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'GRASSLANDS WANA' COCKSFOOT SEED PRODUCTION

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Abstract

'Grasslands Wana' cocksfoot *(Dactylis* glomerata), a new cultivar, produced highest seed yields (405 kg/ha over three years) at 30 cm row spacing in Canterbury. Wider rows (45 and 60cm) produced more seed heads/m^2 but lower yields, whereas with 15 cm rows there were fewer seed heads and lower yields. In the Manawatu, Wana yields averaged 605 kg/ha over three years, although the North Island is not recognised as a cocksfoot seed producing area. Seed weights range from 0.65 to 0.85 g/1000 seeds, lighter than Apanui and Kara cocksfoots. With two autumn sowings, Wana produced 325 and 170 kg/ha 10 months after sowing. Controlling weeds, especially *Poa annoa,* is important for high yields from autumn sowings. Plots treated with ethofumesate yielded up to 7 times more than untreated plots. Management, fertiliser use, and rules for changing cocksfoot cultivars are discussed.

Keywords: *Dactylis glomerata,* row spacing, weed control, ethofumesate, terbicil, nitrogen.

INTRODUCTION

'Grasslands Wana' cocksfoot *(Dactylis glomerata* L.), released in 1980 for commercial multiplication was bred from Spanish material and is more densely tillering and prostrate, and better suited for dry sites and sheep grazing than 'Grasslands Apanui' cocksfoot (Rumball 1982). Compared to perennial ryegrass *(Lolium perenne* L.) Wana reduced the number of barley grass *(Hordeum hystrix, H. murinum)* seed heads in pasture (Popay et al, 1981) and was more productive in the presence of grass grub (East et al. 1982). Management of Wana based pastures is discussed by Lancashire & Brock (1983). Compared to Apanui cocksfoot, Wana foliage is more resistant to stem rust *(Puccinia graminis)* and stripe rust *(P. striiformis),* while inflorescences are shorter, and there are usually more heads per plant. Both cultivars reach peak flowering at the same time (Rumball 1982). No seed production comparisons have been made between Wana and Apanui.

Cocksfoot seed production in New Zealand declined from 1500 t in 1963 to 510 t during 1975-80, but increased to 770 t in 1981. Yields per unit area have averaged, 190, 210 and 440 kg/ha respectively for the periods 1953-59, 1960-69, 1975-80. The increase in yield/ha has coincided with a decline in the area devoted-to-cocksfoot from 4100 ha (1960-69) to 1150 ha (1975-80). However in the last two years (1980-82) the area of cocksfoot entered-for certification has increased to 1900 ha. The provincial distribution by area of cocksfoot seed crops in the period 1975-80 were Canterbury 55%; Southland 37% and Otago 8%.

The common practice among seed growers is to spring sow cocksfoot, the first seed being harvested 15 or 27 months later. Trials at Lincoln (Canterbury) and Palmerston North (Manawatu) have attempted to identify factors influencing seed yields of Wana, including seed rate by changing row spacing, autumn sowing and weed control, in order to shorten this period.

MATERIALS AND METHODS

Canterbury (Lincoln)

In March 1979, Wana was sown at 15, 30, 45 and 60 cm row spacings using 12, 6, 4 and 3 kg seed/ha respectively, and 50 kg N/ha applied annually in late September at stem elongation. Seed was harvested in January 1980, 1981 and 1982. The first 2 harvests were windrowed before heading while the third harvest was direct headed using the same combine as that used for the first harvest.

Manawatu (Palmerston North)

Experiment 1: In November 1977, 0.2 ha of Wana was sown in 60 cm rows at 2.5 kg/ha, and harvested in late December 1978, 1979 and 1980. In autumn 1979 and 1980, weeds were controlled with terbicil (0.5 to 1.1 kg/ha) and terbicil + diuron (0.5 + 2.0 kg/ha) respectively.

Experiment 2: In autumn (March) 1981 0.6 ha Wana was sown at 2.5 kg/ha in 60 cm rows and machine harvested in December 1981.

Experiment 3: A weed control trial was sown at 1.1 kg/ha Wana on 3 April 1981, and plots were sprayed with various herbicides (ethofumesate, methabenzthiazuron, and terbutryn) in mid-May, and hand harvested on 31 December 1981. Fertiliser was applied to 40 kg N/ha in September for the three experiments.

RESULTS AND DISCUSSION

Row Spacing (Lincoln)

Maximum seed yields were obtained with 30 cm row spacing at all 3 harvests

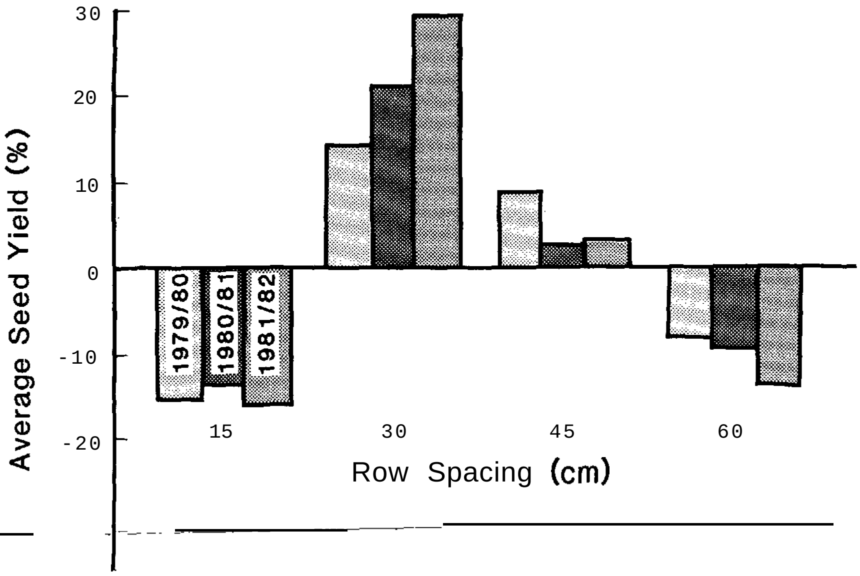

Fig 1: *Effect of rowspacing on relative machine harvested seed yields of Wana cocksfoot for three successive harvests.*

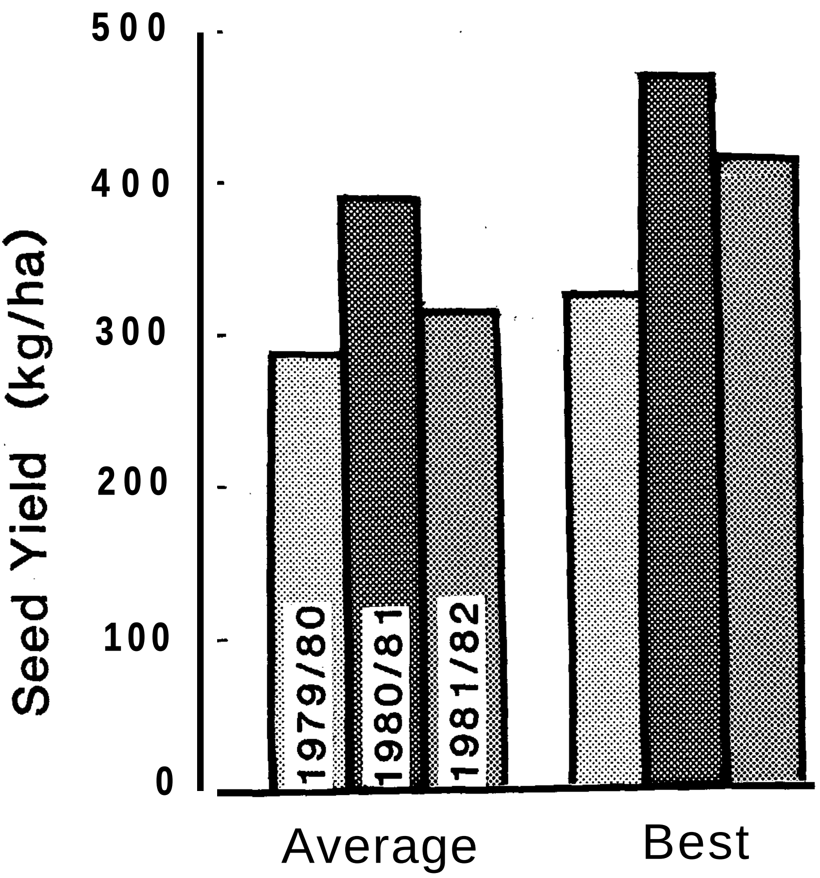

Fig 2: *Wana cocksfoot machine harvested seed yields for three harvests averaged across all rowspacing treatments and for best treatment (30 cm row space).*

(Fig. 1). With further widening of rows, yields declined, until at 60 cm yields were similar to those from 15 cm rows. The effect was similar for all three harvests.

The machine harvested seed yields were only 60% of those measured from hand harvested samples in the first 2 years, and 81% in the third harvest. Despite these harvesting losses, machine dressed seed yields were acceptable (Fig. 2).

Biological losses also occurred. There were indications that at narrow row spacing, limitation to early reproductive development was the major factor whereas losses during late reproductive development were of major importance at wide row spacings. At narrow row spacing there were lower seed head and floret populations which despite greater late reproductive development were apparently unable to compensate for the reduced numbers. The effect of late reproductive losses can best be illustrated as follows. Head and floret densities within a row increased as row spacing increased. In the second and third harvests this increase gave more reproductive tillers and florets/m^2 at wider row spacings. The increased head and floret density within rows at wider spacings presumably caused greater within plant competition than occurs at narrower spacings, causing greater losses over the period of floret appearance to seed maturity. For example, at 60 cm spacings there were 230,000 more florets/m^2 than at 30 cm spacings, but there were 28,000 fewer seeds/m^2 available for harvest (equivalent to 140 kg dressed seed/ha, assuming a 30% loss at harvesting and cleaning, and a 0.7 g/1000 seed weight). These data suggest a spacing of 35 cm would provide the best balance for minimal early and late reproductive losses.

Seed Weight

Seed weights of Wana have ranged from 0.65 to 0.85 g/1000 seeds, a little lighter than 'Grasslands Apanui' cocksfoot at 0.7 to 1.0 g and 'Grasslands Kara' cocksfoot at 1 .O to 1.3 g/1000 seeds.

Autumn Sowings

Autumn sown Wana produced seed yields in the first summer of 325 kg/ha from 30 cm spaced rows crop at Lincoln (Fig. 2), and 170 kg/ha in the Manawatu from 60 cm spaced rows (Experiment 2). The difference was partially due to weed competition, as the Lincoln sowing was relatively weed free, but in the Manawatu *Poa annua* was a problem. Two further trials in Canterbury sown in autumn 1982 will further examine the possibility of autumn sowings.

Autumn sowings have the potential to give a return 10 months after sowing compared with 15 to 27 months for conventional cocksfoot seed production practice, and would increase the speed of multiplication.

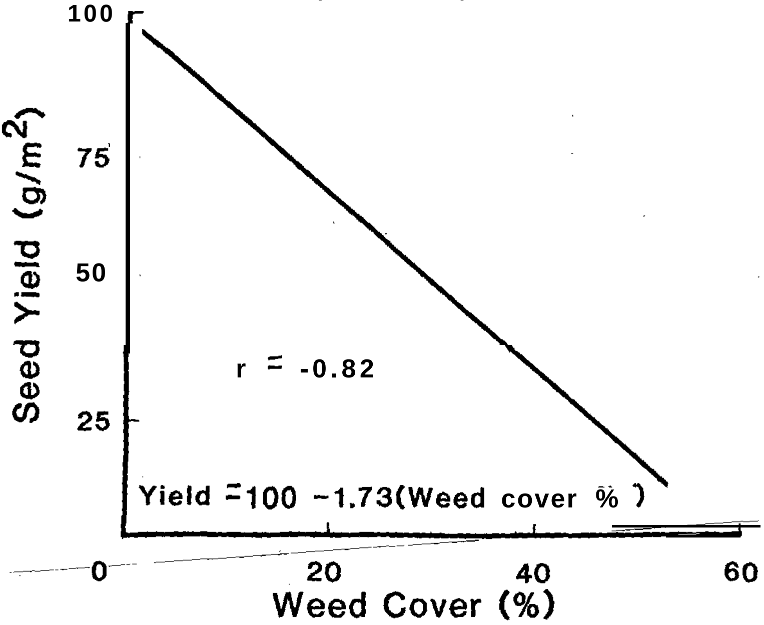

Fig 3: *Relationship between hand harvested seed yields of autumn sown Wana cocksfoot, and weed cover in mid-June.*

Weed Control

With an autumn sowing (Experiment 3) weeds (especially *Poa annual* considerably reduced seed head density and seed yields (Fig. 3). Plots treated early post emergence with ethofumesate at 1.5 kg/ha had 7 fold greater yields than untreated plots. Wana seedlings also tolerated methabenthiazuron at 1.0 to 2.0 kg/ha and produced good seed yields, while 3.0 kg/ha reduced yield.

In established Wana a mixture of diuron + terbicil (2.0 + 0.5 kg/ha) gave excellent weed control and a yield of 580 kg/ha, and may be an alternative to the use of atrazine (1.5 kg/ha) used by Apanui growers. Diclofop-methyl, a herbicide used for control of wild oats in cereals, and ryegrass in white clover killed seedling Wana cocksfoot. However, a spring application to established Wana at rates up to 1.5 kg/ha, did not reduce yields, although foliar browning and reduced spring growth occured. Further trials are in progress.

Manawatu Yields

Although Manawatu is not recognised as a cocksfoot producing area, Wana sown in 60cm rows (Experiment 1) produced machine dressed seed yields of 745, 495 and 580 kg/ha for three successive harvests. These results suggest that Wana could be successfully grown for seed in the lower North Island.

Fertiliser Use

No trials on time of application and rates of N have been conducted on Wana. From previous trials with cocksfoot at Gore (Lambert 1956, Harris et *al.*, 1973) and from information on general responses of grass seed crops to N fertiliser (Brown 1980) it is recommended that no phosphorus or potassium be used on Wana, and that nitrogen be applied as a single application at 50-100 kg N/ha at stem elongation, mid-September in Manawatu, late September in Canterbury, and in May or August-September in Southland.

Management

Although there have been no management trials on Wana, the principles developed for cocksfoot seed crops in New Zealand should apply. These would include no grazing of autumn sown Wana to be harvested in the first summer. Wilson (1959) demonstrated that cocksfoot tillers formed in early winter had the highest production potential. Removing litter in early autumn after harvest by defoliation to 8 cm increased yields by 25%, compared with 15 cm and no defoliation, and was associated with an increase in reproductive tillers per unit area, (Harris et al. 1973). In earlier studies (Sears 1950, Lambert & Thurston 1952) litter removal by defoliation or burning lowered yields because of competition from weeds, especially vetch *(Vicia sativa)*. However most weeds that germinate after autumn defoliation or burning can now be controlled with herbicides, although rhizomatous grasses may be a problem.

Cultivar Change

Seed producers wishing to change from Apanui to Wana (or Kara) cocksfoot have to meet the following minimum paddock history and isolation requirements. The area must not have grown cocksfoot during the previous two harvest seasons, and the crop must be isolated from other cocksfoot cultivars by at least 100 m. Existing cocksfoot stands should be destroyed with herbicides (glyphosate, 2,2-dichloropropionic acid alone or mixed with amitrole) before cultivation. Suitable break crops would include legumes where volunteer grasses can be controlled with pre-plant (EPTC, trifluralin) and post-emergence herbicides (pronamide, carbetamide, paraquat, fluazifop-butyl, sethoxydim), depending on rate used and stage of growth of the cocksfoot.

Hygiene at sowing, harvesting, drying and cleaning is essential if contamination is to be prevented.

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