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'GRASSLANDS MARU' PHALARIS: PRODUCTIVE AND PERSISTENT IN HILL COUNTRY

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Abstract

A series of trials in Taupo, Wairarapa, and Southland showed that 'Grasslands Maru' phalaris *(Phalaris aquatica* L.) was well suited to dry hill country. It yielded as well as or better than 'Grasslands Nui' ryegrass and resident wards on an annual basis, being particularly productive in winter, spring and summer. Its spread by rhizomes ensured good swards which remained productive even under set-stocking. Maru suppressed grass grub numbers and continued to produce well under grass grub attack. Responses to fertiliser were good, but withholding fertiliser did not suppress Maru to any greater extent than other pasture grasses. These trials have shown that the seasonal and annual yields of Maru can add flexibility and improved production to hill country farming.

Keywords: 'Grasslands Maru' phalaris. seasonal production, grass grub, fertiliser, persistence, shelter, hill country

INTRODUCTION

Traditional pasture grasses and legumes do not persist well in New Zealands dry hill country. As farming costs increase, the development of alternative grass species with better persistence and productivity is necessary to maximise the benefits of oversowing.

In the early 1980s a series of trials was established throughout New Zealand to investigate the place of some of these species in dry hill country. One species that has shown dryland potential is phalaris *(Phalaris aquatica* L.). In Australia, phalaris has shown several features which could benefit New Zealand hill country farming, including persistence under drought (Robinson 1952), survival under hard grazing (Hutchinson 1970), cool-season growth and pest resistance.

Phalaris is of Mediterranean origin and therefore produces well in autumn, winter and spring. Severe moisture stress in summer induces dormancy in phalaris which ensures its survival during droughts (McWilliam & Cramer 1968). Problems such as poor palatability, slow establishment, and phalaris staggers in sheep led to the breeding of 'Grasslands Maru' phalaris for New Zealand conditions (Rumball 1980). Maru has shown better persistence and production than other species in dry lowland pastures (Fraser 1982) and is readily eaten by stock once they are used to it. *Maru* has lower alkaloid levels than imported cultivars and therefore phalaris staggers has been noted only when sheep graze young rapidly growing regrowth (Fraser pers. comm.) or when grazing it exclusively for several weeks (Rumball 1980). Phalaris staggers can be prevented by cobalt treatment.

Slow establishment is still a problem, although a dense sward will build up with time through the spread of rhizomes (Barnard 1972).

Phalaris has an erect growth habit. Long intervals between grazing produce much bulk on tall stems. This gives it an additional feature of producing shelter, similar to tussock, for lambing ewes and fawning hinds, which can improve lamb survival and growth rates up to weaning (Alexander 8 Lynch 1976).

Grass grub resistance has also been identified as an important advantage of

Maru phalaris (French et *al.* 1983), probably because of alkaloid levels and an extremely deep rooting system.

In a series of hill country trials, established in Taupo, Wairarapa and Southland, the Performance and persistence of Maru phalaris were compared with those of 'Grasslands Nui' ryegrass (*Lolium* perenne L.) and resident pastures.

MATERIALS AND METHODS

Taupo and Wairarapa both experience regular summer droughts, and the Southland site is occasionally summer dry. Site details are as follows: (1) Taupo (Aratiatia) 5 km north-east of Taupo township; annual rainfall 1200 mm; Taupo hill series yellow-brown pumice soil; resident pasture was Yorkshire fog (*Holcus lanatus*) dominant; sown after herbicide treatment spring 1982, with Maru at 60 kg/ha and Nui at 60 kg/ha, followed by cattle trampling.

(2) Wairarapa (Rawhiti Station) 20 km east of Masterton; annual rainfall 950 mm; Kourarau/Waimarama silt loam central yellow-brown earth soil; resident pasture was ryegrass dominant; sown after cultivation, autumn 1980, with Maru at 60 kg/ha and Nui at 70 kg/ha.

(3) Southland (Fairplace Station) 30 km west-north-west of Gore; annual rainfall 1100 mm; Kaihiku silt loam yellow-grey earth soil; resident pasture was fescue-silver tussock with browntop, sweet vernal and Yorkshire fog introduced; sown after herbicide application, autumn 1981, with Maru at 19 kg/ha and Nui at 18 kg/ha followed by sheep trampling (Meurk & Turner 1985).

High sowing rates, cultivation or herbicide use, and high initial fertiliser (up to 500 kg/ha superphosphate) were used to establish good swards to compare the productivity and persistence of the grasses, and in an attempt to avoid complications of different establishment characteristics.

'Grasslands Huia' white clover (*Trifolium repens* L.) (3 kg/ha) and 'Mt Barker and 'Woogenellup' subterraneum clovers (*Trifolium subterraneum* L.) (4 kg/ha) were also sown with the grasses. Resident plots were undisturbed, except for stock treading, and subsequently received the same management as Maru and Nui pastures. Grazing was with sheep, 6 - 8 times per year when pastures had accumulated 1000 -2500 kg DM/ha. Plots (100 $\geqslant m^2$) were individually fenced and grazing intensity was similar in each plot.

Results for the 1984-85 year are reported for Taupo and Wairarapa and for 1985-86 in Southland. These are the 3rd, 4th and 5th years for each trial respectively.

RESULTS AND DISCUSSION

Annual yields

The total annual production of Maru swards (Fig. 1) was better than or similar to that of Nui or resident swards. However, the composition of the swards varied considerably, as Maru contributed 70% to total yield in Taupo, but only 30% in Wairarapa and Southland (Fig. 1). This stimulation of total production may be related to a shelter effect as the resident grasses are protected from climatic extremes by the erect habit of Maru. There may also be some associated benefits from the pest tolerance of Maru evident in the trend for lower grass grub populations (Table 1).

Seasonal yields of the total swards

The benefits of Maru as a stimulator of total production are shown again in the seasonal yields. The inclusion of Maru does not just replace the resident grasses as Nui does, but adds to them, thus increasing total production.

The contribution of Maru to total yields resulted in good yields in all seasons

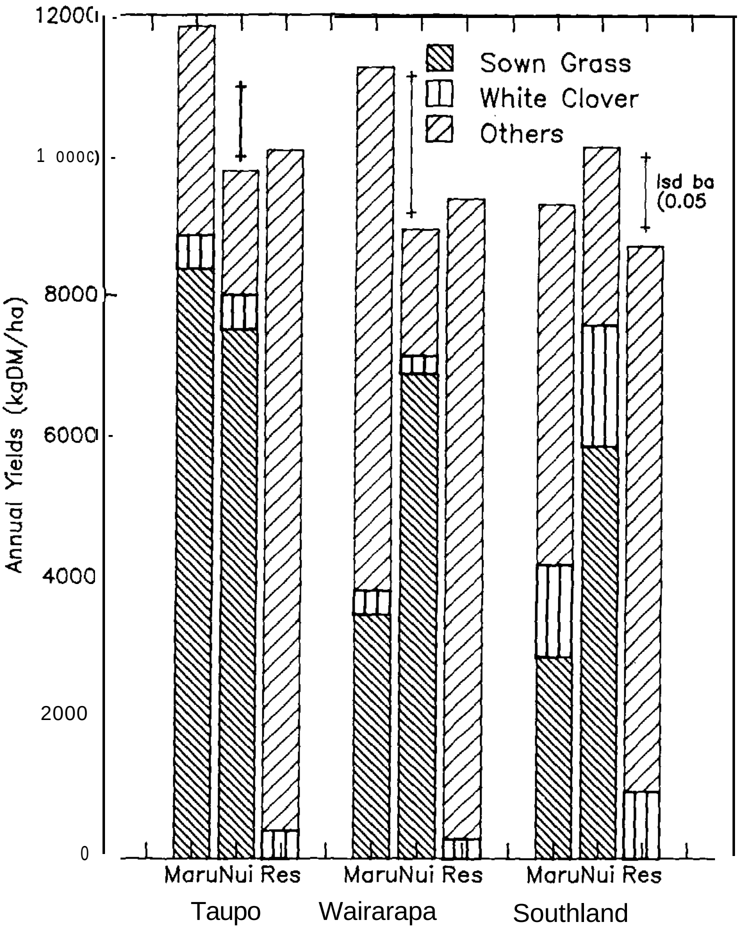

Figure 1: Annual total yields and component production Of Maru, Nui and resident swards at 3 hill country sites.

Table 1: Grass grub populations under Maru, Nui and resident wards at Taupo (grubs/m^2)

	1962	1963	1984	1985	1986	Mean
Maru	166	63	62	172	51	103
Nui	217	50	91	234	179	154
Resident	253	96	102	175	77	141
lsd (0.05%)	52	29	43	25	43	43

except autumn. This was the only time that dormancy of Maru was evident, as growth rates were similar to or lower than those in other swards (Table 2). The late summer-autumn droughts of New Zealand hill country have shifted this dormancy tendency into autumn. However, although referred to as dormancy, it must be noted that Maru still grew, though not quite as Well as other species.

Once soil moisture was replenished, winter growth rates of Maru swards are

Table 2: Seasonal growth rates of Maru, Nui, and resident swards (kg DM/ha/day) under rotational grazing

		Autumn	Winter	Spring	Summer
Taupo	Maru	21.6	20.8	38.2	48.9
	Nui	25.7	11.9	34.6	35.0
	Resident	24.0	10.5	40.0	36.0
	lsd	4.0	5.6	9.2	9.8
Wairarapa	Maru	22.5	25.8	66.0	9.5(27.3)★
Nui		19.3	17.8	54.9	6.5(20.3)
	Resident	17.2	16.7	61.5	7.8(23.6)
		4.1	4.1	4.3	2.8 (3.9)
Southland	Maru	19.7	14.5	39.5	31.0
	Nui	21.7	12.0	46.1	34.1
	Resident	19.1	10.0	32.9	29.4
	lsd	3.2	3.7	9.3	7.3

★ Mean of 5 years data for summer growth rates

excellent (Table 2), exceeding those of both Nui and resident swards by up to 100%. This activity of Maru continued through spring and into summer, making these swards equal to or better than others (Table 2). This was most evident at Taupo where summer growth rates of Maru swards had the biggest advantage over Nui and resident swards, and where Maru contributed the most to total yield (Fig. 1). Summer 1986 in Wairarapa was exceedingly dry but Maru still outperformed the other swards even though growth rates were very low. The 5-year average summer yields for this site are presented in brackets.

The growth of Maru through winter, spring and into summer indicates that this plant is ideal for adding to total yields by utilising the climate and fertility of dry sunny faces. These are generally warmer in winter with a higher nutrient status than corresponding shady faces (Radcliffe et al. 1977).

Persistence

Initial seedling counts for both Wairarapa and Southland indicated a good establishment (969 plants/m^2 and 36% occurrence under point analysis respectively). Seedling survival and hence establishment were variable because of either very wet or dry soil conditions. At Wairarapa, where some soils were wet in winter the contribution of Maru to total yield ranged from 8 to 82% in the final year.

Observations from all trials indicated that Maru improved over time. The rhizomatous character of Maru enabled it to spread well even after poor seedling survival. In Wairarapa rhizomes had spread up to 2 m after 3 years.

Many grass species fail under set-stocking, making them unsuitable for hill country. However, summer set-stocking in Wairapa resulted in a total yield increase of 20% over rotationally grazed swards. This was due to a 90% increase in the contribtion of Maru to the total yield, indicating an improved spread of Maru under set-stocking. Established Maru plants can withstand hard or prolonged grazing. This was shown from the 7- or 30-day grazing periods in the Southland trial. Maru swards continued to spread and improve with time, increasing on slopes up to 15 degrees from 10% in year 1 to 55% by year 5 under both managements.

Grass grub tolerance

Attacks of grass grub occurred at all sites, but at Taupo they were spread evenly throughout the trial and could be accurately measured. Although grass grub numbers at Taupo (Table 1) varied greatly from year to year the trend was for lower populations under Maru swards, similar to the results of French et al. (1983). This difference was largest in years of severest attack

Observations of swards in Southland showed that under severest attack, when grazing uprooted resident species such as dogstail, sweet vernal and Yorkshire fog, Maru continued to grow without apparent attack.

Stock acceptance and phalaris staggers

Sheep occasionally are initially reluctant to graze Maru, possibly because of its erect nature, rough leaves, or seasonal alkaloid levels, but swards of Maru were always well grazed. Spelling for too long in late spring can lead to a build-up of seed-head but most of this is readily eaten.

Phalaris staggers was not observed in any of the trials. Rumball (1980) saw staggers only if sheep grazed solely Maru for several weeks. The presence of other species minimises the danger to stock by diluting the alkaloid intake. However, in Maru-dominant swards, rapid young growth should not be grazed. Empty sheep should be monitored closely and may have to be shifted on and off Maru-dominant swards, and their ration daily increased slowly as they become accustomed to the feed.

Responses to fertiliser

The use of maintenance dressings of 250 kg/ha superphosphate over 5 years in Southland resulted in Maru, Nui and resident swards all producing 26% more herbage than plots which had received no maintenance fertiliser during that time.

At Wairarapa the reduction of superphosphate had no effect on the ranking of the treatments, as Maru swards still remained best. Although the contribution of Maru decreased from 44% to 10% as a result of reducing the fertiliser, the enhancement of total sward production was still evident.

Uses of Maru

The performance of Maru with resident grasses in Wairarapa and Southland, and when sown with Wana cocksfoot in Taupo, indicates that Maru is an ideal companion grass. Mixtures of Maru with ryegrass or cocksfoot will minimise pest damage, and any risk of phalaris staggers, while enhancing total production.

The winter, spring and early-summer growth of Maru adds flexibility and improved production to dry hill country farming.

The continued spread and production of Maru under set-stocking favours its use over other grasses in many situations.

Good establishment of Maru is best achieved in cultivated seed beds, but oversowing into a moist soil after hard grazing, followed by stock trampling is acceptable. However, Maru is slow to establish, and may take several years to reach its maximum potential.

Maru is well placed to utilise extra phosphate, but growth is not suppressed by withholding fertiliser to any greater extent than other pasture grasses.

The use of Maru may also provide lambing and fawning shelter by virtue of its erect cool-season growth, which improves lamb and ewe health up to weaning.

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