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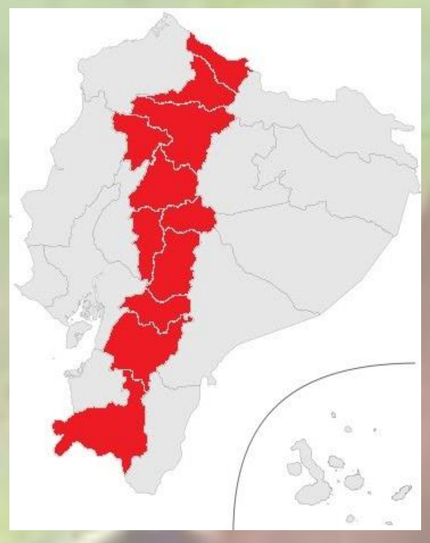
Analysis of Ecuadorian Montbeliarde dairy cattle population revealed an increased inbreeding rate and genetic diversity loss

Luis F. Cartuche-Macas[1], Edilberto Chacón[2], Miguel M. Gutiérrez-Reinoso[2], Manuel García-Herreros[3,4]
[1] Asociación Holstein Friesian del Ecuador, Ecuador
[2] Medicina Veterinaria, Universidad Técnica de Cotopaxi, Ecuador
[3] Instituto Nacional de Investigação Agrária e Veterinária (INIAV), Portugal
[4] CIISA-AL4AnimalS, Faculty of Veterinary Medicine, University of Lisbon, Portugal

INTRODUCTION & AIM

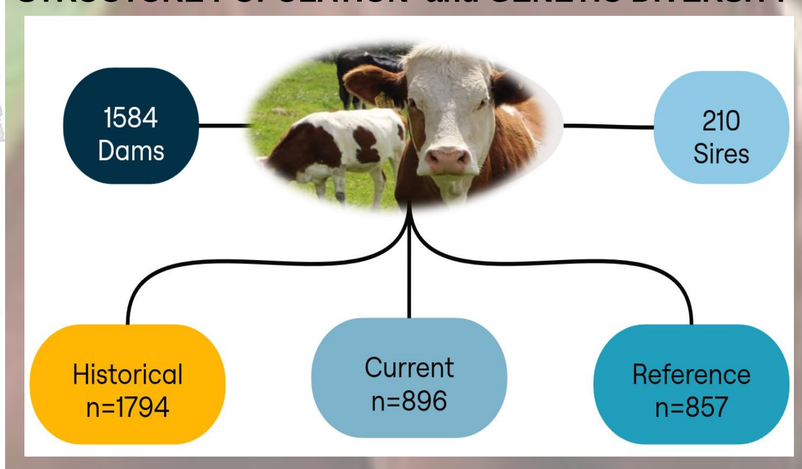
The introduction of the Montbeliarde dairy breed in Ecuador started in the 1990s with the objective of improving the production performance of other dairy breeds. Pedigree information has been widely used to assess the status of genetic diversity in cattle populations. The objective of this study was to analyze the population structure, inbreeding and genetic diversity of the Montbeliarde breed using official pedigree information.

MATERIAL & METHODS



Ecuadorian Highlands
2800-3400 m.a.s.l.

STRUCTURE POPULATION and GENETIC DIVERSITY



ENDOG

POPREP

Population structure: pedigree completeness index (PCI), number of equivalent (GEq), complete (GCom) and maximum (GMax) generations and generation interval (GI).
Genetic diversity: inbreeding (F), inbreeding increment (ΔF), average relatedness (AR), co-ancestry (C), Non-random mating (α), effective population size (Ne) and genetic conservation index (GCI).
Gene origin probability: number of founders (f), effective number of founders (fe) and ancestors (fa), number of equivalent genomes (fg), fe/fa and fg/fa ratio and DG losses.

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RESULTS & DISCUSSION

Population structure
PCI in the historical population compared to the current population increased from 89.1 to 96.7% (sire pathway) and from 48.5 to 53.4% (dam pathway)
GI increased from 7.2 to 7.9 years in the historical and current population, respectively.

Genetic diversity:

The F=1.53%, AR=2.91%, ΔF= 0.14%, C= 1.46%, α=-0.0094; GCI=3.65, and Ne= 56 (2014) values were obtained.

Gene origin probability

Parameters	Reference population
Current population	896
Number of ancestors, n	246
fa/fe ratio	3.48
fg/fe ratio	0.31
Ancestors explaining 25 % of the gene pool (n)	4
Ancestors explaining 50 % of the gene pool (n)	10

The f=372, fa=35, fe=121.71, fg=38.06 showing a GD loss due to unequal contribution of founders (0.41%) and bottleneck and genetic drift (1.31%). The genetic contributors to the population are dominated by Gardian, 6.35% (1), Faucon 5.99% (2), and Micmac, 5.95% (3).

Genetic Diversity Loss
Genetic Diversity Loss due to bottlenecks and genetic drift since founders and Genetic Diversity Loss due to the unequal contribution of founders were 1.78% and 0.44%, respectively.

CONCLUSION

Ecuadorian Montbeliarde cattle population displayed a relatively low diversity and quite high genetic relationship. Inbreeding level of the population increased over time. The introduction of new purebred bloodlines is important to minimize the inbreeding levels ensuring the long-term conservation of this breed to prevent the GD loss.