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# Effect of herbage allowance on the performance of pregnant beef heifers

G. B. NICOLL\*, D. C. SMEATON and K. R. MCGUIRE

Whatawhata Hill Country Research Station  
Ministry of Agriculture and Fisheries, Hamilton

## ABSTRACT

Two experiments studied the effects of herbage allowance in the latter half of pregnancy on the performance of 18-month beef heifers. In Experiment 1, 54 heifers were offered daily allowances of 4.5 (H) or 3.3 (M1) kg DM/100 kg live weight (LW), and in Experiment 2, 64 heifers were offered 3.1 (M2) or 1.9 (L) kg DM/100 kg LW.

Average daily gain to post-calving weight (net ADG) for the H and M1 heifers in Experiment 1 was 0.46 and 0.34 kg/d ( $P < 0.001$ ). The post-partum anoestrous interval (PPAI) was short in both groups (H = 42.7 and M1 = 49.2 days;  $P < 0.10$ ). H calves were 1.8 kg heavier at birth and 7.6 kg heavier at weaning than M1 calves ( $P < 0.05$ ). In Experiment 2, M2 and L heifer net ADG was 0.23 and  $-0.03$  kg/d respectively ( $P < 0.001$ ). The PPAI was 28.4 d shorter for M2 than L heifers ( $P < 0.001$ ). Birth and weaning weights of M2 calves were heavier by 1.8 kg ( $P < 0.07$ ) and 14.0 kg ( $P < 0.05$ ) respectively than those of L calves.

Results suggest that a herbage allowance of around 3 kg DM/100 kg LW over the latter half of gestation may be adequate for satisfactory performance of yearling-mated heifers.

**Keywords** Herbage allowance; beef heifers; growth; calving date; post-partum anoestrous interval

## INTRODUCTION

Relationships between herbage allowance and growth, onset of puberty and the yearling mating performance of beef heifers have been investigated (Smeaton and Winn, 1981). However, relationships during first pregnancy on heifer growth, calving and post-partum reproductive performance traits are not known. This paper describes 2 experiments which studied the effects of winter herbage allowance on the performance of pregnant beef heifers.

## MATERIALS AND METHODS

Two herbage dry matter (DM) allowances were imposed over the last 173 (Experiment 1) and 138 (Experiment 2) d of gestation and continued into the first 28 and 50 d of lactation respectively. Pregnant, 18-month heifers (24 Angus and 30 Hereford  $\times$  Friesian) in Experiment 1 were allocated at random within genotype and live weight to daily herbage allowances of either 4.5 (H) or 3.3 (M1) kg herbage DM/100 kg live weight (LW). In Experiment 2, 32 Angus and 32 Hereford  $\times$  Friesian heifers were allocated within genotype, calving group (Early  $\nu$  Late) and live weight to allowances of 3.1 (M2) or 1.9 (L) kg DM/100 kg LW.

Heifer live weights, gains and post-partum anoestrous interval (PPAI) were analysed by least-

squares procedures, accounting for genotype, treatment and calving group (Experiment 2). Analyses of PPAI included calving day as a covariate. Calf sex was also accounted for in analysing calf weights and gains, with age included as a covariate in weaning weight analyses. Enumerative data were analysed using Fisher's exact test for  $2 \times 2$  contingency tables (Sokal and Rohlf, 1969). Preliminary analyses within experiments indicated that neither the genotype  $\times$  herbage allowance nor herbage allowance  $\times$  calving group (Experiment 2) interactions were significant. These terms were therefore excluded from analyses.

## RESULTS

In Experiment 1, mean pre-grazing herbage mass did not differ significantly between the H and M1 treatments (2120  $\nu$  1890 kg DM/ha; s.e.d. = 229 kg DM/ha). However, residual herbage mass was greater in the H than the M1 treatment (1350  $\nu$  1070 kg DM/ha;  $P < 0.05$ ). In Experiment 2, mean pre-grazing herbage mass did not differ between the M2 and L treatments (1730  $\nu$  1700 kg DM/ha; s.e.d. = 154 kg DM/ha), but residual herbage mass was 340 kg DM/ha higher in the M2 than in the L treatment (810  $\nu$  470 kg DM/ha;  $P < 0.001$ ).

At the start of differential feeding heifers weighed 283 and 292 kg in Experiments 1 and 2 respectively.

\* Present address: Ruakura Agricultural Research Centre, Ministry of Agriculture and Fisheries, Hamilton.

In Experiment 1, H heifers were 19 kg heavier than M1 before calving and 25 kg heavier post-calving (Table 1). Average daily gains to pre-calving weight (gross ADG) or to post-calving weight (net ADG; ignoring conceptus products at 100 d of gestation) were respectively 0.11 and 0.12 kg/d higher for the H than the M1 heifers ( $P < 0.01$ ). The PPAI was short in both groups, but 6.5 d longer for M1 than H heifers ( $P < 0.10$ ). There was no effect of herbage allowance on heifer pregnancy rates.

assisted at calving were 26% (H) and 11% (M1) in Experiment 1 and 12% (M2) and 6% (L) in Experiment 2. Although large, neither set of differences was significantly dependent on herbage allowance treatment within experiments.

## DISCUSSION

The pre-calving feeding period was 35 days shorter in Experiment 2 than in Experiment 1, which probably

**TABLE 1** Effect of herbage allowance treatment on heifer and calf performance in Experiments 1 and 2.

Experiment	1			2		
Allowance	H	M1	s.e.d.	M2	L	s.e.d.
Live weight (kg)						
Pre-calving	400	381	8.4 *	360	329	7.9 ***
Post-calving	369	344	9.2 **	329	288	8.0 ***
Final weight (Nov. 2)	371	346	8.7 **	346	289	7.9 ***
Weight gains (kg/d)						
Gross (to pre-calving wt)	0.70	0.59	0.03**	0.52	0.30	0.03***
Net (to post-calving wt)	0.46	0.34	0.03***	0.23	-0.03	0.03***
Reproduction						
Days to first oestrus	42.7	49.2	3.8 †	57.2	85.6	6.0 ***
Pregnancy rate (%)	96.2	100.0	NS			
Calf weights (kg) and gain (kg/d)						
Birth	30.5	28.7	0.9 *	29.3	27.5	1.0 †
Weaning	138.3	130.7	3.6 *	129.8	115.8	4.4 *
Gain to weaning	0.81	0.77	0.02†	0.78	0.69	0.03*

†  $P < 0.1$

In Experiment 2, heifers on the M2 treatment had heavier pre- and post-calving weights and a greater gross and net ADG than the L heifers ( $P < 0.001$ ; Table 1). The PPAI was 28.4 d shorter for M2 than L heifers ( $P < 0.001$ ). There was a suggestion that PPAI was more influenced by calving date ( $P < 0.09$ ) among L than M2 heifers. Early-calving and late-calving L heifers (mean calving dates = 21 August and 1 October) had intervals of 96.4 and 74.8 d respectively, compared with corresponding M2 intervals of 56.9 and 57.6 d (mean calving dates = 25 August and 28 September).

Calves in both experiments were 1.8 kg lighter at birth when out of heifers on the lower of the 2 allowances (Table 1). In Experiment 1, H calves were 7.6 kg heavier at weaning ( $P < 0.05$ ) and gained faster ( $P < 0.08$ ) than M1 calves. M2 calves in Experiment 2 were 14 kg heavier at weaning ( $P < 0.05$ ) and gained 0.78 kg/d compared with 0.69 kg/d for L calves ( $P < 0.05$ ). Average ages at weaning in Experiments 1 and 2 were 132 and 127 d respectively.

Calf perinatal mortality rates (percent of calves born dead or dying within 48 hours of birth) were 26% (H) and 17% (M1) in Experiment 1, and 16% (M2) and 3% (L) in Experiment 2. The percentages of heifers

accounted for the lighter pre- and post-calving weights of the M2 heifers compared with the M1 heifers. For example, extrapolating the gross ADG of M2 heifers over an additional 35 d produced an estimated pre-calving live weight of 378 kg, which is close to that achieved by M1 heifers (381 kg). Results for traits expressed independently of the difference in pre-calving feeding period for the M1 and M2 heifers in the 2 experiments were quite consistent.

Level of herbage allowance over the latter half of gestation influenced heifer performance. Increased herbage allowance led to increased heifer gross and net rates of gain, and a lower PPAI. Other studies have also shown that higher planes of nutrition during pregnancy result in increased heifer live weights and gains (Corah *et al.*, 1975; Axelsen *et al.*, 1981) and shorter PPAIs (Bellows and Short, 1978).

The influence of calving date on PPAI (Morris, 1980) was well demonstrated in the present experiments. In Experiment 1 mean calving date was October 5, with PPAIs of 49 and 43 d for M1 and H heifers respectively. In Experiment 2, overall calving date was 22 d earlier but PPAIs were longer (57 and 86 d for M2 and L heifers respectively). There were indications in Experiment 2 that calving date had an important

effect on PPAI in heifers offered 2 kg DM/100 kg LW, but not in heifers offered 3 kg DM/100 kg LW. Montgomery (1981) also noted the greater effect of calving date on PPAI in beef females on low compared with high levels of nutrition about calving.

Treatment differences in calving assistance were large within experiments, but not significantly so. Percent calving difficulty was similar for heifers on high or low levels of pre-calving nutrition in the studies of Corah *et al.* (1975), Bellows and Short (1978) and Axelsen *et al.* (1981). The range in percent assisted births in their studies was much higher (26 to 40%) than in the present experiments (6 to 26%), although the range in pre-calving live weight was similar. The above workers also reported significant differences of 2 kg in the birth weights of calves out of high-compared with low-plane heifers. The between-treatment difference in birth weight was 1.8 kg in both Experiments 1 and 2 ( $P < 0.05$  and  $P < 0.07$ ). Different pre-calving feeding levels may therefore influence birth weight but not necessarily calving difficulty.

A daily herbage allowance of 2 kg DM/100 kg LW may only be sufficient for net body weight to be maintained through gestation, with probable detrimental effects on post-calving reproductive activity and calf growth. At the other extreme an allowance of 4.5 kg DM/100 kg LW may result in high net body weight gain and satisfactory reproduction and calf growth. However, high residual herbage masses and increased calf mortalities may have to be tolerated. The present

experiments suggest that a daily herbage allowance in the vicinity of 3 kg DM/100 kg LW over the latter half of gestation could result in satisfactory performance levels in first-calving 2-year-old beef heifers.

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