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Seed Production in tall fescue (*Festuca arundinacea* Schreb.)

A thesis presented in partial fulfilment of the requirements for the
degree of Doctor of Philosophy in Seed Technology at
Massey University, Palmerston North, New Zealand.

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October, 1992

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Abstract

A study of agronomic aspects of tall fescue (*Festuca arundinacea* Schreb.) seed production were investigated at Palmerston North, New Zealand (40° 23' south) from 1990 to 1992.

Sowing Grasslands Roa tall fescue monthly from October to April showed that spring and summer sowings (October to February) gave the highest first season seed yields. Seed yields were significantly ($P < 0.05$) reduced when Roa tall fescue was sown in autumn (April) compared to sowing in spring (October). A further trial showed that the turf cultivar, Grasslands Garland, produced significantly ($P < 0.05$) more seed from autumn sowings than the two pasture cultivars, Roa and Grasslands G48. Time of sowing in the autumn was found to be critical as a delay of only three weeks in autumn sowing (15 April compared to 25 March) reduced seed yields by between 500 and 1000 kg ha⁻¹. In all the time of sowing trials first year seed yields were highly dependent on the number of reproductive tillers produced.

Two field trials investigated undersowing tall fescue in the spring with a barley cover crop. Sowing rates of barley up to 75 kg ha⁻¹ had no effect on first year seed yields of tall fescue compared to tall fescue sown alone. At barley sowing rates of 100, 150 and 200 kg ha⁻¹, seed yields and reproductive tiller numbers of tall fescue were reduced by 248 kg ha⁻¹ and 145 m⁻² respectively compared to tall fescue sown alone, but undersowing produced a net income of \$525 ha⁻¹ more than tall fescue sown alone. Doubling the undersown tall fescue sowing rate from 7.5 to 15 kg ha⁻¹ had no effect on tall fescue seed yields.

Immediate post-harvest management systems comparing burning, grazing and straw removal of tall fescue stubble following seed harvest produced similar seed yields. Autumn defoliation by grazing or cutting produced similar tall fescue seed yields compared to tall fescue plants which were undefoliated from the previous harvest. Applying atrazine (3 kg ai ha⁻¹) initially reduced vegetative tiller numbers but seed yields were not affected.

A study on vernalization requirements found that except for one plant tall fescue could not be vernalized as a germinating seed but was vernalized from any growth stage from main shoot and one leaf appearance onwards. In this study the maximum period of vernalization was 960 hours (40 days) and this was only sufficient to vernalize 64% of the plants. Only between 3 and 14% of plants which received less than 960 hours vernalization became fertile and 10% of plants which were not vernalized produced seed heads.

A field trial on the effects of fungicides on tall fescue seed yields, found that when

stem rust (*Puccinia graminis*) invaded the seed crop before anthesis, propiconazole was effective in preventing a seed yield reduction of more than 1000 kg ha⁻¹ compared to the yield from untreated plots. Green leaf area duration was increased and leaf senescence was reduced following propiconazole application. When stem rust was negligible in a second trial, neither propiconazole nor tebuconazole increased seed yields.

A study on the effects of frost on tall fescue showed that tall fescue seed heads are particularly sensitive to frost damage from ear emergence onwards. Two air frost levels (-2°C and -5°C) were applied to tall fescue reproductive tillers for six hours, (once only), at ear emergence, anthesis, or 4, 6 or 8 days after anthesis. A -5°C frost killed all seed heads. A -2°C frost at ear emergence and anthesis lowered seed yield per tiller, lowered seed weight and reduced germination compared to unfrosted plants. Plants frosted at -2°C after anthesis suffered no loss of germination or seed weight, but seed yield per tiller did decline. Two frost protectants, an ethylene oxide condensate (Teric) and cupric hydroxide (Kocide 101) failed to prevent frost damage but Kocide treated plants suffered a lesser seed yield reduction (39%) than untreated plants (53%) after a -2°C frost exposure.

Keywords: Tall fescue, *Festuca arundinacea*, burning, cover crops, establishment, frost, frost protectants, fungicides, grazing, post-harvest management, sowing rate, undersowing, vernalization.

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