Evaluation of Body Condition Score of lactating cows

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Abstract

The objective of the present study was to investigate the relationships among body condition score, live weight, milk production and length lactation in high producing Holstein dairy cattle and effect diet with content of non-protein nitrogen (NPN) Optigen (Alltech Inc., USA). A total of 210 records of 30 dairy cows were used in the analyses. Treatment cows was fed the same ration as those in control group, with the replacement of 1 kg.day^{-1} of vegetal protein (soyabean meal and potentially other protein sources) with 100 g.day^{-1} of commercially produced NPN source for ruminants. As expected in group of cows treated with NPN was observed higher milk yield in first 100 days in milk, increase of body condition in latter lactation and BW. Differences between both treatment groups were analyzed using estimation of non-linear fixed regression trend. Parity significantly influenced observed results where observed coefficients of determination varied from 22.45 % of BCS resp. 22.67 % of M to 32.23 % by BW, statistically significant (P<0.001).

KeyWords: holstein, body condition, milk production, body weight

Body condition scoring (BCS) is a subjective method of assessing the amount of metabolizable energy stored in fat and muscles on a live animal. (Edmonson et al., 1989). The most prevalent method of body condition scoring is based on visual and tactile appraisal of subcutaneous fat in the caudal, dorsal regions, in which cows are assigned a BCS based on a five-point scale **l** =emaciated, **3** = average, and **5** = obese (Waltner et al., 1993).

The change in BCS over the first few weeks of lactation may indicate the extent of metabolic load as the shortfall of energy to fuel production is thought to be met through mobilizing body reserves (Pryce et al., 2001). As milk yield peaks and demand for energy exceeds intake of energy, the cow mobilizes her lipid reserves and gets thinner, thereby compromising her body condition. This process is related to the daily milk yield curve, which is almost exactly opposite to the energy balance and BCS curves (Coffey et al., 2002, 2003). Negative energy balance is most serve during the first 2 weeks of lactation and may influence physiological functions during this time that are important to conception (Nebel et al., 1993).

Material and methods

For evaluation of body condition development during lactation, two treatment group were established at the university dairy farm in Oponice with 15 cows in every group at the beginning of lactation. Animals are grouped based on recordings taken in the week prior to commencing the study and has been blocked and allocated to one of two treatments according to parity (primaparous or multi), calving date, milk yield, milk composition. Trial was set up for 3 months, with two dietary treatments: Control (C) and Management (M). Control cows were fed a standard total mixed ration formulated to produce approximately 30 – 35 kg of milk per day and containing: maize silage 18 kg, alfalfa haylage 10 kg, meadow hay 1,5 kg, conserved sugar-beet pulp 5 kg, concentrate 7,5 kg, brewer's grain 5 kg.

Treatment cows was fed the same ration as those in group C, with the replacement of 1 kg.day^{-1} of vegetal protein (soyabean meal and potentially other protein sources),

with 100 g.day^{-1} of commercially produced non-protein nitrogen (NPN) – Optigen (Alltech inc., USA) for ruminants.

Parameters recorded:

- Feed intake twice weekly
- Individual feed refusals twice weekly
- Forage samples was taken twice weekly, frozen and bulked for subsequent analysis.

The cows weighed and condition scored before the morning milking during the week prior to the start of the experiment and then weekly. Body condition score was assessed by palpation individual body parts and an average score recorded on a 5-point scale, in which 1 is emaciated and 5 is obese. Data were analyzed using SAS software.

Table 1 and 2 present selected traits of animals before beginning and at the end of study:

Tab.1 The traits animals at the beginning of study

	management group					control group				
	Mean	s	Min.	Max.	N	Mean	s	Min..	Max.	N
M (kg)	17.62	4.77	4	25.6	15	13.52	3.62	8.2	19	15
BW (kg)	596	59.07	465	692	15	582.93	61.19	465	684	15
BCS	3.03	0.61	1.75	4	15	3	0.44	1.75	3.75	15
DIM (day)	44.73	30.41	16	102	15	37.2	41.42	6	164	15

M- milk production; BW – body weight, DIM – days in milk

Tab. 2 The traits animals at the end of study

	management group					control group				
	Mean	s	Min.	Max.	N	Mean	s	Min.	Max.	N
M (kg)	15.87	5.1	4	26.4	15	16.39	4.86	5	22.8	15
BW	612	50.15	526	686	15	584.93	62.98	466	690	15
BCS	3.38	0.37	2.75	3.75	15	3.41	0.3	3	3.75	15
DIM	86.73	30.41	58	114	15	79.2	41.72	48	206	15

Both treatment groups included primiparous and multiparous cows. Detailed view is in tables 3 and 4.

Tab. 3 Parity of cows in Control group

Control		
Lactation No.	N	Percent
1	2	13.33
2	9	60.00
3	2	13.33
5	1	6.67
6	1	6.67

Tab. 4 Parity of cows in Management group

Management		
Lactation No.	N	Percent
1	1	6.67
2	6	40.00
3	5	33.33
4	1	6.67
7	2	13.33

Results

Differences between both management groups were analyzed using estimation of non-linear fixed regression trend. Relationships between individual traits according to management group are shown in figures 1- 4.

Figure 1 Trend of milk yield and DIM

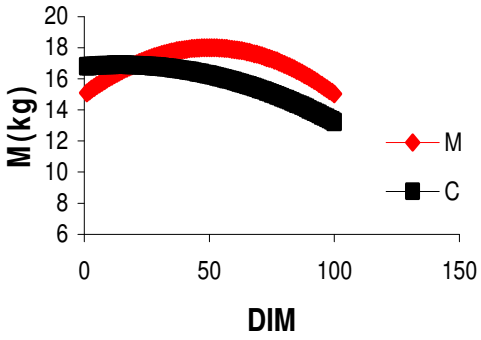


Figure 2 Trend of BCS and DIM

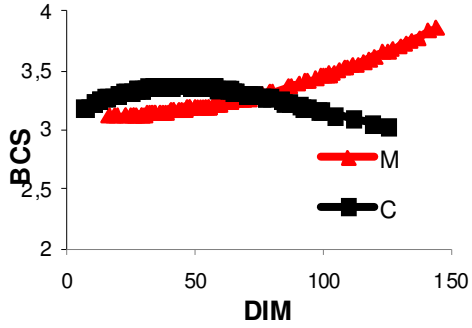


Figure 3 Trend of BCS and BW

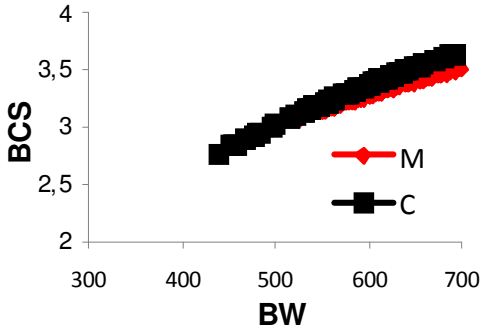
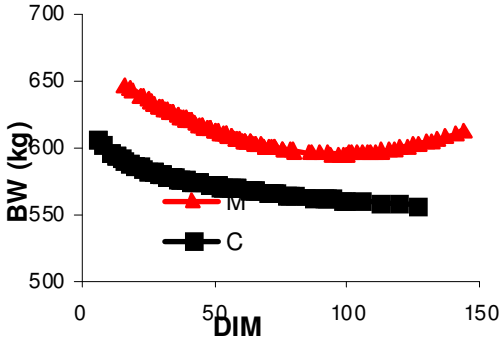


Figure 4 Trend of BW and DIM



Parity significantly influenced observed results where observed coefficients of determination varied from 22.45 % of BCS resp. 22.67 % of M to 32.23 % by BW, statistically significant (P<0.001). Month of lactation determined 6.34 (BW), 6.97 (BCS) resp. 12.96 % of milk yield variation, statistically significant only in milk yield. Influence of management group on observed results was analyzed using ANOVA. Observed coefficients of determination varied from 0.0 (BCS) resp. 0.4 % (M) to 10.30 % by BW, significant results were observed only for BW (P<0.001).

As expected in group of cows treated with NPN was observed higher milk yield in first 100 days in milk. Maximum difference in milk yield was +2.2 kg.day^{-1} observed at the end of second month of lactation in treatment group.

Discussion

Results are consistent with data presented from other studies. Where was found significant effect of BCS and DIM on milk yield. Body condition score is associated with the ability of the cow to produce milk while maintaining its energy balance (Banos et al., 2004). Because of changes in daily milk yield throughout the lactation and other physiological changes, including reproduction and pregnancy status, the energy balance profile varies, prompting variation of daily BCS. The lowest body energy level occurs on average 3 months postpartum, very close to the peak of daily milk yield (Coffey et al., 2003). BCS decrease in early lactation and restore during mid to late lactation. Comparable results were observed in control group of our study, where treatment group shows no decrease of BCS.

The BCS at cessation of lactation was equal to that at the beginning of that lactation (Waltner et al., 1993). Body condition score at calving and nadir as well as loss of BCS

between calving and nadir had significant effects on milk production, which was also reflected by BW and BW change (Roche et al., 2007). Roche et al. (2009) showed that the change in BCS between calving and nadir was linearly associated with all 3 parameters of the lactation profile, such that greater post calving BCS loss increased the height of the lactation profile and the rate of milk yield increase to peak, but reduced lactation persistency. Increasing one factor that contributes total milk yield (e.g., height of the lactation curve) while decreasing another (e.g., lactation persistency) could potentially result in nonlinear associations between post calving change in BCS and lactation milk yield. BCS and milk yield were negatively correlated, thus, high yielding cows generally have lower BCS (Pryce et al., 2001). Lactation persistency tended to decrease with BW while peak milk yield increased with WB. A greater amount of BW loss from calving to nadir was associated with a higher lactation profile, increased lactation persistency, a higher peak milk yield and a shorter interval to peak milk yield; amount of BW loss to nadir did not significantly affect the rate of increase in milk yield to peak. The height of the lactation profile was positively associated with the interval to nadir BW. Furthermore, cows with longer intervals to nadir BW had lower lactation persistency but greater peak milk yield (Berry et al., 2007).The moderate correlation between BCS and BW previously reported (Roche et al., 2007) resulted in a generally similar trend of associations between BW and milk yield as observed between BCS and milk yield heavier cows tended to produce more milk, although the marginal effect per kg BW tended to decrease within increased WB for the majority of the milk yield traits.

Conclusions

The objective of the present study was to investigate the relationships among body condition score, live weight, milk production and length lactation in high producing Holstein dairy cattle and effect diet with content commercially produced non-protein nitrogen (NPN). Parity significantly influenced observed results where observed coefficients of determination varied from 22.45 % of BCS resp. 22.67 % of M to 32.23 % by BW, statistically significant ($P<0.001$). Month of lactation determined 6.34 (BW), 6.97 (BCS) resp. 12.96 % of milk yield variation, statistically significant only in milk yield.

As expected in group of cows treated with NPN was observed higher milk yield in first 100 days in milk. Maximum difference in milk yield was +2.2 $kg.day^{-1}$ observed at the end of second month of lactation in management group. Results from the present study indicate a significant positive effect of supplementation diet with NPN on body weight, positive effect on BCS and milk production. Further study will be oriented on influence of NPN on milk composition traits and their interaction with BCS.

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