Deer production from ryegrass- and tall fescue-based pastures

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Abstract

The development of a Appellation Marketing Strategy by the New Zealand Game Industry Board will change the requirements of the venison industry. High deer liveweight gains throughout the year will be required to ensure a consistent supply of high quality venison. The improvement of spring and summer pasture availability and quality are being investigated at the Invermay Agricultural Centre. Tall fescue (*Festuca arundinacea* Schreb.) and tall fescue/chicory/(*Cichorium intybus* L.) red clover (*Trifolium pratense* L.) pastures were compared with high and low endophyte ryegrass (*Lolium perenne* L.) pastures. Liveweight gain and carrying capacity were measured in spring and summer one year after establishment. Pasture parameters were measured to explain differences in animal performance. Liveweight gain was similar on all treatments, though was 21-35% lower in summer than in spring. The tall fescue-based pastures had significantly higher carrying capacities because of a better clover balance throughout the trial. This led to significantly higher per ha production on first year tall fescue-based pastures. Though ryegrass endophyte had no effect on pasture or animal production, animal behaviour might have been affected.

Keywords *Acremonium loliii*, carrying capacity, *Cichorium intybus*, deer, *Festuca arundinacea*, liveweight gain, *Lolium perenne*, pasture parameters, *Trifolium pratense*, *Trifolium repens*

Introduction

The development of an Appellation Marketing Strategy by the New Zealand Game Industry Board is well underway with its launch in USA and NZ being timed for early 1993. The result of this strategy will be a Product Definition or a standard of meat quality which will have to be met by venison producers throughout the year. Already the pre-Christmas boom in venison demand through traditional markets is waning, as is reflected by the comparison of 1991-92 prices with the previous two seasons (The Deer Farmer June 1992). Pasture production and quality can inhibit the production of a high quality venison product especially as they decline in summer (Adam 1988). Ryegrass staggers can also be a major cause of poor deer growth in summer.

Southern New Zealand is no exception to these problems. A cool moist climate supplies adequate summer rainfall. Ryegrass growth continues but deer can still suffer from ryegrass staggers in some years. Pasture availability and quality decline are both still a problem in ryegrass pastures during summer after heading.

The use of low endophyte ryegrass can be advocated in southern New Zealand as good yields continue without major long term damage from Argentine stem weevil (Stevens & Hickey 1989). However, tall fescue may be a better alternative for deer production, as it has been reported to have higher summer quality than ryegrass (McFarlane 1990). The incorporation of high quality species such as chicory and red clover may also help alleviate the decline in summer pasture availability and quality improving deer production, as they are both highly preferred when grazed by deer (Hunt & Hay 1980).

These options were tested to improve the growth rate of yearling deer in spring and summer by changing the pasture species. As production requirements change to meet appellation standards, surplus yearling hinds will also be required to provide a constant supply of product throughout the breeding season. Both hinds and stags were used to estimate the relative production differences between low and high endophyte ryegrass, tall fescue and tall fescue/chicory/red clover pastures. Pasture production data were collected to provide explanations for differences in animal production.

Methods

Four pasture mixtures were sown into a cultivated seedbed with 3 kg/ha Grasslands Tahora white clover (*Trifolium repens* L.) on 26 October 1990 in 2 replicates of 0.65 ha individually fenced plots at the Invermay Agricultural Centre. The pasture types were Grasslands Nui high endophyte (80%) ryegrass (*Lolium perenne* L.), Grasslands Nui low endophyte (6%) ryegrass, Grasslands Roa tall fescue (*Festuca arundinacea* Schreb.), and Roa tall fescue/Grasslands Puna chicory (*Cichorium intybus*)/Grasslands Pawera red clover (*Trifolium prat-*

ense L.) sown at 15, 15, 20 and 10/1.5/4 kg/ha respectively. All grass seed was superstrike treated and sown with 100 kg/ha superphosphate (0-9-0-11).

Plots were lightly grazed during establishment with weeds being controlled by residual topping. During autumn and winter plots were rotationally grazed with hinds, with pastures containing chicory being only lightly grazed in dry conditions.

The measurement of the trial began in early October and continued until late February when behaviourial problems of the impending rut became apparent. Each plot was subdivided into four with electric fences and grazed rotationally from an available dry matter yield of 2500-3500 kg/ha to a residue of 1200-1600 kg/ha. Stocking rate was varied fortnightly to maintain these pasture conditions. Water was supplied at all times.

The rotation cycle was initially 28 days but was reduced to 20 days during peak November and December growth. The rotation length on the ryegrass treatments was increased back to 28 days after mid December, and stock numbers reduced because of slower pasture recovery. Tall fescue pastures maintained a 20-day rotation until the trial end. Seedhead development was controlled by mechanical topping between December and early February.

The yearling stags and hinds were weighed at 2-week intervals and a core of 10 animals remained on each plot throughout. Stags were velveted at optimum commercial values and regrowth removed in February. Only stag liveweight gains are presented, and stocking rates are expressed as stag equivalents (1 hind = 0.83 stags). Spring data were obtained from 72 days to 12 December and summer data from 70 days to 22 February.

Botanical analysis was performed monthly from October to February (during the trial period) for the pregrazing herbage mass. Spring means were derived from October and November measurements and summer from December, January and February measurements. The sown grass, chicory, red and white clover content and other species (mainly *Poa annua*) were expressed as a percentage of the green fraction of the sward. Dead material was expressed as a percentage of the total sward. Ryegrass endophyte levels were sampled in March 1992 from each plot.

Results

Pasture parameters

Plant establishment in all plots was good although Roa tall fescue seedling numbers when planted in association with Puna chicory and Pawera red clover were half those in the tall fescue-alone plots because of a lower seeding rate. Tall fescue tiller numbers (Table 1) at the end of winter were lower than in the ryegrass treatment when analysed by orthogonal contrasts. This was again mainly accounted for by the lower sowing rate of tall fescue in the mixture. The number of clover growing points was significantly greater in the tall fescue than the ryegrass treatments (Table 1).

Table 1 Tiller and clover growing point numbers in late winter 1991 and ryegrass endophyte levels in mid summer 1992.

Treatment	Late Winter 1991		Endophyte Levels
	Sown Grass Tiller Nos /m²	Clover growing points/m²	% of tillers infected
High endophyte ryegrass	4900	1200	82
Low endophyte ryegrass	4000	1300	12
Tall fescue	3400	3100	0
Tall rescue/chicory/red clover	2000	3700	0
lsd	2800	1700	

Ryegrass endophyte levels (Table 1) corresponded to the endophyte level of the seed sown. The ryegrass contamination of tall fescue plots was between 4 and 11% of the total dry matter production and 90% of these tillers were infected with endophyte. There were no endophyte effects on pasture production or composition.

During spring ryegrass made up 81-90% while tall fescue contributed only 39-48% of the green material of the herbage before grazing (Table 2). White clover content of the ryegrass swards was only 8-11% whereas tall fescue swards had 15-17%. Chicory contributed 5% and red clover 16% to the green herbage mass. Other species were again low in ryegrass pastures (3-8%) but made a significant contribution to tall fescue-based swards (23-37%). Dead material was low in spring, ranging from 4-8% with no difference between ryegrass and tall fescue swards.

The botanical composition in summer shifted the most in ryegrass swards (Table 2). Ryegrass content declined to 64-65% while white clover content increased to 28-31% of the pre-grazing herbage mass. The contribution of the other species changed little. Tall fescue content did not alter significantly in summer but white clover content increased to 27-30% while the contribution of other species declined to 16-26% of the green pregrazing herbage mass. Chicory contribution in summer increased to 17% but red clover content declined to 5%. Dead material in the summer was much higher than in spring, and was significantly greater in the ryegrass swards (27%) than the tall fescue swards (16-23%).

Table 2 Botanical composition of the pastures in spring and summer. Sown grass, clover (red and white) and other species are expressed as the percentage of the green herbage on offer. Dead material is expressed as a percentage of the total herbage on offer

	Sown Grass	White Clover	Red Clover	Chicory	Other Species	Dead
SPRING						
High endophyte ryegrass	90	8			2	5
Low endophyte ryegrass	81	11			8	8
Tall Fescue	48	15			37	4
Tall fescue/chicory/red clover	39	17	16	5	23	7
	*	*			*	NS
lsd	11	7			5	6
SUMMER						
High endophyte ryegrass	65	31			4	27
Low endophyte ryegrass	64	28			8	27
Tall Fescue	44	30			26	16
Tall fescue/chicory/red clover	34	27	5	17	17	23
	NS	NS			*	NS
lsd	30	30			12	12

Animal Production

Deer growth rates were not significantly higher from ryegrass than tall fescue treatments in both spring and summer though this was not significant (Table 3). Summer growth rates were 21-35% lower than in spring, with the largest drop on the tall fescue only treatments. There was no effect of ryegrass endophyte on animal growth rates.

The results in Table 4 show the substantially lower carrying capacity on the ryegrass treatments than on the tall fescue and tall fescue/chicory mixture. On the basis of total liveweight gain per ha, the tall fescue/chicory mixture and the tall fescue pasture were more productive than the ryegrass pastures (Table 4).

Table 3 Average daily growth rate of yearling stags

	Growth Rate (g/day)		
	Spring	Summer	Mean
High endophyte ryegrass	332	256	294
Low endophyte ryegrass	307	234	279
Tall fescue	302	196	249
Tall fescue chicory/red clover	296	235	265
Lsd	53	65	78

Table 4 Grazing capacity of high and low endophyte ryegrass, tall fescue and tall fescue/chicory/red clover pastures one year after establishment

	Number of grazing days over spring - summer[1]	Estimated Deer liveweight gain (kg per ha/day)
High Endophyte ryegrass	1889	6.05
Low endophyte ryegrass	1789	5.52
Tall fescue	2326	6.40
Tall fescue/chicory/red clover	2470	7.17
lsd	480	

[1] Summation of animals and days of grazing (corrected to stag equivalents).

Discussion

The drop in liveweight gain between spring and summer is characteristic of long-term liveweight gain studies, even when clover content in summer is markedly higher than in spring (Stevens *et al.* 1992, 1993). The extra drop in performance of the tall fescue-only treatment, though not significant, has been observed before (Stevens unpub) and may be caused by a rapid decline in digestibility of tall fescue leaf as it ages. Though high dry matter availability was maintained in the tall fescue pastures, patch grazing of new leaf became evident as the summer progressed.

The tall fescue and the tall fescue/chicory/red clover pastures gave 30% more grazing days than the ryegrass pastures without any significant reduction in per animal performance. The effect was probably bought about by the rapid depletion of soil nitrogen in the ryegrass plots because of rapid grass growth in autumn and early winter. Competition from the ryegrass also slowed white clover establishment, as was evident in late winter growing point numbers (Table 1). Hence the ryegrass pastures were nitrogen deficient during spring and early summer while tall fescue pastures with good clover development produced well.

Chicory contributed more to the green herbage in summer than in spring but this contribution was not as high as expected. This, coupled with the reduction in summer red clover content, may be the result of preferential grazing of these species (Hunt & Hay 1990), especially under the short 20-day rotation through the summer.

The mean spring/summer growth rate of the yearling stags compares well with the 7-year Invermay average of 242+/-13 g/day (Moore *et al.* 1988). Spring growth rates were very high and close to that reported by Barry (1991) on ryegrass. Barry's red clover growth rate of 366 g/day is higher than on the present experiment. This is understandable as the available dry matter in the current experiment was mainly grass in all treatments. The 1991/92 summer season was relatively wet and conditions did not affect adversely the ryegrass performance, as it was still 64-65% of the available dry matter. The variable stocking regime used to ensure a high level of available dry matter did maintain a high growth rate on the ryegrass treatments, and no endophyte effects on animal growth were evident.

In a dry year animal growth rate as well as grazing days on ryegrass pastures would probably have been depressed owing to a declining availability of dry matter when compared with tall fescue based pastures. Wright *et al.* (1985) found no difference in animal performance between tall fescue- and ryegrass-based pastures in spring, but showed significant differences in a dry autumn. Behaviourial patterns appeared to be altered by high endophyte ryegrass. Deer on low endophyte ryegrass- and tall fescue-based pastures were quiet, easily handled and trained well to electric fences. The deer on the high endophyte pasture became flighthly, hard to handle and could not be easily kept behind electric fences if disturbed. Ergovaline, a chemical which affects the animal's nervous system and is produced in high endophyte ryegrass, may be the cause of these apparent behaviourial problems.

Results from this first year's results show that deer liveweight gains can be high in both spring and summer on good pastures. High available dry matter levels and residues must be used and are most easily achieved by break grazing. Ryegrass endophyte had no effect on production. The better establishment of clover with tall fescue allowed much higher carrying capacities to be achieved while per head performance remained similar to that on ryegrass pastures. The first-year performance of tall fescue/chicory/red clover pastures was 24% and the tall fescue-alone pastures 11% more productive than the mean production from ryegrass pastures.

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