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Grasslands Kara cocksfoot: a productive cultivar under lax grazing

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Abstract

Field testing compared the agronomic performance of Grasslands Kara cocksfoot (*Dactylis glomerata* L.) with other commercially available cocksfoot cultivars and perennial ryegrass (*Lolium perenne* L.) in Southland and Canterbury. Animal performance was also assessed in southland. Kara cocksfoot had the highest establishment score of the cocksfoot cultivars in Canterbury but was slower to establish than ryegrass. Annual yields of Kara cocksfoot were 7% lower than Wana in Southland. The yield of Kara in Canterbury was 131 and 74% greater than ryegrass in a dry summer and autumn respectively. In Southland the pasture production from Kara under goat grazing was never significantly different from that of Nui ryegrass. The liveweight gains of both sheep and goats on Kara pastures were similar to those on ryegrass. Pasture digestibility was lower for Kara than Nui ryegrass pastures in spring but similar in summer and autumn. Pasture protein content was higher for Kara than Nui pastures in spring and similar in summer and autumn. The leaf-stem ratio of Kara was higher than Nui in spring but similar in summer and autumn. Rust tolerance of Kara was high and similar to Wana and Porto. The results from animal performance and pasture parameters show that Kara has a high feeding value. The effects of winter frost damage were greater on Kara and Wana than on Apanui due to their winter activity.

Keywords animal performance, *Dactylis glomerata L.*, cocksfoot, establishment, frost damage, pasture production, pasture quality

Introduction

The use of cocksfoot (*Dactylis glomerata* L.) in drier environments and withlowerfertility soils has long been part of New Zealand farming (Levy 1951). Cocksfoot have lower digestibility than many other grasses (Minson et al. 1964) and rust infection in autumn makes them unpalatable (Rumball 1982). Rumball (1982) addressed both of these problems during the breeding of Grasslands Kara cocksfoot, an erect cultivar suitable for laxer grazing by stock classes like cattle.

This paper summarises the herbage and animal production information available for Kara cocksfoot in Southland and Canterbury and compares it with alternative cocksfoot cultivars and ryegrass. These data will help farmers and farm consultants make better informed decisions about the use of Kara cocksfoot in the South Island.

Materials and methods

Experiment one

Kara, sown with Grasslands Huia white clover (*Trifolium repens* L.) was tested under sheep grazing at the DSIR Grasslands regional station at Gore, Southland, in the period 1980-1983. Kara was compared with three other cocksfoot cultivars Grasslands Apanui, Grasslands Wana and Saborto under infrequent grazing (6 week regrowth) to a residual height of 10 mm in four replicates of 10 x 15 m^2 individually fenced plots. Pasture yield and botanical composition were measured at each grazing date and data analysed by season and year.

Experiment two

Kara was included in an evaluation of nine pasture mixtures grazed by goats for three years (1988-1991) and then sheep for one year (1991-1992) at the DSIR Gore Research Centre. Southland. Results from the comparison of pasture and animal production from Kara cocksfoot and Grasslands *Nui* ryegrass (*Lolium perenne* L.) pastures both sown with Grasslands Tahora white clover in two replicates of individually fenced 0.25 ha plots are compared here. Measurements under goat grazing began in September 1989 and continued for the spring, summer and autumn of the following two years. A put and take grazing system (Stevens *etal.* 1992) was used to ensure a residual grazing height of 100 mm was achieved while confining 10 measurement goats to each plot during spring and summer. The amount of live weight gain and stocking rate were measured for each season over two years. Pastures were grazed by goats grazing for 7 days with a 21-day *regrowth* period. Animal husbandry and pasture measurement procedures are described by Stevens *et* al. 1992. The liveweight gain and stocking rates of lamb hoggets were also measured for the same plots in spring of 1991. Pasture digestibility and protein levels were assessed in spring, summer and autumn in the first year. Samples of the whole pasture in the grazing horizon above 100 mm were used.

Experiment three

The dry matter yield of Kara cocksfoot was compared with Nui ryegrass (endophyte *Acremonium lolii* = 83%) in a mowing evaluation at Ceres Research Farm, Canterbury, on a drought prone soil for 2 years after sowing in autumn 1989. The annual rainfall over the trial period was 785 and 605 mm in years one and two respectively, receiving 60% more and year two 60% less summer rainfall than average.

Observation plots of Kara. Wana, Apanui, Saborto and Porto cocksfoots were scored for rust tolerance and establishment vigour over a period of ten years between 1981 and 1991.

Results and discussion

Establishment

Cocksfoot establishedmore slowly than ryegrass (Table 1) especially from autumn sowings. This can be attributed to the slower germination of cocksfoot (Charlton et al. 1986). Within the cocksfoot cultivars Kara and Saborto had significantly higher vigour than Wana or Apanui after autumn sowing in Canterbury (Table 1).

Table 1 Establishment features of cocksfoot cultivars

	Pasture yield (kg DM/ha) at Rrst harvest		
	Cocksfoot	Ryegrass	lsd 5%
Southland (late spring)	1300	2500	350
Canterbury (autumn)	290	950	310

	Relative establishment vigour				
	Kara	Wana	Saborto	Porto	lsd 5%
Canterbury (autumn)	100	07	95	87	12

Pasture production

Under lax grazing in Southland (Experiment 1) Kara produced similar winter and spring yields to Wana (Table 2) but lower summer and autumn yields, and annual yield was 7% lower than for Wana. Saborto was similar to Kara in spring and autumn. produced more in summer but less in winter. Apanui produced well in spring and summer but was lower yielding than Kara in winter. The pasture production of Kara under goat grazing in Southland (Experiment 2; Table 3a) was never significantly different than that of Nui. Thii supports the principle of high herbage production under lax grazing (Rumball 1982) and suggests that Kara will perform well under cattle grazing.

Canterbury yields (Experiment 3) show the distinct advantage of Kara over high endophyte Nui ryegrass in dry conditions (Table 3b). In the year after establishment yields were not high with Kara yielding only 80% of Nui pastures. Once Kara was established fully, however, it produced 131% more summer herbage ($P<0.05$) and 74% more autumn herbage ($P<0.05$) than Nui in a year when summer rainfall was only 60% of average. This resulted in a significant annual advantage of 51%.

Table 3 Pasture production of **Km cocksfoot compared** with **Nui ryegrass** under lax grazing in (a) Southland **and** lax **mowing in (b) Canterbury**

(a) Southland			
(Mean 2 yrs)	Spring	Summer	Autumn
Kara	4250	3230	3320
Nul	5080	3030	2880
lsd 5%	1300	1140	2030

(b) Canterbury						
		Spring	Summer	Autumn	Winter	Annual
Yr 1	Kara	1260	1080	1510	290	4140
	Nui	2000	1010	1110	950	5070
	lsd 5%	500	415	310	310	860
Yr2	Kara	2280	2480	2370	510	7640
	Nui	1930	1070	1360	570	4930
	lsd	350	350	420	520	990

Table 2 Seasonal and annual pasture production **(kg DM/ha) and white** clover **content (wc%)** of **cocksfoot cultivars** in **Southland** (Experiment **one,** 1981-1983) **under** infrequent **grazing**

	Kara		Wana		Apanui		Saborto		lsd
	kgDM/ha	wc%	kgDM/ha	wc%	kgDM/ha	wc%	kgDM/ha	wc%	5%
Spring	5110	15	5270	21	5490	12	5140	13	250
Summer	4760	17	5330	22	5170	12	5110	15	167
Autumn	2380	5	2700	5	2310	5	2450	6	156
winter	1270	6	1260	10	1160	7	1140	11	70
Annual	13520	13	14560	18	14130	11	13340	12	503

Table 4 Animal production from Kara cocksfoot and Nui ryegrass swards in Southland under hard and lax grazing including individual liveweight gain (LWG), stocking rate (SR) and total production per hectare (/ha)

	Goats (2 yrs) Lax						Hoggets (1 yr) Hard		
	Spring			Summer			Spring		
	LWG	SR	ha	LWG	SR	/ha	LWG	SR	/ha
Kara	113	56	406	53	52	236	207	26	516
Nui	126	54	43s	53	50	231	172	37	579
	ns	ns	ns	ns	ns	ns	ns	·	ns
lsd 5%	19	7.6	80	16	5.4	63	55	9.5	85

The advantage of cocksfoot over ryegrass in summer and autumn has also been noted in North Island dairy pastures (Judd et *al.* 1990). This extra production is an important feature for its use to provide improved nutrition for animal growth in dry environments.

These data show the importance of environment in determining the appropriate species choice. Kara is a valuable replacement for ryegrass in the dry Canterbury environment, but produces similarly to ryegrass in the cool moist Southland environment.

Animal production

Lax grazing with goats produced no differences in either the carrying capacity, liveweight gain or total liveweight gain per hectare between Kara and Nui in either spring or summer when averaged over 2 years (Table 4).

The growth rate of hoggets grazing Kara pastures during spring was not significantly higher than those on Nui pasture (Table 4). The stocking rate was lower on the Kara pastures due to *lower* pasture production (3390 vs 4280 kg DM/ha for Kara and Nuirespectively) under the closer sheep grazing regime imposed (to a residual herbage mass of approximately 600 kg DM/ha).

The animal performance gained from Kara pastures in the *Gore* trial is in contrast to early research which showed that animal growth on cocksfoot was lower than that of animals grazing ryegrass (Davies & Morgan 1979, Evans *et al.* 1979). This was attributed to the lower digestibility of older cocksfoot cultivars (Davies & Morgan 1979; Minson et al. 1964) and their low summer palatability due to rust (Rumball 1984).

Pasture quality

The digestibility of Kara cocksfoot pastures (Table 5), though lower than ryegrass in spring, was high throughout the Gore trial (Experiment 2) The protein levels of Kara cocksfoot pastures in spring were significantly greater than Nui ryegrass pastures. White clover content of the pasture was 29 and 20% in the Kara and Nui pastures respectively and may account for the change in the protein levels. The summer and autumn protein levels were similar inbothpashues (Table 5). Cocksfoot is an aggressive grass and can reduce clover content. This is illustrated by the lower clover contents in Kara than Nui pastures in year 2 of experiment 2 (Table 5). There were no significant differences between Kara and Nui pastures in any of the major elements (Casey 1992). Kara cocksfoot (Table 6) had high tolerance of summer and autumn rust infection, being greater than Apanui and Saborto though similar to Wana and Porto. This improves pasture palatability and consequently utilisation during late summer and autumn.

The *proportion* of leaf in the spring was significantly higher in Kara pastures than Nui pastures (Table 6). The proportion of leaf in Kara pastures increased slightly through summer to peak in autumn, though was not significantly different from Nui pastures in either of these seasons (Table 6).

Other attributes of Kara cocksfoot

Pest tolerance of pasture cultivars is an important feature in todays low cost farming. Kara cocksfoot has been

Table 5 **Digestibility** and **protein percentages** of Km **cocksfoot** and **Nui ryegrass pastures** in spring, **summer** and **autumn** (above **residual grazing** height) **and** white **clover** content in **two years.**

	Spring		Summer		Autumn		White Clover Content %	
	Dig %	Protein %	Dig %	Protein %	Dig %	Protein %	Year 1	Year 2
Kara	71.9	27.2	72.1	23.2	69.3	23.4	19	4
Nui	76.9	22.3	73.0	23.0	77.2	22.0	19	11
	·	*	ns	ns	ns	ns	ns	·
lsd	3.5	4.13	3.9	4.3	6.5	4.9	5	6

Table 6 Comparative quality features of Kara cocksfoot compared with other cocksfoot cultivars and ryegrass

	Relative rust tolerance	Winter frosting damage: Winter growth (kgDM/ha)	Winter frosting damage: Spring recovery (kgDM/ha)	Proportion of leaf: Spring	Proportion of leaf: Summer	Proportion of leaf: Autumn
Kara	7.2	250	1460	62	68	74
Wane	7.7	140	440			
Apanui	6.3	400	1930			
Saborto	8.1					
Porto	7.7					
Nui				36	67	n
lsd 5%		100	340	8	8	7

shown to harbour only low numbers of grass grub when compared with ryegrass pastures (McCallum et *al.* 1990) and in those conditions the production from Kara cocksfoot pastures was significantly greater than ryegrass in the summer and autumn.

Winter diseases particularly winter brown stripe *(Scallecotrichum gramineus)* play a role in the dieback of cocksfoot. Scoring for this disease in Argentina has shown that Kara had moderate resistance while Wana was susceptible (R. Neldo pars comm).[1]

Frosting damagecanbe aproblem with winter active cocksfoots but this problem is less in Kara than Wana. The winter growth and early spring recovery of cocksfoot plots in Southland were affected by winter frosting. This effect of winter frosting on winter yield and spring recovery was measured on laxly cut plots during the winter of 1978 in Gore when frosts were -4 to -7°C over a period of 6 days in mid June. The winter yields of Kara. though low, were twice that of Wana (Table 6). Apanui was not active in winter and therefore did not suffer *winter* production losses after frosting. The recovery of Kara in early spring was also greater than Wana, indicating its better tolerance of frosting. The measurement of the effect of frosting on winter feed reserves in the Mackenzie Basin by Scott & Maunsell (1986) showed that Kara retained a greater bulk of green material in winter than either Wana or Apanui.

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