Comparison of autumn/winter with spring pasture for growing beef cattle

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ABSTRACT

A series of 4 herbage allowance trials was conducted over 2 years with beef cattle on a well-drained site in Northland. Two trials were conducted in autumn/winter (April-July) and 2 in spring (October and November).

Analysis of the data, for each seasonal period combined over the 2 years, showed large differences in the relationships between daily live-weight gain and herbage allowance between the 2 seasons. At the same allowance, beef cattle grew faster in spring than in autumn/winter. Relationships between allowance and daily live-weight gain were:

Autumn/winter: $LWG = 0.48-1.37^{*}\ 0.65^{allowance}$

Spring: $LWG = 1.09-2.82^{*}\ 0.45^{allowance}$

These differences were not associated with differences in *in vitro* digestibility (70 to 78% in all trials) or N concentrations. Allowances required for maintenance were lower in spring than in autumn/winter and potential growth rates in spring approximately double those in autumn.

Keywords Cattle; live-weight gain; herbage allowance; winter; spring.

INTRODUCTION

The curvilinear relationship between herbage allowance and growth of beef cattle during 6-month trials over summer/autumn was described for Friesian steers by Marsh (1979). Earlier work (Marsh, 1975) suggested that cattle growth on autumn pasture was less than that on spring pasture at the same herbage allowance. Pasture growth rates in Northland are relatively high in autumn and winter and low in spring compared with those elsewhere in New Zealand. Four trials were conducted to compare cattle growth on autumn/winter-grown pasture with that on spring pasture.

EXPERIMENTAL

The trials were conducted on Punakitere Trial Area, 10 km west of Kaikohe (Shannon and During, 1980). The Trial Area was divided into 9 blocks of 2 to 4 ha.

Design

In each of 2 years a herbage allowance trial of 52 to 70 days duration was conducted in each of 2 seasonal periods, namely autumn/winter (April-July) and spring (October and November). In each seasonal period, 5 groups of Angus steers were offered herbage allowances ranging from 2.0 to 11.0 kg DM/100 kg live weight (LWT)/d in daily breaks (Table 1). The same animals were used for both seasonal periods within each year. Between the autumn/winter and spring seasonal periods in each year animals were grazed as one group, and offered 5 kg DM/100 kg LWT/d in 3 to 4 day breaks.

TABLE 1 Design of experimental treatments.

Year	Season	Months	Duration (d)	Mean initial LWT (kg)	Herbage allowance (kg DM/100 kg LWT/d)						
1	Autumn/winter	Jun/Jul	64	220	2.0	3.5	5.0	6.5	8.0		
2	Autumn/winter	Apr/Jun	68	169	2.0	3.5	5.0	6.5	8.0		
1	Spring	Oct/Nov	52	293			5.0	6.5	8.0	9.5	11.0
2	Spring	Oct/Nov	70	211	2.0	3.5	5.0	6.5	8.0		

Animals

Weaner Angus steers (initial live weights 220 and 169 kg in years 1 and 2 respectively) were selected from a larger group and allocated by restricted randomisation among the treatment groups for each autumn/winter seasonal period. For each spring period, animals were re-randomised from their autumn/winter period groups.

Animals were weighed after an 18-hour fast at the start and end of each seasonal period for calculation of live-weight gain and were weighed unfasted every 2 to 3 weeks for calculation of grazing areas. Drenching (oral Nilverm) was carried out approximately 3-weekly. The amount of pasture present before and after grazing was estimated by calibrated visual estimates (Haydock and Shaw, 1975).

Samples of pasture were cut, ahead of the cattle, to 2.5 cm stubble height (year 1) or to a height representing residual dry matter (year 2) for determination of *in vitro* digestibility and N concentration.

Statistical Analysis

For each seasonal period (autumn/winter or spring), there was no difference between years in the relationship between herbage allowance and daily live-weight gain. Therefore, for each seasonal period, a Mitscherlich equation of the form

$y = a + bc^{allowance}$

was fitted to the data from both years (y = daily live-weight gain in kg/d, allowance in kg DM/100 kg LWT/d).

TABLE 2 *In vitro* digestibility and N contents of pasture on offer for all herbage allowances. Standard deviation in parenthesis.

Year	Season	*In vitro* digestibility (%)	N concentration (g/kg DM)
1	Autumn/winter	77.6 (3.00)	31.6 (2.8)
2	Autumn/winter	69.7 (2.30)	35.0 (3.3)
1	Spring	77.7 (0.85)	26.6 (4.0)
2	Spring	76.3 (0.94)	20.5 (4.6)

RESULTS

Nitrogen concentration was higher in autumn/winter pasture than in spring pasture in both years, while *in vitro* digestibility was lower in year 2, autumn/winter than in the other 3 periods (Table 2).

TABLE 3 Apparent daily pasture utilisation (dry matter disappearance during grazing (kg/head/d)) at a range of herbage allowances (kg DM/100 kg LWT/d).

	Autumn/Winter		Spring	
	Year 1	Year 2	Year 1	Year 2
Allowance				
2.0	3.5	2.7	—	3.6
3.5	4.9	3.9	—	5.0
5.0	5.3	5.5	7.1	4.9
6.5	6.2	5.8	7.4	4.4
8.0	6.5	6.4	7.7	4.4
9.5	—	—	8.2	—
11.0	—	—	7.7	—
SE mean	0.33	0.20	0.57	0.34

In both years, pasture utilisation (apparent dry matter disappearance) calculated from before and after grazing, increased with allowance in autumn/winter periods. In year 1, spring utilisation increased up to an allowance of 9.5 kg DM/100 kg LWT/d, while in the second spring, highest apparent utilisation occurred at 3.5 to 5.0 kg DM/100 kg LWT/d. Utilisation was higher in year 1 spring than in the other 3 periods at the same allowances and lower in year 2 spring than in the other 3 periods at the 2 highest allowances (Table 3).

The relationships between herbage allowance and daily live-weight gain (Fig. 1) show that while the curves obtained in the same seasonal period are similar for the 2 years, daily live-weight gains were much higher in spring than in autumn/winter at the same allowance.

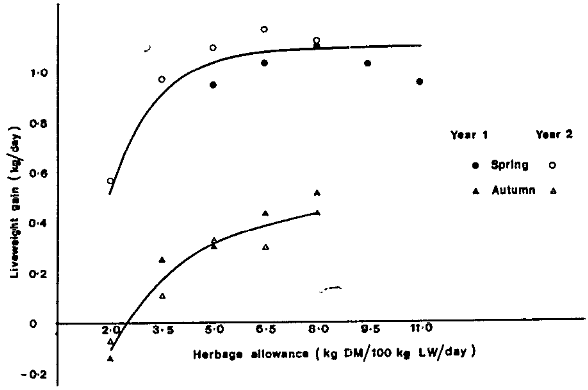

FIG. 1 Relationships between live-weight gain of beef cattle and pasture allowance in autumn/winter or spring.

The equations for the 2 curves are:

Autumn/winter:

$LWG = 0.48\text{-}1.37^* \; 0.65^{allowance}$ $R^2 = 0.95$ (approx.)

Spring:

$LWG = 1.09\text{-}2.82^* \; 0.45^{allowance}$ $R^2 = 0.94$ (approx.)

(LWG = live-weight gain in kg/d, allowance in kg DM/100 kg LWT/d.)

This suggests that at infinite allowance, daily live-weight gain in spring would be more than double that in autumn/winter (1.09 *v* 0.48 kg/d respectively). From these equations, the predicted allowances required for maintenance in spring (approx. 1.2 kg DM/100 kg LWT/d) were half those required for maintenance in autumn/winter (approx. 2.4 kg DM/100 kg LWT/d). At all allowances, predicted daily live-weight gains were greater in spring than in autumn, with a 5-fold difference at 3.5 kg DM/100 kg LWT/d.

DISCUSSION

Higher growth rates at the same herbage allowance in spring than in autumn have been reported before (Clark and Brougham, 1979; Marsh, 1975, with bulls and steers respectively). These differences were attributed to differences in digestibility (Clark and Brougham, 1979) or in maintenance requirements because of different weather patterns in the 2 seasons (Marsh, 1975). Often, as in the trials reported here, the effects of season and animal age are confounded. However, Trigg and Marsh (1979) observed no difference in intake of animals of 5 to 6 or 15 to 18 months of age. In the trials reported here there were no consistent differences between apparent pasture utilisation in the different seasonal periods.

It was suggested by Corbett *et al.* (1966) that the retention of metabolisable energy of spring pasture by sheep was higher than that of autumn pasture. This suggestion was confirmed by MacRae *et al.* (1985) who showed differences in efficiency of utilisation of metabolisable energy for production, in absorption of non-amino N and total amino acids in the small intestine between spring and autumn harvested pasture.

In this trial, faster cattle growth on spring than on autumn pasture at the same pasture allowance was not associated with differences in *in vitro* digestibility. When differences were observed in *in vitro* digestibility of pasture, namely between the 2 autumn periods, the response in live-weight gain to herbage allowance did not differ.

The N content of autumn pasture was higher than that of spring pasture, a difference also noted by Beever *et al.* (1978). If differences between autumn and spring pasture in nutritive value resulted from differences in absorption of glucogenic amino acids in the small intestine, then much of this extra nitrogen must have been lost from the rumen (MacRae *et al.*, 1985).

The trials reported here show that pasture allowances required for maintenance or for maximum growth rates of beef cattle are higher in autumn/ winter than in spring. Maximum animal growth rates during autumn/ winter are only half those obtainable in spring.

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