Wana cocksfoot: nitrogen effects on quantity and quality

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Abstract

Wana cocksfoot *(Dactylis glomerata)* has proven to be one of the most persistent pasture grass cultivars in summer-dry regions in New Zealand. However, doubt has been expressed about obtaining satisfactory animal performance from pastures that are cocksfoot dominant. This trial looks at the effect nitrogen (N) fertiliser has on pasture production, composition and animal performance when grazing a non-irrigated, seven-year-old Wana pasture in Canterbury. Spring nitrogen (N) increased grazing days by 25% and legume content as a percentage of early spring herbage production from 8 to 23%. Autumn N (50 kg/ha) increased grazing days by 25% with no increase in legume content. Sheep performance on treatments with no N applied were 120 g/day over 120 days in spring and 135 g/day over 50 days in autumn. Nitrogen treatments increased lamb growth by 10% during both grazing periods. Little increase in herbage and animal production was recorded from spring application of nitrogen above 25 kg/ha.

Additional keywords: *animal performance, dryland pastures, grazing management, herbage allowance, legume production, nitrogen*

Introduction

Cocksfoot *(Dactylis glomerata L.)* has been included in many pasture mixtures in New Zealand agriculture since the 1850s. In the last decade there has been an increase in demand for cocksfoot, particularly for a prostrate form of cocksfoot, cv. Grasslands Wana. Wana has accounted for 80% of all cocksfoot seed production over the last five years (Anon, 1994). Wana cocksfoot was bred as a persistent cocksfoot cultivar for regions of summer-moisture stress, lower fertility areas and for set stocking under sheep grazing (Rumball, 1982). The persistence and performance of Wana in these situations, and in areas where grass grubs are a problem, is well recognised by farmers and researchers (Fraser, 1994; Fraser and Hewson, 1994; Korte *et al.,* 1992; Moloney, 1993).

Success with Wana-based pastures has resulted in an increased use of Wana in areas of adequate summer moisture and fertility - environments that are better suited to other pasture plants. Concern has been expressed about the palatability and animal performance of Wana cocksfoot at farm field days, in particular Ashley Dene in 1993 (R.J. Lucas, pers. comm.), and in the literature (Edwards *et al.*, 1993; Moloney, 1993). It is of interest to note that apart from the Ashley Dene data (which will be discussed later in this paper) none of these references contain animal performance data. Other research results (Komolong *et al.*, 1992; Korte *et al.*, 1993) have shown acceptable animal performances when compared to other grass cultivars under trial. This field trial was established in an attempt to clarify the conflict between perception and data.

Materials and Methods

The trial was established on a drought-prone Eyre soil of medium fertility (pH 5.8, P 11, S 5, K 13) at Springston in Canterbury in 1993. The paddock had been sown in 1986 with 1 kg/ha cocksfoot cv. Grasslands Wana, 20 kg/ha ryegrass cv. Grasslands Nui (non- endophyte) and 3 kg/ha white clover cv. Grasslands Huia. Seed of subterranean clover (*Trifolium subterraneum*) was present in the soil. Management since establishment had been conventional sheep management under dryland situations, which included some severe grazings during drought periods.

The pasture composition at the beginning of the trial was almost totally cocksfoot with a small amount of legume. The perennial ryegrass had completely disappeared from the pasture, probably due to previous Argentine stem weevil and grass grub attacks and general overgrazing during drought periods.

The paddock was divided into eight 1 ha plots. Nitrogen fertiliser (urea) treatments were applied as follows:

Treatment	Applied nitrogen (kg/ha) Spring (mid-Sept. '93)	Autumn (mid-Feb. '94)
1	0	0
2	0	25
3	0	50
4	0	100
5	25	25
6	50	50
7	50	0
8	100	100

Maintenance fertiliser of 200 kg/ha of superphosphate was applied to all treatments in autumn.

Sheep were allocated to treatments to give equal allowances of 2 kg/head/day with extra, non-trial animals being added during the grazing period if required. Ewe hoggets (mean starting weight 45.2 kg; range 42.0-52.0 kg) were used for the spring grazing (14 October - 13 January) and weaned-ewe lambs (mean starting weight 32.5 kg; range 30.8-36.5 kg) in the autumn (30 March - 9 May). Animals were fasted for 24 hours prior to weighing and allocation to treatments at the start of the trial, and at the conclusion of each grazing period.

Pasture was measured by taking weekly pasture-probe readings to estimate total herbage on offer; random cuts were taken at the start, mid point and end of each trial period to estimate botanical composition.

Results and Discussion

The 1993/94 season was unusual in that the spring and autumn were drier and the summer was wetter than the long term average (Table 1). Soil temperatures (10 cm) during November (13.3°C) and December (14.6°C) were 2.0°C cooler than the long term mean.

There were no significant differences among +N treatments in the spring; average data are therefore presented for simplicity. Herbage on offer for N treatments averaged 38% greater than nil N treatments at the first grazing (Table 2); pasture growth rates were 24 vs. 17 kg/ha/day between the application of N and the start of grazing. Increased growth from N treatments during the grazing period enabled, on average, an extra 4 sheep/ha to be carried, i.e., an extra 20% carrying capacity.

In autumn herbage on offer increased with increasing rate of N applied (Table 3). Furthermore, herbage growth rates from time of nitrogen application until start of grazing were 6, 10, 11, and 19 kg/ha/day for 0, 25, 50 and 100 kg of nitrogen respectively, indicating an increased response to N in autumn.Spring legume production was significantly increased by nitrogen (Table 4); there was no significant difference among N rates (data not presented). This indicates that under the

Table 1. Rainfall (mm).

	Spring (Aug-Oct)	Summer (Nov-Jan)	Autumn (Feb-Apr)
1993/94	133[1]	227	136
Mean	162	166	161

[1] 80 mm recorded over a 4-day period.

Table 2. Herbage on offer in spring (kg/ha).

	23 Aug[1]	11 Oct[2]	21 Nov	12 Jan
+N	963	2124	1747	1280
-N	975	1811	1551	1187

[1] nitrogen applied; [2] grazing started

Table 3. Herbage on offer in autumn (kg/ha).

Treatment	15 Feb[1]	30 Mar[2]	9 May
1	748	1000	980
2	823	1353	1088
3	791	1361	1222
4	847	1700	1372
5	811	1210	1144
6	794	1191	1216
7	816	1086	1106
8	813	1604	1311

[1] nitrogen applied; [2] grazing started

Table 4. Spring pasture composition.

Treatment	% Wana	% legume
+ N	73	23
- N	89	8

conditions of this trial (which represent a considerable proportion of the East Coast of New Zealand) clover growth was suppressed in spring due to insufficient availability of non-fertiliser N. Clover suppression has been noted in Canterbury conditions when grown with high-endophyte ryegrass (Sutherland and Hoglund, 1990). It is possible that Wana cocksfoot is also interacting with clover; this deserves further investigation, but can be overcome readily with the addition of fertiliser N.

Nitrogen had no significant effect on pasture composition in autumn; the legume component contributed under 5% of total pasture production in all treatments over this period.

Total herbage production was not measured in this trial as all pastures were set stocked throughout the grazing periods. However, pasture production may be estimated for spring, summer and autumn from stocking rates and animal performance which are presented below.

In spring there were no significant differences in animal data among the +N treatments; average data are presented for simplicity (Table 5).

Ewe hogget liveweight gain over spring/early summer period of 120 g/day was similar to most on-farm performances. Hoggets went on to the trial in mid-October at 44 kg and weighed 55 kg in mid-January at the end of the first trial period.

Lamb growth rates in autumn (Table 6) compared favourably with growth rates from other species trials (Macfarlane, 1990). High rates of N (treatments 4 and 8) significantly increased per head performance.

Nitrogen fertiliser not only increased per head growth rates in both seasons, but also increased per hectare carrying capacity. Carrying capacity and per head performance together gave a 31% increase in production in spring and a 25% increase in autumn (mean of nitrogen treatments).

The results from this trial differ from the results and conclusions reached by some other researchers, particularly with the results presented at the Ashley Dene field day in October 1993. The data in Table 7 are from the Ashley Dene trial carried out with ewes and lambs grazing different pasture types in spring 1992.

From these data it was concluded that stock were not content with their diet when grazing on the Wana pastures, very happy on tall fescue and reasonably happy on ryegrass. However, when stocking rate and lambing percentage are considered, kilogram lamb liveweight produced per ha was 435, 414 and 385 respectively for Wana, tall fescue and ryegrass. The comment was made that Wana cover was kept between 2.5 and 5 cm compared to 2 to 4 cm on tall fescue. In the present trial, herbage mass on offer was lower than most other animal performance trials and recommendations. This may be one of the main reasons for the higher than

Table 5. Means of stocking rate and fasted liveweight gains in spring.

Treatment	Stocking rate (sheep/ha)	Weight gain (kg in 3 months)	(g/day)
+N	27.0	11.6	129
-N	22.5	10.6	118
LSD (5%)	4.2	0.5	4
LSD (1%)	6.4	0.6	6

Table 6. Means of stocking rate and fasted liveweight gains in autumn.

Treatment	Stocking rate (sheep/ha)	Total weight gain (kg)	Daily weight gain (g/day)
1	10	8.0	200
2	15	7.9	197
3	15	8.1	202
4	21	9.6	240
5	15	8.2	205
6	12	7.9	197
7	15	7.9	197
8	19	8.8	220
LSD (5%)		0.6	
LSD (1%)		0.8	

Table 7. Data from Ashley Dene.

Pasture type	Ewe numbers	Weight (kg)	Lamb numbers	Weight (kg)	Lambing (%)	Ewes/ha
Cocksfoot	70	51.5	106	28.5	151	10.1
Tall fescue	79	68.9	109	31.9	138	9.4
Ryegrass	99	60.9	129	29.9	130	9.9

expected animal performance (Tables 5 and 6). At all times the pasture on offer was young, and as a result contained very little dead material. Most cocksfoot pastures on farms are allowed to go rank, a possible carry over from grazing management of the more erect cocksfoot cultivars to which farmers have been accustomed.

Conclusions

In this trial sheep and lambs grew at average rates (for the time of year); no poor performance was noted, even without nitrogen application. Nitrogen fertiliser enhanced clover production in spring; together with an increase in grass production, this resulted in a 20% increase in carrying capacity. Nitrogen fertiliser increased herbage on offer in autumn, again resulting in an increased carrying capacity. When animal growth rates and carrying capacity were considered, nitrogen fertilizer gave a significant increase in overall production.

From these results we can conclude that when Wana is managed to maintain the sward in an actively growing state, animal production from Wana cocksfoot is within expectations from other grass pasture species. When these results are considered with the proven persistence, low maintenance and ease of management of these pastures in summer-dry regions, the value of Wana-based pastures can be fully realised.

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