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Implementation of longevity genetic index in Italian Jersey

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Introduction

Longevity plays a relevant role in the **profit** of a dairy herd, but also on **animal welfare**.

Aim: to estimate genetic correlation with other Italian phenotypes and to estimate a genetic selection index for this trait in Italian Jersey population.

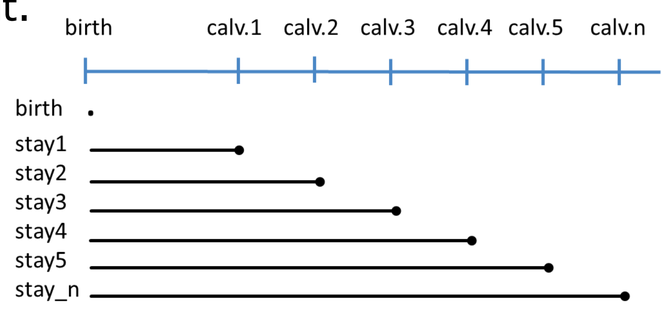
Material and methods

Dataset: 15,550 Italian Jersey cows

Data editing:

- Calving date from 1996 to 2018
- Calving intervals: 240d to 700d
- Sires with at least 3 daughters, herds with at least 3 cows and at least 2 sires
- Age at first calving: 18 to 36 months
- 1 as survived cow, 0 not survived cow
- Information from type traits evaluations (9,706 animals)

Approach: stay-ability, which is a binary trait for success or failure to remain in the herd until a given time point.



STAY was analysed using the following linear animal model

$$STAY = HY + a + e$$

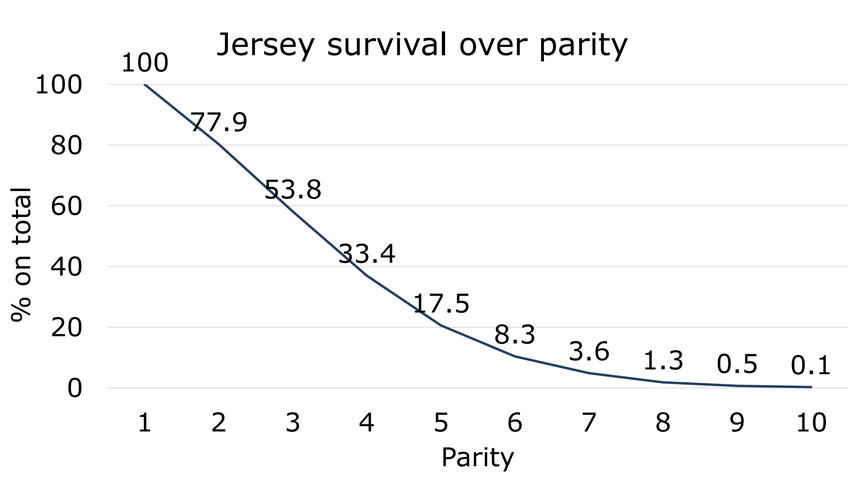
HY = random, effect of herd-year of first calving;
a = random, additive genetic effect;
e = random error.

Genetic parameters estimation → THRGIBBS1F90
Post-Gibbs analysis → POSTGIBBSF90
Breeding values estimation → MiX99 software

EBVs are standardized to average 100 ± 5.

Results

Figure 1. Phenotypic survival curve over parity.



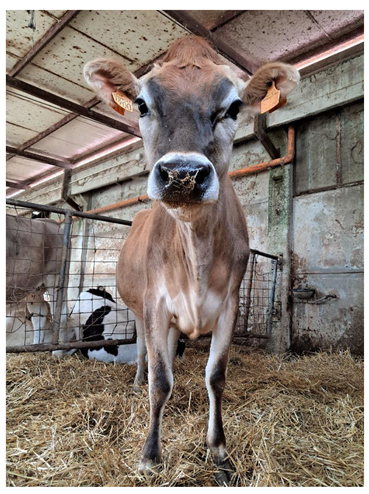


Table 1. Heritability and phenotypic variation of contemporary group.

	h^2 (C.I.)	HY (C.I.)
stay2	0.094 (0.069; 0.116)	0.041 (0.040; 0.043)
stay3	0.101 (0.077; 0.124)	0.123 (0.119; 0.127)
stay4	0.110 (0.086; 0.134)	0.152 (0.148; 0.157)

Table 2. Bulls' daughter's stay-ability rate (DSR) for bulls' EBV classes for stay4.

Bull's EBVs category	DSR – stay4
EBVs < 95	21.79%
95 <= EBVs <= 105	34.94%
EBVs > 105	45.50%

Table 3. Phenotypic and genetic correlations between type traits and stay-ability (in bold significative ones).

	Phenotypic correlations			Genetic correlations		
	stay2	stay3	stay4	stay2	stay3	stay4
Foot angle	**0.048**	**0.056**	**0.041**	0.208	**0.309**	0.277
Fore udder attachment	**0.059**	**0.080**	**0.056**	**0.432**	**0.499**	**0.325**
Rear udder height	**0.039**	**0.055**	**0.039**	0.276	**0.461**	0.104
Udder support	**0.036**	**0.055**	**0.041**	0.253	**0.316**	-0.010
Udder depth	**0.289**	**0.076**	**0.094**	0.426	**0.468**	0.409

Discussion

- h^2 aligned with literature, from 0.02 to 0.20 *(Schuster et al., 2020; Hardie et al., 2021, Khansefid et al., 2023; Nascimiento et al., 2023)*
- Based on DSR, using high EBVs bulls can enhance longevity in Italian Jersey population
- The most correlated trait with stay-ability is fore udder attachment; this can influence the cattle survival in herds

Conclusion

- Selection based on longevity index can be applied
- Balancing genetic progress, longevity of the animal and its welfare could lead to a better profit for the farmer