Proceedings of the New Zealand Grassland Association 44: 74–80 (1983)

'GRASSLANDS ROA' TALL FESCUE: A REVIEW.

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Abstract

Relative to perennial ryegrass, tall fescue has increased summer production, pest resistance and persistency under summer dry conditions. The new cultivar 'Grasslands Roa' also has attributes of increased crown rust resistance and a high acceptability to stock. Animal performance has proved similar to that of perennial ryegrass with no stock health problems. Roa has very slow growth and no other grass species should be included in the seed mixture; the seed should be well covered at sowing: N fertiliser could be used to speed seedling growth; grazing should be frequent and lax with young stock during the first year to allow adequate root development. Methods of use of Roa are discussed.

Keywords: ***Festuca arundinacea,*** **Roa tall fescue, potential, selection, summergrowth, drought tolerance, establishment management.**

REPUTATION AND POTENTIAL

Introduced into New Zealand from Europe over 100 years ago, tall fescue *(Festuca arundinacea* Schreb.) has not enjoyed the popularity of its very successful and close relatives, the ryegrasses *(Lolium* spp), both belonging to the same family *(Festucoidae)*. Naturalised tall fescue plants, widespread in wasteland areas, are generally coarse and unpalatable to stock, and as cattle grazing then **often suffered from fescue foot poisoning (Cunningham 1948), many early reports were directed towards its eradication (eg. Taylor 1938, Saxby 1949,** Collins 1954).

With characteristics of summer productivity, drought tolerance and persistency, (Cowan 1956, Cregan 1978) tall fescue could be of considerable potential **in New Zealand agriculture. In Europe and North America, (Hentgen & Desroches 1977, Frame et al 1970,** Buckner **et al 1976). many cultivars have been** produced which compare favourably with perennial ryegrass. With most of these new improved cultivars there have been no reports of fescue foot poisoning (Langer 1973).

In recent years evaluations of overseas cultivars in New Zealand, chiefly 'Aberystywth S170' from the U.K., have given encouraging results in several regions such as the Bay of Plenty (Allo & Southon, 1967; Reeves, 1975), **Canterbury (Allen & Cullen, 1975; Watkin, 1975) and Otago (Sheath & Greenwood,** 1982). A further important attribute is the high tolerance of tall fescue to grass grub *(Costelytra zealandica* (White)) (Kain et al 1978, 1979; East et al 1980, 1981) and Argentine stem weevil (Barker et al 1981).

DEVELOPMENT OF 'ROA' TALL FESCUE

Breeding for this cultivar was initiated in 1958 by J.M.McNeur and continued by L.B.Anderson in 1963 at Grasslands Division DSIR, Palmerston North (Anderson 1982). A wide collection of tall fescue plants from both overseas and within New Zealand were screened and bred for several years for vigour, disease

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resistance and acceptability to sheep, and a selection of parent plants based entirely on overseas material, mainly Mediterranean, with no history of fescue poisoning was made in 1966. As fibre content (leaf breaking strength) had been shown to be negatively correlated with animal intake (Reid et al 1967). these plants were further divided into high and low leaf strength populations using the method of Evans (1964). Seed harvested from the low leaf strength population (18 plants) has formed the basis of the newly released cultivar 'Grasslands Roa'.

CHARACTERISTICS OF 'ROA'

In most characteristics Roa is a typical tall fescue. Its main differences from other tall fescue cultivars, particularly S170, are later flowering, laxer foliage and increased resistance to crown rust *(Puccinia coronata).*

Comparisons of the acceptability of herbage of Roa and S170 were made by observing the numbers of sheep grazing each cultivar when grazed ad *lib* by sheep. Roa was preferred to S170 on each of five occasions, the overall preference ratio being 2.3 Roa: 1 S170, with seasonal variations from 1.5:1 in winter to 3.5:1 in spring. Apart from the laxer leaves of Roa, the leaf strength of both cultivars were similar, and only leaf hair density was far lower than that of S170 (Anderson et *al* 1982). The few comparisons of chemical composition made, show Roa and S170 herbage to be similar (Anderson *et al* 1982).

SEASONAL PRODUCTIVITY AND MANAGEMENT

Mowing evaluations conducted at the regional stations of Grasslands Division, DSIR (Vartha 1978, Anderson et al 1982), showed Roa to be more productive than perennial ryegrass over summer-autumn only in areas prone to long periods of moisture stress (Lincoln and Palmerston North), the greater the stress the greater the relative advantage. Where soil moisture was less limiting due to either better rainfall distribution or heavier soils, (Gore and Kaikohe, particularly the gumland Wharekohe soil), perennial ryegrass was generally superior (Fig. 1). During winter and spring Roa was similar or slightly lower producing than perennial ryegrass.

A grazing trial in the Manawatu comparing frequency and intensity of defoliation, with grazings completed in 2-3 days (Brock 1982). showed in the first year with only 55% of normal rainfall from October to March, established Roa pastures produced 170% more dry matter than Ruanui pastures, and in the second year under normal rainfall, 40% more. Of greater significance during this stress period was the higher quality of the green erect Roa herbage on offer, a major attribute when compared to the heavily rusted and brown wilted appearance of the Ruanui herbage. Even when severe moisture stress forces Roa to cease growing, recovery with the occurrence of rain is far more rapid than that of ryegrass (Wright et al 1982). However, as a consequence of this more vigorous summer growth of Roa, white clover production tended to be lower than with Ruanui. Duration of grazing may be important, as Vartha (1978) found Roa did not persist under dry conditions when periods of grazing were 2-3 weeks at 6 weekly intervals in Canterbury.

It would appear that a laxer, infrequently grazed management with short duration grazings would result in higher yields of Roa. Such systems would have to be exercised with some care as herbage quality and acceptability to stock

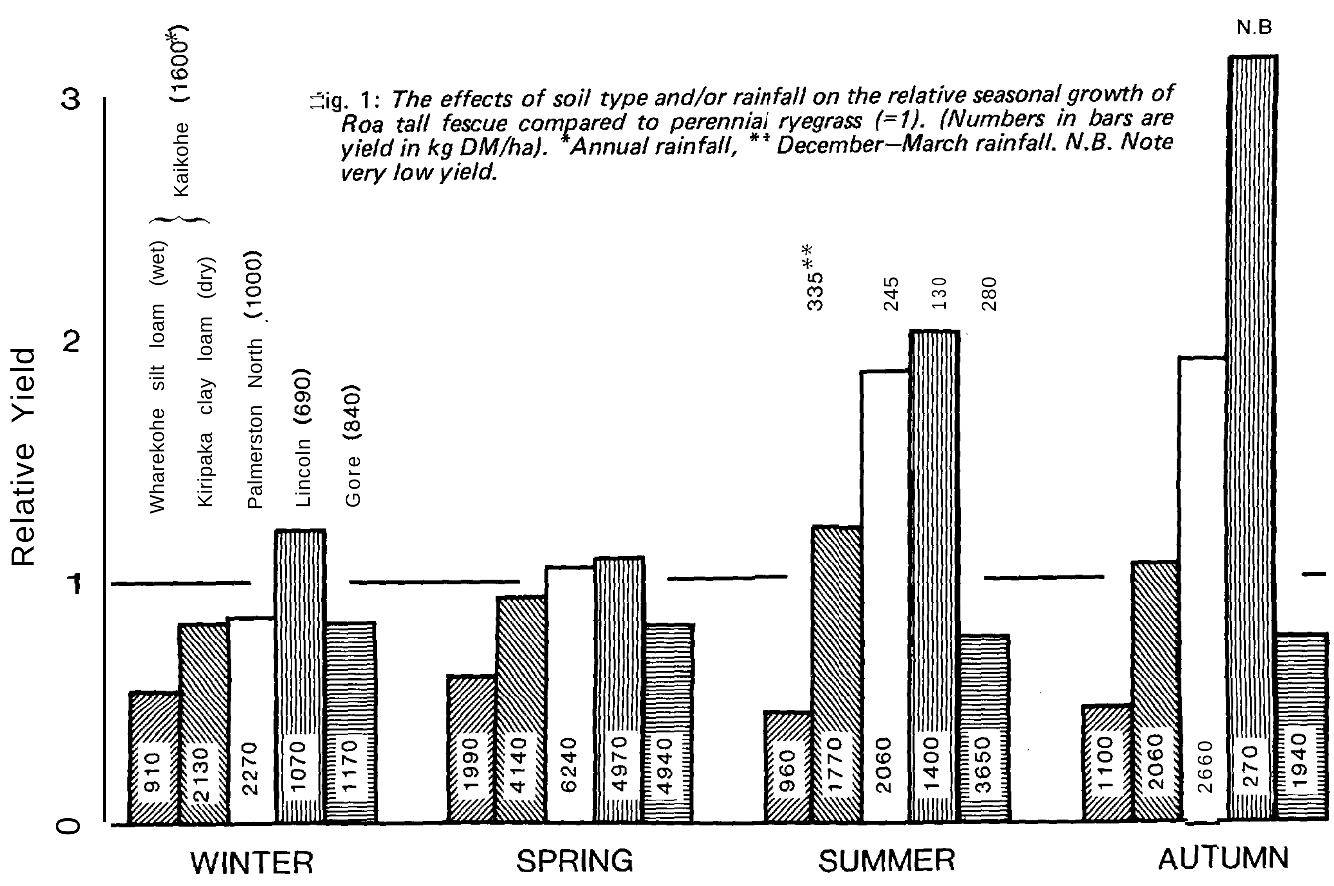

Fig. 1: *The effects of soil type and/or rainfall on the relative seasonal growth of Roa tall fescue compared to perennial ryegrass (=1). (Numbers in bars are yield in kg DM/ha). *Annual rainfall, ** December–March rainfall. N.B. Note very low yield.*

declines more rapidly with advancing maturity with tall fescue than perennial ryegrass (Harkness 1969). The aim with Roa must be always to maintain acceptable herbage and a reasonable intensity of defoliation must be maintained. A rotation length of 6 weeks, or a pasture height at grazing of 20-25cm should not be exceeded. Even with 3 weekly grazing in the dry period production of acceptable herbage was far greater with Roa than with Ruanui (Brock 1982).

ANIMAL PRODUCTION

Several experiments have compared animal production between Roa and ryegrass. On the Massey University No. 3 Dairy Unit, Wilson (1975) obtained similar milk yields from dairy cows grazing either Roa or perennial ryegrass. Goold & van der Elst (1980) found Roa pastures to produce 20% more herbage than Nui pastures resulting in a 10% greater liveweight gain from Friesian steers over 3 years on a peat soil in the Waikato. At the MAF Takapau Research Area in the Southern Hawkes Bay, the liveweight gains and carcass weights of groups of weaned lambs fed on Roa or Nui pastures were similar (Wright et al 1982). Also, at the MAF Normanby Research Area in Taranaki, Roa as a major pasture component is proving very successful with dairy cows on the drier volcanic soils prone to grass grub attack (N.A. Thomson pers comm.). In all cases no stock health problems have been encountered.

ESTABLISHMENT

Seedling Growth

A major problem is its very slow seedling growth which places Roa at a considerable competitive disadvantage in mixed swards, resulting in a long establishment period during which grazing management is critical.

The main factor responsible has been identified as slow root growth (Rhodes 1968). For example in germination cabinets at 20°C. Roa root appearance was later and root elongation slower than Ruanui ryegrass (Table 1). This results in slower shoot growth, particularly slower tillering rates, of Roa than Ruanui in both glasshouse (Table 1) and field (Brock 1973). Hayes (1976) found similar results when comparing S170 and Irish perennial ryegrass.

A major criterion in tall fescue selection and breeding programmes of new tall fescue cultivars is increased seedling vigour (H.S.Easton, pers comm.).

Management

In the field soil moisture relations may also have an effect. McWilliam & Dowling (1970) and McWilliam et al (1970) have shown that ryegrass can germinate under greater soil moisture tension than many other temperate grasses. This may account for the significantly slower germination rate of Roa in controlled conditions (Table 1). Greater shoot growth of Roa when sown in the field at 12.5 or 25mm depth than on the surface (Brock 1973) may have resulted from better moisture relations for its more slowly elongating roots. Ryegrass on the other hand, with its faster penetrating roots established equally well on the surface or at 12.5mm (Table 2). Adequate coverage of tall fescue seed at sowing is therefore important.

Because of its slow establishment, companion species with faster seedling growth should not be sown with Roa, For instance even 7 kg/ha of Nui ryegrass sown with 18 kg/ha of Roa reduced Roa establishment by 75% (Lancashire *pers comm.)*, and increasing the seed rate of tall fescue will not improve the situ-

Table 1: GERMINATION RATE AND SEEDLING GROWTH OF ROA TALL FESCUE AND RUANUI PERENNIAL RYEGRASS UNDER CONTROLLED CONDITIONS. a) GERMINATION CABINET AT 20°C, b) GLASSHOUSE.

Character	Day	Ruanui	Roa
a) Cabinet (20°C)			
Germination (%)	4	51 a	6 b
	8	73a	52 b
	10	74a	56 b
Root Length (mm)	4	15.5 a	2.4 b
	8	33.6 a	15.9 b
Root DW (mg)	10	0.51 a	0.46 a
Shoot DW (mg)	10	0.67 a	0.46 b
b) Glasshouse Shoot DW (mg)	42	13.3 a	9.9 b
Tillers/plant	42	2.0 a	1.1 b
Leaves/tiller	42	2.8 a	2.9 a
Leaf length (mm)	42	96a	94 a

Table 2: EFFECT OF SOWING DEPTH ON THE SHOOT GROWTH (mg) OF ROA AND RUANUI SEEDLINGS 56 DAYS AFTER SOWING IN AUTUMN.

Cultivar	Sowing depth (mm)			
	0	12.5	25	37.5
Ruanui	39.9 a	45.2 a	32.5 b	27.4 c
Roa	14.0 b	20.3 a	20.3 a	17.1 ab

ation (Frame & Hunt 1965). Volunteer weeds will also need controlling and herbicide treatments similar to that for establishing ryegrass pastures should be used (M.P.Rolston pers. comm.). Nitrogen fertiliser application during establishment may be an important tool (Brock 1982).

During establishment Roa cannot be grazed in a similar manner to an establishing ryegrass pasture. Roa should be established under frequent though lax defoliation (preferably cutting) to allow adequate development of the root system. Early close grazing can result in a severe reduction in plant population (Brock 1982). Any grazing through the first season should be very light and with young stock. Once established which is usually by the following winter, tall fescue plants have proved very persistent (Brock 1982).

PASTORAL USE

Because of its slow establishment, no other grass species should be included in the original seed mixture which should be Roa tall fescue at 15-20 kg/ha at

(east, with white clover (2 kg/ha) and possibly red clover (R.J.M.Hay perscomm.). The primary emphasis must be placed on establishing an adequate plant density in the first year. Once achieved, other species could possibly be overdrilled as desired.

Best use of tall fescue would be made in areas where because of lack of summer moisture or pest problems the ryegrasses do not persist. The potential of Roa has already been demonstrated in the peat soils of the Waikato (Goold & van der Elst 1980) and the grass grub affected areas of Taranaki (N.A.Thomson pers comm.). Other suitable areas would include the pumice soils of the Central Plateau and the lighter drier soils of Hawkes Bay and Canterbury. While Roa could be of importance in dry hill and high country, establishment from surface oversowing may not be satisfactory.

SEED PRODUCTION

As Roa is slow establishing the seed bed should be weed free and paddocks used for ryegrass seed crops or hay crops should be avoided. Direct drilling of Roa in spring at 3-5 kg seed/ha, preferably in rows (50-60cm) for weed control, into a seedbed previously prepared by the stale seedbed technique (autumn cultivation followed by winter paraquat) is recommended (M.P.Rolston pers comm.). Weed control is as for ryegrass seed crops, but ryegrass itself, a serious weed, will have to be rogued or spot sprayed.

In the North Island Roa flowers 2-3 weeks earlier than ryegrass, but at the' same time in the South Island. Closing date should be no later than mid-August (Lancashire et *a/* 1980). which has given seed yields of 540 kg/ha (range 210-1110) over 6 years in the Manawatu. Recent experiments suggest that a higher yield may be obtained with earlier closing dates eg. no grazing, mid-June and mid-August closing gave yields of 660, 500 and 370 kg seed/ha respectively (M.P.Rolston pers comm.).

Harvesting techniques are similar to those for ryegrass although the seed is larger than that of perennial ryegrass. (Roa 2.5-3.2g/1000 seed). Post harvest the straw should be removed and the crop hard grazed. Alternatively the straw can be burnt without damaging plants, which will reduce disease problems such as blind seed disease found in one crop in the Manawatu.

At present only small amounts of Roa seed are available, but with several new crops being grown, supply should increase in autumn 1983.

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