Estimate of inbreeding depression of the birth weight in the population of Pag sheep breed

ANTE KASAP¹, JELENA RAMLJAK¹, BARTOL SMUTNI¹, MARIJA ŠPEHAR²

¹University of Zagreb. Faculty of Agriculture. Svetošimunska 25. 10000 Zagreb. Croatia; ²Croatian Agency for Agriculture and Food. Svetošimunska 25. 10000 Zagreb. Croatia









IV. International Applied Statistics Congress I 25-29 September 2023 I Sarajevo

Pag sheep

Croatian local (native) breed / Population size ~ 30 000 (CAAF) DAIRY breed (Wool – historical imortance)

Very well adapted to carst area and scarce pasture



Pag sheep

~ 0.8 Kg milk/day / Lactation: 5 months
Products: on: fresh milk, cheese, curd cheese, fresh meat
• Tourism - gastronomic offer



Pag sheep

Breeding goal: To increase milk yield •~ 4 500 sheep under selection Pedigree + Milk control (ICAR) Pedigree BLUP \rightarrow Single step GBLUP OCS – optimum contribution selection





Aim of the study

- **1) Coefficient of inbreeding (** F_{ped} **)** \rightarrow the probability that two alleles at any locus are "identical by descent" (IBD)
- important for posing restrictions in mating plans in OCS
- 2) Inbreeding depression \rightarrow regression of birth weight on coefficient of inbreeding (F_{ped})

Materials and methods – F_{ped}

Croatian Ministry of Agriculture Croatian Agency for Food and Agriculture



Pedigree \rightarrow n= ~ 282 000 animals born from 1981 to 2019

F_{ped} → OptiSel package in R software (Wellmann, 2021.)

Materials and methods – inbreeding depression

Pedigree QC \rightarrow NFG \geq 3 & born after 2010

~ 15200 lambs with known birth weight and Fped

Three-way ANCOVA Birth weigth ~ F_{ped} + Parity + Litter size +Sex



Results – coefficient of inbreeding

Class of F _{PED}	Percent (%)
0.0000-0.0875	76.4
0.0875-0.1750	17.1
0.1750-0.2625	4.2
0.2625-0.3500	2.2
0.3500-0.4375	0.1
Total	100



Distribution of the coefficient of inbreeding (F_{PFD})

Average F = 6%

Results – inbreeding depression



Discussion

Presence of the inbreeding depression on body weight

 $\beta 1 = -0.005 \text{ kg}$ (for every 10% increase in F_{PED} we can expect decrease of body weight for 0.05 kg)

It is possible that the coefficient was $\beta 1$ underestimated due to the small number of individuals with high F_{PED}



Conclusion

Carefully conduct mating plans

Needs for the more accurate estimation

 Include parameter of genomic inbreeding coefficient in futeure analysis in single step GBLUP analysis



The research supported by Croatian Science Foundation. Project: *Genomic characterization, preservation, and optimum contribution selection of Croatian dairy sheep (OPTI-SHEEP). Grant number IP-2019-04-3559*



Thank You for Your attention !