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# ESTABLISHMENT OF **OVERSOWN** PERENNIAL **RYEGRASS** IN NORTH ISLAND **HILL** COUNTRY

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### Abstract

Seed of perennial ryegrass (Lolium perenne L. cv. 'Grasslands Ruanui') either untreated, treated with the fungicide captan, coated by a commercial process or coated plus captan, was oversown by hand into existing pastures at three separate hill country sites in Manawatu, Southern Hawke's Bay and Northern Wairarapa. The sites experienced dry, moist and wet conditions respectively, during the period after Oversowing. Seedling establishment was poor at all sites and was unaffected by different seed treatments. The number of seedlings decreased between 2 and 8 weeks after oversowing at the moist and wet sites, but increased during this time at the dry site. Seedling establishment levels (% of viable seeds sown) at the three sites 8 weeks after oversowing were: dry, 17%; moist, 11%; and wet, 14%. It was only at the dry site that large numbers of viable seeds were recovered four weeks after oversowing. These results typify the poor levels of establishment that are achieved in hill country from Oversown grass seed.

Keywords: pasture establishment, perennial ryegrass, seed treatment, oversowing, hill country.

#### INTRODUCTION

Establishment of ryegrasses (Lolium spp.) from Oversown seed in hill country areas is often very poor (Suckling 1949, Cullen 1966, Charlton & Brock 1980). Vartha & Clifford (1973) demonstrated that coating seeds with various materials could improve perennial ryegrass seedling establishment after oversowing in tussock grassland. Seed treatment with protectant fungicides has improved levels of seedling establishment following cultivation (Falloon 1981) and has given increased herbage production from pure perennial ryegrass swards (Falloon & Fletcher 1983).

A field experiment was therefore carried out to determine the effect of seed coating, either with or without an additional protectant fungicide, on seedling establishment of perennial ryegrass sown into North Island hill country.

# METHODS AND MATERIALS

Three hill country sites *were* chosen for the experiment. The first was at Coonoor, North Wairarapa, on a Waimarama hill soil, where pasture composition (dry matter basis) was 50% grass (Agrostis sp. dominant), 7% Trifolium repens L., and 37% dead matter. This site normally has a growing season soil moisture surplus of 100-200 mm (E.Griffiths, pers. comm). The second site, at Weber in Southern Hawke's Bay, was on a Tinui hill soil, where pasture composition was 51% grass, predominantly perennial ryegrass (Lolium perenne L.), 8% clovers (T. repens and T. subterraneum L.), and 40% dead matter. This site normally has a growing season soil moisture deficit of O-100 mm. The third site was at Aokautere in Manawatu on a Raumai hill soil, normally intermediate in soil moisture status compared with the other sites; pasture composition was 67% grass (Agrostis spp.) and 33% dead matter. Soil pH at the three sites was within the range 4.9 to 5.1, and Olsen test P from 5 to 9 ppm. These sites were selected to cover a

range of soil moisture content, but rainfall differences following oversowing in the experiment were such that the sites are hereafter designated as wet (Coonoor), moist (Weber) and dry (Aokautere).

A seedline of the perennial ryegrass cv. 'Grasslands Ruanui' was divided into four lots and given the following treatments by a seed coating company:

untreated nil

captan 3.0 g captan/kg seed applied as a slurry coated seed coated by the 'Prillcote' process

coated + captan seed coated by the 'Prillcote' process with 3.0 g captan/kg bare seed incorporated.

Germination of each seed lot was determined before sowing.

At each site a randomised complete block trial with six replicates was laid down on 14 April 1982. Seeds from each treatment were counted and hand sown onto the resident pastures in 1 m rows at the rate of 300/m. At 2, 4 or 8 weeks after sowing, a turf 33 cm long, 8 cm wide and 6 cm deep was cut from each row, placed in a polythene bag, and examined in the laboratory. Each turf was carefully searched within 24 h from sampling, and seeds and seedlings were removed and counted. Statistical analysis of counts was carried out on  $\sqrt{x+0.5}$ ) transformed data.

At 4 weeks after sowing all seeds recovered from turfs were assessed for viability (Copeland 1978). Percentage germination data were analysed after Bliss transformation.

# RESULTS

Germination of seed prior to sowing was 84% and was unaffected by the different seed treatments.

Seedling count data from the three field sites are summarised in Fig. 1. Two weeks after sowing at the moist site all three seed treatments gave significantly, (P < 0.05) greater numbers of seedlings than the untreated controls. At 4 and 8 weeks, however, no significant (P > 0.05) differences in numbers of seedlings were recorded for different treatments.

At the dry site, numbers of seedlings increased between 2 and 8 weeks after

At the dry site, numbers of seedlings increased between 2 and 8 weeks after sowing, seedling establishment at 8 weeks being 17% of viable seeds sown. At both the moist and wet sites this trend was reversed, and the final levels of seedling establishment were 11% (moist site) and 14% (wet site).

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Numbers of ungerminated seeds recovered at each of the sampling times were unaffected by different seed treatments. At two weeks after sowing, 70% of seeds sown at the dry site, 34% at the moist site and 14% at the wet site were recovered ungerminated. At four weeks after sowing (Fig. 2A), numbers of seeds recovered at the dry site (62% of seeds sown) were significantly (P<0.01) greater than at the other two sites (20% moist site, 16% wet site). At the wet site there was evidence of high earthworm activity. Several empty seed husks were also found, indicating pest damage, At eight weeks after sowing, 38%, 18% and 10% of seeds sown were recovered ungerminated at the dry, moist and wet sites respectively.

Viability of ungerminated seed recovered (Fig, 2B) also varied between sites. At the dry site coated + captan-treated seed had a germination capacity four weeks after sowing close to that recorded at time of sowing. At the two other sites, seed treatments had no significant (P>0.05) effect on seed viability. Ger-

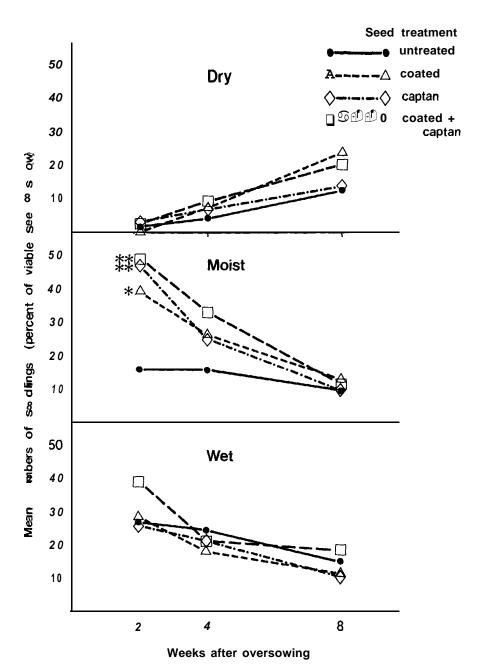


Figure I: Mean numbers of 'Ruanui' seedlings (as percent of viable seeds sown) recovered at three hill country sites 2, 3 or 8 weeks after oversowing seed to which different treatments had been applied. (\*, \* \*, indicate means significantly different from untreated seed at P < 0.05 and P < 0.01 respectively).

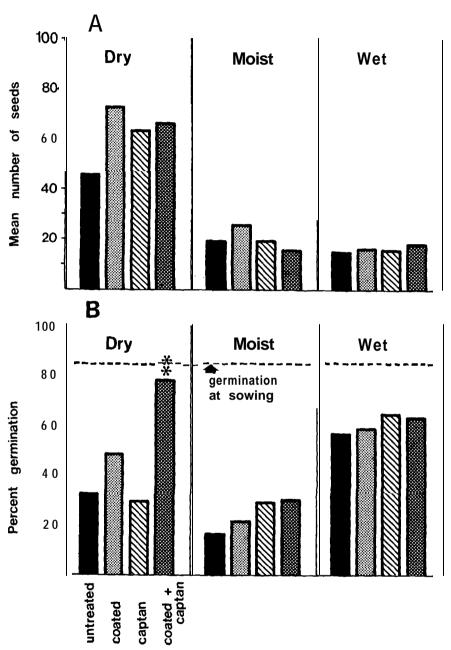


Figure 2: Mean numbers (A) and percentage germination (B) of 'Ruanui' seeds recovered at three different hill country sites four weeks after oversowing seed to which different treatments had been applied. (\* \* indicates mean significantly (P < 0.01) different from untreated).

mination of seed recovered from the moist site was particularly low, less than 30%.

Total numbers of seeds plus seedlings recovered from turfs eight weeks after sowing represented 53% of seeds sown at the dry site, 27% at the moist site and 22% at the wet site.

### DISCUSSION

These results typify the low levels of establishment obtained from grass Oversowing in hill country (Suckling 1949, Charlton & Brock 1980). Poor establishment occurred at all three sites under different levels of moisture within the sward environment during the weeks after oversowing. Although water is essential for germination and seedling growth, establishment was very poor even where rainfall and soil moisture conditions appeared to be adequate.

The different treatments applied to perennial ryegrass seed prior to oversowing into three different hill country sites had little effect on seedling establishment. Although the treatments increased numbers of seedlings recovered at one site two weeks after oversowing, these effects quickly disappeared. This suggests that while fungi may have been involved in seedling death, other factors predominated as the causes of poor establishment,

Factors that led to poor establishment obviously differed at different sites. At the dry site, low rainfall after sowing gave low seedling numbers, and the pattern of seedling establishment with time was different from the other two sites. However, at the other two sites, most of the seeds sown disappeared soon after sowing. Similar results have been reported following white clover oversowing  $\{Charlton \& Giddens 1983\}$ . This suggests that seed or seedling removal was an important factor. Feeding activities of birds (Suckling 1949), slugs (Charlton 1978) or field crickets (Blank et al. 1981) may have contributed to poor establishment. It is also possible that earthworms, particularly active at these sites during this period, could have removed seeds or seedlings. Their ability to consume seeds has been reported (Bates 1933, McRiii & Saggar 1973) and is being studied (J.A.Springett, pers. comm).

Perhaps the most effective way to improve grass establishment from Oversowing would be to use 'hoof and tooth' cultivation (Suckling 1951, 1959, Kikuchi et al. 1966, Charlton 1981). This practice, to reduce sward density and trample seeds into the soil, can enhance seedling establishment. Addition of a spectrum of pesticides (e.g. fungicides, insecticides, molluscicides) to prevent seed and seedling death or removal could also give advantages. Without such treatments, the oversowing of grasses into hill country seems unreliable and uneconomic.

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