

Venison production from red deer and red – elk hybrid weaner stags: implications for management

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Abstract

Previously published data (Judson and Nicol, 1997) was used to compare per-head and per-hectare performance of rotationally-grazed weaner red deer and hybrid stags to identify key seasonal and genotype management implications

Winter liveweight gain of both red deer and hybrids at all pasture allowances was low (50-80g/d) and there was little benefit in offering high pasture allowances. Spring liveweight gain was between 4 and 6 times that achieved in winter with hybrids gaining 90g/d more than red deer at the highest allowance (10kg/hd/day). Liveweight gain data was used to demonstrate that a combination of a high pre-winter weight (>65kg on 1 June) and rapid spring liveweight gain (>250g/d) is required if a high proportion (>70%) of the mob is to be slaughtered by 1 December.

High per-head liveweight gain was associated with lower levels of liveweight gain per-hectare. Specific management implications from these results for the efficient production of venison are discussed.

Introduction

Many deer breeding and breeding - finishing systems now use a terminal sire (elk type stag) over a proportion of red hinds to produce hybrid offspring specifically for venison production. Hybrids, under most circumstances, have a higher birth weight and faster pre- and post-weaning liveweight gain compared with red deer. The liveweight gain of red deer and hybrids has been measured on swards of chicory, (Kusmartono, *et al* 1996) perennial and annual ryegrass (Ataja, *et al* 1990) and red clover and annual ryegrass (Semjadi *et al* 1993), but few have made a systematic comparison of red deer and hybrids over a wide range of pasture allowances and during different seasons (Judson and Nicol 1997). Furthermore, most previous work has measured per-head production and has paid little attention to per-hectare performance. Since many of the costs associated with finishing weaners are incurred on a per-hectare basis, high per-head performance may be to the detriment of per-hectare performance and may not represent the most cost efficient production system.

This paper uses some previously published data to compare the per-head and per-hectare production of red deer and hybrids in a rotationally grazed system and identifies key seasonal and genotype management issues.

Material and methods

The data used in these analyses came from an experiment in which separate groups (10-12) of red deer and hybrid weaner stags were rotationally grazed on weekly breaks of ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) pasture during winter, spring and summer. In each season, red deer groups and hybrid groups were paired and offered separately one of four pasture allowance treatments.

Pasture allowance treatments were based on metabolic liveweight ($\text{kg DM/W}^{0.75}/\text{d}$). Consequently, on a kg DM per head basis they were lower for red deer than for hybrids and increased with liveweight during the experiment. Increased pasture allowance was achieved by increasing both pre-grazing pasture mass and grazing area. In winter, the range of pasture allowance was 2.0–5.0 and 2.3–6.0 kg DM/hd/day for red deer and hybrids, respectively. Spring and summer allowances for red deer and hybrids ranged from 1.8 to 9.1 and 2.1 to 10.3 kg DM/hd/day and 3.7 to 14.4 and 4.3 to 16.5 kg DM/hd/day respectively.

The lowest pasture allowance was equivalent to 70 weaners on 1 ha of 5cm pasture (800kg DM/ha) for 1 week while the highest was equivalent to 50 weaners on a 1 ha of 20cm pasture (4500kg DM/ha) for a week. This was assumed to cover the range normally found on commercial deer farms.

At the beginning of winter (1 June), red deer weighed 57.4 ± 2.0 kg (mean \pm SD) and hybrids 68.0 ± 2.2 kg (mean \pm SD). Blood typing confirmed parentage of red deer and revealed hybrids contained on average 35% elk genes.

Greater detail of the experimental methods is given in Judson and Nicol (1997).

Results

The key points for winter were:

- During winter (June/July), mean liveweight gain of both genotypes and at all allowances was low (50g/d)
- There was no significant benefit to liveweight gain in offering pasture allowances above 2kg DM/h/d during winter in this study
- There was no significant difference in winter liveweight gain between red deer and hybrids
- Other studies (Ataja, 1992) have reported higher winter (May-August) liveweight gain (130-150g/d) on ryegrass than this study. The higher liveweight gain may in part be due to the inclusion of late autumn and early spring liveweight gain not included in this study (June – July).

Liveweight gain of weaner stags on each allowance in spring and summer is presented in Figure 1. The key points were:

- Liveweight gain in spring was between about four and six times that achieved in winter on comparable pasture allowances
- The difference in the rate of liveweight gain between red deer and hybrids was highest at the highest pasture allowances with hybrids growing 90g/d faster than reds. This is equivalent to an extra 2.7kg each month.
- The response to additional pasture in spring was initially large. Increasing pasture allowance from 2 to 4kg DM/h/d increased growth from 50 to 200g/d
- Red deer and hybrids differed in their response to pasture allowance. Maximum per-head liveweight gain was achieved by red deer in spring at a pasture allowance of about 4kg DM/h/d. Hybrids continued to respond to extra pasture even above 6kg DM/h/d and needed allowances above 4kg DM/h/d before they began to exhibit their liveweight gain advantage over red deer (Figure 1a)

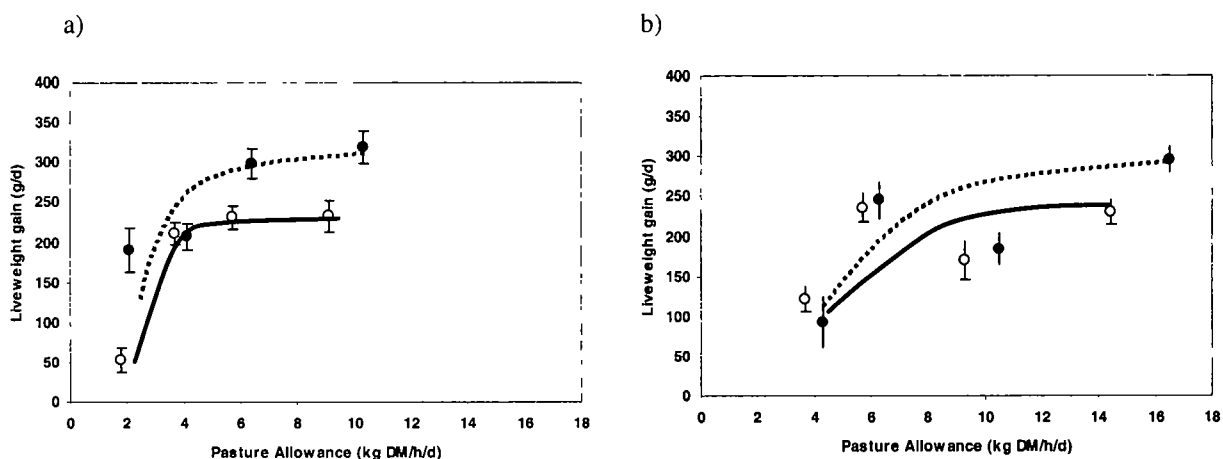


Figure 1. Liveweight gain (\pm SEM) of red deer (O) and hybrids (●) over a range of pasture allowances during spring (a) and summer (b) (adapted from Judson and Nicol, 1997).

In summer, with yearlings at 15 months of age the key points were

- Liveweight gain on average was lower than in spring and reached plateau at 250g/d and 200g/d for hybrids and red deer, respectively
- Higher allowances (8-10kg DM/hd/d) seem to be needed for maximum liveweight gain (compared to spring)

Management Implications

Management implications of this work are

- Offering large quantities of pasture did not increase liveweight gain during winter for either red deer or hybrids. Liveweight gain was similar if deer were restricted to a 'fresh pick' or had access to large allowances at a high pasture mass
- From a feed management standpoint there appeared to be little benefit in offering high allowances to weaners during mid winter. Autumn saved/winter pasture could be used more effectively by other stock or by weaners in autumn or during early spring
- Winter feed crops for weaners are likely to be inefficient in terms of liveweight produced. Spring feeding in both red deer and hybrids is far more important than winter feeding in influencing liveweight gain from winter to slaughter
- Hybrids gained liveweight faster than red deer at all allowances but the difference was greater at higher allowances. Hybrids essentially exhibited a greater amplitude in seasonal growth. Provision of sufficient pasture in spring is critical for maximising liveweight gain. Failing to provide appropriate pasture allowances (6-8kg DM/hd/d) to deer will result in liveweight gain below their potential
- During spring, hybrids required a higher allowance (7kgDM/hd/d) than red deer (4kgDM/hd/d) to achieve maximum liveweight gain
- That red deer and hybrids have different pasture requirements in spring suggests it would be detrimental to either hybrid liveweight gain or pasture utilisation to graze red deer and hybrids together. Hybrids in a mixed herd offered 4 kgDM/hd/d would not gain liveweight at their potential rate while reds offered 7kg DM/hd/d would be under-stocked

Slaughter Targets

This data set was also used to demonstrate how differences in liveweight gain affect the ability of deer to reach 92kg liveweight by mid December. Various winter and spring liveweight gain was used to simulate liveweight at 12 months of age for both deer types at different pasture allowances (Judson and Nicol, 1997). Final mean liveweight (liveweight on 1 December) in each treatment was determined by adding liveweight accumulated during winter and spring to mean winter liveweight (liveweight on 1 June) for each treatment. Winter liveweight gain was applied between 1 June – 1 September and spring liveweight gain between 1 September – 1 December. The simulated mean final weight and the measured SD of liveweight in treatment groups in spring was used to estimate the percentage of animals in each treatment which would have attained 92kg liveweight by 1 December

This analysis showed that at an allowance of 2kg DM/hd/d in winter and spring, 68% of hybrids but no reds would reach target liveweight. Even at an allowance of 10kg DM/hd/d in both winter and spring only 10% of red deer compared to 99% of hybrids would reach target liveweight (Judson and Nicol, 1997)

Key points from this simulation are,

- Red deer and hybrids differed by between 12 and 17kg at 12 months of age but between 61 and 87% of this difference was due to differences in pre-winter liveweight.

- Regardless of pasture allowance most hybrid stags with a 1 June liveweight of 65kg would reach 92kg by 1 December
- Regardless of pasture allowance few red stags with a 1 June liveweight of 55kg would reach 92kg by 1 December

Such calculations can be extended to cover a range in both liveweight gain and initial liveweight. Differences in initial liveweight and liveweight gain explain most of the differences in the number of weaners reaching 92kg by 1 December between this and other studies. The effect of winter liveweight in addition to liveweight gain on the proportion of stags reaching 92kg is illustrated in Figure 2.

Winter LWG		50				75				100			
Spring LWG		200	250	300	350	200	250	300	350	200	250	300	350
Mean liveweight (kg) 1 June	50	73	77	82	86	75	80	84	89	77	82	87	91
		5	10	18	28	7	13	23	34	10	18	28	41
	55	78	82	87	91	80	85	89	94	82	87	92	96
		11	19	29	42	14	24	36	49	19	29	42	56
	60	83	87	92	96	85	90	94	99	87	92	97	101
		19	30	44	57	25	37	51	64	31	44	58	71
	65	88	92	97	101	90	95	99	104	92	97	102	106
	32	45	59	72	38	52	66	80	45	59	72	86	
70	93	97	102	106	95	100	104	109	97	102	107	111	
	46	60	73	83	53	67	78	87	60	73	83	91	
75	98	102	107	111	100	105	109	114	102	107	112	116	
	61	74	84	91	68	79	88	94	74	84	91	96	

	Likely for red deer		Likely for hybrids
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Figure 2. Effect of pre-winter weight (1 June) and winter and spring mean liveweight gain (g/d) on the liveweight at 1 December (top value) and percentage of deer in a herd reaching 92kg liveweight by 1 December (bottom value).

The inability of small, slow growing deer (red deer) to reach 92kg within 12 months is clearly illustrated here. For red deer herds, at a mean winter weight of 55kg and gaining 75 and 250g/d on average during winter and spring, respectively, mean liveweight on 1 December is 85kg and only 24% are greater than 92kg at this time. However, if just 5kg extra are added to the winter weight (60kg) without increasing either winter or spring liveweight gain, the proportion of animals successfully reaching 92kg by 1 December increases to 37%. If 65kg is achieved by 1 June then 52% will be successful in reaching a 92kg target.

For bigger, faster growing deer (hybrids) at a 55kg winter weight and gaining 75g/d winter and 350g/d spring growth rate, a greater number reach the 92kg target (49%). However, in our experience hybrid weaners usually enter winter at approximately 65 kg so 82% will reach 92 kg by 1 December.

The implications for farmers are that

- Pre-winter (1 June) weight of weaner stags has a large effect on the proportion of animals attaining 92kg by 1 December. Maximising liveweight at 1 June reduces the need for rapid spring liveweight gain in order to achieve targets.
- At a mean winter weight of 55kg, less than 1 in 3 red deer will reach 92kg liveweight by 1 December even supposing maximum spring liveweight gain is achieved at pasture. About ½ of hybrids will reach 92kg if weaned at 65kg even if liveweight gain is no greater than red deer.

- Financial returns depend on schedule price and more specifically the value (\$/kg) of the different weight ranges (ie <50kg and 50-60kg) Individual producers need to consider the cost –benefits of early (Oct-Nov) vs late (Jan –Feb) venison production

Per hectare production

So far this work has considered liveweight on a per-head basis and has given no consideration to per-hectare performance. In a finishing system the latter is also of relevance since many of the costs associated with production are on a per-hectare basis.

The per-hectare production (kg liveweight gain per-hectare) for spring and summer experimental periods for each pasture allowance is given in Figure 3

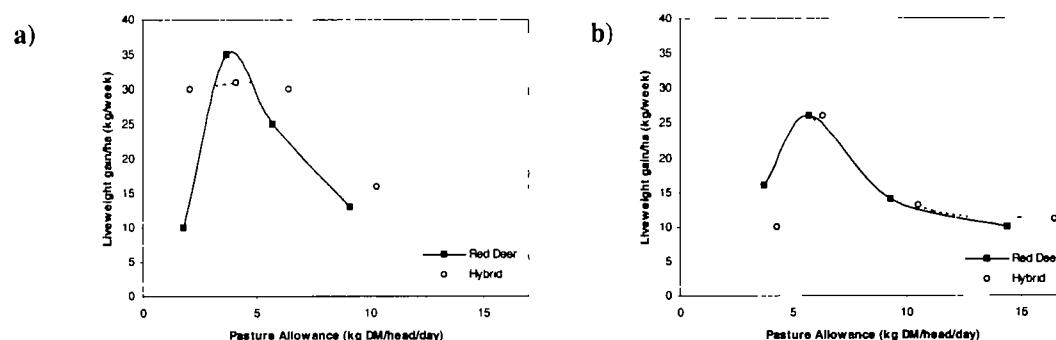


Figure 3. Per-hectare production (kg liveweight gain/ha/week) of red deer and hybrid weaner stags in spring (a) and summer (b).

Mean liveweight gain per-hectare was greater in spring compared with summer (23.8 kg/ha/week vs 15.8 kg/ha/week for spring and summer, respectively). During spring, hybrid per-hectare mean liveweight gain (26.8 kg/ha/week) was on average greater than red deer (20.8 kg/ha/week). During summer, the mean production per hectare was similar (15.0 and 16.5 kg/ha/week for hybrid and red deer, respectively). Maximum weekly per hectare liveweight gain for both genotypes occurred at an allowance of approximately 4 kg DM/head/day during the spring and 6 kg DM/hd/day during the summer. During spring a penalty in per-hectare production of offering high pasture allowances only occurred at the highest pasture allowance (10.3 kg DM/hd/d) with hybrids whereas red deer per hectare production declined when offered allowances at > 5.7 kg DM/hd/d.

Key points

- Maximum liveweight gain per-hectare occurs at about 80% of maximum liveweight gain per head. Maximising hybrid individual liveweight gain in both spring and summer halved per-hectare production.
- Offering generous pasture allowances (> 8-10 kg DM/hd/d) achieves similar liveweight gain per hectare to offering low pasture allowances (2-3 kg DM/hd/d).

Implications

Management implications of this work are;

- During spring hybrids require a higher allowance (7 kg DM/hd/d) than red deer (4 kg DM/hd/d) to achieve maximum liveweight gain and therefore to gain the benefit of hybrid's liveweight gain potential, they need to be offered higher pasture allowances. However maximising gain in large, fast growing animals provides poor returns in terms of per-hectare production.

- Given sufficient pasture (6-8kg DM/hd/d), hybrids have the potential to gain liveweight faster than red deer on a per-head basis and are more likely to achieve a 92kg target weight by 1 December
- Identifying production goals is necessary in selecting appropriate feed management and animals (eg. winter liveweight)

References

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