

Evaluation of dryland species and new ryegrass cultivars to increase pasture productivity in coastal Taranaki

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Abstract

Seasonal and annual DM production of direct drilled dryland species 'Grasslands Maru' phalaris (*Phalaris aquatica* L.) and 'Grasslands Roa' tall fescue (*Festuca arundinacea* Schreb.) and perennial ryegrass (*Lolium perenne* L.) cultivars 'Grasslands Pacific', 'Droughtmaster' and 'Yatsyn-1' was compared with that of established pasture in an environment prone to summer dry spells. Two methods of establishment using only Yatsyn-1 were examined: either the elimination of existing pasture with glyphosate and drilling, or drilling without spraying (undersowing).

Average annual DM production (over 3 years) of Yatsyn-1 drilled into pasture previously sprayed with glyphosate was 12% more productive than established pasture. Maru phalaris, Droughtmaster and Pacific had similar annual DM production to established pasture, and Roa tall fescue produced 25% less. Yatsyn-1 undersown in pastures without previous spraying with glyphosate produced 9% less than Yatsyn-1 established by the spray and drill technique.

Phalaris established well but after 3 years the content of phalaris had declined markedly, suggesting poor persistency. Tall fescue was slow establishing but had good persistency, as did all ryegrass cultivars.

Yatsyn-1 direct drilled into pastures eliminated with glyphosate before drilling is recommended for an environment prone to summer dryness to increase annual DM production.

Keywords pasture production, established pasture, ryegrass cultivars, phalaris, tall fescue, establishment techniques, summer droughts

Introduction

Summer dry spells in coastal Taranaki occur one in every three years (Roberts & Thomson 1984). Pastures here are predominantly ryegrass/white clover and are unproductive during periods of soil moisture deficit. Possible means of increasing summer pasture

productivity are through irrigation, which is expensive, or by introducing drought-tolerant species or new improved ryegrass cultivars. Tall fescue and phalaris have been recognised as pasture species tolerant to drought and grass grub (Kain & Atkinson 1977). In trials at the Taranaki Agricultural Research Station, tall fescue and phalaris produced 15% and 17% more than established pasture respectively (Judd *et al.* 1989). New improved ryegrass cultivars are also proving effective in increasing dry matter (DM) productivity, especially over summer and autumn (Kerr *et al.* 1987).

When renovating pastures the method of establishment must ensure a persistent and productive pasture. Thorn *et al.* (1985) found that spraying with a herbicide before drilling was better than undersowing (drilling directly into pasture without spraying with a herbicide); however, undersowing is still common.

The value of dryland species or new ryegrass cultivars to increase DM productivity was evaluated at a southern site in coastal Taranaki. Two establishment methods were also examined.

Materials and Methods

The trial was conducted in coastal Taranaki from autumn 1987 to spring 1990 with measurements beginning in spring 1987. A northern (Okato) and a central (Hawera) site were used for observations (plant counts in May 1987 and each subsequent autumn, point analysis) and a southern (Patea) site for pasture production and again point analysis for determining persistency of the respective species.

The existing pasture (left unsprayed) was compared over 3 years with 3 perennial ryegrass cultivars ('Yatsyn-1', 'Grasslands Pacific', and 'Droughtmaster') and two dryland species 'Grasslands Maru' phalaris (*Phalaris aquatica* L.) and 'Grasslands Roa' tall fescue (*Festuca arundinacea* Schreb.). Established pasture was also compared with Yatsyn-1 established by spraying with glyphosate before drilling and Yatsyn-1 undersown (no spray used). A randomised block design, with 3 replicates, was used with plot size 4.9 m x 20 m. All sown treatments (excluding undersown Yatsyn-1) were sprayed out with glyphosate at 3 l/ha 1 week before drilling. Ryegrass and phalaris were sown at 12 kg/ha and tall

fescue at 25 kg/ha, all with Pitau white clover at 3 kg/ha using a triple disc drill, in April 1987.

The trial areas were rotationally grazed with dairy cows. Production cuts were taken 12 times per year to 4 cm height with a rotary mower (one strip 10 m long per plot) before grazing, with a new area trimmed after grazing. Point analysis was done each autumn to determine botanical composition. Species identified were sown species, other grasses, white clover (*Trifolium repens*), weed and dead matter.

Results

Total herbage dry matter production

(a) Establishment

There was no consistent effect between sites of grass species on plant numbers at establishment. The northern and central sites had fewer plants. At the northern site, tall fescue established significantly better than the ryegrasses and phalaris. Pacific and Droughtmaster established significantly better than the other grasses at the southern site. Droughtmaster again had superior plant numbers at the central site.

In general Yatsyn-1 established by spraying before drilling and phalaris were the poorest establishing at all sites.

(b) Species and cultivar effects

Table 1 Average, seasonal and annual DM production (kg DM/ha) of dryland species and ryegrass cultivars average for three years.

	Winter	Spring	Summer	Autumn	Annual
Yatsyn-1	1630	3560	2190	1320	6920
Droughtmaster	1420	3530	1790	1140	7670
Pacific	1660	3500	1660	1170	6210
Established Pasture	1420	3210	2160	1170	7960
Phalaris	1630	2640	1990	1340	6010
Tall fescue	1160	2650	1670	920	6420
Significance	..	.	NS	NS	.
LSD _{0.05}	306	640	.	▪	1330
LSD _{0.01}	366	▪	▪	▪	▪

In winter, Yatsyn-1 and phalaris produced significantly ($P<0.01$) more than tall fescue, Droughtmaster and established pasture (Table 1), and Pacific produced significantly ($P<0.01$) more than tall fescue. In spring, Yatsyn-1, Droughtmaster and Pacific were significantly ($P<0.05$) more productive than tall fescue and phalaris. Dryland species or ryegrass cultivars did not differ significantly in summer and autumn, although DM production of Yatsyn-1, established pasture and phalaris was greater than that of other species in summer. In

autumn Yatsyn-1 and phalaris were again more productive.

Average annual DM production of the ryegrass cultivars and phalaris was significantly ($P<0.05$) higher than that of tall fescue. Although other treatments did not differ significantly, Yatsyn-1 produced (kg DM/ha) 1050, 960, 910 and 710 more than Droughtmaster, established pasture, phalaris and Pacific, respectively.

(c) Establishment method

In winter, Yatsyn-1 established by the spray and drill method produced significantly ($P<0.01$) more DM than undersown Yatsyn-1 and established pasture (Table 2). Establishment method had no significant effect on DM production in the other seasons or on annual average DM production. Annual DM production for Yatsyn-1 established by the spray and drill method was 960 and 710 kg DM/ha more than established pasture and undersown Yatsyn-1, respectively.

Table 2 Average seasonal and annual DM production (kg DM/ha) spray and drill versus undersowing average for three years.

	Winter	Spring	Summer	Autumn	Annual
Yatsyn-1 + herbicide	1630	3560	2190	1320	6920
Yatsyn-1 • herbicide	1430	3370	1790	1140	7670
Established Pasture	1430	3210	2160	1170	7960
Significance	**	NS	NS	NS	NS
LSD _{0.05}	306	.	.	▪	▪
LSD _{0.01}	360			.	.

Botanical composition

From year one to year two, at all sites, sown species content increased, then from year two to three sown species content declined (Figure 1). Ryegrass content of undersown Yatsyn-1 and established pasture did not differ significantly.

In year one, Yatsyn-1 established by the spray and drill method had significantly ($P<0.05$) higher ryegrass content than established pasture at the northern and central sites. In year two, this was significant at the central site only, and by year three there were no significant differences.

Differences in ryegrass content between the ryegrass cultivars were significant ($P<0.05$) in year one and two. In year one, there were no significant differences at the southern site; at the northern and central site, Yatsyn-1 was significantly superior to Pacific; and at the central site Droughtmaster was superior to Pacific. In year two, there were no significant differences at the southern site; at the northern and central sites, Yatsyn-1 and Droughtmaster were not significantly different but had

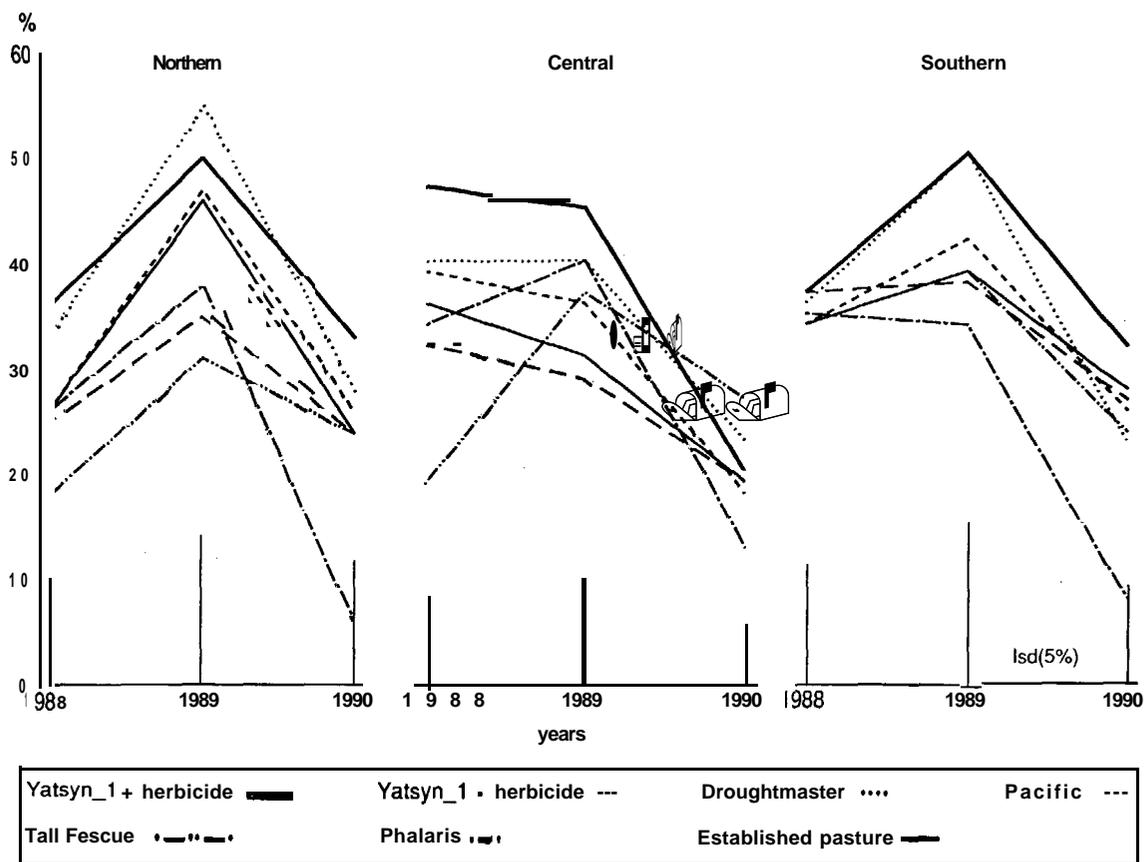


Figure 1 Sown species content of dryland species and ryegrass cultivars.

a significantly ($P < 0.05$) higher ryegrass content than Pacific.

In year one, at the northern and central sites, sown species content of tall fescue was significantly ($P < 0.05$) lower than that of phalaris and established pasture. By year two, the content of tall fescue at all sites had increased and was not significantly different from either phalaris or established pasture. In year three, the content of phalaris was significantly lower than that of all other species.

For all sites content of other grasses, clover and dead matter was high. Point analysis was conducted each autumn and dead matter content on all treatments was high (20-40%). Dead matter content was significantly lower in phalaris than in all other treatments. Clover and other grasses content was higher in both tall fescue and phalaris than in ryegrass cultivars (29% clover in tall fescue and phalaris vs. 19% in ryegrasses).

Discussion

The average DM production of tall fescue over the three years was 25% less than that of established pasture. Phalaris produced similarly to established pasture.

Therefore, tall fescue and phalaris would not be a recommended pasture species for coastal Taranaki. In contrast, Judd *et al.* (1989) reported that phalaris and tall fescue could be recommended as alternatives to ryegrass in the grass grub prone, summer dry environment of south Taranaki. Judd *et al.* (1989) also reported that over time, the productivity of phalaris declined, suggesting that it may not persist as well as tall fescue. Despite the slow establishment of tall fescue at the northern and central sites, the content of tall fescue increased in the second year, and by the third year at the central site tall fescue had the highest sown species content, indicating good persistency. Phalaris established well at all sites but by 1990 the sown species content was very low, suggesting poor persistency. These observations are summarised in Table 3, which highlights the lack of persistency of phalaris. The poor production from tall fescue and phalaris may have been due to the method of establishment. In recent years it has been recommended that the most successful method to establish tall fescue and phalaris is by cultivation (McCallum & Thomson 1990). Over the trial it was observed that tall fescue was grazed more intensely than ryegrass. This did not appear to affect persistency (Figure 1), but might have affected

productivity (Table 1). Productivity of tall fescue and phalaris might have been greater if they had been established through cultivation.

Yatsyn-1 was the superior ryegrass cultivar, producing on average 12% more than established pasture over the three years, confirming the results of Kerr (1989). Average annual DM production of Pacific and Droughtmaster were similar to that of established pasture (Table 1). The ryegrass content of Yatsyn-1 was superior to that of established pasture, suggesting that Yatsyn-1 establishes and persists well in a summer dry environment. Yatsyn-1 and Droughtmaster had a higher content of ryegrass than Pacific over the three years at all sites except at the southern site in 1988, suggesting that Pacific did not establish as well as either Yatsyn-1 or Droughtmaster (Table 3). However, although Pacific had poor establishment, it persisted as well as if not better than other ryegrasses (Table 3).

Table 3 Botanical composition average decline in percentage units of sown species content from 1988 to 1990

Treatment	Decline
Yatsyn-1	-11
Droughtmaster	-11
Pacific	-8
Tall fescue	+1
Phalaris	-23
Established pasture	-8

Drilling into pasture eliminated with glyphosate was the superior method of establishing perennial ryegrass. Yatsyn-1 drilled into previously sprayed pastures produced 12% and 9% more DM than established pasture and undersown Yatsyn-1 respectively (Table 2). This result confirms recommendations by Thorn (1985) and Baker (1980). The pastures in which these trials were established were not severely run out and therefore the results may have differed if the pastures were in need of renovation.

The results have confirmed earlier reported trends by other authors. The trial was conducted under practical farming conditions and as such the results may truly reflect the production and persistency of pasture species established by the direct drilling method. That the

productivity of tall fescue and phalaris differs from that previously reported does highlight the possible bias that establishment method and trial management have on experimental work.

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