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Effects of grazing red clover (*Trifolium pratense*) or perennial ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) pastures upon growth and venison production from weaner red deer (*Cervus elaphus*)

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Abstract Forty-four weaner red deer (*Cervus elaphus*) fawns (26 stags; 18 hinds) were used to vestigate the effects of grazing pure red clover (*Trifolium pratense*) or perennial ryegrass (*Lolium renne*)/white clover (*Trifolium repens*) pastures upon growth and venison production, with the objective of the stags attaining a minimum target slaughter liveweight (92 kg liveweight; 50 kg carcass) by 12 months of age. The experiment commenced on 13 March and concluded on 26 November 1991. The deer were rotationally grazed on either red clover or perennial ryegrass/white clover pasture during autumn and spring (feed allowances 6, 7 kg dry matter (DM)/h per day, respectively). During winter, all animals were combined and grazed together on perennial ryegrass/white clover pasture, at a pasture residual DM of 1100 kg DM/ha. Pre-grazing herbage mass for red clover and perennial ryegrass/white clover were respectively 3568 and 3706 kg DM/ha in autumn, and 2726 and 2150 kg DM/ha in spring, and 1736 kg DM/ha for perennial ryegrass/white clover in winter. Post-grazing herbage mass for red clover and perennial ryegrass/white clover averaged respectively 1822 and 1882 in autumn and 1705 and 1334 in spring, and 1170 kg DM/ha for perennial ryegrass/white clover in winter. Total nitrogen (N) concentration and organic matter digestibility of both feed on offer and diet selected were higher in red clover than perennial ryegrass/white clover. Liveweight gain of red clover stags (237 versus 207 g/day) and hinds (197 versus 159 g/day) was significantly higher than that of perennial ryegrass/white clover animals in autumn ($P < 0.01$) and in spring (346 versus 281; 260 versus 188 g/day; $P < 0.001$). Weaner stags and hinds grazing red clover forage had significantly higher voluntary feed intake than the comparable animals grazing perennial ryegrass/white clover pasture in both autumn ($P < 0.05$) or spring ($P < 0.001$). By 12 months of age, stags grazing red clover were 6 kg heavier and hinds 7 kg heavier than animals grazing perennial ryegrass/white clover forage. All (100%) red clover stags attained the minimum target slaughter liveweight (92 kg liveweight ; 50 kg carcass) by 12 months of age at the end of November, compared to 90% of perennial ryegrass/white clover stags. Carcass weights (kg) and dressing percentage (%) of red clover stags were significantly higher than those of perennial ryegrass/white clover stags (58.9 versus 53.3 kg, $P < 0.01$; 56.2 versus 52.4%, $P < 0.001$), but the carcass GR was not different ($P > 0.05$) either before or after being adjusted to equal carcass weight. It was concluded that early venison production from grazed perennial ryegrass/white clover pastures is possible, and that this can be

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further improved by inputs of red clover. Red clover offers very good potential as a special-purpose forage for venison production.

Keywords venison production; red deer; *Cervus elaphus*; red clover; *Trifolium pratense*; perennial ryegrass; *Lolium perenne*

INTRODUCTION

The deer in New Zealand (NZ) is considered as a dual-purpose animal, producing both venison and velvet, and grazing mainly on traditional perennial ryegrass (*Lolium perenne*)/white clover (*Trifolium repens*) pasture. Under current pasture conditions and management, young red deer (*Cervus elaphus*) stags normally reach the target slaughter liveweight (92 kg; 50 kg carcass) at 15 months of age (March) (Drew 1989), when venison schedule prices have declined. It is most profitable to produce venison from red deer in NZ with carcasses weighing more than 50 kg by just under 1 year of age, to meet the demand of Northern Hemisphere markets resulting in highest schedule prices in the August to December period (Ataja et al. 1992). By offering high allowances (6.3 kg DM/ha per day) to weaner red deer stags grazing annual ryegrass pasture during both winter and spring, Ataja et al. (1992) showed that 60% of animals could attain this target.

Young red deer exhibit a seasonal pattern of growth and voluntary feed intake, with high values in spring and summer, and low values in winter (Barry et al. 1991). This is a major constraint to increasing growth during winter and hence to increasing venison production.

Red clover (*Trifolium pratense*) has a high nutritive value and is highly preferred by red deer (Hunt & Hay 1990). It is considered as a summer-autumn alternative crop for deer farming, because both the growth rate and nutritive value of perennial ryegrass decline during summer. Offering a high allowance to hinds grazing on red clover forage during lactation significantly improved fawn growth rates (433 versus 333 g/day) and weaning weights (49.5 versus 42.8 kg), compared to those grazing perennial ryegrass/white clover pasture (Niezen et al. 1993).

The present study was designed to investigate feeding red clover for increasing venison production from young red deer by 1 year of age. Measurements made included diet composition, growth, voluntary feed intake, carcass weight, and fatness.

MATERIALS AND METHODS

Experimental design

Forty-four weaner red deer (26 stags and 18 hinds) aged 3½ months were randomly allocated to two types of forage—pure red clover and perennial ryegrass/white clover—with treatment groups balanced for sex. Equal numbers of animals were allocated to each forage. The groups were rotationally grazed on either pure red clover or perennial ryegrass/white clover pasture. The present experiment was therefore of 2×2 factorial design. The trial was conducted at Massey University Deer Research Unit, NZ, from 13 March 1991 to 26 November 1991, and was divided into autumn (13 March–15 May), winter (16 May–8 September), and spring (9 September–26 November) periods

Animals

The forty-four weaner red deer fawns were randomly allocated to red clover or perennial ryegrass/white clover on 13 March 1993. During the experiment, one hind and one stag from the red clover group died as a result of yersiniosis. One stag from the perennial ryegrass/white clover group was euthanised because of misadministering a chromium slow-release capsule, which caused an abscess in the neck. Data from these animals were excluded from the statistical analyses.

All animals were eartagged and vaccinated against clostridial infections (Coopers, Animal Health Ltd, NZ) at weaning (11 March 1991), and orally drenched with invermectin (IVOMEC—0.4 % m/v at 200 μg/kg liveweight; Merck, Sharp and Dohme, NZ) to prevent lungworm and internal parasites, at 3-week intervals until end of Jun. then 6-weekly. Animals were weighed every 3 weeks.

Pasture management

Areas for the trial comprised 2.4 ha (8 paddocks) of red clover, and 2 ha (4 paddocks) of perennial ryegrass/white clover pasture. Pasture areas received urea fertilisation in April and mid July 1991 at the level of 50 and 100 kg urea/ha, corresponding to 23 and 46 kg N/ha, respectively. The herbicide (KERB-FLO, RHOM and HAAS Ltd., NZ) treatment was also applied to part of the red clover area to control grasses during winter. The red clover forage was in the second year, whereas the perennial ryegrass/white clover pasture was several years old.

Animals allocated to the two forage treatments were rotationally grazed during autumn and spring, with rotation length being c. 28 days. During winter, the animals were grazed together on perennial ryegrass/white clover pasture (4 ha; 8 paddocks), because red clover is dormant over this time. Pasture hay supplementation (0.5 kg dry matter (DM)/ head per day) was provided over winter. Pasture residual DM was maintained at about 1100 kg DM/ha during the winter. Feed allowances offered to the animals were 6 and 7 kg DM/deer per day during autumn and spring, respectively.

Pasture sampling

Herbage mass (kg DM/ha) was measured before the animals were introduced into each paddock, and post-grazing (i.e. residual) as soon as the animals were shifted from the paddock. Forage samples were cut to ground-level with eight quadrats per plot of 0.10 m^2 size using a portable shearing hand-piece (Clipmaster, Sunbeam, Australia) powered by a portable generator (Kawasaki, Japan). The herbage samples were then washed, oven-dried at 90°C for 18 h, and weighed.

The length of time for the animals grazing each paddock based on the specified allowances was calculated as follows:

$$\text{Total days} = \frac{\text{herbage mass (kg DM/ha)} \times \text{total area of paddock}}{\text{(total animals/group)} \times \text{(pasture allowance/deer per day)}}$$

For laboratory analysis, eight quadrats (0.1 m^2) of fresh herbage/feed on offer were cut to ground-level from each paddock when the deer were introduced. Samples were then combined, mixed, and divided into two parts. The first part was to determine botanical composition, and the second part was stored at –20°C to determine nutritive value.

While the deer were grazing on each allocated paddock, diet selection samples were collected by hand-plucking plants in that particular area. The samples were harvested daily by imitating the animal's selection of plants. Collected daily samples were then pooled for each paddock, combined, mixed, and stored at –20°C for total N and in-vitro digestibility analysis.

Estimation of faeces output and voluntary feed intake

To estimate the faecal organic matter output, 24 stags and 16 hinds were dosed with sheep-size and calf-size intra-ruminal chromium (Cr) slow-release capsules (CRD, Cr_2O_3 matrix, Captec Ltd., Auckland, NZ) during autumn and spring, respectively. Faeces were sampled from the rectum of individual animals from Day 7 to Day 21 after CRD administration, at 3-day intervals. The faecal samples were collected in plastic bottles, oven-dried at 90°C for 24 h, and stored until required for laboratory analysis.

Velvet antler removal

Velvet antler was harvested when it attained c. 20 cm in length. The precise length, weight, and velveting dates were recorded. The animals were treated either by sedating with 10 % xylazine (Rompun, Bayer Ltd., NZ) administered intra-muscularly at a dosage rate of 0.5 mg/kg body weight, or by restraining the animals in a pneumatic deer crush. After the animals had been mildly sedated or restrained in a crush, local anaesthetic was given by injecting 15 ml lignocaine hydro-chloride (Xylotox, A. H. Robins Co. Ltd., England) in a ring block around each antler, which was then tied up with tape to form a tourniquet. About 5 min later, the velvet was cut using a sterilised saw. To counteract the xylazine effect, the sedated animals were administered with 1.5–2.0 ml yohimbine hydrochloride (Reservyl, Aspiring Veterinary Service, NZ) . Lastly, the tapes were removed and the animals released.

Carcass data

All stags attaining 92 kg liveweight or greater by 30 November were weighed 24 h before the slaughter time. Stags with velvet antler were de-velveted before being transported to the DSP in Feilding. Hot carcasses (kg) were weighed, and the carcass GR (mm) (soft tissue depth over the 12th rib 16 cm from the mid line) measured as an indirect measure of fatness (Kirton 1989).

Laboratory analysis

All herbage samples were stored at –20°C, freeze-dried, and ground to pass a 1 mm mesh diameter sieve (Willey mill, USA) before laboratory analysis. DM was determined by oven-heating at 100°C for 16 h. Total nitrogen (N) was determined by the Kjeldahl procedure, using a selenium catalyst and sulphuric acid digestion. In-vitro digestibility was determined following the method of Roughan & Holland (1977).

Chromium analysis of faeces was done according to the method of Parker et al. (1989).

Crushed 0.5 g samples of faeces taken from individual daily faecal sampling were pooled per animal, oven-dried at 100°C for 17 h, re-weighed after being cooled, ashed for 17 h, and Cr then determined by atomic absorption. Faecal output (FO) was calculated as:

$$\text{FO (g OM/day)} = \frac{\text{Cr release rate (RR) (mg/day)}}{\text{Faecal Cr concentration (mg/g OM)}}$$

The RR of sheep-size and calf-size CRD used in autumn and in spring was assumed to be 121 mg/day (A. M. Ataja pers. comm.) and 344 mg/day (J. Niezen, pers. comm.), respectively, based on the RR obtained in rumen-fistulated red deer. Voluntary feed intake was then calculated as shown below, using organic matter digestibility from estimated diet selected samples.

$$\text{Voluntary feed intake (g OM/day)} = \frac{\text{FO (g OM/day)}}{1 - \text{digestibility of OM}}$$

For botanical composition, samples of fresh herbage were dissected into grasses, clover (red or white clover), dead material, and others. The components were separately oven-dried at 90°C for 17 h, and weighed.

Data calculation and statistical analysis

The experimental data, liveweight gain, carcass weight, GR measurement, velvet weight, and voluntary feed intake were analysed using General Linear Model Procedure (GLM), as a 2 × 2 factorial design, with two types of forages (red clover and perennial ryegrass/white clover) and two sexes (male and female; Statistical Analysis System 1987). Initial body weight was fitted as a covariate except for velvet weight, and voluntary feed intake values. To test the differences between treatments, Least Square Means (LSM) analysis was used.

RESULTS

Pre- and post-grazing herbage mass

Mean values of pre- and post-grazing herbage mass are shown in Table 1. Post-grazing herbage mass was kept above 1800 kg DM/ha in autumn and 1300 kg DM/ha in spring.

Botanical composition of pastures

Red clover dominated 72 and 63% of the red clover sward DM during autumn and spring, respectively, with the proportion of white clover increasing from 5% in autumn to 26% in spring (Table 2). Perennial ryegrass/white clover swards were predominantly composed of perennial ryegrass (62% in autumn; and > 80% in winter and spring), with 7—10% of white clover. The red clover and perennial ryegrass/white clover swards contained 21 and 26% de material in autumn, respectively. Both white clover and dead matter proportions declined in winter and in spring.

Chemical composition

Total N content and organic matter digestibility values of both feed on offer and estimated diet selected were generally higher in red clover than perennial ryegrass/white clover pasture, with the differences attaining significance for total N ($P < 0.001$) and for organic matter digestibility ($P < 0.01$) of feed on offer in spring, and for total N and organic matter digestibility ($P < 0.001$) of diet selected in spring (Table 3). The total N and organic matter digestibility values of diet selected for both red clover and perennial ryegrass/white clover pastures in autumn and in spring were consistently higher than of feed on offer. The were highly significant ($P < 0.001$) for red clover

Table 1 Pre- and post-grazing herbage mass (kg DM/ha ± SE) of red clover (RC) and perennial ryegrass/white clover (PRG/WC) forages grazed by weaner red deer during autumn, winter, and spring 1991.

	PRG/WC					RC				
	Pre-grazing (Mean ± SE)		Post-grazing (n)[1] (Mean ± SE)			Pre-grazing (Mean ± SE)		Post-grazing (n)[1] (Mean ± SE)		
Autumn	3706	219.7	1886	256.6	7	3569	215.1	1823	132.1	9
Winter[2]	1736	83.1	1170	41.4	40					
Spring	2150	63.9	1335	21.8	13	2726	43.2	1705	41.4	19

[1]Number of samples taken per season.

[2]During winter, all animals from both PRG/WC and RC groups were combined and grazed together on PRG/WC pasture.

and significant ($P < 0.05$) for perennial ryegrass/white clover, except the organic matter digestibility value for perennial ryegrass/white clover in spring.

Voluntary feed intake

Voluntary feed intake of weaner red deer grazing either red clover or perennial ryegrass/white clover pasture during autumn and spring is shown in Table 4. The interaction between forage groups and sex was significant ($P < 0.001$) in autumn, but not in spring ($P > 0.05$). Weaner stags and hinds grazing red clover forage had significantly higher voluntary feed intake than comparable animals grazing perennial ryegrass/white clover pasture in both autumn ($P < 0.05$) and spring ($P < 0.001$).

Seasonal liveweight change

The seasonal pattern of growth in the weaner red deer grazing either red clover or perennial ryegrass/white clover forages can be seen in Fig. 1. It shows three phases in the growth curve: intermediate growth during the autumn; slow growth during the winter; and faster growth during the spring period. Animals in all treatment groups showed similar growth patterns.

Forage effects on liveweight gain

Liveweight gain (g/day) of weaner red deer stags and hinds grazing either red clover forage or perennial ryegrass/white clover pasture during autumn, winter, and spring is shown in Table 5.

Table 2 Botanical composition (% DM ± SE) of red clover (RC) and perennial ryegrass/white clover (PRG/WC) forages on offer to weaner red deer during autumn, winter, and spring 1991.

	RC					PRG/WC				
Components	RC	WC	Dead matter	Other	(*n*)[1]	PRG	WC	Dead matter	Other	(*n*)[1]
Autumn	72.1	5.4	21.4	1.1	8	62.1	10.1	26.8	1.3	6
(SE)	(4.51)	(1.18)	(3.74)	(0.33)		(4.24)	(2.08)	(2.69)	(0.37)	
Winter	–	–	–	–	–	81.2	7.4	10.2	1.4	40
(SE)						(2.04)	(0.97)	(1.83)	(0.46)	
Spring	63.7	26.0	10.3	0.04	19	81.5	8.6	9.3	0.03	13
(SE)	(5.89)	(3.90)	(1.53)	(0.02)		(3.15)	(1.66)	(1.78)	(0.01)	

[1]Number of samples taken per season.

Table 3 Nutritive value of feed on offer and diet selected for weaner red deer grazing either red clover (RC) or perennial ryegrass (PRG/WC) forages during autumn, winter, and spring 1991.

	Total nitrogen (% DM)				Organic matter digestibility (%)			
	RC	*n*	PRG/RG	*n*[1]	RC	*n*	PRG/WC	*n*[1]
				Feed on offer				
Autumn	3.44	9	3.42	7	77.3	9	78.6	7
(SE)	(0.124)		(0.161)		(0.67)		(0.78)	
Winter	–	–	3.93	11	–	–	76.9	11
(SE)			(0.150)				(0.91)	
Spring	4.12	9	2.60	6	84.5	9	80.3	6
(SE)	(0.110)		(0.121)		(0.38)		(0.45)	
				Diet selected				
Autumn	4.23	9	3.90	7	84.2	9	83.2	7
(SE)	(0.104)		(0.152)		(0.56)		(0.63)	
Winter	–	–	4.34	11	–	–	79.7	11
(SE)			(0.141)				(0.24)	
Spring	4.72	9	3.30	6	87.7	9	82.4	6
(SE)	(0.092)		(0.113)		(0.28)		(0.39)	

[1]Number of pooled samples taken per season for laboratory analysis.

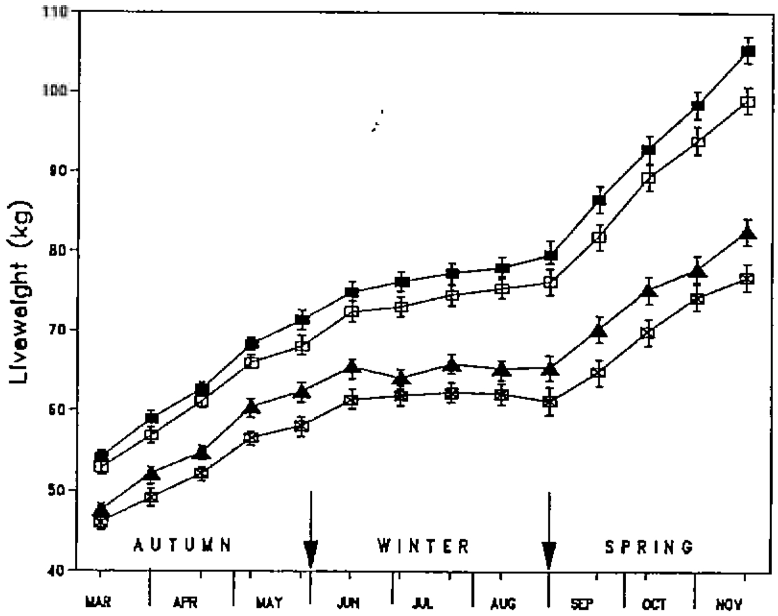

Fig. 1 Overall liveweight change (Mean; kg ± SE) of weaner red deer stags and hinds grazing either red clover or perennial ryegrass/white clover forages. (■, stags red clover; □, stags perennial ryegrass/white clover; ▲, hinds red clover; ⊠, hinds perennial ryegrass/white clover).

The mean initial liveweight of animals allocated to red clover or perennial ryegrass/white clover was not significantly different ($P > 0.05$) for both stags and hinds at the beginning of the trial. The interaction between forage groups and sex for liveweight gain was not significantly different ($P > 0.05$) in either autumn and spring.

Liveweight gain of stags and hinds grazing red clover forage was higher than that of those grazing perennial ryegrass/white clover pasture, with the difference attaining significance in autumn ($P < 0.01$) and in spring ($P < 0.001$). At the end of spring (by 1 year of age), stags and hinds grazing red clover forage were respectively 7 and 6 kg liveweight heavier ($P < 0.05$) than those animals grazing perennial ryegrass/white clover pasture.

Table 4 Organic matter intake (g OM/kg $W^{0.75}$ per day ± SE) of weaner red deer grazing either red clover (RC) or perennial ryegrass/white clover (PRG/WC) forages during autumn and spring 1991.

	Stags		Hinds		
	RC (n = 12)[1]	PRG/WC (n = 12)	RC (n = 7)	PRG/WC (n = 10)	SE
Autumn	124	109	116	71	4.56
Spring	181	125	169	126	6.71

[1]Number of animals dosed with chromium slow-release capsules.

Treatment effects on carcass production

All stags grazing red clover forage during autumn and spring, and 90% of stags grazing perennial ryegrass/white clover pasture during autumn, winter, and spring attained the target slaughter weight (> 92 kg; 50 kg carcass) by 1 year of age (at the end of November). Carcass weight (kg) ($P < 0.01$) and dressing percentage (%) ($P < 0.001$) were significantly higher for red clover tha perennial ryegrass/white clover stags (Table 6). There was no difference ($P > 0.05$) in carcass G either before or after being adjusted to equal carcass weight.

Velvet antler production

The first-cut velvet antler weight from weaner red deer stags was variable between treatment groups, with no difference ($P > 0.05$) between red clover stags and perennial ryegrass/white clover stags (Table 6).

DISCUSSION

The objective of the present work was to study nutritional methods for increasing liveweight gains of weaner red deer such that they attained at least 92 kg liveweight (50 kg carcass) by 1 year of age (30 November). Earlier studies (Ataja et al. 1992) showed that by feeding high allowances of pastures based upon perennial or annual ryegrass during winter and spring, respectively 41 and 60% of young red deer stags could attain this slaughter target. The present studies were designed to further extend this concept, by feeding high allowances of perennial ryegrass/white clover pasture in autumn as well as in winter and spring, and replacing annual ryegrass with red clover as a special-purpose forage for deer production. The choice of red clover was based upon economics, as its establishment cost could be spread over several years versus only 1 year for annual ryegrass, and the observation that it is highly preferred by red deer (Hunt & Hay 1990).

Seasonal liveweight changes

The weaner red deer showed intermediate growth during autumn, slow growth during winter, and high growth during spring in the present experiment, in agreement with the growth of farmed red deer being seasonal (Blaxter et al. 1974; Drew 1976; Fennessy et al. 1981; Ataja et al. 1992; Semiadi et al. 1993). Slow growth of the animals during winter is typical for young red deer, because of the seasonal loss of appetite (Kay 1985; Barry et al. 1991), and acts as a major constraint to increasing venison production from young deer.

Growth on the perennial ryegrass/white clover pasture diet

Stags (90%) of the perennial ryegrass/white clover group attained the target slaughter weight (>92 kg liveweight; 50 kg carcass) by 1 year old, because they consumed forage diets with a high feed allowance during autumn, winter, and spring, with high values for total N and organic matter digestibility in the diet selected (Table 3). This resulted in high growth rates and the proportion of animals attaining target slaughter weight was an improvement on the findings of Ataja et al. (1992) (41%) and Semiadi et al. (1993) (75%) for young red deer stags grazing perennial ryegrass/white clover pastures (Table 7).

Growth on red clover diet

Weaner red deer grazing red clover grew better than those grazing perennial ryegrass/white clover, because red clover contained higher total N and organic matter digestibility values in the diet on offer and in the diet selected (Table 3), and had a higher voluntary feed intake (Table 4). Hence, red clover has some advantages as an alternative forage for weaner red deer during autumn and spring, compared to perennial ryegrass/white clover-based pasture, and consistently produced heavier deer carcasses (Table 7). Niezen et al. (1993) also reported that red clover had a high nutritive value during summer, resulting in a higher fawn growth rate (433 versus 333 g/day) from the hinds grazing on red clover forage than on perennial ryegrass/white clover pasture. This was also associated with higher voluntary feed intake on red clover.

Table 5 Liveweight gain (g/day ± SE) of weaner red deer grazing either red clover (RC) or perennial ryegrass/white clover (PRG/WC) pasture, during autumn, winter, and spring of 1991.

	Stags		Hinds		
	PRG/WC (n = 12)[1]	RC (n = 12)	PRG/WC (n = 10)	RC (n = 7)	SE
Autumn	207	237	159	197	13.7
Winter[2]	95	94	40	38	8.5
Spring	281	346	188	260	13.2

[1]Number of animals per group.
[2]All animals joined and grazed on PRG/WC pasture during winter.

Table 6 Carcass and velvet antler production from red deer stags grazing either red clover (RC) or perennial ryegrass/white clover (PRG/WC) pasture and attaining slaughter liveweight (92 kg) by 1 year of age, during 1991. Mean values were adjusted to equal initial liveweight for carcass data.

	PRG/WC (n = 11)[1]	RC (n = 12)	SE
Carcass			
Stags attaining target slaughter liveweight (%)	90	100	
Liveweight (kg)	101.8	104.7	1.76
Carcass weight (kg)	53.3	58.9	1.00
Dressing percentage (%)	52.4	56.2	0.52
GR (mm)	4.9	6.4	0.73
GR[2] (mm)	5.7	5.7	0.76
First-cut velvet antler (g)	221.0 (n = 7)[1]	241.5 (n =8)	45.70

[1]Number of stags per group.
[2]Carcass weight as covariate.

Deer fed red clover had a faster rumen fractional outflow rate of liquid relative to particulate matter than those fed perennial ryegrass, and very fast liquid fractional outflow rate has been suggested as a reason why deer grazing red clover never get rumen frothy bloat (Freudenberger et al. 1993). Rumen pool size in deer fed red clover was lower than for those fed perennial ryegrass, because of the higher contents of protein and non-protein cell contents in red clover, and their more rapid rate of disappearance from the rumen, compared with deer fed perennial ryegrass (Freudenberger et al. 1993). This allows greater opportunity for increasing voluntary feed intake in deer consuming red clover than perennial ryegrass/white clover, as found in the present study and in the studies of Niezen et al. (1993) and Semiadi et al. (1993).

The present study has shown that red clover has real potential as a special-purpose forage for deer production. Under the management system described in this study, the stand of red clover at Massey University lasted for 3 years, when red clover had declined to less than 50% of plant DM. There is thus a need to evaluate deer production and persistency of red clover cultivars selected for their ability to withstand grazing.

Table 7 Comparison between liveweight gain, total animals attaining target slaughter weight (92 kg), and carcass production from red deer stags at Massey University Deer Unit during 1989, 1990, and 1991. (RC, red clover; PRG/WC, perennial ryegrass/white clover pasture).

	Stags		Hinds	
	RC	PRG/WC	RC	PRG/WC
Liveweight gain (g/day):				
Autumn 1990	263	197	200	173
Autumn 1991	237	207	197	159
Winter 1989[1]	–	140 (165)[4]	–	–
Winter 1990[2]	103	110	55	54
Winter 1991[3]	94	95	38	40
Spring 1989	–	226 (235)[4]	–	–
Spring 1990	366	343	238	218
Spring 1991	346	281	260	188
Liveweight and slaughter criteria:				
Animals over 92 kg (%):				
1989	–	41 (60)[4]		
1990	100	75		
1991	100	90		
Mean liveweight (kg) end of November:				
1990	108	101	87	84
1991	105	99	83	77
Carcass production:				
Carcass weight (kg)				
1990	59.9	54.5		
1991	58.9	53.3		
Dressing out (%)				
1989	–	52.6 (53.8)[4]		
1990	55.4	53.0		
1991	56.2	52.4		
GR (mm)				
1989	–	2.9 (3.6)[4]		
1990	9.2	6.3		
1991	6.4	4.9		

[1]Ataja et al. (1992)
[2]Semiadi et al. (1993)
[3]Present investigation
[4]Annual ryegrass pastures

In all years, animals from both the RC and PRG/WC groups were joined and grazed on PRG/WC pasture during winter.

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