

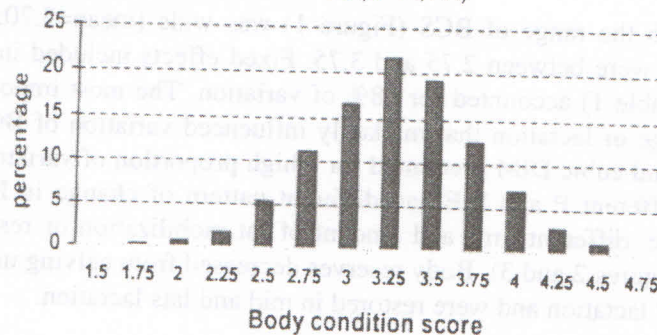
CHANGE AND GENETIC ASPECTS OF BODY CONDITION
SCORE (BCS) IN ITALIAN BROWN CATTLER. Dal Zotto, M. Cassandro, C. Valorz, P. Zischg, L. Gallo,
P. Carnier, G. Bittante*Objective*

The objective of this study was to investigate the pattern of changes of BCS during lactation in Brown Swiss cows and to estimate heritability of BCS and its genetic correlation with daily milk fat and protein yield, using a repeatability test day model.

Introduction

Body condition score (BCS) has proved to be a useful management tool for assessing the nutritional status of dairy cows. The scoring method is based on a linear grid from 1 (thin animal) to 5 (fat animal) after visual and tactile appraisal of the amount of body fat in the pelvic and back vertebral regions.

Figure 1. - FREQUENCY DISTRIBUTION OF BCS (n.=11,144)



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Materials and methods

A total of 11,144 BCS records from 1,850 lactations of 1,541 Brown Swiss cows were available for the statistical analysis. Records were collected in 48 herds of Trentino Alto Adige region. Dry and lactating cows were scored for body condition at four-week interval from 2001 to 2002. Repeated BCS observations per cow were considered repeated measurements of the same trait. Records were grouped by parity (P) (1, 2, or 3+) and by mature equivalent milk yield class (ME: cumulative 305-d milk yield adjusted for age at calving and month of calving) according to the following bounds: ≤ 6500 kg (1649 obs); 6500-11500 kg (7648 obs); ≥ 11500 kg (1847 obs). Estimation of (co)variance components for BCS and milk yield was performed using a REML multi-trait procedure under a repeatability test-day model. The linear model included the fixed effects of herd-test date, age at calving within parity, stage of lactation (14 classes of 30 d), ME class (only for BCS) and cow additive genetic and permanent environmental random effects.

Results and discussion

Change of Body Condition Score

Although the range of BCS (Figure 1) was wide (mean=3.20; SD:0.47), most scores were between 2.75 and 3.75. Fixed effects included in the model for BCS (Table 1) accounted for 68% of variation. The most important effect was the stage of lactation that markedly influenced variation of BCS. Linear, quadratic, and cubic DIM accounted for a high proportion of variation of BCS. Cows of different P and ME had different pattern of change in BCS during lactation, i.e. different time and amount of fat mobilization or restore during lactation (figures 2 and 3). Body reserves decreased from calving until the first 3 months of lactation and were restored in mid and late lactation.

Genetic aspects of Body Condition Score

Estimated heritability for test-day BCS was considerably higher than those estimated for test-day milk yield traits and, for all traits, permanent environmental effects accounted for a considerable proportion of phenotypic variation (table 2).

Table 1. - LEAST SQUARES ANOVA FOR BODY CONDITION SCORE

Source of variation	df	MS	P
Herd	47	6.94	0.0001
Cow	1493	0.64	0.0001
Year	1	8.19	0.0001
Season	2	0.32	0.0242
Dim x P ^(a) x ME ^(b)	9	17.53	0.0001
Dim ² x P x ME	9	12.90	0.0001
Dim ³ x P x ME	9	7.92	0.0001

R²: 68% (a) Parity - (b) Mature equivalent milk yield

Figure 2. - PATTERN OF CHANGE IN BODY CONDITION SCORE IN DIFFERENT PARITY

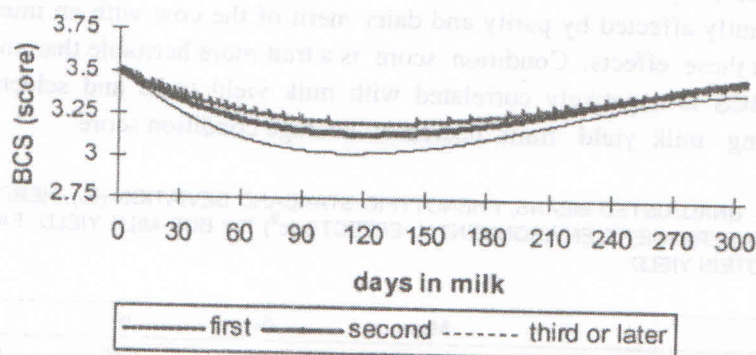
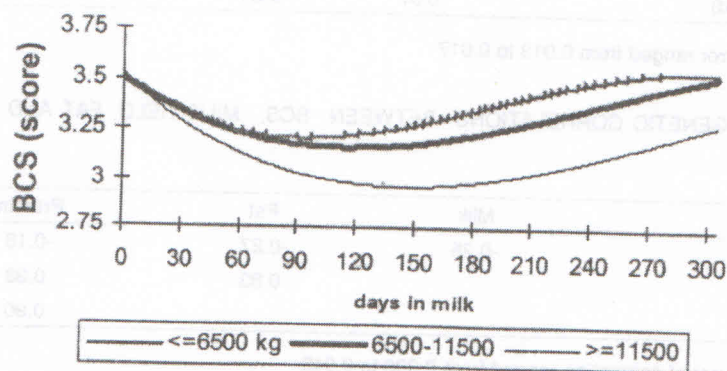


Figure 3. - PATTERN OF CHANGE IN BODY CONDITION SCORE IN DIFFERENT MATURE EQUIVALENT MILK YIELD (kg)



Acknowledgments

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BCS showed a negative genetic correlation with milk, fat and protein yield (table 3): selection for higher yield alone tends to increase negative energy balance during lactation.

Conclusion

Body condition score was strongly related to the stage of lactation, and the pattern of body fat mobilization and recovery during lactation appeared to be significantly affected by parity and dairy merit of the cow with an interaction between these effects. Condition score is a trait more heritable than milk yield traits. BCS is negatively correlated with milk yield traits and selection for increasing milk yield traits decreases average condition score.

Table 2. - UNADJUSTED MEANS, PHENOTYPIC STANDARD DEVIATION (δ_p), HERITABILITY (h^2), AND PERMANENT ENVIRONMENTAL EFFECTS (c^2) For BCS MILK YIELD, FAT YIELD AND PROTEIN YIELD

Trait	Mean	δ_p	h^2	c^2
BCS	3.21	0.45	0.40	0.27
Milk (kg/d)	26.47	7.42	0.28	0.37
Fat (kg/d)	1.08	0.34	0.16	0.29
Protein (kg/d)	0.97	0.24	0.26	0.33

Standard error ranged from 0.013 to 0.017

Table 3. - GENETIC CORRELATIONS BETWEEN BCS, MILK YIELD, FAT AND PROTEIN YIELD

Trait	Milk	Fat	Protein
Bcs	-0.25	-0.27	-0.18
Milk		0.83	0.93
Fat			0.90

Standard error of correlation ranged from 0.006 to 0.045

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PROMJENA I GENETSKI ASPEKTI BODOVA STANJA TIJELA (BCS) U TALIJANSKOG SMEĐEG GOVEDA

Sažetak

Bodovi tjelesnog stanja /BCS/ korisno su sredstvo za ocjenjivanje hranidbenog stanja mliječnih krava. Metoda bodova temelji se na linearnoj mreži od 1 (mršava životinja) do 5 (debela životinja) nakon vizualne i taktilne procjene količine tjelesne masnoće u područjima zdjelice i leđnih kralježaka.

Bodovi tjelesnog stanja bili su veoma povezani sa stadijem laktacije a na uzorak mobilizacije i obnavljanje tjelesne masnoće značajno su djelovali paritet i mliječna vrijednost krave s interakcijom između ovih djelovanja. Bodovi stanja više su značajka naslijeđa nego obilježja prinosa mlijeka, BCS se redovito povezuje sa značajkama prinosa mlijeka i selekcija na povećanje prinosa mlijeka smanjuje prosječne bodove stanja.

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