PERFORMANCE OF 'GRASSLANDS MATUA' PRAIRIE GRASS UNDER CLOSE MOWING IN THE CENTRAL NORTH ISLAND

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Abstract

'Grasslands Matua' prairie grass (*Bromus* catharticus) was evaluated under close mowing (a) against cocksfoot, phalaris, and tall fescue as a companion grass for lucerne, on a pumice soil from 1974 to 1977 at sowing rates of 4, 13 and 22 kg/ha and (b) against ryegrasses in grass/white clover pastures on a sandy loam from 1975 to 1977.

(a) In the first year lucerne/Matua sown at 13 and 22 kg/ha outyielded lucerne/Matua sown at 4 kg/ha by 19%, lucerne alone by 61%, and other mixtures by at least 21%. There were no significant differences in total production between the three lucerne/Matua treatments, lucerne alone, and other mixtures over the second and third year. The inclusion of Matua reduced weed ingress. In the third year, Matua had a higher weed content than lucerne/tall fescue, which was almost weed free.

(b) Annual production of Matua and Nui ryegrass swards was not significantly different. Matua swards were, however, superior to Nui from midsummer to early spring, whereas over spring/early summer Nui swards outproduced Matua swards.

INTRODUCTION

Prairie grass (*Bromus catharticus)* has been recognized as a valuable species in dairying pastures for many years in warm and fertile areas of New Zealand (Burgess, 1951: Jordan, 1957; Moss, 1962; Pantall, 1961). Few quantitative data are available on its relative merit and performance in the North Island. In Canterbury, Watkin (1975) found that prairie grass/white clover pastures had higher annual yields than Ruanui and Manawa/white clover pastures under sheep grazing and were superior in yield during autumn and winter. The performance of earlier commercial strains of prairie grass with lucerne at Invermay (Cullen, 1965) and in North Otago (Douglas, 1973) has, however, been disappointing.

'Grasslands Matua' is the first prairie grass cultivar selected and bred for New Zealand conditions, and is intended for use on high fertility dairy farms under rotational, lax defoliation grazing systems (Rumball, 1974) . The aims of the present study were to provide information on the herbage production of this

recently released cultivar, in comparison with other grass species, in lucerne/grass mixtures in the pumice country, and with ryegrasses in grass/white clover pastures in the Waikato.

EXPERIMENTAL

LUCERNE/GRASS MIXTURES

The experiment was sown on September 19. 1974, on Atiamuri sand at the Wairakei Research Station. The area was drilled with lucerne (cv. Wairau) and subsequently four grasses were broadcast on to 10 X 2 m plots arranged in a randomized block design with four replicates. The treatments were:

Treafmenf	*Sowing Rate of Viable Seed (kg/ha)*
Lucerne alone	8
+ cocksfoot cv. 'Grasslands Apanui'	2
+ phalaris cv. 'Seedmaster'	9
+ prairie grass cv. 'Grasslands Matua'	4, 13 and 22
+ tall fescue cv. 'Grasslands 4710'	9

From mid-spring to late autumn treatments were cut when lucerne was at 10% flowering or crown bud movement and for the remainder of the year when a height of 15 cm was reached. Plots were cut 4 to 6 times annually and dry matter production assessments made from a 6 m^2 area cut with a flail mower to 3 cm. Hand-cut samples to determine the percentage contribution of the various species were taken before mowing.

Applications of 400 kg/ha 50% potassic superphosphate and 10 kg/ha calcined magnesite were made in spring and autumn. In late autumn and in late winter 50 kg/ha of N as nitrolime was applied' — i.e., 100 kg/ha of N annually. Prairie grass showed prolific reseeding and young plants were removed from other lucerne/grass plots by hand and sprayed out of pure lucerne in autumn: and winter of the second and third year.

GRASS/WHITE CLOVER MIXTURES

The experiment was sown on April 24, 1975, on Horotiu sandy loam at the Ruakura Agricultural Research Centre. Eight grasses and white clover cv. 'Grasslands Huia' (3 kg/ha) were broadcast on to 4 × 1 m plots. arranged in a randomized block design (8 grasses x 2 N rates) with four replicates. However, in this paper Matua is compared only with 'Grasslands Nui' perennial ryegrass which was the highest producing ryegrass

cultivar. Sowing rates were 30 kg/ha of viable seed for Matua and 22 kg/ha for Nui. Nitrogen (0 to 40 kg/ha) as nitrolime was applied after each cut, this amounting to 480 kg/ha/yr. Dry matter production was assessed from a 2 m^2 area, mown down to 3 cm with a flail mower when the mean sward height on the best treatment reached 20 cm. Clippings were discarded. Hand-cut samples to determine the percentage contribution of various species were taken before mowing. Potassic superphosphate was applied after each cut, a total of 750 kg/ha/yr.

RESULTS

LUCERNE/GRASS MIXTURES

Annual dry matter yields and yield of sward components are presented in Table 1.

EFFECT OF SEEDING RATE ON MATUA PRAIRIE GRASS

In the first year increasing the seeding rate from 4 to 13 kg/ha resulted in an additional total production of 740 kg DM/ha (19%), although this was non-significant. A seeding rate of 22 kg/ha was not more productive than 13 kg/ha. The higher total annual yields at 13 and 22 kg/ha were due to higher grass yields compared with 4 kg/ha. This was at the expense of lucerne production at 22 kg/ha, which had a 27% lower lucene yield ($P < 5\%$) than at 4 kg/ha. In the second and third years there were no significant differences in lucerne, grass, other species, and total production, although total and lucerne production were slightly less at 22 kg/ha than at 4 and 13 kg/ha. Results given below refer to lucerne/prairie grass mixtures with prairie grass sown at 4 kg/ha. This rate was used for comparison, because there was little difference between rates in total, grass, and lucerne component yield after the first year.

TOTAL HERBAGE YIELDS

In the first year, lucerne/Matua outyielded all other lucerne/grass mixtures (by at least 21%) and lucerne alone (by 61 %). In the second year, lucerne/Matua, lucerne/phalaris, lucerne/tall fescue and lucerne alone had similar production, but lucerne/cocksfoot had lower production than the other treatments.

In the third year, there were no statistically significant differences between lucerne/Matua, other mixtures, and lucerne alone.

TABLE 1: TOTAL HERBAGE DRY MATTER PRODUCTION AND COMPONENT CONTRIBUTIONS OF GRASS/ LUCERNE MIXTURES AND LUCERNE ALONE, (kg/ha)

	Lucerne	*Grass*	*Other Species*	*Total*†
Year 1 — 19.9.74 (sowing), to 18.6.75				
Lucerne alone	1990 aA	—	330 a	2420 bC
Lucerne/cocksfoot	1970 aA	680 cC	350 a	3210 bBC
Lucerne/phalaris	1640 abAB	650 cC	170 a	2460 bB
Lucerne/tall fescue	1940 aA	730 cC	350 a	3020 bB
Lucerne/prairie grass 4 kg/ha*	1620 abAB	1860 bB	250 a	3900 aAB
Lucerne/prairie grass 13 kg/ha	1490 bcAB	2790 aA	190 a	4640 aA
Lucerne/prairie grass 22 kg/ha	1180 cB	2750 aA	240 a	4490 aA
CV %	18	21	52	13
Year 2 — 18.6.75, to 19.8.76:				
Lucerne alone	9290 aA	—	1490 aA	11090 abA
Lucerne/cocksfoot	5220 dD	3760 bcAB	600 bcdB	10040 bA
Lucerne/phalaris	7170 bB	2550 cB	1110 abAB	11190 abA
Lucerne/tall fescue	6600 bcBC	3700 bcAB	540 cdB	11470 abA
Lucerne/prairie grass 4 kg/ha*	4950 dD	5180 aA	740 bcdB	11340 abA
Lucerne/prairie grass 13 kg/ha	5710 cdCD	5370 aA	450 dB	11900 aA
Lucerne/prairie grass 22 kg/ha	4740 dD	4400 abA	860 bcdAB	10800 abA
cv %	10	20	39	9
Part Year 3 — 19.8.76, to 22.7.77:				
Lucerne alone	7920 aA	—	2080 abAB	10030 a
Lucerne/cocksfoot	5200 bcB	3550 bAB	850 bcABC	9640 a
Lucerne/phalaris	6070 bAB	1810 cB	2720 aA	10630 a
Lucerne/tall fescue	5530 bcB	5440 aA	140 dC	11160 a
Lucerne/prairie grass 4 kg/ha*	4760 bcB	4800 abA	850 bcABC	10510 a
Lucerne/prairie grass 13 kg/ha	5160 bcB	4590 abA	390 cdC	10190 a
Lucerne/prairie grass 22 kg/ha	3870 cB	5230 aA	620 cBC	9800 a
c v %	19	21	59	10

*Seeding rates of prairie grass.
†Includes dead matter.
Figures in a column sharing the same letter do not differ significantly: lower case at the 5%, upper case at the 1% level of significance.

SOWN SPECIES YIELDS

Lucerne/Matua had higher grass yields than lucerne/tall fescue, lucerne/cocksfoot, and lucerne/phalaris in the first and second years. In the third year, lucerne/Matua outyielded lucerne/phalaris and lucerne/cocksfoot, but was no more productive than lucerne/tall fescue.

The lucerne content of lucerne/Matua was not significantly different from other lucerne/grass mixtures and lucerne alone in the first year. In the second year it was less than lucerne alone, lucerne/phalaris, and lucerne/tall fescue, but similar to lucerne/cocksfoot. In the third year, it was less than lucerne alone, but not significantly different from other lucerne/grass mixtures.

OTHER SPECIES YIELDS

In the first year, there were no differences in weed content between treatments. In the second year, lucerne/Matua had fewer weeds than lucerne alone and was similar in weed content to the other lucerne/grass mixtures. In the third year, it had fewer weeds than lucerne/phalaris ($P < 5\%$) and lucerne alone (NS), but more than lucerne/tall fescue ($P < 5\%$).

TABLE 2: TOTAL ANNUAL HERBAGE DRY MATTER PRODUCTION AND SOWN SPECIES CONTRIBUTIONS (kg/ha) OF MATUA PRAIRIE GRASS AND NUI RYEGRASS MIXTURES

		Sown Grass	*White Clover*	*Total*
1975-6				
Matua prairie grass	no N	5740 cB	950 aA	10540 aA
	N	8500 aA	510 bA	12210 aA
Nui ryegrass	no N	6550 bcB	690 abA	10810 aA
	N	7060 bAB	510 bA	12200 aA
c v %		11	40	11
Int. %		1	5	NS
1976-7				
Matua prairie grass	no N	4640 bB	2250 abA	10860 bA
	N	7030 aA	1110 bA	12110 abA
Nui ryegrass	no N	4510 bB	2950 aA	11530 bA
	N	7280 aA	1560 abA	12820 aA
cv %		21	48	10
Int. %		NS	NS	NS

Figures in a column sharing the same letter do not differ significantly; lower case at the 5%, upper case at the 1% level of significance.

GRASS/WHITE CLOVER MIXTURES

Herbage DM production from Matua and Nui/white clover mixtures are presented in Table 2.

DRY MATTER YIELDS

Matua swards were as productive as Nui swards in the first year. Each was higher yielding with nitrogen, although this was not statistically significant. In the first year, grass yield without N from Matua swards was less than from Nui swards and the Matua grass component yield with N was 20% higher than Nui swards ($P < 5\%$). In the second year, Matua and Nui swards had similar grass yields and showed large N responses (51 and 61%, respectively, $P < 1\%$).

Without N, more clover was present in Matua swards than in the Nui swards in the first year, but in the second year the situation was reversed. In both years, N depressed clover yields, although this was significant for the Nui swards only in the first year.

PATTERNS OF PRODUCTION

Seasonal patterns of production for Matua and Nui are shown in Figs. 1 and 2. The data show Matua to be superior to Nui from January to April and over the winter period, but in spring/early summer Nui outproduced Matua. This effect was less pronounced without N. Much of the late summer growth of Matua was as seed stalks.

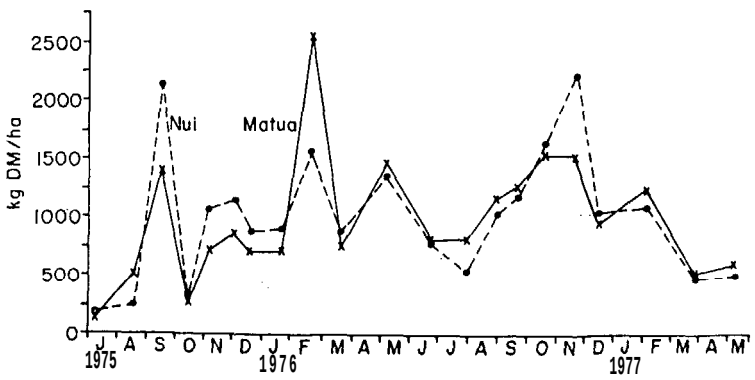

FIG. 1: *Dry matter production of Nui/white clover and Matua/white clover swards without nitrogen.*

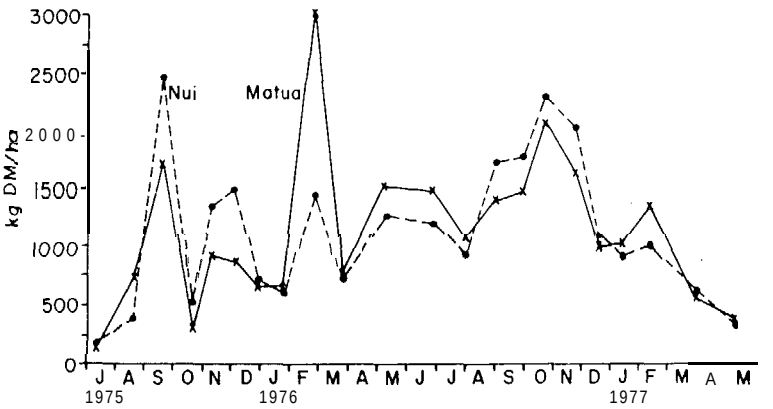

FIG. 2: *Dry matter production of Nui/white clover and Matua/white clover swards with nitrogen.*

DISCUSSION

In the pumice country there has been a swing to lucerne for grazing to the point where some dairy farmers are almost totally relying on it. Lucerne/grass mixtures should supply a more balanced stock feed with less risk of bloat problems than pure lucerne. *In* the first year, the inclusion of Matua resulted in a higher annual herbage yield than from lucerne alone. This advantage was not sustained in the second and third year, however, especially in cool seasons, as grass production only compensated for the decrease in lucerne production. Hence, it may also be useful to consider overdrilling cereals into pure lucerne stands (Baars and Douglas, 1976) as their growth is more likely to be complementary to that of lucerne. At Invermay, Cullen (1965) found tall fescue a better companion for lucerne than phalaris and cocksfoot. In the present trial Matua proved to be equal to tall fescue as a companion for lucerne. In fact, Matua was superior to tall fescue over the first year owing to the slow establishment of tall fescue. In addition to its higher first year production there is evidence that Matua is more nutritious and palatable at all stages of growth than tall fescue and at least similar to the perennial ryegrasses in this respect (Wilson, 1975, 1977).

In earlier trial work with commercial prairie grass seeding rates of 2.7 kg/ha (Cullen, 1965) to 31 kg/ha (Douglas, 1973) have been used. Low seeding rates (2 kg/ha), commonly used in the pumice country, relying on reseeding to increase plant numbers,

seem to be well justified under infrequent mowing or grazing systems similar to this trial.

The inclusion of grasses means that the mixture has higher production over late winter/early spring than pure lucerne. Early and frequent spring grazings reduce lucerne production (Douglas and Wilkinson, 1976), but are carried out in the pumice country because often this is the only feed available. Any depression in lucerne production owing to early spring cutting in this trial was probably small as only one early spring cut in addition to one mid-winter cut was taken.

GRASS/WHITE CLOVER MIXTURES

In the first year, the grass component of Matua swards with nitrogen was higher yielding than that of Nui swards, but without nitrogen it produced less. This confirms the high fertility requirements of Matua (Rumball, 1974).

In the second year there was also a large response to N in both grasses, with the production from Matua and Nui similar. The Matua grass yields had declined from the first year levels, especially with nitrogen, this possibly being due to the significant ingress of weedy grasses and the close cutting regime with higher clover contents.

The different pattern of production of Matua compared with Nui is of special interest on dairy farms as its production comes at critical periods of DM requirements (mid-summer/late winter) for dairy cows (Hutton, 1974). Lower spring production than Nui was obvious in both trial years. There appears to be scope for pasture mixtures through the association of Matua with species having different growth periods — e.g., cocksfoot and Nui. More intensive pasture utilization associated with summer/autumn droughts has shown up a lack of persistence of perennial ryegrasses, and overdrilling to replace them has became a costly practice (Weeda and During, 1974). Although Nui is an improvement on Ruanui and Ariki (Baars *et al.*, 1976), having better persistence under drought conditions, it lacks the reseeding ability of Matua. This is a worthwhile advantage of Matua that could be promoted when necessary.

It is acknowledged that a more lenient defoliation than used in the present trials will favour Matua (Rumball, 1972, 1974). But this is often impossible in farming situations. Consequently it is of importance that Matua is able to withstand severe defoliation, being at least similar in performance to the other grasses that were tested.

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