Associations of age and season at first calving with first-lactation curve shape in Mediterranean buffaloes

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Supplementary Materials

Supplementary Table S1. Number of total and atypical curves according to calving season.

Calving season	N. of total curves	N. of atypical curves	Atypical curves (%)
Summer	12,230	3,058	25.0
Spring	18,061	4,283	23.7
Autumn	7,266	1,683	23.2
Winter	24,810	4,831	19.5

Supplementary Table S2. Number of total and atypical curves according to age at first calving class (AFC class).

AFC Class	N. of total curves	N. of atypical curves	Atypical curves (%)
≤30	10,905	2,454	22.5
30-32	7,525	1,623	21.6
32-34	9,583	2,099	21.9
34-35	5,586	1,174	21.0
35–37	10,690	2,343	21.9
37–38	3,818	800	21.0
38–42	8,558	2,005	23.4
>42	5,702	1,357	23.8

Supplementary Table S3. Number of total and atypical curves according to age at first calving class (AFC class) and calving season.

Season	AFC class	N. of total curves	N. of atypical curves	Atypical curves (%)
Autumn	≤30	1,537	347	22.6
	30-32	1,002	232	23.2
	32-34	1,193	266	22.3
	34-35	517	128	24.8
	35–37	803	185	23.0
	37–38	402	95	23.6
	38–42	1,138	260	22.8
	>42	674	170	25.2
Spring	≤30	3,357	772	23.0
	30-32	1,913	421	22.0
	32-34	3,060	721	23.6
	34-35	1,533	362	23.6
	35–37	2,760	681	24.7
	37–38	1,373	319	23.2
	38–42	2,442	614	25.1
	>42	1,623	393	24.2
Summer	≤30	3,131	738	23.6
	30-32	1,442	368	25.5
	32-34	1,201	303	25.2
	34-35	881	198	22.5
	35–37	1,981	532	26.9
	37–38	715	168	23.5
	38–42	1,984	510	25.7
	>42	895	241	26.9
Winter	≤30	2,880	597	20.7
	30-32	3,168	602	19.0
	32-34	4,129	809	19.6
	34-35	2,655	486	18.3
	35–37	5,146	945	18.4
	37–38	1,328	218	16.4
	38–42	2,994	621	20.7
	>42	2,510	553	22.0

Supplementary Table S4. Comparison of model fit statistics for alternative parameterizations of age at first calving (AFC) as a categorical, linear, or quadratic effect on Wood parameters (*a*, *b*, and *c*) and lactation curve characteristics (LCCs).

Parameters	Models	N.	AIC	BIC	logLik
a	AFC categorical	46289	230304.7	230610.7	−115117.4
	AFC linear	46289	230273.7	230369.9	−115125.9
	AFC quadratic	46289	230279.7	230410.9	−115124.9
b	AFC categorical	46289	−7838.740	−7532.747	3954.37
	AFC linear	46289	−7852.626	−7756.457	3937.313
	AFC quadratic	46289	−7846.559	−7715.419	3938.28
c	AFC categorical	46289	−400754.1	−400448.1	200412
	AFC linear	46289	−401141.8	−401045.7	200581.9
	AFC quadratic	46289	−401037.2	−400906.1	200533.6
DIM_{peak}*(days)*	AFC categorical	46289	426876.9	427182.9	−213403.4
	AFC linear	46289	426918.1	427014.3	−213448.1
	AFC quadratic	46289	426955.2	427086.3	−213462.6
$Milk_{peak}$ *(kg/d)*	AFC categorical	46289	197182.7	197488.7	−98556.35
	AFC linear	46289	197199.5	197295.7	−98588.74
	AFC quadratic	46289	197168.7	197299.9	−98569.36
MY270(kg)	AFC categorical	46289	692732.9	693038.9	−346331.5
	AFC linear	46289	692990.0	693086.2	−346484.0
	AFC quadratic	46289	692938.4	693069.6	−346454.2

[1]LCC = Lactation curve characteristics were calculated as follows: $DIM_{peak} = \frac{b}{c}$, $Milk_{peak} = a \cdot DIM_{peak}^{b} \cdot e^{-c \cdot DIM_{peak}}$ and $MY270 = \int_0^{270} a \cdot t^b \cdot e^{-ct}\, dt$

Supplementary Table S5. Degrees of freedom (DF num) or fixed effects in generalized mixed model for wood parameters (*a, b* and *c*). Models included AFC class, calving season, their interaction and year of calving with herd as a random effect. Herd variance and intraclass correlation coefficient (ICC) describe between-herd variability.

Parameters	Factor	DF num	Var (herd)	ICC
a	AFCClass	7	0.024	0.049
	Season	3		
	Year of calving	10		
	AFC Class x Season	21		
b	AFCClass	7	0.023	0.051
	Season	3		
	Year	10		

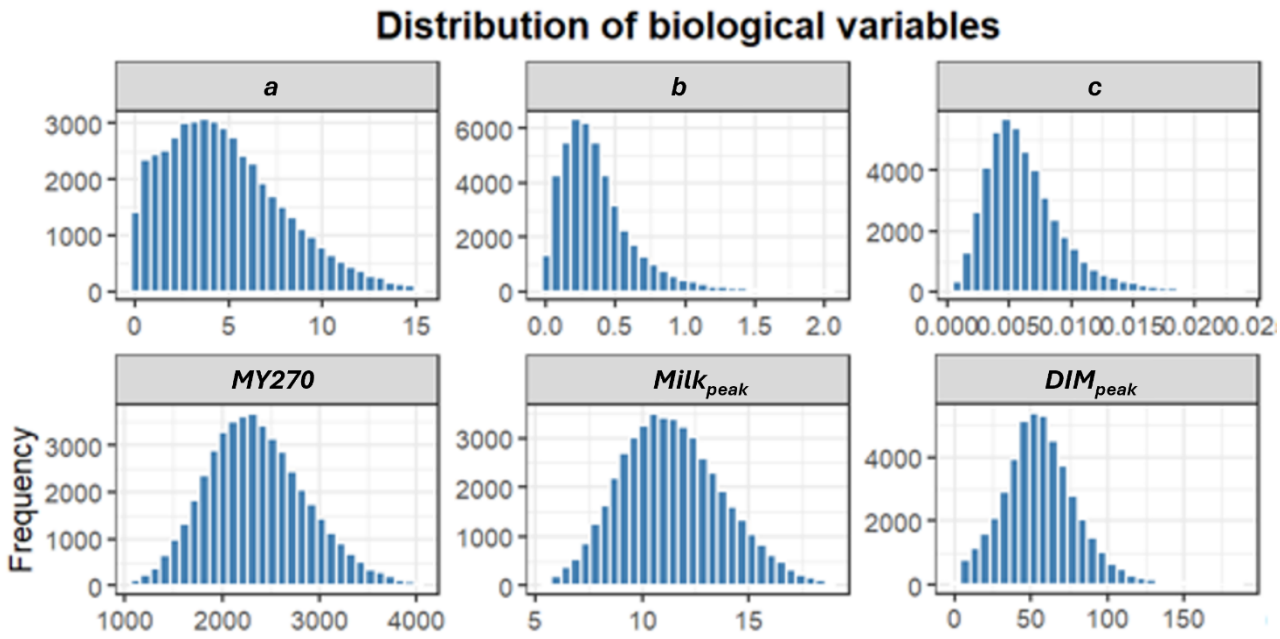
	AFC Class x Season	21		
c	AFCClass	7	0.023	0.010
	Season	3		
	Year of calving	10		
	AFC Class x Season	21		

Supplementary Table S6. Numerator and denominator degrees of freedom (DF num and DF den) or fixed effects in linear mixed model for LCC[1]. Models included AFC class, calving season, their interaction and year of calving with herd as a random effect. Herd variance and intraclass correlation coefficient (ICC) describe between-herd variability.

LCC[1]	**Factor**	**DF num**	**DF Den**	**Var (herd)**	**ICC**
$Milk_{peak}$ (kg/ day)	AFCClass	7	46060	1.61	0.07
	Season	3	46118		
	Year of calving	10	46136		
	AFC Class x Season	21	46011		
DIM_{peak} (days)	AFCClass	7	46117	45.32	0.28
	Season	3	46205		
	Year of calving	10	46013		
	AFC Class x Season	21	46120		
MY270 (kg)	AFCClass	7	46056	76,319	0.30
	Season	3	46112		
	Year of calving	10	46130		
	AFC Class x Season	21	46009		

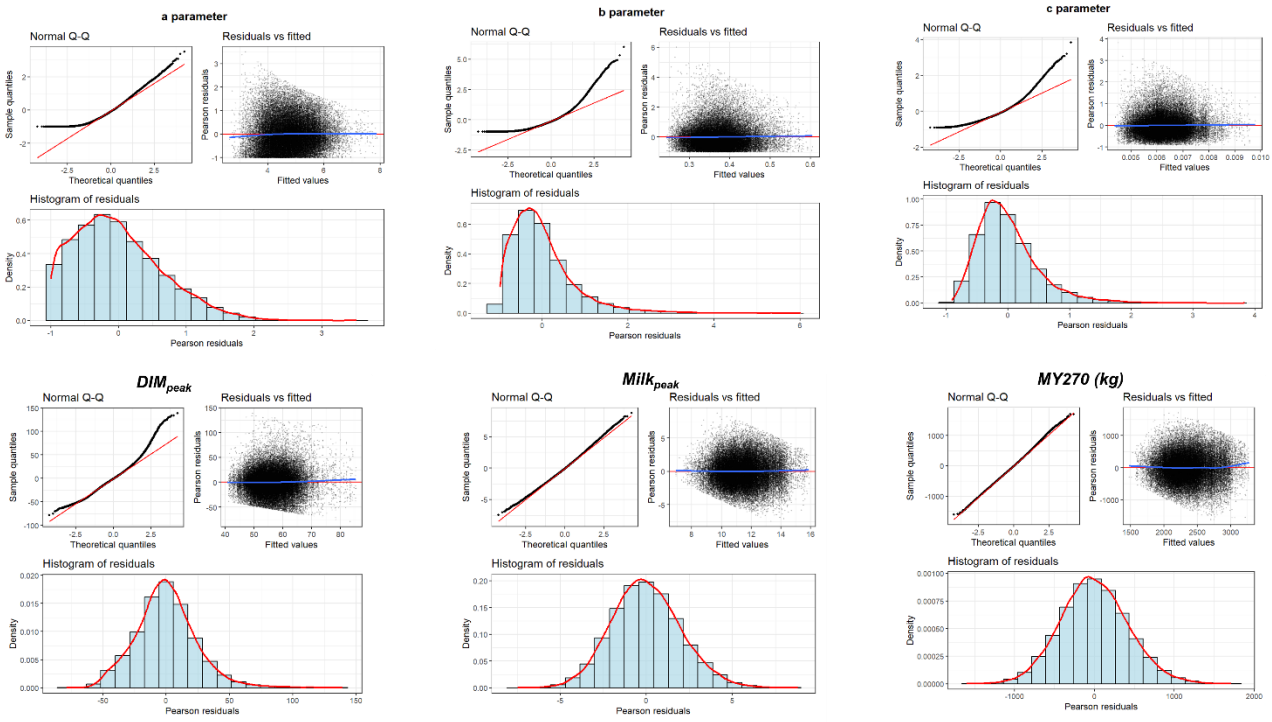
[1]LCC = Lactation curve characteristics were calculated as follows: $DIM_{peak} = \frac{b}{c}$, $Milk_{peak} = a \cdot DIM_{peak}^{b} \cdot e^{-c \cdot DIM_{peak}}$ and $MY270 = \int_0^{270} a \cdot t^b \cdot e^{-ct}\, dt$

Supplementary Figure S1. Distribution of the Wood parameters, LCC[1] after the trimming of the after quantile-based trimming. Values below the 0.5th percentile and above the 99.5th percentile of each variable were excluded (n=46,289).



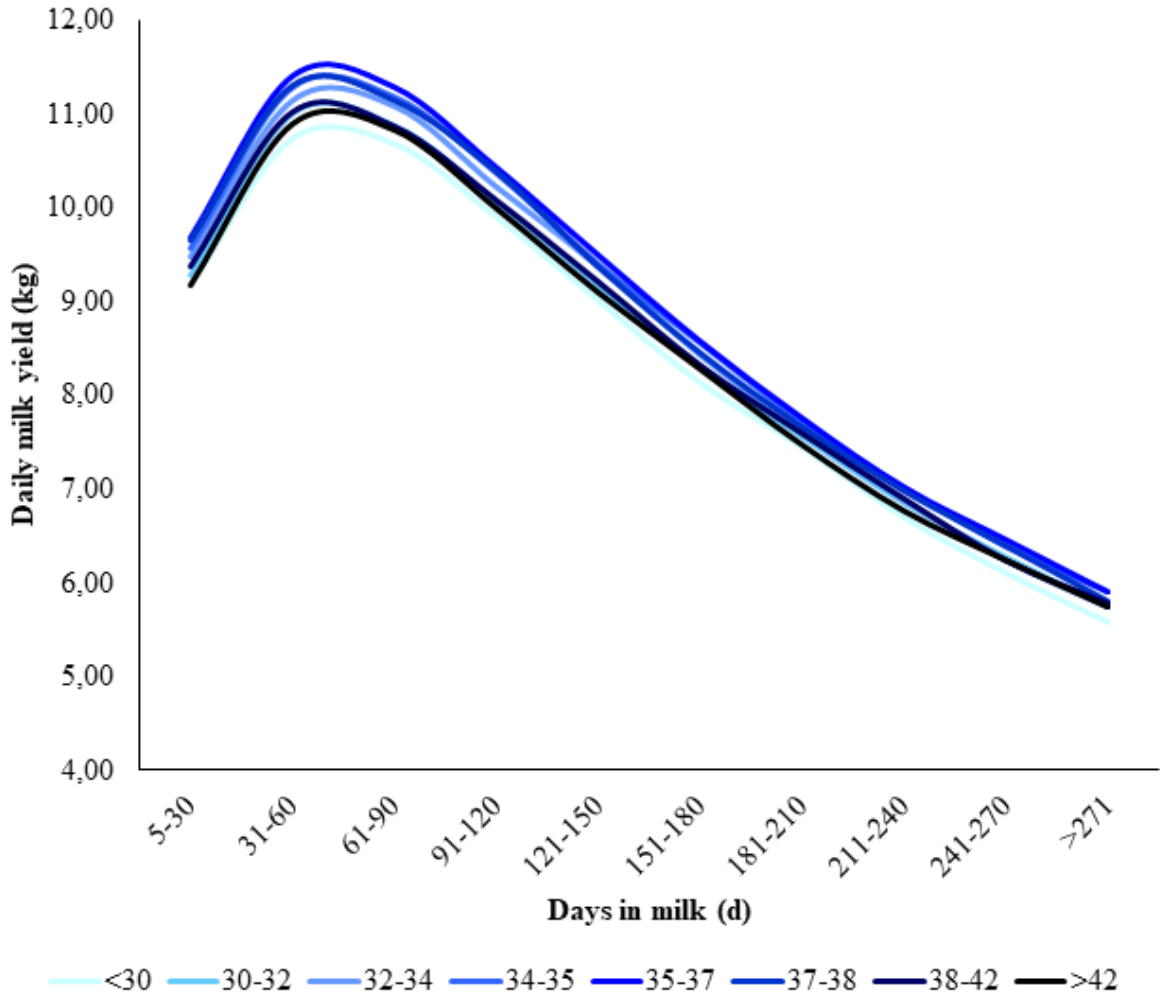
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Supplementary Figure S2. Diagnostic plot of the Wood parameters and LCC[1].



[1]LCC = Lactation curve characteristics were calculated as follows: $DIM_{peak} = \frac{b}{c}$, $Milk_{peak} = a \cdot DIM_{peak}^{b} \cdot e^{-c \cdot DIM_{peak}}$ and $MY270 = \int_0^{270} a \cdot t^b \cdot e^{-ct}\, dt$

Supplementary Figure S3. Average lactation curves (milk yield, kg/day) of primiparous Italian Mediterranean buffaloes according to age at first calving classes (AFC)[1].



[1]AFC (months): first: ≤30 months; second: 30–32 months; third: 32–34 months; fourth: 34–35 months; fifth: 35–37 months; sixth: 37–38 months; seventh: 38–42 months; and eighth: >42 months.

Supplementary Figure S4. Average lactation curves (milk yield, kg/day) of primiparous Italian Mediterranean buffaloes according to the season of calving.

