EMERGENCE AND ESTABLISHMENT OF WALLABY GRASS (DANTHONIA SPP.)

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Abstract

Emergence and establishment of Danthonia richardsonii cv. Taranna, D. linkii cv. Bunderra and Phalaris aquatica cv. Sirosa seedlings were compared in surface broadcast and direct drilled sowings in native pastures in 1990 and 1994 on the Northern Slopes of NSW. In 1990, emergence of both Danthonia spp. was higher ($P<0.05$) than Sirosa in both direct drilled and broadcast plots and the application of glyphosate (360 g a.i./ha) increased ($P<0.05$) plant counts 8 weeks after sowing. However, in a drier year (1994) all grasses emerged and established best ($P<0.05$) with direct drilling, and Sirosa had the highest emergence ($P<0.05$) at all 3 sites. In a single study, phosphorous, nitrogen or fungicide seed coating treatments showed little advantage in emergence, compared with sowing uncoated Danthonia seed. A survey of sowings by NSW Agriculture district agronomists in 1992 confirmed that both time and depth of sowing were critical for successful establishment of Danthonia spp. in prepared seedbeds.

Key words: Danthonia, wallaby grass, establishment, emergence, seed coats.

Successful establishment depends on several controllable factors such as time and depth of sow-ing, method of sowing, seed quality and control of com- petition from resident vegetation. For Danthonia spp. seedling sensitivity to a range of herbicides has been previously reported (3) and sowing guidelines produced (2). Previous research (1) indicated that sowing seed on or near the soil surface in mid to late autumn gave maximum emergence of D. richardsonii and D. linkii when sowing into a prepared seedbed. No data have been reported for oversowing these species into existing native pastures.

This paper reports data from a series of sowings undertaken in 1990, 1993, and 1994 in native pastures in northern NSW. These data and survey results of sowings by District Agronomists were used to devise further guidelines to assist producers sowing Danthonia spp.

Materials and methods

Seedling emergence studies

Experiments were sown in native pastures dominated by Bothriochloa macra (redgrass) and Aristida ramosa (wiregrass) in the Tamworth and Manilla districts of the North West Slopes of NSW. Plots (2 x 4 m) were sown in May 1990 (1 site) and May 1994 (3 sites) to examine the effects of sowing method (surface broadcast, direct drilled) on the seedling emergence of Danthonia richardsonii cv. Taranna, D. linkii cv. Bunderra, and Phalaris aquatica cv. Sirosa. In 1990, the effects of a pre-sowing herbicide application were investigated, with glyphosate (360 g a.i./ha) applied to control com-petition from resident vegetation 14 days before sowing in half of the plots; the remainder of the plots were unsprayed. In 1994, glyphosate (360 g a.i./ha) was applied to all plots 21 days before sowing to control competition. Dry matter levels at sowing in each experiment were 1200-1500 kg/ha. In all studies, plots were randomly allocated in 3 replicates. All experiments were watered to assist establishment and seeds treated with bendiocarb (800g/kg), applied at a rate of 200 g/kg of seed to prevent ant theft. Sites were located on hard-setting red and red-brown earths, except for 1 site (1994) which was self-mulching.

In 1990, 50 viable seeds of each species were sown in a 1 m2 area on a 20 x 10 cm grid (surface broadcast) or hand-sown 4 cm apart in 2 rows made by a tined seeder. ?In 1994, seed was germination and viability tested, and after allowing for differences in seed sizes, sown at a rate equivalent to 2 kg/ha of cv. Bunderra (3.2 kg/ha cv. Taranna; 7 kg/ha cv. Sirosa). Seed of the sown species was mixed with inert seed of Trifolium balansae (balansa clover, autoclaved for 10 hours), mixed with sand and surface broadcast by hand, or direct drilled to a depth of 1 cm using a tined seeder.

In all studies, numbers of emerged seedlings of each species were counted 8 weeks after sowing. In 1990, seedlings were counted using the fixed grids described above in a 1 m2 area in each plot. In 1994, seedlings of sown species were counted in 4 quadrats (40 x 40 cm) in each plot. Quadrats were randomly located in broad-cast plots and placed so as to always sample 1 row in each direct drilled plot.

Data (seedlings/m2) were examined by analysis of variance. Plots of residual and fitted error mean square values indicated that transformation was not required.

Seed coat studies

Florets (caryopsis, glumes, lemma and palea) of D. richardsonii cv. Taranna and D. linkii cv. Bunderra were treated with an inert coating containing nutrients (0.77 mg phosphorus (P) per seed; 0.77 mg nitrogen (N) per seed) and/or fungicide (2 g/kg). Uncoated and coated florets of each species were sown at a rate equivalent to 2 kg/ha of naked caryopses, after adjusting for empty florets, differences in seed and floret weights and the weight of the coating material. The experimental area was a native pasture dominated by B. macra. Plots (2 x 2 m) were sprayed with glyphosate (360 g a.i./ha), applied 21 days before sowing to control competition from resident vegetation (approximately 1500 kg/ha dry matter). Florets were surface broadcast by hand onto randomized plots in 3 replicates in June 1993. Plots were watered as required to assist establishment. Emerged seedlings of each species were counted in 2 randomly located quadrats (50 x 10 cm) in each plot, 8 and 24 weeks after sowing.

Data (seedlings/m2) were examined by analysis of variance. Plots of residual and fitted error mean square values indicated that transformation was not required.

District survey

A mixture of D. richardsonii and D. linkii seed was distributed in 1992 to NSW Agriculture district agronomists at Albury, Wagga Wagga, Temora, Dareton/Hay, West Wyalong, Condobolin, Young, Cootamundra, Parkes, Orange, Mudgee, Wellington, Bathurst, Scone, Maitland, Tamworth, Inverell and Cobar, as part of a wider perennial grass evaluation program. Replicated experiments were sown into prepared seedbeds on farmer's properties and plots were managed and grazed using commercial practices appropriate to each district.

In 1994, agronomists in these districts were surveyed to assess the success of these Danthonia sowings, particularly in relation to soil type, average annual rainfall, sowing time (month of the year) and sowing depth. Establishment was rated by each agronomist on a 1 (low) to 3 (high) scale. Responses were obtained for 12 locations.

Results and discussion

In 1990, emergence 8 weeks after sowing was highest ($P<0.05$) in surface broadcast plots sprayed with glyphosate before sowing (Table 1). Emergence of both Danthonia cultivars was higher ($P<0.05$) than for cv. Sirosa. With drier conditions in 1994, emergence was higher ($P<0.05$) in all cultivars sown in direct drilled plots compared with those that were surface broadcast (Table 2), and cv. Sirosa had the highest emergence at all 3 sites.

For both cv. Taranna and Bunderra there appeared to be little benefit from using seed coatings containing P, N or fungicide, since numbers of seedlings that emerged and established (Table 3) were not significantly different from uncoated seeds. However, further studies are required to more fully assess the role of seed coats in ?Danthonia establishment.

A survey of district agronomists confirmed previous results (1), highlighting the importance of sowing time and depth on the successful establishment of D. richard-sonii and D. linkii (Table 4). Establishment of both species was satisfactory on medium to heavy textured soils in several environments, but was poor on light, sandy soils.

Conclusions

The data from the seedling emergence studies clearly show that both D. richardsonii cv. Taranna and D. linkii ?cv. Bunderra can be successfully established in summer growing, native perennial grass pastures in northern NSW, by either direct drilling or surface broadcasting. ?Further, both species can also establish in a wide range of environments when sown at or near the soil surface in autumn, on medium to heavy textured soils in prepared seedbeds. When sowing into native pastures, a pre-sowing application of glyphosate (360 g a.i./ha) should be applied to control competition from resident vegetation, particularly seedlings of volunteer annual grasses, naturalised legumes and broadleaf weeds. Seed should be treated to prevent ant theft. Preferred sowing time in northern NSW is April to May. When direct drill- ing, sow seed at 0-10 mm to ensure high seedling emerg-ence.

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References

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