

Preliminary findings of genotype variations in growth rate and feed intake of weaner deer

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Abstract

Deer are seasonal animals with a feed intake that varies with day length, reaching a low in winter. Feed intake then rises rapidly in spring. Superimposed on the nutritional response to day length are the genetics of the deer. This paper documents preliminary findings of live weight gain in winter and spring and intake during September for red deer (*Cervus elaphus*) and elk (*Cervus elaphus canadensis*) x red deer hybrids. Two experiments examined the relative growth rates and feed intake of rising 1 year old red and elk x red hybrid male deer during winter and spring 2001 and 2002. Live weight gain was higher in the elk x red than the red deer in both winter (averaging 262 and 144 g/d respectively) and spring (averaging 390 and 272 g/d respectively). Dry matter intake in September 2001 was 1.64 and 2.13 kg DM/d for red and elk x red deer respectively ($P=0.003$). Dry matter intake in September 2002 averaged 2.04 and 2.35 kg DM/d ($P<0.05$) for the red and elk x red deer respectively. Feed intake, when expressed as a percentage of body weight or metabolic body weight terms did not differ between the red and elk x red deer, indicating that the main driver of intake was body size, rather than any true genotype differences. A major difference in weight gain between the genotypes was related to the different size of the animals rather than an inherent difference in their feed conversion efficiency. This research indicates that maximising the potential of weaners to reach spring slaughter weights is a result of having heavy weaners going into winter combined with a good feeding programme to maximise feed intake.

Keywords: elk, genotype, food intake, live weight gain, red deer, seasonality

Introduction

Much is known about the feeding requirements of the New Zealand red deer though little data is available defining the requirements of elk x red deer hybrids.

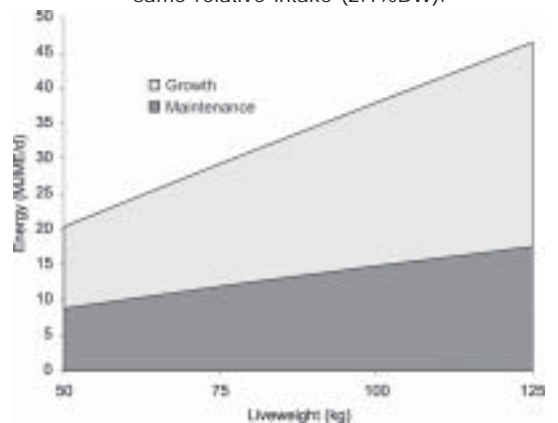
Earlier work defining the seasonal dry matter requirements and growth response of the red deer of New Zealand may not be applicable to the hybrid lines of elk x red deer now being farmed in New Zealand. For this reason it seemed appropriate to establish whether feed requirements and subsequent growth performance of these hybrid animals differs substantially from the red deer and if so why.

It has been observed that elk and elk x red deer hybrids

often grow faster in winter than pure red deer (Judson & Nicol 1997; Beatson *et al.* 2000), though variation in this observation can be great (Beatson *et al.* 2000). The hypothesis being tested was that the elk x red deer hybrids are larger at the start of winter and therefore have a lower relative maintenance requirement per unit of feed intake (Nicol & Stevens 1999) as depicted in Figure 1.

This study aimed to determine the importance of variations caused by size and to compare the metabolic requirements for maintenance and growth between red deer and elk x red deer hybrids. Red deer were compared

Figure 1 Energy partitioning to maintenance and growth as body size increases at the same relative intake (2.1%BW).



to elk x red deer hybrids during winter and spring to estimate the intake and live weight gain of each genotype, and the impact of weaner size on live weight gain efficiency.

Methods

Experimental design

Two studies undertaken in the winter and spring of 2001 and 2002 compared the food intake and growth of the red deer to the elk x red deer hybrid. The animals representing these genotypes were produced on the AgResearch Invermay farm. The studies used socially equivalent groups fed a high energy pelleted ration indoors to express the genetic potential for growth of the animal. A completely randomised experiment was used to compare the feed intake and weight gain of six red deer to six elk x red deer from June to October 2001 at the Invermay Agricultural Research Centre, Mosgiel,

New Zealand. Three animals from each genotype were allocated to one of two rooms. One of the red deer failed to adjust fully to the feeding regime and was removed from the study.

The feed intake and weight gain of eight 7–8 month male red deer calves was compared with eight 7 month male elk x red deer calves from June to October 2002 using a completely randomised experiment at the Invermay Agricultural Research Centre, Mosgiel, New Zealand. Of the 16 animals that began the study, one elk x red and two red deer were subsequently removed due to unsuitable behaviour patterns for the study.

In each study the calves were housed in each of two 10 m by 6 m rooms from May in 2001 and 2002 through to the experiments conclusion on a deep litter of sawdust. Lighting in the well ventilated rooms by fluorescent tubes was controlled by a light sensor mounted on the outside wall of the building to produce a photoperiod pattern similar to ambient at an intensity of >300 lux. Each week day morning animals were exercised for 60–90 minutes in their groups on large bare pads.

The animals were offered an *ad libitum* pelleted diet commercially produced to provide 140 g/kg crude protein and 11 MJ metabolisable energy per kg of dry matter at a dry matter content of 870 g/kg. Water was provided at communal troughs. Feed was accessed from feeding stalls that were activated by electronic identification tags unique to each individual to allow measurement of individual intakes. Daily feeding enabled early detection of technical problems with gate function and behavioural and health problems with the deer, meaning corrective action could be implemented immediately. Animals were familiarised to the diet the feeding regime and the indoor environment for at least four weeks before each study began. Standard animal health practices were followed, as required.

Measurements

Food intake was measured daily. The food offered was adjusted to appetite following the collection and weighing of refusals and fed daily to ensure between 10 and 20% refusal each day. Chaffed lucerne hay was offered at 100 g/d to each deer to maintain rumen health and was included in the calculations of dry matter and energy consumed. Animals were weighed weekly.

Live weights were analysed by ANOVA for each week, with a repeated measures in time analysis used to determine the change in live weight gain over time. Preliminary intake data from September each year was analysed by ANOVA.

Results and Discussion

The live weight gain (Table 1) of red deer weaners measured during winter was similar to gains of between 151 and 196 g/d reported by (Webster *et al.* 2000; Webster

et al. 1997). Live weight gain during winter was higher ($P<0.001$) in the elk x red deer (230 and 295 g/d in 2001 and 2002 respectively) than the red deer weaners (125 and 164 g/d in 2001 and 2002 respectively) and was relatively constant throughout the period. Live weight gain during winter was closely correlated to the live weight of the animal.

Live weight gain during spring was higher ($P<0.05$) in the elk x red (395 and 384 g/d in 2001 and 2002 respectively) than the red deer (280 and 264 g/d in 2001 and 2002 respectively). Judson & Nicol (1997) reported live weight gains during spring of up to 319 and 232 g/d for elk x red (35% elk) and red deer respectively on pasture, compared with approximately 308 g/d reported by Webster *et al.* (2000) for red deer fed a concentrate ration during spring. Live weight gain in red deer over many feeding experiments during spring has ranged from approximately 260 to 350 g/d (Nicol & Barry 2002).

The mean intake during September (Table 2) was greater for elk x red than red deer ($P<0.05$). Feed intake, when expressed as a percentage of body weight had a tendency to be higher in red than elk x red weaners during September being significantly different in 2002. However, when expressed as energy intake per kg metabolic body weight, it did not differ between the red or elk x red deer in either year, indicating that an important determinate of intake at this time of year was body size, rather than any true genotype differences.

Analysis of intake and live weight data estimated the energy requirements for maintenance to be 0.47 and 0.53 MJME/kgBW^{0.75} (SE=0.2) for the elk x red and red deer respectively in September 2002. Energy requirements for gain in September 2002 were 34.5 and 39.5 MJME/kg gain (SE=5) for the elk x red and red deer respectively. The major difference in weight gain during this period was related mainly to the different size of the animals at the same age, rather than a major difference in their feed conversion efficiency.

The September intakes are lower than other measurements that have been made during spring. Webster *et al.* (2000) found intake increased in red deer from 2.08 to 2.93 kg DM/d or 0.82 to 0.90 MJME/kg BW^{0.75} over the mid-August to mid-October period. When exposing male red deer to 16 hr day lengths Webster *et al.* (1997) found that feed intake increased from the winter levels of 1.48 kg DM/d to average 2.04 kg DM/d, increasing from 1.6 to 2.4 kg DM/d or 7% per week over a 10 week period. Intake for 1 year old female elk fed lucerne pellets in spring (early March and late April) by Galbraith *et al.* (1998) was 62 and 110 g/kg BW^{0.75}, or 2.65 and 4.82 kg DM/d. Indoor housing of the deer in the current experiment may have reduced feed requirements.

This experiment has confirmed other suggestions that

Table 1 Genetic variation between red deer and elk x red deer hybrids in live weight and live weight gain in winter and spring.

	Live weight (kg)			Live weight gain (g/d)		
	Red	Elk x Red	LSD	Red	Elk x Red	LSD
Winter 2001	64	77	9.2	125	230	79
Spring 2001	75	102	11.1	280	395	107
Winter 2002	72	91	11.0	164	295	48
Spring 2002	90	119	12.4	264	384	75

Table 2 Preliminary feed intake results for red deer and elk x red deer hybrids in September.

Year	Intake								
	Total (kg/d)			By bodyweight (%)			By metabolic bodyweight (MJME/kg BW ^{0.75})		
	Red	Elk x Red	LSD	Red	Elk x Red	LSD	Red	Elk x Red	LSD
2001	1.63 a	2.13 b	0.38	2.17	2.10	0.25	0.704	0.733	0.096
2002	2.04 a	2.35 b	0.36	2.22 a	1.98 b	0.24	0.756	0.719	0.086

elk x red deer and red deer have similar intake characteristics. This experiment however has been able to do that with the animals in the same conditions, rather than by the comparison of red deer and elk through the literature. During spring this experiment showed high live weight gain in both the red and elk x red weaners. The response in intake and live weight gain were similar in spring and the higher live weight gain of the elk x red weaners was mainly attributable to their greater size at the same age.

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