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EFFECTS OF DIFFERENT LEVELS OF ENERGY ON GROWTH OF GRAZING AND DRYLOT FED HOLSTEIN HEIFERS.

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Abstract

Growth of Holstein heifers were studied to evaluate the combination of a drylot phase followed by feeding energy for pasture supplementation during the grazing season of 1988. Heifers grazed a grass-legume mixture in six paddocks of 1.5 ha each. After drylot, animals were equally allotted to pasture and none or 2.0 kg/d of corn were fed in addition to grazing in a changeover design with repeated measurements. Heifers were fed a high (HE) or low energy (LE) diets in confinement and daily gains were 1190 (HE) and 990 g/day (LE) which were different. On pasture, corn supplementation did not enhance weight gain overall, but did result in greater gains in lighter animals that were previously fed the LE confinement diet. Heavy and light heifers on previously HE diet gained more than heifers previously on LE diet (358 vs 486 g/d).

Keywords: Holstein heifers, confinement, energy supplementation

Introduction

A common approach to reduce age at first calving has been to increase energy intake by dairy heifers to attain adequate rates of gain between 600 and 800 g/d (Waldo et al. 1988).

Usually, this reduction in time from birth to production has been achieved using confinement feeding and feeding high energy diets, Stelwagen and Grieve (1990). However, diet recommendations NRC (1988) for heifers reared in confinement may be too high in energy, Bagg et al. (1985), James (1988), Quigley (1985) and Richardson (1987).

This study evaluated the effects of high and low energy diets in the confinement with subsequent energy supplementation on pasture for adequate structural growth of Holstein heifers.

Material and Methods

Drylot phase

Sixteen Holstein heifers averaging 206 kg and 9.2 months of age (heavies, H) and 16 averaging 129 kg and 5.6 months of age (light, L) were each divided again into two groups. Animals (H and L) were paired into similar groups of 2 and then randomized to one of two diets, high energy (HE) and low energy (LE). Thus the treatments each with 8 heifers (H) and (L) each with HE and LE diets were randomized into four pens and each treatment diet fed from a Pinpointer 4000 - B. Diets were calculated to contain 85% (LE) and 105% (HE) of recommended TDN, NRC (1989). Diets containing corn silage, alfalfa silage, soybean meal and high moisture corn comprised for LE, DM (47.7%), CP (13.3%), ADF (29.7%), TDN (67.0%), NEm, Mcal 1.52 and NEg, Mcal .92, and DM (53.3%), CP (12.1%), ADF (25.8%), TDN (70.0%), NEm, Mcal 1.60 and NEg, Mcal 1.01 for HE. Diets were mixed as TMR before noon and delivered to the feed bank at 13:00 h. and was offered to allow between 5 and 10% to remain after 24 h. Heifers had access to the feed at all times. Daily intake for individual heifers was recorded automatically by computerized weigh cell.

Pasture phase

Nine hectares of pasture located at the Virginia Tech Dairy Center was subdivided into six paddocks of 1.5 ha each by electric fence. Orchardgrass (*Dactylis glomerata L*), tall fescue (*Festuca arundinacea Schreb*), bluegrass (*Poapratense L*), and white clover (*Trifolium repens L*) were the species of the grass-legume mixture. Carrying capacity was estimated from previous grazing studies at six animals/ha (3.1 animal unit, AU = 450 kg BW). The six paddocks were divided into 3 blocks of 2 paddocks for rotational grazing. The two treatment groups of 12 heifers were randomized to the 2 paddocks in each block each time the heifers were switched to a fresh pasture when available forage had declined to about 800 kg DM / ha. Of the 8 heifers in each of the four drylot treatments, four animals were randomized to G1 and G2; hence 16 heifers in each group.

Statistical analysis

Drylot phase: heifer response variables were analyzed as a completely randomized design. Pasture phase: heifer response variables were analyzed as a repeated measurement split-plot with heifers as an incomplete block.

Results and Discussion

Drylot phase

Least squares means (Table 1) for ADG in g/d were 1190 (HE) and 990 (LE) respectively and were different ($P<.01$). Means for actual BW, HG and DM intake (DMI, kg/d) did not differ by diet ($P>.05$). Wither heights (cm) were 112.3 (HE) and 109.8 (LE) and were influenced by diet ($P<.05$).

As expected, size of heifers had a significant effect on BW, ADG, DMI, WH and HG. There were no significant size-diet interactions. However, the higher DMI for LE diet as

compared to HE diet, for both heifer sizes caused similar rates of gains for H and L heifers. Baile and Della-Fera (1981) found that growing animals are able to regulate feed consumption in order to maintain a relatively steady rate of gain, even under different environmental and feeding conditions.

Dry matter intakes and BW for HE and LE diets were higher than the 6.0 kg/d obtained by Richardson (1987) with heifers of similar BW (226 to 275 kg). Heavier heifers on LE diet consumed more DM (8.7) than heifers on HE (7.5 kg/day) diet. The difference in DMI was not similar (6.3 vs 5.6 kg/d), for light heifers fed low and high energy diets. Although not significant, heifers receiving LE diet had 10.7% (7.5 vs 6.7 kg/d) higher DMI than those on HE diet, which agrees with data of Quigley (1985).

Although the rations were formulated for 800 g/d of ADG, heifers fed these rations ad libitum gained above 1000 g/d, except for light heifers on LE diet did gain 880 g/d. These results confirm previous studies of Quigley (1985), Richardson (1987), and those reported by James (1988), that heifers in confinement gain more weight than expected by NRC (1989).

Pasture phase

The grazing days were 184. Group one was supplemented for 4 periods of 28 d and the alternate for 3 periods. Initial BW after balanced distribution into Groups (G1 and G2) was 316.4 and 315.5 kg at the start of grazing. At this time, heavy heifers averaged 353.7 and light heifers averaged 255.1 kg BW.

Overall, corn supplementation did not increase BW nor ADG, however, corn supplementation tended to improve ADG of lighter animals that were previously fed the LE diet during wintering in confinement (486 vs 345 g/d). Heavy and light heifers on previously HE diet gained 358 g/d in contrast to heifers on the previously LE energy diet which had gains of 478 g/d (Table 2). Lewis et al. (1990) with beef steers obtained similar results.

These ADG suggest that effects from previous treatments during wintering in drylot influenced the growth of heifers during the grazing period. The previous low energy diet with light heifers giving lower gains than for HE diets compensated by giving the greater heifer gains on pasture. Similar results were found by Beacom, (1970) with steers grazing oats in summer and fall to supplement pasture after being wintered. A small but significant difference (2.9 cm) in WH favored the heifers wintered on HE diet.

Diet affected only WH; no effects on BW, HG and DMI were present. Gain was greater in light heifers that were fed LE diet. Lighter heifers, previously fed 85% TDN diet seemed to gain more when supplemented with 2 kg corn.

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Table 1 - Performance of Holstein heifers with low and high energy diets in confinement feeding from December 1987 until April 1988 before turning out on pasture (LS means).

	BW (kg)	ADG (kg)	DMI Kg/d	WH (cm)	HG (cm)
Size:					
Heavier heifers (H)	285.9**	1180*	7.7**	117.3**	157.7**
Lighter heifers (L)	192.0**	1000*	6.3**	104.5**	138.2**
Diet:					
High energy (HE)	244.2	1190**	6.7	112.3*	148.7
Low energy (LE)	233.8	990**	7.5	109.8*	147.2
Size * Diet:					
H * HE	290.9	1260	7.5	119.8	158.2
H * LE	281.0	1120	8.7	115.5	157.1
L * HE	197.5	1130	5.6	105.6	139.2
L * HE	186.6	880	6.3	104.1	137.2

* (P<.05)

** (P<.01)

BW - body weight, ADG - average daily gains, WH- wither height, HG - heart girth.

Table 2 - Least square means for body weight, gain, wither height and heart girth of Holstein heifers grazing a grass-legume mixture with or without energy supplementation for alternate 28 days in 1988.

	BW (kg)	ADG (g/d)	WH (cm)	HG (cm)
Corn supplemented in alternate 28 d periods				
Periods with corn (S)	342.6	393	122.7	168.9
Periods with no corn (NS)	342.2	439	122.9	168.8
Size of heifers:				
Heavier (H)	374.9**	345**	125.9	174.5
Lighter (L)	309.9**	486**	119.8	163.2
Previous diet:				
High energy (HE)	347.5	358**	124.3	169.7
Low energy (LE)	337.3	478**	121.4	168.1

** ($P<.01$)

BW - body weight, ADG - average daily gains, WH- wither height, HG - heart girth.