Grasslands Advance tall fescue establishment and animal performance

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Abstract

Tall fescue (*Festuca arundinacea* Schreb.) pastures in New Zealand have been considered to have slow establishment (Grasslands Roa) or lower summer quality (the faster establishing AU Triumph). Three experiments were conducted to study the establishment vigour, herbage production and animal growth rates of a new tall fescue cultivar, Grasslands Advance. Establishment vigour of Advance was similar to that of Au Triumph and 30% greater than that of Roa. Advance and AU Triumph were 17 and 8% higher in annual grass production than Roa, with Advance significantly out yielding the other two cultivars in the warm season. Animal performance per head of young sheep on Roa was significantly higher than on AU Triumph in spring, both Advance and Roa having a significant advantage over AU Triumph in the warm season.

Keywords: animal performance, *Festucu urundinuceu,* herbage production, pasture establishment, seedling vigour

Introduction

Tall fescue (*Festuca arundinacea* Schreb.) has for many years been recognised as having an important place in New Zealand pastoral farming systems. Once established, tall fescue will tolerate hot dry conditions and pasture pest attack (Kain *et al.* 1979; East *et al.* 1982; Prestidge *et al.* 1986); and it will also produce high quality leafy herbage over summer (Wright *et al.* 1985).

The use of tall fescue pastures has increased significantly over the last 10 years (McFarlane 1990; Milne & Fraser 1990) but it still fails to meet its potential. This is thought to be mainly due to the slow establishment of Grasslands Roa (Brock *et al. 1982;* Woodman *et al.* 1990) and/or summer quality problems of AU Triumph, an imported American tall fescue. In an attempt to overcome these problems a lo-year breeding programme at AgResearch Grasslands concentrated on improving vigour at establishment while maintaining the forage quality of Roa and enhancing its seasonal regrowth (Easton & Pennell 1993).

This paper reports on three trials set up to evaluate Grasslands Advance tall fescue, a new cultivar bred by AgResearch Grasslands.

Methods

Trial 1: Establishment

This experiment was sown on an irrigated Wakanui silt loam at Lincoln in mid September 1992. Three replications of Grasslands Roa, Grasslands Advance and AU Triumph were sown in 20 m drill rows with an Oxford precision seed drill (9 coulters). Seeding rates were adjusted to sow 100 viable seeds per metre row (equivalent to 17 kg/ha). Six weeks after sowing, whole plants were harvested, counted, dried and total root and shoot growth weighed. Twelve 250-mm row lengths per plot were taken for this measurement.

Trial 2: Herbage production

This trial site was a free draining Manawatu fine sandy loam overlying medium - coarse sands and deep gravel. The trial area had been in grazed ryegrass and white clover plots for the previous 3 years and spray/fallowed over the summer until drilled with an Aitchison Seedmatic 800 into a lightly cultivated seedbed on 25th March 1992. Each of the tall fescue cultivars was sown into 145 m^2 plots at a rate of 15.5 kg/ha, with Grasslands Kopu white clover at 3 kg/ha. The whole trial was lightly grazed at the end of July before all plots were individually fenced.

The trial design was a randomised block design consisting of 3 replicates of the 3 tall fescue cultivars. Grazing management was equivalent to 3-4 weekly grazings by young sheep during spring, summer and autumn, and 6-8 weekly in winter all to post grazing residual of 800- 1000 kg/ha.

Herbage accumulation was measured prior to each grazing by cutting two 0.5 m^2 quadrats per plot to 30 mm, and a subsample was taken for determination of botanical composition. Post-grazing residuals were determined using a pasture probe. Soil tests taken before sowing indicated an Olsen P of 16 mg/g. Annual autumn applications of 200 kg/ha of 30% potassic super-phosphate have increased Olsen P tests to 22 mg/g. The initial pH of 5.6 has been maintained.

Trial 3: Animal performance

This trial involved 4 tall fescue cultivars in a latin square design. For grazing, the trial was treated as a randomised block design with 2 replicates (effectively dividing the trial in half to give 2 animal replications). Cultivars were sown as pure species at 15 kg/ha of viable seed in spring 1992 into an irrigated Templeton silt loam soil. Soil quick test parameters were pH 5.8, P 12 and S 6 at sowing.

Plots were 1000 m^2 and were individually fenced. Over the first year the pastures were managed to ensure successful establishment. Animal measurements began in spring, 1993. Sheep were allocated to pastures to give similar herbage allowances per head. Extra, non-trial, animals were added if required to maintain equal allowances during the grazing periods. Two animal measurement periods are reported, spring 1993 (50 days) and summer and autumn 1993/94 (120 days).

Herbage mass, pre- and post-grazing was measured by a pasture probe. Trial periods started with a herbage mass of 2000 kg/ha on the highest yielding pasture which was grazed down to about 700 kg/h before moving the animals to the next pasture replication. All pastures were herbicide sprayed to maintain pure tall fescue swards. Nitrogen fertiliser (80 kg/ha of urea) was applied 3 times a year. Maintenance superphosphate (200 kg/ha) was applied in spring.

To maintain uniformity with the other 2 trials only the same 3 cultivars will be reported on from this trial.

Results and Discussion

For all trials,, results are expressed as a percentage relative to the performance of Roa. Actual figures are included for Roa to give some level of general performance.

Trial 1

Seedling vigour of tall fescue can be influenced by the growing and harvest conditions of the seed crop (Easton & Pennel11993). While it is recognised that this may have had some influence on the results from this trial when comparing the New Zealand cultivars to AU Triumph, the comparison between Advance and Roa is valid as both seed lines were grown and harvested under similar conditions (Easton pers. comm.).

There were no significant differences between seedling numbers (Table 1). However, seedling weight and total weight per unit area of Roa were significantly lighter than for AU Triumph and Advance. Seedling vigour has a major effect on subsequent establishment (Brock 1973: Woodman *et* al. 1990), and long-term production and persistence of pastures.

Table 1 Seedling numbers and establishment vigour.

	Seedling numbers	Total weight
Roa	100	100
Au Triumph	103	123
Advance	102	122
LSD 5%	6	6

Trial 2

The data 'presented from this trial are for year two (1993/4),with the emphasis on sown species (tall fescue and white clover). Advance was the highest yielding cultivar in all seasons (Table 2). Its superiority over AU Triumph and Roa in summer and autumn and in annual grass production was significant at the 5% probability level. Clover growth tended to be more vigorous when grass growth was reduced. However, total sown species production for Advance was significantly greater than for Roa.

Table 2 Herbage production and composition.

		Roa	Au Triumph	Advance	LSD (5%)
Winter	fescue	100 (68)	100 (70)	**115 (78)**	**33 (13)**
	clover	100	**88**	69	44
	total	100 **[1490]**	**96**	100	23
Spring	fescue	100 (73)	86 (63)	116 (74)	47 (5)
	clover	100	**110**	67	38
	total	100 **[2220]**	94	107	**38**
Summer	fescue	100 (51)	120 (49)	172 (67)	52 (9)
	clover	100	135	92	32
	total	100 **[2660]**	127	134	41
Autumn	fescue	100 (76)	**81** (75)	129 (65)	**17 (4)**
	clover	100	98	83	24
	total	100 **[2347]**	65	119	15
Annual	fescue	100 (69)	95 (62)	133 (75)	27 (6)
	clover	100	115	85	22
	total	100 **[8720]**	102	**117**	**21**

% fescue of sown species ( )
actual kg/ha. sown species [ ]

Table 3 Animal growth rates.

	spring	sum/aut
Roa	100	100
Au Triumph	79	**71**
Advance	84	94
LSD 5%	18	15

Trial 3

Animal growth rates on Roa were significantly higher than on AU Triumph in spring, both Advance and Roa having a significant advantage over AU Triumph during summer and autumn (Table 3). Total grazing days for

this trial (pure species) gave a 30% and 25% increase for AU Triumph and Advance over Roa. This resulted in an animal production per unit area index of Roa 100, AU Triumph 98, and Advance 112.

Conclusions

The combined effect of extra dry matter production plus improved animal performance of Advance gave a total production advantage of 14% over AU Triumph and 12% over Roa in the first season of the Lincoln grazing trial. The results published in this paper clearly indicate that the aim of the plant breeder to breed a tall fescue cultivar with improved seedling vigour while maintaining warm-season quality has been met. With the release of Advance the place of tall fescue in New Zealand agriculture will be further enhanced.

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