Suitability of Small and Large Size Dairy Cows in a Pasture-Based Production System

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Introduction Pasture-based dairy production with greatly reduced supplemental feeding and block-calving in spring is increasingly applied in Switzerland. The prevalent cow type has been selected mainly for high individual production in a barn feeding system with balanced diet. This cow type has continuously increased in size over the last 30 years. The question arises whether this type is suitable for the new system, and particularly if cow size is a critical factor. Theoretically a large, heavy type of cow has a higher intake capacity, while the nutrient requirements for a small, light type are easier to satisfy.

Materials and methods In a 3-year trial, two herds of multiparous Red-Holstein-Simmental crossbred and Brown Swiss cows were formed (breed distribution: 50/50). Herd B consisted of 13 large and heavy cows [in 2002: 4.4 ± 0.9 years old (mean ± SD), 726 ± 62 kg body weight (BW) of the cows having calved at turnout to pasture, 147 ± 2 cm withers height (WH); in 2003: 4.6 ± 1 years old, 720 ± 63 kg, 146 ± 2 cm WH]. Herd S consisted of 16 smaller and lighter cows (3.8 ± 0.6 years old, 558 ± 34 kg BW, 138 ± 3 cm WH, resp. 4.4 ± 0.6 years old, 590 ± 38 kg BW, 137 ± 2 cm WH). Each herd had access to 5.8 ha pasture in a rotational system, so that the same overall stocking rate was obtained (1700 kg/ha). Each herd received 2115 kg of concentrate until the end of the 10-week breeding season. Individual milk production and contents of fat, protein and acetone as well as BW were recorded once a week, and body condition score (BCS) once a month. Concentration of acetone was determined by flow injection analysis as described by Reist *et al*. (2000). BW and BCS changes were analysed statistically with a t-test resp. Aspin-Welch test in case of unequal variances. Acetone values were analysed with a Mann-Whitney test.

Results Herd S produced more milk than herd B (82,527 *vs* 78,741 in 2002 and 91,173 *vs* 83,560 kg ECM in 2003). During the same time, the changes in BW and BCS were slightly higher in the B-cows than in the S-cows (Table 1). Acetone milk content was also higher in the B-cows, especially during the first year (Figure 1).

Table 1 Body weight and BCS changes (mean ± SD) of the large and heavy cows (B) and small and light cows (S) between calving and nadir

	Type B		Type S	
Body weight changes				
In 2002 (kg/cow)	-101	± 32	-53	± 35*
In 2002 (%)	-13.7	± 3.9	-10.4	± 4.9*
In 2003 (kg/cow)	-132	± 57	-91	± 24*
In 2003 (%)	-17.2	± 6.6	-14.8	± 3.2
BCS changes				
In 2002	-0.65	± 0.45	-0.32	± 0.34*
In 2003	-0.73	± 0.51	-0.55	± 0.32

*differences between types were significant (P<0.05)

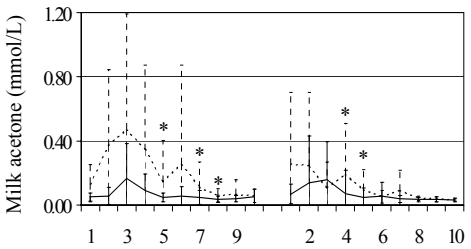

Figure 1 Acetone content in the milk (mean ± SD) of the large and heavy cows (---) and of the small and light cows (—)(* P<0.05 between types)

Conclusions The results of the first 2 years show that the small and light cows seem to be better adapted to the pasture-based milk production as practiced in this trial: as a herd they produced more milk but mobilized less body reserves than the large and heavy cows. Differences between types were more distinct in 2002 and became statistically less significant in 2003. If this trend is confirmed during the third year, this would suggest that the cows might have adapted to trial conditions over the years.

References

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