PERFORMANCE OF LUCERNE/GRASS MIXTURES ON ATIAMURI SAND

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ABSTRACT

Dry matter production from lucerne/grass mixtures and lucerne alone was compared from 1974 to 1978. The grasses were 'Grasslands Apanui' cocksfoot, *Phalaris tuberosa,* cv. 'Seedmaster', 'Grasslands Matua' prairie grass and 'Grasslands Roa' tall fescue.

Where management aimed for maximum yield of lucerne in the warm season the inclusion of perennial grasses did not result in increased winter - early spring production. Grasses tested did not form stable high-yielding combinations with lucerne.

In the first year, lucerne/Matua outproduced lucerne alone by 61% and other mixtures by at least 21% while lucerne/Roa outyielded lucerne alone by 27%. There were no significant differences in total annual production after the first year.

Lucerne/Roa outyielded lucerne alone by 10% over the trial period. Lucerne/Roa had the highest grass production and was almost weed free, but had the lowest lucerne production of all treatments. The inclusion of grasses, other than 'Roa' tall fescue, with lucerne is not recommended in the pumice country.

INTRODUCTION

In the Central Plateau pumice country there has been a swing from pasture to lucerne to the point where some dairy farmers are almost totally relying on lucerne for grazing. The main reason for the change to lucerne is the considerably higher dry matter production of lucerne (Baars *et.al.,* 1975) and its grass grub resistance (East *et.al.,* 1980).

However, lucerne production is low during winter-early spring (McQueen and Baars, 1980) at a time when the dry matter requirements of pregnant and lactating ewes and dairy cows are high. Many authors (e.g. O'Connor, 1967) have suggested that to sustain herbage production over winter-early spring a strongly winter-active grass should be grown with lucerne, provided the grass does not suppress lucerne production.

A mowing experiment was conducted at Wairakei Research Station to provide information on the total and seasonal dry matter production of a number of lucerne/grass mixtures relative to a pure lucerne sward. Results for the first three trial years have been reported elsewhere (Baars and Cranston, 1978). This paper reports on dry matter yields over the remainder of the trial period and evaluates the performance and persistence of the mixtures from establishment in September 1974 to the final cut in November 1978.

MATERIALS AND METHODS

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

Treatment	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
+ prairie grass cv. 'Grasslands Matua'	13
+ prairie grass cv. 'Grasslands Matua'	22
+ tall fescue cv. 'Grasslands Roa'	9

(* each grass species + 8 kg/ha of lucerne)

From mid-spring to late-autumn treatments were cut when the lucerne was at 10% flowering or at crown bud movement and for the remainder of the year at a sward height of 15cm. Plots were cut 4 to 6 times annually and dry matter production assessments made from a $6m^2$ area cut with a flail mower to a stubble height of 3cm. 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 were sprayed out of pure lucerne in autumn and winter of 1976, 1977 and 1978.

RESULTS

Dry matter yields and yield of sward components over the final trial period (22.7.77 — 21.11.78) are presented in Table 1.

TABLE 1: Total and component yield (kg DM/ha) of lucerne/grass mixtures and lucerne alone (22.7.77 to 21.11.78).

	Lucerne	Grass	Weed Species	Total*
Lucerne alone	9160		1430	11490
Lucerne/cocksfoot	5300	4750	720	12010
Lucerne/phalaris	4590	1240	1620	12600
Lucerne/tall fescue	3750	8330	470	12930
Lucerne/prairie grass 4kg/ha	4410	5680	1590	12410
Lucerne/prairie grass 13kg/ha	4620	5320	1460	12460
Lucerne/prairie grass 22kg/ha	4370	5200	1400	11760
C.V.%	25	26	70	9
LSD 5%	2150	1820	650	1500
LSD 1%	2930	2480	880	2040

*Including dead matter

Effect of seeding rate of prairie grass on yield.
Increasing the seeding rate of prairie grass sown with lucerne had no effect on its yield nor did it result in significant differences in yields of lucerne or weed species and thus total yield. Thus comparisons below refer to the prairie grass mixture sown at 4 kg/ha.

Herbage yields
Lucerne/tall fescue was the highest producing mixture and outyielded lucerne alone by 12%. There were no statistically significant differences between lucerne/grass mixtures and lucerne alone.

There were no statistically significant differences in lucerne yield amongst lucerne/grass mixtures. Inclusion of the grasses reduced the lucerne yield compared with lucerne alone ($P<1\%$) by amounts ranging from 42% (with cocksfoot) to 59% (with tall fescue).

Tall fescue outyielded prairie grass by 47% ($P<1\%$), cocksfoot by 75% ($P<1\%$) and phalaris by 572% ($P<1\%$).

The weed content of the lucerne/tall fescue mixture was considerably lower than lucerne alone, lucerne/phalaris and lucerne/prairie grass ($P<1\%$). But although lucerne/tall fescue had a 59% lower weed content than lucerne/cocksfoot, this difference was not significant.

Production patterns of lucerne/tall fescue and lucerne alone.
Seasonal patterns of total dry matter production from lucerne alone and lucerne/tall fescue are presented in Fig. 1. Fig. 2 depicts the seasonal pattern of the grass and lucerne components of the lucerne/tall fescue mixture.

Fig. 3 shows the relative differences in dry matter production between the lucerne/tall fescue mixture and lucerne alone for individual cuts. In the first year after establishment (1975) there was no significant difference between lucerne/tall fescue and lucerne alone over the winter-spring period. Sugsequently lucerne/tall fescue outyielded lucerne alone by 24% in 1976, 61% in 1977 and 22% in 1978 over the latter period. In 1975, 1976 and 1977 summer dry matter production from lucerne and the lucerne/tall fescue mixture were similar. In the summer of 1978, however, the former outproduced the latter by 47% as the lucerne/tall fescue mixture was the lowest producing treatment of all, due to a severe drought.

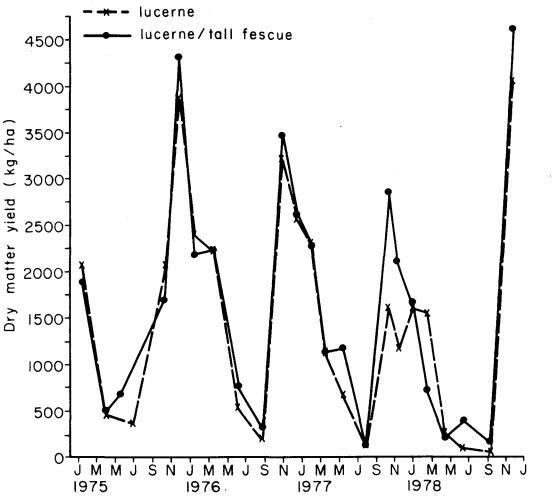

Figure 1 — Seasonal pattern of total dry matter production of lucerne/tall fescue and lucerne alone (September 1974 — November 1978).

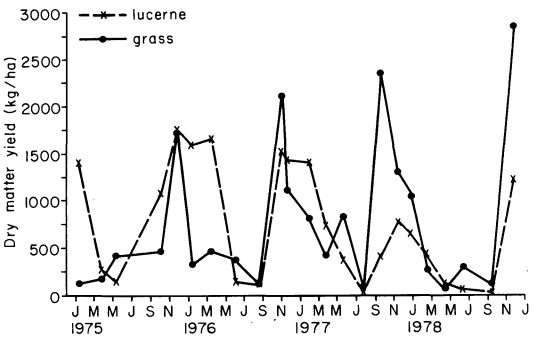

Figure 2 — Seasonal pattern of dry matter production of the grass and lucerne component of lucerne/tall fescue (September 1974 — November 1978).

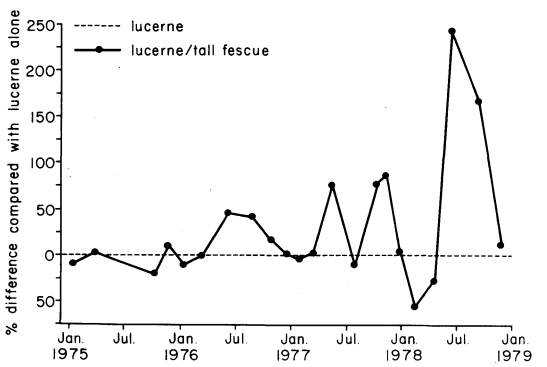

Figure 3 — Percentage difference in total dry matter production of lucerne/tall fescue compared with lucerne alone (September 1974 — November 1978).

DISCUSSION

The results from this experiment have shown that under a management where lucerne was cut at the early flowering stage of growth there was poor survival of phalaris and cocksfoot. Establishment of the latter species and tall fescue was slow and grass yields were low in the first year compared with prairie grass (Baars and Cranston, 1978). The poor performance of cocksfoot in this trial is in agreement with findings by Vartha (1973) in Canterbury, although his first year's grass yields were three times as high as recorded in this trial.

In an earlier report Baars and Cranston (1978) concluded that prairie grass was equal to tall fescue as a companion for lucerne. In the latter years of the trial however, tall fescue proved to be superior to prairie grass in total production, grass yield and in suppressing weeds.

These results are in agreement with the findings by East *et al.,* (1980) in the pumice country and Cullen (1965) at Invermay. Tall fescue cultivars in combinations with lucerne have also shown good persistence and production in the USA (e.g. Smith *et al.,* 1973).

While tall fescue showed a superior performance compared with other grasses it also gave the greatest suppression of lucerne. Over the trial period the lucerne content of the mixture decreased from 64% in 1975 to 29% in 1978. Similar findings have been reported by Chamblee and Lovvorn (1953).

Figs 1,2 and 3 show that including tall fescue with lucerne gave no real advantage in winter-early spring production, most probably due to the cold climatic conditions over this period (Baars *et.al.,* 1975). Overdrilling cereals in autumn into lucerne, however, may result in large increases in late winter-early spring production of the sward without any large supression of the lucerne component, but variable results have been reported (Baars and Douglas 1976; Mcqueen and Baars, 1980).

Figs 1,2 and 3 also show that, after the establishment year, tall fescue increased mid-late spring production by considerable margins. However, the peaks of lucerne and tall fescue production coincide in mid-spring resulting in severe competition between these species for space and nutrients. It is likely that this factor caused a decline in the lucerne component of the mixture which was expressed in the summer of 1978 by a 53% difference in production in favour of lucerne over the tall fescue mixture. The applications of 50kg N/ha in late autumn and late winter to increase winter-early spring production may have added to the suppressive effects of tall fescue. These effects on composition should be less without nitrogen applications.

In addition to competition from tall fescue, early spring-winter cutting may also have contributed to the progressive reduction in lucerne content (Fig. 2). It is well known that late winter - early spring utilisation of lucerne stands reduces subsequent production of lucerne (Douglas and Wilkinson, 1976).

Lucerne/tall fescue produced 8115 kg DM/ha over 1977/78 which was a dry and cool year. The production of the mixture (63% tall fescue, 31% lucerne) under the latter conditions was 41% higher than the mean annual production of 5750 kg DM/ha recorded for a browntop/ryegrass/white clover sward on Atiamuri sand over 1964-71 (Baars *et.al.,* 1975). 'Roa' tall fescue is also resistant to grass grub (East *et.al.,* 1980), a serious pest in the pumice country. From this trial work it seems that 'Roa' tall fescue is well adapted to the pumice soils and an investigation into its use in pasture systems might well be justified.

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