Comparison of the effect of simultaneous grazing of sheep or cattle with hinds during fawning

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ABSTRACT

Groups (4) of aged, pregnant red deer hinds (n = 7 or 12) were set-stocked pre-fawning with similar liveweight per ha of either dry ewes or yearling heifers in one of two paddocks equally divided in area (2 replicates). Cattle and sheep were progressively withdrawn from each area independently so that the average pasture height did not fall below 6 cm. The liveweight of the hinds and fawns was recorded and pasture samples taken for botanical and chemical analysis.

There was no significant effect of sheep *vs*. cattle on the liveweight change of hinds or their fawns. All groups of hinds lost condition over lactation even though pasture height was maintained around 6-8 cm. However the liveweight gain of the fawns (from mid January to early March) was close to 350 g/day. Overall, there was no significant difference in composition or quality between the pastures grazed by the two stock combinations.

We conclude from this study that under the conditions of this trial, in which the pasture was kept under tight control (6-8 cm) over the whole of lactation, there was no difference in the effect of the co-grazing species (sheep or cattle) on the performance of lactating hinds and their fawns.

Keywords: deer, cattle, sheep, mixed grazing.

INTRODUCTION

Over 60% of deer farmers responding to a survey (Griffiths *et al*., 2006) integrated sheep or cattle on their deer units. From the survey, the perceived advantages of mixed grazing were an improved match of energy demand and pasture growth, maintenance of pasture composition, better weed control and animal health benefits. However, there is little formal evidence available to guide deer farmers as to the appropriate timing, animal species or grazing management to optimise the potential of mixed grazing.

There are many situations where integrated grazing may be beneficial. For example, on many deer farms the energy requirement of hinds in late pregnancy/early lactation (October-December) is less than the pasture growth on areas that will sustain the requirements of hinds in later lactation (January-March). Thus the opportunity exists to introduce other classes of stock to the deer area during the late-pregnancy/early lactation period so that the combined energy demand matches pasture growth over this period. These stock can then be progressively removed as the requirements of the hinds and their fawns increase and pasture growth slows down. Such integration of other livestock may also have an impact on the quality of pasture available to the hinds through changes in proportions of grass, legumes and other species. Mixed grazing of sheep and cattle has been successful in increasing the performance of both classes of stock on North Island hill country (McCall *et al*., 1986). This study compared the performance of hinds and their fawns when co-grazing with cattle or sheep.

EXPERIMENTAL DESIGN AND METHODS

The trial was run over the 2005/2006 season (October-March) on two areas of permanent ryegrass/white clover pasture (1.4 ha, 2 years old and 2.8 ha > 3 years old). Each area was grazed as a single pasture by deer prior to the experiment then subdivided into two equal plots. Groups of aged, pregnant (to F1 Elk x red stags) red deer hinds (102 kg liveweight, n = 7 and 12 on 0.7 and 1.4 ha plots respectively) were set-stocked pre-fawning (22 October) with either dry ewes (80 kg liveweight, n = 12 and 23 on 0.7 and 1.4 ha plots respectively) or yearling heifers (305 kg liveweight, n = 3 and 6 on 0.7 and 1.4 ha plots respectively). The liveweight and condition score (CS) of the hinds were recorded pre-fawning in October, in early January and at weaning in early March. Fawns were weighed in early January and early March.

Pasture availability was assessed each week on each plot using a rising plate meter (40 observations per plot) and by pasture height using a sward stick at fortnightly intervals (40 measurements per plot). Pasture in four quadrants (0.2 m^2) representing areas of high (1), medium (2) and low (1) pasture mass from each plot were double sampled by plate meter and cutting to ground level at the beginning, middle and end of

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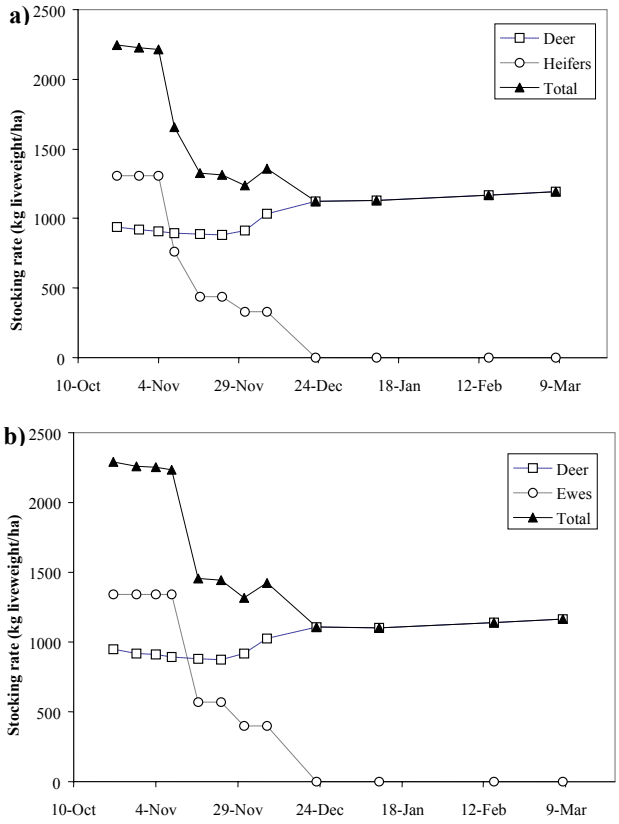
the experiment to calibrate the plate meter readings. These samples were dried for 48 hours at 70°C in a forced air oven. Pasture samples (40 snips taken to ground level) were taken from each plot at approximately 2 week intervals for botanical analysis and a sub-sample of these was retained for subsequent estimate of components of nutritive value by NIRS

The number of cattle and sheep was progressively reduced over time from each area independently so that pasture height did not fall below 6 cm. No deer were removed.

RESULTS

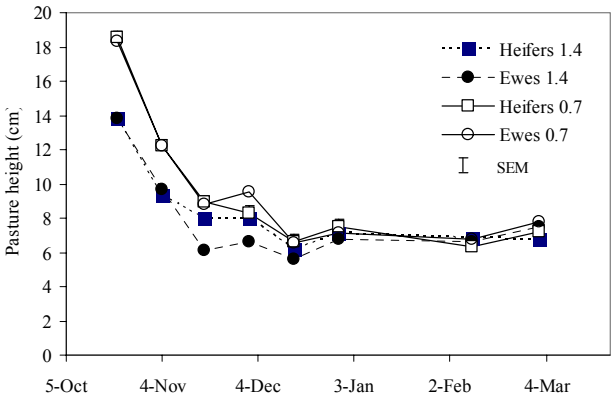
The seasonal change in total stocking rate (kg liveweight/ha) and that of the hinds, sheep or cattle separately is shown in Figure 1 for the two treatments. For the first month of the trial (mid October-mid November) the stocking rate was unaltered at around 2250 kg liveweight per ha. But from then on cattle and sheep were progressively removed until only hinds were left on the areas by mid-December through to weaning in early March. The pattern of change in stocking rate was similar for both sheep and cattle.

Figure 1: The change in stocking rate (kg liveweight/ha) of hinds+heifers (a) or hinds+ewes (b) from pre-fawning (October) to weaning (March) (Data are mean of two replicates).



The pastures prepared for this trial averaged 16 cm in mean sward height (Figure 2) at the beginning of the trial. From then on pasture height declined until mid-November, with the decline matched by the removal of ewes/cattle from the hinds and fawns. Thereafter, pasture height was maintained around 6-8 cm on across treatments and replicates and represented a mean pasture mass of 1367 and 1340 on plots grazed by hinds+heifers and hinds+ewes respectively. There was no significant difference ($p>0.05$) between the treatments in the mean pasture height at any stage of the experiment.

Figure 2: The mean pasture height of pastures grazed by of hinds+heifers or hinds+ewes from pre-fawning (October) to weaning (March). The 0.7 and 1.4 refer to the two replicates. Typical SEM at any one date is shown.



There was no major difference in the density of the pasture under either treatment as the linear relationship between pasture height and rising plate meter record was similar ($p>0.05$) for both treatments (Figure 3a). The relationship between pasture mass and rising plate meter measurement was also similar for pastures grazed by the two stock combinations (Figure 3b).

Mean water soluble carbohydrate concentration was significantly higher in pasture available to hinds and ewes than hinds and cattle (Table 1) but no other differences in chemical composition were found.

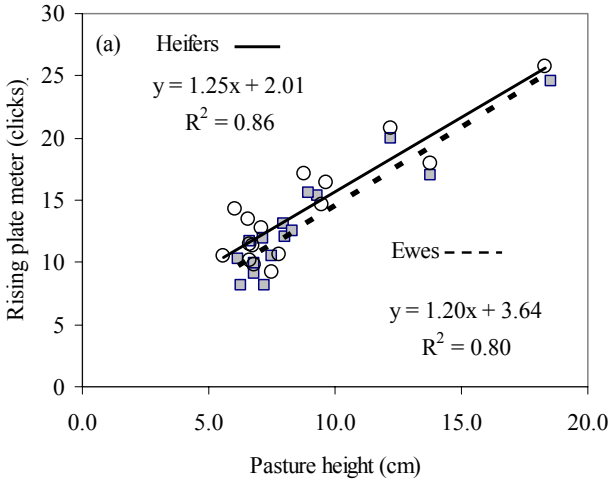
The botanical composition of the pasture on offer showed a seasonal change (Figure 4) in which the proportion of stem declined from around 0.45 to 0.20 of the fresh weight and there was a concomitant increase in green leaf proportion from 0.50 to 0.70 of the total. However there was little systematic difference between pasture grazed by deer and cattle compared with that grazed by deer and sheep. There was a slightly higher clover content in the deer and cattle pastures (average 5.5 and 3.4% for cattle and sheep grazing respectively)

but this was balanced by a slightly lower green leaf component in these swards. These trends were not apparent until mid January but persisted through to weaning (early March).

Reproductive performance was similar in both groups of hinds. Of the hinds co-grazing with sheep, 1 hind died of misadventure, and 1 fawn died. In the group co-grazed with heifers, 1 fawn died and 1 hind produced twins. Weaning % (fawns weaned per pregnant hind) was 0.89 and 1.0 for the hinds+ewes and hinds+heifers respectively.

There was no significant effect of treatment on the liveweight or condition score of hinds or the liveweight gain or weaning weight of their fawns (Table 2). Both groups of hinds lost condition over lactation. The liveweight gain of fawns (from mid January to early March) was close to 350 g/day.

Figure 3: The relationship between (a) pasture height and rising plate meter measurement and (b) pasture mass and rising plate meter measurement of pastures grazed by hinds+heifers (shaded symbol) and hinds+ewes (open symbol).



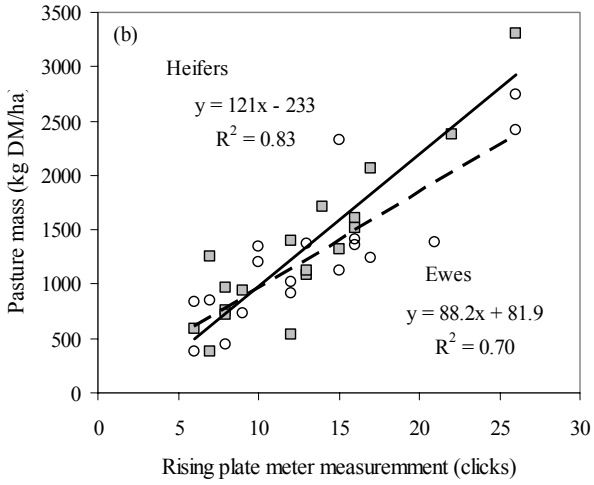


Figure 4: The botanical composition (% fresh weight) of pastures grazed by hinds+ heifers (C) and hinds+ewes (S) from fawning (November) to weaning (March).

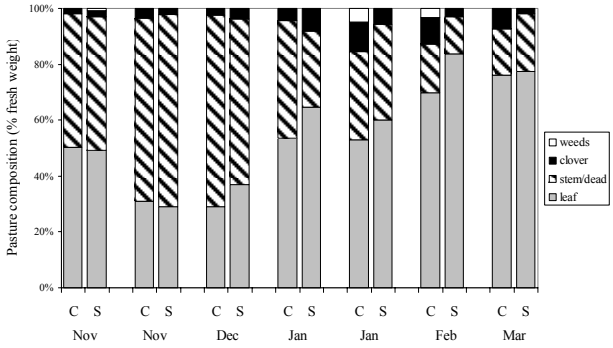


Table 1: Features of the pastures (mean and SEM of samples taken at 2 weekly intervals) grazed by hinds+heifers or hinds+ewes from pre-fawning to weaning.

	Grazed by hinds and		
	Heifers	**Ewes**	**SEM**
Pasture height (cm)	8.98	8.84	0.10
Pasture mass (kg DM/ha) *	1367	1340	
Digestible organic matter (g/kg DM)	650	656	6.9
Neutral detergent fibre (g/kg DM)	550	552	6.4
Acid detergent fibre (g/kg DM)	321	322	4.0
Water soluble carbohydrates (g/kg DM)	89 a	115 b	5.1

*Calculated from mean sward height and relationships in Figure 3.

Table 2: The liveweight, condition score (CS) of hinds and the liveweight gain of their fawns when grazed with either cattle or sheep.

		Hinds with		
		Heifers	**Ewes**	**SEM**
Hinds				
	pre-fawning (kg)	101.7	102.5	1.65
	(CS)	2.61	2.48	0.128
	mid-lactation (kg)	92.4	92.0	1.49
	(CS)	2.12	1.94	0.113
	weaning (kg)	89.7	90.1	1.50
	(CS)	1.72	1.80	0.104
Fawns				
	mid-lactation (kg)	25.7	26.5	1.35
	weaning (kg)	42.0	41.8	1.60
	LWG (g/day)	348	325	16.5

DISCUSSION

We conclude from this study that under the conditions of this trial, in which the pasture was kept under tight control (6-8 cm) during lactation, there was no difference in the effect of the co-grazing species (sheep or cattle) on the liveweight or condition score of lactating hinds and their fawns. The number of hinds was too low to draw any conclusions as to the impact of the co-grazing species on fawn survival. We recorded no important behaviour interaction between the hinds or their fawns and the co-grazing species, although other anecdotal evidence suggests that cattle may disturb new born fawns.

Vegetation community selection of deer and cattle has been studied under extensive conditions (Gordon, 1989; Virtanen *et al.* 2002) but no animal production data were gathered to provide data comparable to this trial. These results do not support the perception of deer farmers (Griffiths *et al*., 2006) of whom a higher proportion (55 *vs*. 46%) considered cattle more effective than sheep in improving the match of feed demand to supply and improving pasture quality on deer units (75 *vs*. 50%).

It is perhaps not surprising that there was no difference between cattle/sheep as the effects of companion grazing species on pasture composition and quality were small and pasture availability was similar. The time period over which changes in pasture quality and composition could have developed was from late October to late December. A period of two months grazing by cattle (Wright *et al*., 2001) and goats (Radcliffe & Francis, 1988) has been long enough to increase the legume content of pastures. But in the current study where the companion grazing species (cattle or sheep) were a maximum of only 50% of the stocking rate for the first month and lower, at 30%, for the second month, any impact of differential diet selection by cattle and sheep (Grant *et al*., 1985; Collins & Nicol, 1987) was apparently insufficient to change pasture structure or quality significantly. Small differences in pasture quality were observed. The significantly higher water soluble carbohydrate content of the pastures grazed by deer and sheep may reflect the trend to a higher green leaf and lower clover proportion in the pasture grazed by hinds+ewes, however this was not enough to affect the performance of the hinds and fawns.

It is interesting that the trend to higher clover content of the hinds+heifer pasture (Figure 4) persisted through the subsequent period (2 months) in which these pastures were grazed only by deer. When pastures of increased legume content have been established by cattle or goats, subsequent grazing by sheep has rapidly (6 weeks) reduced the clover content (Radcliffe & Francis, 1988: Wright *et al*., 2001) due to the strong preference of sheep for clover over grass (Clark & Harris, 1985). In the absence of good information of the relative preference of deer for clover and grass (Hunt & Hay, 1990) and stronger evidence for changes in pasture composition than in the current work, it is speculative to suggest that pastures under deer grazing may support a higher clover content than under sheep grazing.

It could be argued that the stocking rate selected for hinds and their fawns in summer (1000 kg liveweight/ha) was too high because the liveweight of hinds decreased during lactation and the weaning weight of fawns was not high (Beatson *et al*., 2000). It was not possible to reduce the stocking rate over summer by removing hinds and fawns as dam-offspring pairs had not been established. Neither was it possible to increase the grazing area as this was fixed by permanent deer fencing. However, the mean pasture mass was within the range recommended for lactating hinds (1200-1500 kg DM/ha) and the green leaf component during the summer (January-March) was maintained at 70% which is recommended for high fawn liveweight gain (Stevens & Corson, 2003).

The small number of heifers used in this work and the short period of time (1 month) that all cattle and sheep were on the trial makes any assessment of the effect of co-grazing with deer on the ewes and heifers unrealistic. Such an assessment is further compromised by the lack of treatments in which each species grazed alone. However, the average pasture height (6 - 8 cm) was likely to have been high enough to have at least maintained the liveweight of both the ewes and heifers (Nicol & Nicoll, 1987; Rattray *et al.*, 1987).

In this relatively short term study and with the small number of animals involved, no comments can be made about any comparative animal health aspects of co-grazing although this is a topic of discussion (Macintosh & Wilson, 2005; Griffiths *et al*., 2006).

These results reflect a grazing environment under which tight control was maintained on pasture availability. We caution that results may have been different had the pasture become reproductive with seedhead and dead material accumulation. Under such conditions cattle have been shown to consume a higher proportion of seedhead and stem than sheep (Grant *et al.,* 1985; Collins & Nicol, 1987) and thus might be the preferable co-grazing species to deer. Confirmation

of this hypothesis is needed.

In this study, relatively high (30-50% of the total stocking rate) levels of co-grazing of pregnant/lactating hinds from October to January with either cattle or sheep generated similar pasture and had no differential effect on the liveweight and condition score change of hinds or their fawns. We conclude that where pasture height is controlled to within 6-8cm, choice of co-grazing species can be made, on grounds other than their effect on pasture quality or deer performance.

The opportunity to introduce a varying number of either cattle or sheep, initially as a significant proportion of the stocking rate, for a relatively short time (2½ months) is, in practice, restricted to hinds on deer units in mixed livestock farms where sufficient additional stock already exist. The alternative of purchasing the cattle or sheep required is not attractive on economic grounds. On mixed livestock farms it is common practice to concentrate stock in late spring on areas of the farm (such as a deer unit) on which it is important that pasture quality is maintained. This is done at the expense of other parts of the farm (higher altitude, less well developed areas) where pasture accumulates for use later in the season.

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