HERBAGE PRODUCTION FROM OVERDRILLED PASTURE IN CANTERBURY

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A bstract

Established Ruanui ryegrass pasture on Ruapuna and Lismore soils in Canterbury was overdrilled with Ariki or Tama ryegrasses. Other treatments investigated were paraquat spray before overdrilling and application of nitrogen after overdrilling. The Lismore soil was flood irrigated in spring and autumn, but not in summer.

Paraquat spray enabled superior establishment of Tama ryegrass. Total annual herbage yields were 4400 to 5 100 kg/ha on the Ruapuna soil and 8 900 to 11 100 kg/ha on the Lismore soil. Applied nitrogen (112 kg/ha) increased grass yield in cool season by 7 to 10 kg DM per kg N. Maximum yields were 2 590 and 3 200 kg/ha on Ruapuna and Lismore soils, respectively. Because of competition between Tams ryegrass and existing pasture components, there was a marked slump in herbage production when Tama ryegrass died in spring.

Repeat overdrilling of paraquat-treated pasture the following autumn with Tama ryegrass gave total annual herbage yields of 5 800 kg/ha on the Ruapuna soil and 11 800 kg/ha on the Lismore soil. Applied nitrogen increased grass yield in cool season by 11 to 17 kg DM per kg N. Maximum yields were 2 370 and 4 820 kg/ha on Ruapuna and Lismore soils, respectively.

Pasture overdrilled with Ariki ryegrass was measured in the second year only. Total annual herbage yields were 5 700 to 6 300 kg/ha on the Ruapuna soil and 11 300 to 11 800 kg/ha on the Lismore soil. Applied nitrogen increased grass yield in cool season by 8 to 15 kg DM per kg N. Maximum yields were 1 860 and 4 180 kg/ha on Ruapuna and Lismore soils, respectively.

Pasture overdrilled with Tama ryegrass grew a greater proportion of its cool season grass yield in winter than in autumn whilst the reverse result was shown for pasture overdrilled with Ariki ryegrass. Mixture of the two species is suggested for overdrilling, to provide for improved cool season herbage yield.

INTRODUCTION

PASTURE PRODUCTION in Canterbury is characterized by a low contribution of winter growth to annual herbage yield, requiring cultivation for the growing of supplementary crops. However, with the development of overdrilling* techniques, cool

*Sowing species into existing swards, seed and fertilizer being placed separately and covered with soil in cultivated grooves, in a single operation with specially designed machinery.

season active grasses may be sown into existing pasture. The advantages of these species may not be realized in winter if low temperatures affect availability of nitrogen from the soil. Thus, a role for nitrogen fertilizer may be established.

In the present experiments, cool season active ryegrasses, either 'Grasslands Tama' or 'Grasslands Ariki', were overdrilled into existing Ruanui ryegrass pastures and nitrogen fertilizer was applied to determine what levels of cool season herbage yield could be obtained.

EXPERIMENTAL

Sites were in the View Hill district of Oxford (Ruapuna soil) and in the Lismore district of Ashburton (Lismore soil). These soils are described in *Soil Bureau Bulletin* 14 (Kear et al., 1967). The pastures had been established for at least five years and on the Lismore soil had been flood-irrigated.

Three blocks of pasture were half overdrilled with Ariki ryegrass and half with Tama ryegrass. Cross treatments were a factorial design of with and without spray treatment before overdrilling, by, with and without nitrogenous fertilizer applied after overdrilling. These four treatments were separately fenced for grazing; within each, the overdrilled grasses were grazed in common. Plot size was 12 m by. 12 m.

The experiments commenced in February 1970. Pasture was close-grazed by sheep and, at the Ashburton site, then irrigated. The appropriate plots were sprayed with 280g active ingredient per hectare of paraquat and all plots immediately overdrilled. Seeding rate was 16.8 kg/ha for Ariki ryegrass and 33.6 kg/ha for Tama ryegrass with 188 kg/ha of superphosphate drilled with the seed. At the commencement of 'autumn, winter, spring and summer, 56 kg N/ha (as lime-ammonium nitrate) was applied to the appropriate plots.

At the Oxford site there were four grazings per year, commencing in August, while at the Ashburton site there were five grazings per year, commencing in June. Sufficient sheep were used to fully utilize the herbage in 48 hours. The Ashburton site was irrigated in spring and before overdrilling in autumn only, as the co-operating farmer was unable to supply water in summer.

Herbage yields were obtained prior to each grazing by harvesting to 25 mm, four 0.25 m^2 quadrats per plot.

The Tama ryegrass strips only were redrilled in the following autumn. No further paraquat spray was applied before this over-

drilling. A further 188 kg/ha of superphosphate was drilled with the Tama seed and also was topdressed on the Ariki strips.

RESULTS AND DISCUSSION

Meteorological data in Table 1 indicate the general pattern of rainfall on the Canterbury Plains from foothills to mid-coast. Rainfall for both the sites would be about that recorded at Darfield but as the Oxford site was near the outer gorge of the Waimakariri River the adverse effects of the drying north-west wind were more severe than at Ashburton. Mean monthly temperatures in winter in Canterbury are about 4" C.

TABLE 1: RAINFALL DATA (mm) FROM OFFICIAL METEOROLOGICAL STATIONS IN CANTERBURY

	Highbank	*Darfield*	*Ashburton*
Altitude (m)	340	200	100
Cool season (Mar.-Aug.) :			
1970-1	430	370	390
1971-2	370	300	310
Warm season (Sep.-Feb.) :			
1970-1	400	310	260
1971-2	430	320	270
Total:			
1970-1	830	680	650
1971-2	800	620	580

YIELD FOR 1970-1 FROM PASTURE OVERDRILLED WITH TAMA RYEGRASS IN AUTUMN *1970* — TABLE 2

The pasture at Oxford contained more unsown grasses than at Ashburton, so that, without paraquat spray, yield of Tama ryegrass was considerably lower. Paraquat spray had greater relative effect at the Oxford than at the Ashburton site. Paraquat treatments gave 300 to 700 kg/ha higher yield from total grasses in cool season (March-August) at Oxford,. but had no effect at Ashburton. Applied nitrogen gave about 7 to 10 kg additional DM per kg N.

At Oxford, there was negliglible yield of perennial ryegrass where the pastures had been sprayed with paraquat. When Tama ryegrass died in fate spring, there was a marked slump in yield because only the clover base was left productive. The low yield from clover reflects, not only the effects of considerable competition from Tama ryegrass under infrequent grazing, but also dry

TABLE 2: HERBAGE YIELDS FOR 1970-1 FROM PASTURE OVERDRILLED WITH TAMA RYEGRASS IN AUTUMN 1970 (kg/ha)

Herbicide	Nitrogen	Tama Annual Total	All Ryegrasses Cool Season	All Ryegrasses Warm Season	Clover Annual Total	All Herbage Annual Total
OXFORD SITE						
Nil paraquat	No	2240	1120	1930	900	4380
	N224	4020	1860	3020	1420	6730
Plus paraquat	No	3800	1410	2580	660	5130
	N224	6100	2590	3560	420	7130
			SE ± 250	280		
ASHBURTON SITE					200	400
Nil paraquat	No	4010	2080	4890	1450	8910
	N224	5970	3200	7310	1140	12840
Plus paraquat	No	5940	2040	6930	1710	11090
	N224	7570	2910	7580	1480	12540
			SE ± 90	360	120	360

TABLE 3: HERBAGE YIELDS FOR 1971-2 FROM PASTURE OVERDRILLED WITH TAMA RYEGRASS IN AUTUMN 1971 (kg/ha)
(Second overdrilling of paraquat treatments from *autumn 1970 only)*

Nitrogen	Tama Annual Total	All Ryegrasses Cool Season	All Ryegrasses Warm Season	Clover Annual Tofal	All Herbage Annual Total
OXFORD SITE					
No	4560 5850	2370 1100	3840 4010	310	5820 6870
N224		SE ± 310	520	30	750
ASHBURTON SITE					
No	10500	2940	7690	580	11780
N224	13350	4820	8820	330	14420
		SE ± 320	220	100	210

summer conditions adversely affecting clover growth. At Ashburton, yield of perennial ryegrass from the paraquat treatments was about 3000 kg/ha and, if irrigation could have been applied in summer, reasonable pastures would have been maintained.

YIELDS FOR 1971-2 FROM PASTURE OVERDRILLED WITH TAMA RYEGRASS IN AUTUMN 1971 — TABLE 3

The subsequent overdrilling with Tama ryegrass gave similar yields at the Oxford site to those obtained in the previous year, but considerably higher Tama yields at the Ashburton site. Competition from Tama ryegrass reduced perennial ryegrass yield to a negligible amount. Nitrogen had a greater effect in increasing cool season yields than in the previous year (11 to 17 kg additional DM per kg N). At both sites there was a considerable slump in herbage production when Tama ryegrass died, because the clover had been considerably weakened.

YIELDS FOR 1971-2 FROM PASTURE OVERDRILLED WITH ARIKI RYEGRASS IN AUTUMN 1970 - TABLE 4

Ariki ryegrass could not be distinguished from Ruanui ryegrass. Data for the first year from overdrilling, in which Ariki ryegrass was establishing, are not presented.

For cool season there was nil or only a small increase in yield from paraquat treatments, contrasting with treatments where Tama ryegrass was overdrilled. Applied nitrogen increased grass yield in cool season by 8 to 9 kg additional DM per kg N at Oxford and by 10 to 15 kg at Ashburton. Clover yields were markedly higher than those from pasture overdrilled with Tama ryegrass. With the perennial ryegrasses there was not the same slump in pasture production in late spring as with Tama ryegrass.

Figure 1 shows how the distribution of herbage grown in cool season varied according to cultural practice at Ashburton in 1971-2. For pasture overdrilled with Ariki ryegrass there was no improvement in winter contribution to annual herbage yield (less than 10%), but overdrilling with Tama ryegrass increased winter contribution to about 20%.

The results from these experiments indicate that production in cool season from overdrilled species is in part dependent upon favourable moisture conditions for, their establishment and in part upon adequate nitrogen supply for their growth. Thus, at the irrigated Ashburton site, yields of overdrilled pasture without

TABLE 4: HERBAGE YIELDS FOR 1971-2 FROM PASTURES OVERDRILLED WITH ARIKI RYEGRASS IN AUTUMN 1970 (kg/ha)

Herbicide	*Nitrogen*	*Cool Season*	*Warm Season*	*Clover Annual Tofal*	*All Herbage Annual Total*
OXFORD SITE					
Nil paraquat	No	710	3940	1360	6300
	N224	1620	5450	1150	8380
Plus paraquat	No	810	3360	930	5660
	N224	1860	4460	880	7850
		SE ± 210	480	100	220
ASHBURTON SITE					
Nil paraquat	No	2520	5250	1750	11300
	N224	4180	7980	1110	14120
Plus paraquat	No	2570	6700	1720	11830
	N224	3730	7100	1050	12990
		SE ± 400	630	190	520

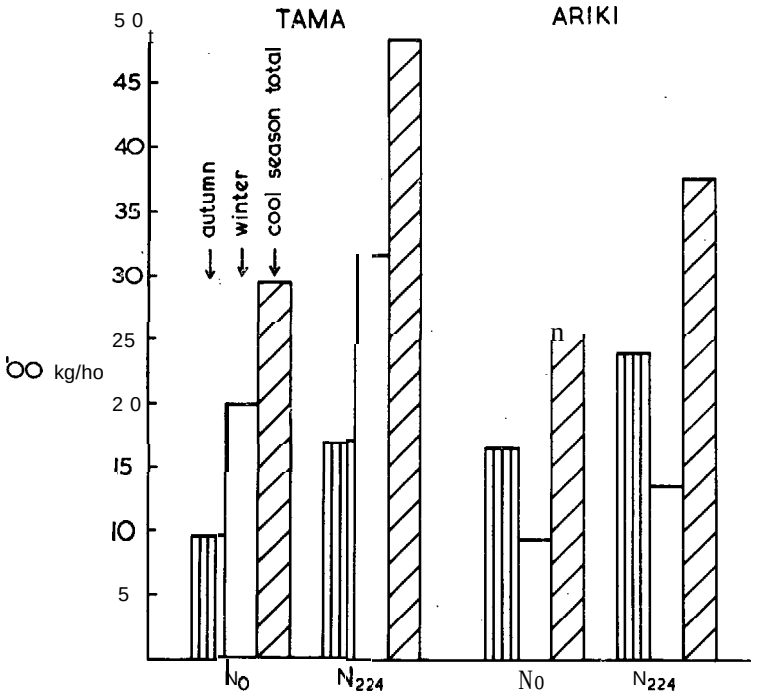

FIG. 1: *Cool season disfribufion of herbage yield — Ashburton site, year 1971-z.*

nitrogen in cool season (2040 to 2940 kg/ha), compared with average values of 3000 kg/ha obtained at Lincoln from Ruanui ryegrass pasture (O'Connor *et* al., 1968) and were generally higher than average values of 1510 to 2050 kg/ha obtained at Winchmore from irrigated Ruanui ryegrass pasture (Rickard, 1972). Nitrogen increased yields by 45 to 65%. At Oxford, yields of overdrilled pasture without nitrogen in cool season (810 to 1400 kg/ha) were lower than at Ashburton, but nitrogen gave substantially greater percentage increases in yield (84 to 130%) .

A current improvement practice for' pasture damaged by grass grub in Çanterbury is to overdrill in autumn with both Tama and Ariki or Ruanui ryegrasses. Insecticide is also drilled with the seeds. The Tama ryegrass could then contribute to the immediate needs for cool season herbage production. Pasture production from the mixed overdrilling would not be expected to slump to the same extent in spring as shown when only Tama ryegrass is overdrilled.

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