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Effect of curve traits and Age at first calving on productive life of Holstein primiparous Walloon cows

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Longevity, productive life, or lifespan of dairy cattle defined as the time from first calving to culling, death or sale, is an important and ambiguous trait resulting from many factors.

Objectives

Linking cow's longevity to lactation curve characteristics and age at first calving.

Data

- **Lactation curve traits for milk provided by the Walloon Breeding Association**
- **20.766 primiparous Holstein cows calving from 2003 to 2014**
- **395 herds (> 50cows)**

Model

Linear model :

$$LPL_{ijkmpnoq} = \mu + H_i + CY_j + CS_k + AFC_m + M305_P + \beta 1\, PS_n + \beta 2\, Pk_o + \beta 3\, DIM_q + e_{ijkmpnoq}$$

$LPL_{ijkmpnoq}$: length of productive life, μ overall mean

H_i, Cy_j , CS_k and ***AFC_m*** fixed effects of i^{th}herd, j^{th} year of calving , k^{th} calving season and age at first calving (AFC=C1 to C10)

***$M305_P$*,PS_n,*Pk_o*, DIM_q** fixed effects of Milk Yield adjusted to 305 days (M305d= L1 to L4), persistency, peak and days in milk.

β1, β2,β3 Regression coefficients **,e** residual effect with $e_{ijkmpnoq} \sim N(0, \sigma_e^2)$.

Results and discussion

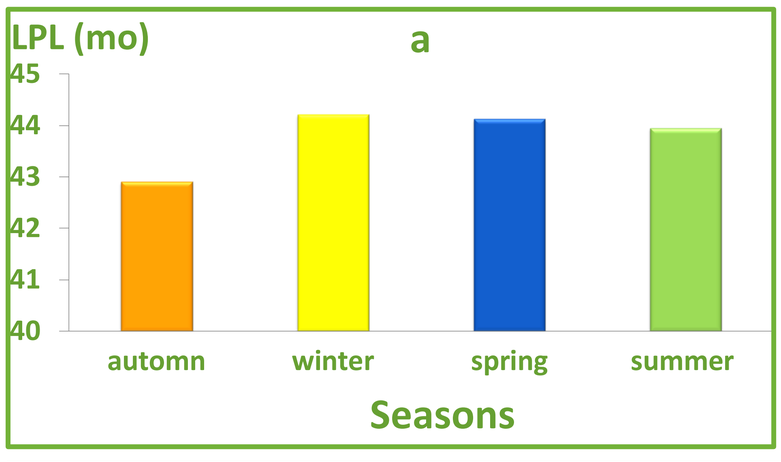
Table 1 : descriptive statistics

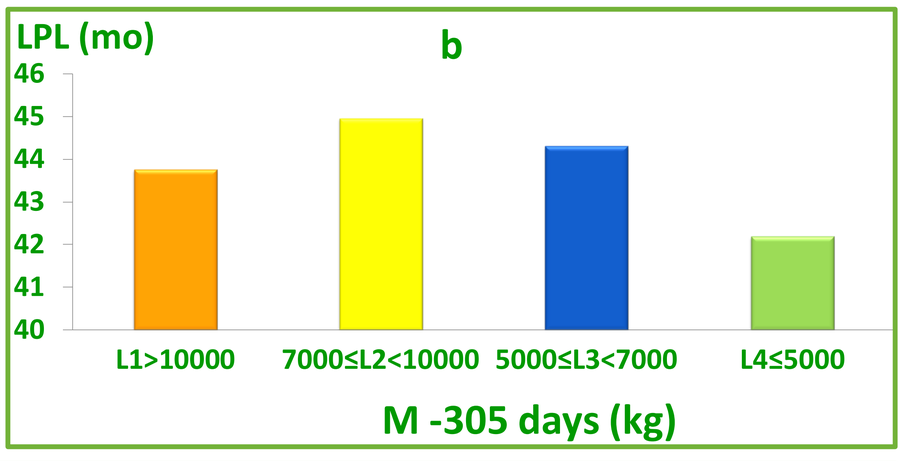
	n	Mean	SD	Min	Max
LPL (mo)	20766	**45.9**	18.9	14.75	119.8
M305 (kg)	20766	**7427**	1257.2	4032	14632
PS	20766	**98.05**	2.44	88.3	112.4
Peak (kg)	20766	**28.07**	4.41	12.9	56
AFC (mo)	20766	**27.7**	3.7	13.28	48.4
Dim	20577	**393.7**	68.25	233	700

Table 2: Means squares of traits of interest on longevity

	DF	Significance level	
M305	3	**0.04**	**R^2**
PS	1	**0.44**	**=**
Peak	1	**0.57**	**26.87%**
Herd	394	**0.0001**	**CV**
CS	3	**0.002**	**=**
AFC	9	**0.0001**	**35.68**
dim	1	**0.06**	
CY	10	**0.0001**	

- **Effects of censored LPL were reduced by the CY effect**
- **LPL was affected by herd (P<0.01) linked to management strategies among herds, which conditions culling decisions**
- **For linear regressions of DIM on LPL, significance was close (P<0.06) for a positive relationship. This could be an artifact of LPL's definition**





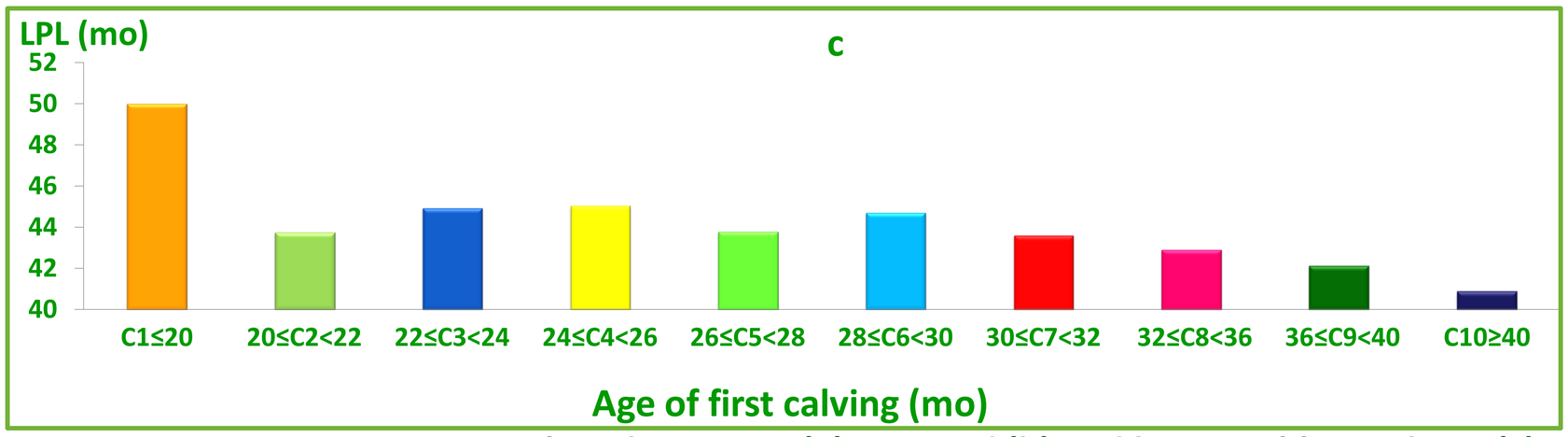


Figure 1: Lsmeans of LPL by season (a), M-305d (b) and by age of first calving (c).

- **Autumn seemed to be the least favorable season (P<0.01) to LPL .**
- **Cows with intermediate yields tended to stay longer in the herd low (M305<5000) or high (M305>10000) producing ones.**

➔**This result can be explained by voluntary culling of low producing cows and of involuntary culling for reasons such as diseases for very high producing cows.**

- **Results for AFC were less clear: later calvings (> 28 month) being linked to lower LPL. e**

Conclusion

The lack of significance for the regressions of PK and PS on LPL in this study should be considered a preliminary result for two reasons:

1) the simultaneous presence of other correlated effects as milk yield in the model and

2) the use of a linear regression when non-linear relationship are more likely (intermediate optimum).

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