipment and procurement of sterile populations.

The first research on applying this method was conducted during 2008/2009 as a part of the IAEA Coordinated Research Project: Improving Sterile Male Performances in Fruit Fly Sterile Insect Technique Programmes, 2005/2009. Releases of the fly, with the purpose of larger areas control, began in April 2010.

From 2010 the program of pest control is being conducted by applying the SIT technique in the Neretva river valley on 1000 hectares positioned by the left and right coast of little Neretva river (350 hectares) and on "Vidrice" locality (650 hectares). This area is characterised by cultivation of early cultivars of mandarin, but also significant surfaces are planted with other hosts of this pest, particularly apricot, peach and fig.

With the capital investment of MAFRD, the facilities were built and equipped in Opuzen on 130m². They are used for reception, development, packing and preparing of sterile insects for release in orchards. Premises of the facilities allow creation of the controlled humidity, temperature and venting environment needed for development of sterile cocoons and adult flies until the day of pubescence. Also, there is a room with the equipment to conduct quality control of imported sterile insects (cocoon counter, specific scale, Perspex cages and other) where every shipment is inspected with the series of mandatory tests; as well as the premises with the fluorescent microscope and fluorescent lamps to distinguish sterile from natural populations.

The Opuzen facilities have the capacity of 20 million insects per week, which is enough to conduct the control program in all breeding areas of the Neretva river valley. Since mid April 2010, parcels with 950 000 sterilised cocoons of Mediterranean fruit fly are delivered twice a week from the factory Bio-Fly (Israel). After the development of adult flies which lasts for about 5 days, sterile males are released twice a week on the areas of Opuzen and Slivno districts (locality Vlaka, Crepina, Trn, Otok, Mihalj, Lučina, Tuštevac, Lovorje and Pižinovac, as well as the Vidrice area). Release is conducted from the ground by opening paper bags from a moving vehicle and entering inaccessible orchards. Currently a

Program provode djelatnici Hrvatskog centra za poljoprivrednu, hranu i selo – Zavoda za zaštitu bilja i Zavoda za maslinarstvo i južne kulture. To se odvija u okviru PPN Ministarstva poljoprivrede, ribarstva i ruralnog razvoja: Sredozemna voćna muha – *Ceratitis capitata* Wiedemann i suzbijanje primjenom tehnike SIT, na temelju Naredbe o poduzimanju mjera za sprječavanje širenja i suzbijanju sredozemne voćne muhe (NN 96/09). Njom se područje doline rijeke Neretve tretira kao područje od posebnoga gospodarskog značaja, za koje Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja donosi poseban program suzbijanja sredozemne voćne muhe, što ga ostvaruje Hrvatski centar za poljoprivrednu, hranu i selo.

Učinkovitost suzbijanja provodi se ocjenom zaraze plodova domaćina, koji se stavljuju na razvoj u laboratorijske uvjete i kontroliraju na nazočnost ličinki/kilogramu ploda. Također, upotreboom kontrolnih lovki prati se pojava ženki iz prirodnih populacija te odnos oslobođenih sterilnih mužjaka i mužjaka iz prirodne populacije. Osnovom rezultata ulova izračunava se odnos FTD sterilni: FTD prirodni (FTD - flies/trap/day).

S obzirom da je taj program tehničke suradnje s FAO/IAEA-om regionalnoga karaktera te u njemu sudjeluju kolege iz susjedne Bosne i Hercegovine, planira se proširenje programa na područje doline Neretve u ovoj susjednoj državi.



Slika 71. dr.sc. Mario Bjeliš – voditelj projekta i pomoćnik ravnateljice HCPHS
Figure 71 Mario Bjeliš PhD – Project Leader and Assistant Director of CCAFRA

prototype device for automatic release of cooled adults is being tested, which is constructed and assembled on a car trailer.

*The program is being conducted by the employees of the Croatian Centre for Agriculture, Food and Rural Affairs, Institute for Plant Protection and the Institute of Olive Growing and Southern Crops, which is carried out within a survey of MAFRD: Mediterranean fruit fly – *Ceratitis capitata*, Wiedemann and pest control by using SIT technique, based on the Directive on taking measures to prevent the spread and control of Mediterranean fruit fly (Official Gazette 96/09). Hereby, the area of the Neretva river valley is treated as an area of particular economic importance for which MAFRD is establishing a special program of control of Mediterranean fruit fly, implemented by the Croatian Centre for Agriculture, Food and Rural Affairs.*

The effectiveness of pest control is carried out with infection assessment of the host fruit, which are placed to be developed under laboratory conditions and are controlled for the presence of larvae/kg of fruit. Also, by using control traps, the appearance of females in natural populations is monitored and the ratio of released sterile males and males in natural populations. Based on the results of the catch, the ratio of sterile FTD to natural FTD (FTD - flies/trap/day) is calculated. Since the program of technical cooperation with the FAO/IAEA is of a regional character and also the colleagues from Bosnia and Herzegovina are participating, it is planned to expand it to the area of the Neretva river valley in this neighbouring country as well.



Slika 72. Imago sredozemne voćne muhe

Figure 72 Adult of Mediterranean fruit fly



Slika 73. Plod mandarine zaražen ličinkama sredozemne voćne muhe

Figure 73 Mandarin fruit infected with Mediterranean fruit fly larvae



Slika 74. Lokalitet Vidrice na kojem se provodi program suzbijanja

Figure 74 Vidrice pilot area of medfly suppression



Slika 75. Soba za razvoj - Pakiranje kukuljica u papirnate vrećice

Figure 75 Emergency room – packing of sterile pupae in paper bags



Slika 76. Test kompetitivnosti u poljskim kavezima

Figure 76 Matting competitiveness tests in field cages



Slika 77. Djelatnici HCPHS-a koji rade na programu

Figure 77 Employees of the CCAFRA in program activities



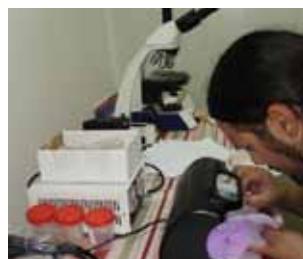
Slika 78. Laboratorij za kontrolu kvalitete

Figure 78 Quality control laboratory



Slika 79. Lovke za praćenje prirodnih i sterilnih jedinki

Figure 79 Traps for monitoring of sterile and wild flies



Slika 80. Kontrola ulova pod UV lampom i fluorescentnim mikroskopom

Figure 80 Control of fly captures under UV lamp and fluorescent microscope

2.3.5.2. IPA 2007. "Daljnje jačanje kapaciteta u području sredstava za zaštitu bilja i ostataka pesticida (SZB)"

Projekt IPA 2007 twinning nastavak je već provedenih projekata CARDS 2002 i CARDS 2004. Na projektu CARDS 2002 "Jačanje kapaciteta u području poljoprivrede, živilih životinja i prehrabnenih proizvoda" sudjelovalo je 6 stručnjaka iz Zavoda za zaštitu bilja. Tijekom ovog projekta stručnjaci su prvi put upoznati s ocjenjivanjem dokumentacije u postupku registracije SZB-a prema Direktivi Europske unije 91/414/EEC, a edukacija je pokrivala pet područja ocjene dokumentacije sredstva za zaštitu bilja: fizikalno – kemijska svojstva, ostaci pesticida, ponašanje u okolišu, ekotoksičologija i učinkovitost.

Tijekom projekta CARDS 2004 "Daljnje jačanje kapaciteta u području sredstava za zaštitu bilja" koji se nastavio na projekt CARDS 2002, educirano je 12 stručnjaka Zavoda, a edukacija je pokrivala osim već spomenutih područja ocjene dokumentacije sredstva za zaštitu bilja i jedno novo - izložnost primjenitelja.

Cilj projekta IPA 2007 je jačanje institucionalnih i administrativnih kapaciteta Republike Hrvatske u području sredstva za zaštitu bilja i ostataka pesticida kao završna priprema prije ulaska u Europsku uniju, kako bi se učvrstila kontrola nad sredstvima za zaštitu bilja i osigurala zaštita ljudskog zdravlja, okoliša i potrošača. U ovaj projekt uključeno je 16 stručnjaka Zavoda koji će se educirati ne samo iz područja ocjenjivanja dokumentacije sredstva za zaštitu bilja, nego će se obuhvatiti i područje postregistracijske kontrole.

Stručnjaci Zavoda su jedini u Hrvatskoj sposobljeni za provođenje registracije sredstva za zaštitu bilja sukladno zahtjevima Europske unije i njezinom zakonodavstvu. Svoja znanja, jedinstvena u Hrvatskoj, stekli su tijekom već provedenih projekata CARDS 2002 i CARDS 2004, a usavršit će ih tijekom projekta IPA 2007.

Ovim projektom, ali i u okviru drugih aktivnosti, radi se na potpunom usklađivanju sa zakonodavstvom EU-a iz područja

2.3.5.2. IPA 2007 "Further Strengthening of Capacities in the Field of Plant Protection Products and Pesticide Residues (PPP)"

Twinning project IPA 2007 is the extension of already conducted projects CARDS 2002 and CARDS 2004. Six specialists from Plant Protection Institute participated in the CARDS 2002 project "Strengthening of Capacities in Fields of Agriculture, Live Animals and Food Products". During this project specialists were first introduced to documentation evaluation in the registration process of plant protection products according to EC Directive 91/414/EEC. Education covered five areas of documentation evaluation in the registration process of PPP: physical and chemical features, pesticide residues, environmental behaviour, ecotoxicology and efficacy.

During the CARDS 2004 project "Further Strengthening of Capacities in the Field of Plant Protection Products and Pesticide Residues" which followed up CARDS 2002 project, 12 specialists from the Institute were educated. In addition to the aforementioned areas of documentation evaluation of plant protection products, education covered one new area - exposure of the user.

The objective of the IPA 2007 project is strengthening of the institutional and administrative capacities of the Republic of Croatia in the area of plant protection products and pesticide residues, as a final preparation before entering the European Union, in order to consolidate control over plant protection products and to ensure the protection of human health, the environment and consumers. 16 specialists of the Institute are participating in this project and will be trained, not only in the field of documentation evaluation of plant protection products, but will also cover the area of post-registration control.

In Croatia, specialists of the Institute are the only ones trained to conduct the registration of plant protection products in accordance with the requirements of the European Union and its legislation. Their knowledge, unique in Croatia, was gained

sredstava za zaštitu bilja. Time će se omogućiti učinkovito sudjelovanje Hrvatske u svim aspektima procesa evaluacije novih i postojećih aktivnih tvari u Europskoj uniji, sukladno njezinim zakonima, re-registracija postojećih sredstva za zaštitu bilja te izdavanje novih rješenja o registraciji na nacionalnoj razini u skladu sa svim zakonskim zahtjevima EU-a te provedba postregistracijske kontrole.

U projektu sudjeluju: Ministarstvo poljoprivrede, ribarstva i ruralnog razvoja, Hrvatski centar za poljoprivrodu, hranu i selo – Zavod za zaštitu bilja, Institut za medicinska istraživanja i medicinu rada, Hrvatski zavod za javno zdravstvo, Uprava za sanitarnu inspekciju, Ministarstvo zdravstva i socijalne skrbi i Hrvatska agencija za hranu.

2.4. Sažetak

Zaštita bilja u davnoj prošlosti oslanjala se samo na iskuštvene spoznaje. Čovjek je baveći se poljoprivredom uočavao štete i gubitke te slučajno uspio suzbiti štetne organizme. Postupno razvojem poljoprivredne proizvodnje, prometa roba i ljudi šire se štetni organizmi i povećavaju štete. Najveće zabilježene štete u 19. stoljeću na poljoprivrednim kulturama, koje su čak uzrokovale iseljavanje stanovništva, su plamenjača krumpira u Irskoj i trsov ušenac – filoksera na domaćoj lozi zbog čega su se iseljavali naši otočani i do danas su nam otoci ostali rijetko naseljeni. Kao i u mnogim drugim prilikama, entuzijasti su počeli bilježiti uvjete koji su utjecali na pojавu i širenje nekog štetnog organizma. Stoga se pokazala potreba osnivanja institucije koja bi to mogla obavljati i na stručnoj i znanstvenoj razini, pa se osnivanje Entomološke sekcije 3. veljače 1909. razumijeva kao danom osnivanja prve institucije u jugoistočnom dijelu Europe, koja će tijekom idućih stotinu godina, samostalna ili u sklopu drugih institucija, aktivno sudjelovati u pronalaženju štetnih organizama i njihovom suzbijanju, registraciji sredstava za zaštitu bilja, obrazovanju te drugim poslovima važnim za biljno zdravstvo.

Važni poslovi vezani su uz pronalaženje štetnih organizama u suradnji s Fitosanitarnom inspekcijom Ministarstva poljo-

during the already conducted projects CARDS 2002 and CARDS 2004, and will be improved during the IPA 2007 project.

With this project, but also within other activities, complete alignment with EU legislation in the field of plant protection products is being worked on. This will enable Croatia's effective participation in all aspects of the evaluation process of new and existing active substances in the European Union, in accordance with its laws, re-registration of existing pesticides and the issuance of new decisions on the registration at the national level, in accordance with all legal requirements of the EU and implementation of a post-registration control.

Participants of the project are: Ministry of Agriculture, Fisheries and Rural Development, Croatian Centre for Agriculture, Food and Rural Affairs – Institute for Plant Protection, Institute for Medical Research and Occupational Health, Croatian National Institute of Public Health, Department for Sanitary Inspection of the Ministry of Health and Social Care and the Croatian Food Agency.

2.4. Summary

In the past, Plant Protection relied only on the empirical knowledge. Dealing with agriculture, man noticed damages and losses and accidentally managed to suppress harmful organisms. With the gradual development of the agricultural production and trade of goods among people, harmful organisms are being spread and the damages are being increased. The highest recorded damage on the crops in the 19th century, which has even caused the emigration of the people, were Potato blight in Ireland and Grape phylloxera on domestic grapevine, which caused the emigration of our islanders. Until today, our islands remained poorly populated. As in many other issues, enthusiasts have begun to record the conditions that influenced on the appearance and spreading of the harmful organisms. Therefore, a need to establish an institution that could perform it on the professional and scientific level had shown itself. The establishment of the Entomological Section on the 3rd of February 1909 is considered the day that the first institution in south-east Europe was established. In the

privrede, ribarstva i ruralnog razvoja. U posljednjih desetak godina stručnjaci Zavoda pronašli su i potvrdili nalaze više štetnih organizama. Neki od njih su: kukaci - *Bemisia tabaci*, *Liriomyza huidobrensis*, *Ceratitis capitata*, *Anoplophora chinensis*, *Dryocosmus kuriphilus*, *Rhagoletis completa*, *Rhagoletis cingulata*, *Tuta absoluta*, gljive - *Phytophthora ramorum*, bakterije - *Erwinia amylovora*, virusi - PPV, PepMV i PSTVd, fitoplazme - bois noir, aster yellows te flavescence dorée kao i vektori fitoplazmi *Hyalesthes obsoletus* i *Scaphoideus titanus* na raznim lokalitetima u Hrvatskoj. Već nekoliko godina prati se proširenje *Globodera rostochiensis*, *Globodera pallida* i *Diabrotica virgifera virgifera*. Pozornost je usmjerena i na invazivne korove pridošlice s EPPO liste pa je tijekom 4 godine nađeno već 13 vrsta korova: *Ailanthus altissima*, *Amorpha fruticosa*, *Bidens frondosa*, *Buddleja davidii*, *Carpobrotus acinaciformis*, *Cortaderia selloana*, *Helianthus tuberosus*, *Impatiens glandulifera*, *Lupinus polyphyllus*, *Reynoutria (Fallopia) japonica*, *Solidago canadensis*, *Solidago gigantea* i *Solanum elaeagnifolium*, dok je istraživanje nazočnosti *Ambrosia artemisiifolia* obavljanu u ranijim projektima.

To zasigurno nije konačan broj pronađenih štetnih organizama u Hrvatskoj, jer istraživanja kojima se želi pronaći štetne organizme karantenske važnosti nastavljaju se i bit će važna i u budućnosti i nakon ulaska u EU.

Izvještajno prognozni poslovi su nakon višegodišnje stanke nastavljeni 2001. godine te je do 2009. upisano 12964 obavijesti, objavljeno 553 prognoze na republičkoj razini te 13772 na regionalnoj razini. Održano je 179 predavanja za subjekte uključene u poslove zaštite bilja. Ti poslovi pružaju informacije o nalazima i proširenosti gospodarski štetnih organizama u Hrvatskoj što je važno za smanjenje gubitaka u poljoprivrednoj proizvodnji i uskladištenju poljoprivrednih proizvoda.

Istraživanja biološke učinkovitosti te fizikalno-kemijskih svojstva sredstava za zaštitu bilja kojima se predlagalo koja sredstva će biti registrirana za primjenu u Hrvatskoj imaju svoje korijene u dvadesetim godinama dvadesetog stoljeća. Posebno važna su bila istraživanja od 1953. do 2008. jer su tijekom tog razdoblja gotovo sva registrirana sredstva za

next one hundred years, autonomous or within other institutions, it will actively participate in finding harmful organisms and in their control, registration of the plant protection products, education and other activities relevant to the plant health.

*Important tasks are related to the finding of harmful organisms in collaboration with the Phytosanitary Inspection of the Ministry of Agriculture, Fisheries and Rural Development. In the last ten years experts of the Institute found and confirmed their findings of numerous harmful organisms: Insects - *Bemisia tabaci*, *Liriomyza huidobrensis*, *Ceratitis capitata*, *Anoplophora chinensis*, *Dryocosmus kuriphilus*, *Rhagoletis completa*, *Rhagoletis cingulata* and *Tuta absoluta*; Fungi - *Phytophthora ramorum*; Bacteria - *Erwinia amylovora*; Viruses - PPV, PepMV and PSTVd; Phytoplasmas - bois noir, aster yellows and flavescence dorée, as well as the Phytoplasmas Vectors - *Hyalesthes obsoletus* and *Scaphoideus titanus*, at different locations in Croatia. For several years now the expansion of *Globodera rostochiensis*, *Globodera pallida* and *Diabrotica virgifera virgifera* is being followed. Attention is also directed on the alien weeds, so during the four years 13 species of weeds were already found: *Ailanthus altissima*, *Amorpha fruticosa*, *Bidens frondosa*, *Buddleja davidii*, *Carpobrotus acinaciformis*, *Cortaderia selloana*, *Helianthus tuberosus*, *Impatiens glandulifera*, *Lupinus polyphyllus*, *Reynoutria (Fallopia) japonica*, *Solidago canadensis*, *Solidago gigantea* and *Solanum elaeagnifolium*, while the research on *Ambrosia artemisiifolia* was performed in earlier projects.*

The number of harmful organisms found in Croatia is surely not final because the researches that aim to find harmful organisms of the quarantine importance will continue and will stay important in the future, even after joining the EU.

After a long period of break, reporting and early warning system were continued in 2001. Up until 2009, 12,964 notifications were written, 553 forecasts at the national level and 13,772 on the regional level were published. 179 lectures for subjects involved in the plant protection tasks were held. These tasks provide information on the findings and the extent of the economically harmful organisms in Croatia, which is important for the reduction of losses in the agricultural production and storage of the agricultural products.

zaštitu bilja istraživana u Zavodu. Uskladijanjem hrvatskih propisa s onima EU sada se obavlja ocjena dokumentacije sredstava za zaštitu bilja prema jedinstvenim načelima i to: identitet i fizikalno-kemijska svojstva aktivnih tvari i pripravaka, učinkovitost, ekotoksikologija, ponašanje u okolišu, ostaci pesticida u hrani i hrani za životinje, toksikologija sisavaca i izloženost primjenitelja, radnika i drugih nazočnih osoba. Također postupak ocjenjivanja dokumentacije sredstava za zaštitu bilja važan je jer će se i nakon ulaska u EU morati obavljati registracija sredstava prema tim načelima.

Mnogo godina su bili važni istraživački projekti s ministarstvom poljoprivrede SAD, a danas su to s međunarodnim agencijama ili institucijama koje omogućuju istraživanja kao što su uvođenje SIT tehnike ili usavršavanja znanja iz područja registracije sredstava za zaštitu bilja i dijagnostike štetnih organizama. Ulaskom u EU bit će omogućena istraživanja na projektima sa srodnim institucijama.

U Zavodu je prihvaćen suvremen pristup prijenosa znanja sudjelovanjem na radionicama, stručnim i znanstvenim skupovima te predavanjima za usavršavanje znanja zaposlenika u poljoprivrednim ljekarnama, stručnjaka fitosanitarne inspekcije, stručnjacima Hrvatskog zavoda za poljoprivrednu savjetodavnu službu i drugih sudionika u biljnem zdravstvu.

Studies of biological efficacy and physico-chemical properties of the plant protection products, with which it was suggested which products would be registered for application in Croatia, started in the 1920s. Researches that were being done from 1953 until 2008 were of particular importance, because during that period almost all registered plant protection products were being researched at the Institute. With the adjustment of Croatian legislation to the EU, the assessment of the documentation of plant protection products is now being done according to uniform principles: identity and physico-chemical features of active substances and preparations, efficacy, ecotoxicology, behaviour in the environment, residues of pesticides in the food and in the animal food, mammal toxicology and exposure of the applicator, employees and other persons present. Such procedure in documentation assessment of the plant protection products is very important because even after joining the EU the registration will have to be done by these principles.

For many years, Research Projects in cooperation with the Ministry of Agriculture of the United States of America were of great importance. Today, they are being done with international agencies or institutions which enable researches like implementation of the SIT technique or development of knowledge on registration of the plant protection products or diagnostics of harmful organisms. By joining the EU, researches on the projects with the similar institutions will be possible.

The Institute has adopted a modern approach of the transfer of knowledge by participating in workshops, professional and scientific assemblies and lectures for the development of knowledge of the employees in the agricultural chemist, phytosanitary inspection experts, experts of the Croatian Agricultural Extension Institute and other participants in the area of the plant health.

2.5. Pogovor

Zavod za zaštitu bilja oduvijek je njegovao tradiciju znanstvenog i stručnog napretka svakog stručnjaka. Tako se to nastavlja i danas stjecanjem magistarskih i doktorskih zvanja te specijalizacijama iz djelokruga rada u europskim i svjetski priznatim institucijama. U Zavodu danas radi 7 doktora znanosti, 7 magistra znanosti, 12 diplomiranih inženjera, 1 inženjer te 9-ero tehničkog i administrativnog osoblja. Svakako treba istaknuti da je u ovom trenutku 12-ero naših stručnjaka na doktorskom studiju i jedan na magistarskom te da će to u budućnosti još više podići razinu kvalitete Zavoda.

Tijekom zadnjih 10 godina, stručnjaci Zavoda kroz svoja istraživanja u sklopu doktorskih i magistarskih studija, programa posebnog nadzora, izvještajno prognoznih poslova, a vrlo često vlastitim entuzijazmom, otkrili su preko 150 novih štetnih organizama za Republiku Hrvatsku. Time su dali neprocjenjiv doprinos struci.

Tijekom mnogobrojnih specijalizacija stručnjaka Zavoda u zemlji i inozemstvu, kao i razmjenom znanja i rezultata istraživanja, uspostavljena je suradnja s velikim brojem stručnjaka iz eminentnih ustanova što je doprinijelo i doprinosi kvaliteti Zavoda.

Preuzimanjem propisa EU te fitosanitarnih standarda koji služe za praktičnu primjenu odredbi propisa na terenu, zahtjevi za kontinuiranim usvajanjem novih znanja i vještina stručnjaka Zavoda stalno rastu. Uz to, stalno unaprjeđenje sofisticirane tehnologije, laboratorijskih uređaja, novih metoda determinacija, kompleksnih softverskih aplikacija podrazumijevaju kontinuirano ulaganje u izobrazbu stručnjaka Zavoda kako bi mogli slijediti svjetske trendove i pružati ciljanim skupinama adekvatne stručne usluge. Zavod je vrlo uspješno sudjelovao i u prilagodbi procesa u fitosanitarnom području u poglavljju 12. kroz većinu svojih redovitih djelatnosti s kojima će nastaviti i nakon ulaska u EU.

2.5. Afterword

The Institute for Plant Protection has always nurtured a tradition of scientific and professional progress of each specialist. So it continues today, through acquiring of Master's and Doctoral degrees and specializations within the domain of work in acknowledged institutions in Europe and in the world. 7 PhD's, 7 Masters of Science, 12 Bachelors of Science, 1 engineer and 9 of the technical and administrative staff are currently working at the Institute today. It should certainly be noted that right now 12 of our experts are attending their Doctoral studies and 1 is attending the Master's study, which will raise the quality of the Institute even more in the future.

During the last 10 years, experts of the Institute for Plant Protection through their researches within Doctoral and Masters Studies, surveys, reporting and early warning system and very often with their own enthusiasm have detected over 150 new harmful organisms in the Republic of Croatia. Herewith they provided an invaluable contribution to the profession.

During numerous specializations of the experts of the Institute, in Croatia and abroad, as well as with the exchange of knowledge and research results, cooperation has been established with a large number of experts from renowned institutions. This also contributed and contributes to the quality of the Institute.

By taking over the EU regulations and phytosanitary standards, used for the practical application of the provisions on site, the requirements for continued adoption of new knowledge and skills of experts of the Institute is constantly growing. In addition, the continuous improvement of sophisticated technology, laboratory equipment, new methods of determination and complex software applications imply continuous investment in education of the specialists of the Institute in order to follow world trends and provide adequate professional services to the target groups. The Institute has successfully participated in the adjustment process in the phytosanitary field in Chapter 12 through most of its regular activities which will continue even after joining the EU.

Because of the need for adjustment with the EU, the span of tasks has been increased and the structure of the operations

Unatrag par godina, zbog potrebe za usklađivanjem s EU, po-većan je opseg i promijenjena je struktura poslova koje obavlja Zavod. Uslijed sveukupne gospodarske situacije u zemlji, ograničeno je raspolaganje ljudskim i materijalnim resursima. Iz tog razloga stručnjaci Zavoda primorani su na multidisciplinarnost u smislu obavljanja poslova u više Odjela.

Zavod je oduvijek njegovao i njeguje još jednu tradiciju. To je rijetko viđena kolegijalnost i harmonija između djelatnika ove institucije. Tako je to i danas. Nesebično prenošenje znanja na mlađe kolege kao i razmjena iskustava, osobito u multidisciplinarnim zadacima, osobine su koje krase radnu atmosferu ovog Zavoda. Povremeni zajednički izleti i okupljanja doprinose jačanju duha naše skladne zajednice.

I za kraj želimo istaknuti da smo iznimno ponosni što smo dio stoljetne tradicije prve specijalističke institucije za poslove takve vrste u jugoistočnom dijelu Europe te ćemo se truditi i dalje ostati na zacrtanom pravcu uvaženih nam prethodnika!

v.d. predstojnica Zavoda za zaštitu bilja
dr.sc. Tatjana Masten Milek

performed by the Institute was changed, few years back. Due to the overall economic situation in the country, available human and material resources are limited. Therefore, the experts of the Institute are forced to multi-disciplinary tasks, in terms of performing tasks in many departments.

The Institute has always cherished and nurtured another tradition: rarely seen collegiality and harmony between the employees of this institution. And so it is today. Generous transfer of knowledge to younger colleagues and exchange of experiences, especially in multi-disciplinary tasks, are the features that adorn the working atmosphere of this Institute. Occasional joint excursions and gatherings contribute to the strengthening of the spirit of our harmonious community.

In the end, we would like to emphasize that we are very proud to be a part of the centennial tradition of the first institution specialized in activities of such kind in the south-east Europe and that we will try to stay on the course set by our reputable forerunners.

*Acting Head of the Institute for Plant Protection
Tatjana Masten Milek PhD*

Dodatak pogovoru



Priznanje povodom 95. godišnjice postojanja Zavoda
Recognition honoring 95 years of the Institute

Addition to afterword



Seminar biljne zaštite – Opatija 2004.
Plant protection seminar – Opatija 2004



Božićni ručak 2009.
Christmas dinner 2009



Smiljan Kraljević dipl.ing. i Darko Jelković dipl.ing.
Smiljan Kraljević BSc and Darko Jelković BSc



Božićni ručak 2009.
Christmas dinner 2009



Izlet u dolinu Neretve 2008.
Trip to Neretva valley 2008



Izlet u Zagorje 2010.

Trip to Zagorje 2010



Djelatnici ZZB s poslovnim suradnicima – Rim

Employees of PPI with business associates – Rim

2.6. Bibliografija stručnjaka Zavoda za zaštitu bilja

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