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Pasture dry matter and drinking water intake of grazing red deer stags and steers

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ABSTRACT

Eleven rising 2 year old red deer stags (127 kg LW) and five yearling steers (297 kg LW) were used to examine and compare pasture dry matter and water intake when grazing a rapidly decreasing pasture mass. The two groups grazed separately on adjoining 0.024 ha paddock breaks (12 per group) for 3 day periods.

Mean pre and post-grazing pasture mass for both groups was 3400 (± 80) and 1100 (± 40) kg DM/ha. Pasture intake (g DM/kg LW^{0.75}/d) for stags and steers respectively was 65, 93 (day 1) 44, 45 (day 2) 28, 25 (day 3). Results indicate that at pasture allowances greater than 4.0 kg DM/100 kg LW comparatively higher intake was achieved by steers. Daily pasture intake, expressed as a proportion of initial pasture intake (day 1), of stags was less affected by decreasing pasture mass (days 2 and 3) than steers.

Voluntary water intake by stags was approximately one sixth that of steers (3.6 vs. 23.2 l/hd/d). When compared on the basis of 1/ kg LW^{0.75}/d, steers consumed 3.4 times more water than stags. Faecal dry matter content (%DM) differed between species, being 25.6% for stags and 14.7% for steers. These results indicate faecal water loss may be a major factor contributing to higher water consumption by steers.

Keywords Stags; steers; grazing; pasture intake; water consumption.

INTRODUCTION

New Zealand's reliance on grazing production has encouraged study and appreciation of pasture and animal interrelationships and the development of farm grazing strategies, primarily for sheep and cattle. Deer farming, a more recent innovation, now requires such information to facilitate pasture feed planning for grazing deer (Milligan *et al.*, 1987).

In New Zealand the majority of farmed deer are red deer (*Cervus elaphus*) and as they become more numerous, prices reflect productive rather than speculative values. The declining value for all classes of red deer justifies research and implementation of grazing strategies to replace expensive supplementation used regularly in the past.

The objectives of this study were twofold; firstly, examining the suitability and compatibility of red deer stags and steers in intensive grazing systems, and secondly determining and comparing pasture and water intakes of red deer stags and steers under similar grazing conditions.

MATERIALS AND METHODS

The trial was conducted at the Lincoln University deer unit during the period 21 October to 31 December, 1988. By using electric fencing tape to create 8 x 30 metre paddock breaks (0.024 ha) a total of 24 breaks were grazed, two adjacent breaks at a time, one by each grazing group. Grazing groups consisted of either eleven rising 2 year old red deer stags or five yearling Hereford-Friesian cross steers. Group sizes were based on prior experience, which indicated pasture mass after 3 days grazing would be similar at these group sizes.

The small grazing areas were designed to force groups to graze to a pasture mass of approximately 1000 kg DM/ha in 3 days. Capacitance probe readings (CMR) on 20 sites in each of the two breaks being grazed were made immediately before beginning grazing a break and daily thereafter. Six sites within each break were chosen for sampling each day; 2 representing mean CMR, 2 with CMR one standard deviation below the mean and 2 with CMR one standard deviation above the mean. Pasture was cut to ground level at these sites in a 0.045m² quadrant and samples were dried and

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weighed.

Regression equations, for both stags and steers, relating CMR and PM were calculated from pooled data to estimate daily pasture mass (PM). Dry matter intake (DMI) was estimated from daily pasture mass disappearance.

Each grazing group had access to drinking water via portable troughs that were filled to specific levels at 0900 h each day to measure drinking water disappearance. Two identical troughs, in close proximity, measured daily precipitation and evaporation to correct water disappearance and estimate voluntary drinking water intake (VWI). Total water intake (TWI) was estimated from VWI and water content of pasture consumed. Fresh faecal samples, 3 per grazing group, were obtained daily and dried to determine faecal water content.

RESULTS

Starting and final fasted liveweights (LW) for stags were (mean \pm SEM) 117 \pm 3, 132 \pm 2 kg. and steers 269 \pm 10, 314 \pm 15 kg. There was no significant difference between stags or steers for starting or final mean PM at 3400 \pm 80 and 1100 \pm 40 kg DM/ha respectively (Fig. 1).

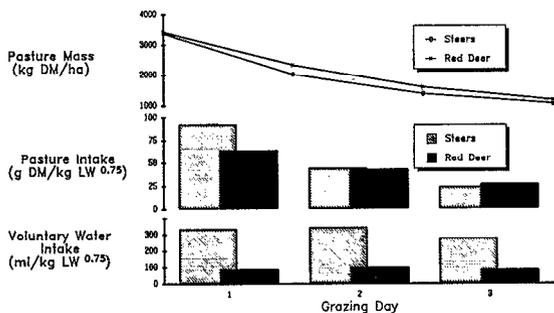


FIG 1 Daily mean pasture mass, pasture DM intake and voluntary water intake of steers (n=5) and red deer stags (n=11) grazing 0.024 ha pasture breaks for 3 days.

Steer DMI was significantly higher ($p < 0.01$) than stags on day 1, (93.3 \pm 5.6 vs. 65.1 \pm 6.6 g DM/kg LW^{0.75}/d) with no significant difference in pasture allowances. On days 2 and 3 there was no significant difference between stags or steers in either DMI or pasture allowance (Table 1).

TABLE 1 Mean (\pm SEM) pasture dry matter intake (DMI) and pasture allowance for each of 3 consecutive days of grazing.

Day	DMI per Head	Allowance (kg)	DMI (g/kg LW ^{0.75})
Stags			
1	2.4 \pm 0.24	203 \pm 8.4	65 \pm 6.6
2	1.6 \pm 0.18	137 \pm 8.2	43 \pm 4.9
3	1.0 \pm 0.16	98 \pm 5.7	28 \pm 4.4
Steers			
1	6.5 \pm 0.38	232 \pm 6.4	93 \pm 5.6
2	3.1 \pm 0.41	140 \pm 6.5	45 \pm 5.9
3	1.8 \pm 0.36	100 \pm 6.0	25 \pm 4.9

Mean steer VWI was over six times greater than stags, 23.2 \pm 1.4 vs. 3.6 \pm 0.3 l/h/d. No significant difference within groups in daily VWI was found with mean VWI (ml/kg LW^{0.75}) of 323 \pm 19 and 95 \pm 7 for steers and stags respectively. There were significant increases in faecal dry matter for stags ($p < 0.01$) and steers ($p < 0.05$) between days 1 and 3 (Table 2). Overall mean steer faecal dry matter was found to be 58% that of deer.

DISCUSSION

Estimated DMI requirements for 16 month red deer stags is 2.3 kg/hd/day (Adam, 1988) which was achieved only on day 1 (2.4 \pm 0.24), at high pasture allowance. Mean stag DMI (g DM/kg LW^{0.75}) of 65.1 on day 1 is similar to spring ad libitum DMI found for mature female elk at 56.2 and 66.7 (Robbins *et al.*, 1981) and yearling red deer stags consuming hay at 70.0 (Milne *et al.*, 1978). Yearling elk stags fed a pelleted ration *ad libitum* in spring had higher DMI at 79.6 (Westra and Hudson, 1981) apparently due to increased digestibility of pellets over forages.

The relationship between DMI and pasture allowance (PA), both on the basis of g DM/kg LW^{0.75}, was found to be linear rather than the typical curvilinear correlation (Rattray and Clark, 1984). Generally cattle DMI has been found to plateau at pasture allowances

TABLE 2 Water intake from consumed pasture (PWI), total water intake (TWI), faecal dry matter content (FDM) and steer:stag ratios when grazing 3 day pasture breaks.

Day	Steers	Stags	Ratio
PWI (ml/kgLW ^{0.75})			
1	112±9	72±15	1.6
2	2±10	52±8	0.8
3	31±8	27±4	1.1
TWI (ml/kgLW ^{0.75})			
1	450±25	164±23	2.7
2	390±49	155±9	2.5
3	325±32	115±17	2.8
FDM (%DM)			
1	13.8±0.3	22.8±0.8	0.61
2	14.9±0.9	25.1±0.9	0.59
3	15.6±0.5	27.8±1.4	0.56

greater than 5.0 kg DM/100kg LW (Trigg and Marsh, 1975; Reid, 1986). Maximum allowances in this trial, although higher than this (Fig. 2), may not have been high enough to allow the curvilinear relationship to be realised.

The equations developed were:

Steers DMI = 0.52 PA - 26.9 SE = 15.2, r² = 0.80
 Stags DMI = 0.38 PA - 9.5 SE = 14.2, r² = 0.65

These equations predict that under the grazing conditions in this trial, steer DMI would be nil at pasture mass lower than 750 kg DM/ha while stags would maintain some DMI, albeit minimal, at pasture masses down to 450 kg DM/ha.

Stags in this trial exhibited less fluctuation in DMI over the 3 day grazing period than steers. Steer DMI on days 2 and 3 was 48% and 27% of day 1 while

stag DMI was 67% and 43% respectively. Collins and Nicol (1986) found, under conditions of declining pasture mass, that cattle exhibited lower daily decline in DMI than sheep or goats. Grazing red deer stags appear to be able to maintain DMI under declining pasture allowances to a greater degree than cattle, goats or sheep. In contrast, at pasture allowances greater than 4.0 kg DM/100kg LW steers achieved much higher relative DMI than stags.

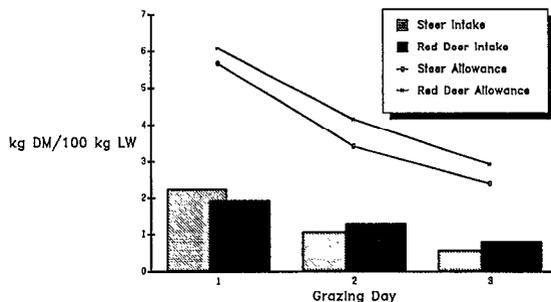


FIG 2 Daily mean pasture allowance and DMI of steers (n=5) and red deer stags (n=11) grazing 0.024 ha pasture breaks over a 3 day period.

Stag VWI in this trial was higher than the 75 ± 5 ml/kg LW^{0.75} reported by Barrell and Topp (1989) for mature stags grazing pasture. TWI for both stags and steers declined each day, primarily as a result of decreasing water intake from consumed pasture. Higher water losses in faeces may be a contributing factor to the significantly greater water intake by steers.

Results of this trial clearly show that red deer and cattle can be grazed intensively and in close association using existing methods of electric fencing and break grazing. There are significant species differences in DMI and in drinking water requirements and this information is particularly useful in the further development of red deer and cattle grazing strategies.

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