
FUNGICIDE SEED TREATMENT OF RYEGRASSES TO IMPROVE SEEDLING ESTABLISHMENT AND INCREASE FORAGE YIELDS

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Abstract

Treatment of seed of four ryegrass cultivars (*Lolium* spp.) with captan or thiram before sowing increased herbage yields from field plots 3 months after sowing by 33% (Ruanui), 51% (Manawa), 51% (Paroa) and 104% (Moata). Herbage yields and numbers of established plants were closely correlated. A second trial measured yield of Ruanui during 12 months following sowing. Captan seed treatment increased dry matter by 51% at conventional seeding rates (17.5 kg/ha). Dry matter from plots sown with captan treated seed at 2.2 kg/ha did not differ from that from plots sown with untreated seed at 17.5 kg/ha. Routine treatment of ryegrass seed to improve seedling establishment is strongly recommended.

INTRODUCTION

Some fungicides applied to seeds prior to sowing can protect seedlings from soil-borne fungi capable of killing seedlings before they emerge from the soil. Application of captan, captafol, drazoxolon or thiram to seed of ryegrasses (*Lolium* spp.) prior to sowing can improve seedling establishment (Falloon, 1980; 1981). Increases in seedling emergence of from 16 to 158% have been achieved with treated seed sown into field soil. Increases in seedling establishment are dependent on ryegrass cultivar, fungicide, temperature, soil and age of seed (Falloon, 1980). Improved establishment from treated seed has been demonstrated in field trials throughout New Zealand (Falloon, 1981).

Previous studies considered effects of seed treatments on seedling establishment. This paper outlines two field experiments which have measured effects on seed treatments on ryegrass forage yields.

MATERIALS AND METHODS

Seed of the ryegrasses *Lolium perenne* L. 'Grasslands Ruanui', *L. multiflorum* Lam. 'Grasslands Paroa' and 'Grasslands Moata', and *L. (multiflorum x perenne)* 'Grasslands Manawa' was used. The fungicides benomyl, captan, or thiram were applied to seed as dusts at the rate of 3.0g active ingredient/ kg seed.

TRIAL 1

This trial was sown on a Kairanga silt loam at Palmerston North in March, 1979. One hundred seeds each of the ryegrass cultivars, Ruanui, Manawa, Paroa or Moata, treated with benomyl, captan or thiram (with untreated seed for controls) were sown singly into 30 x 30cm plots on a 10 x 10 grid pattern. Five replicate plots of each treatment were sown in a completely randomised experiment. Twelve weeks after sowing, plants were counted and then harvested to soil level. Dry weight of herbage removed from each plot was determined.

TRIAL 2

The second trial was sown on a Karapoti brown sandy loam at Palmerston North in April, 1980. Potassic superphosphate equivalent to 200 kg/ ha was applied to the trial area before sowing. Seeds of Ruanui, either untreated or treated with captan, were sown singly at even spacings into 60 x 60cm plots at 400,200, 100 or 50 seeds per plot (equivalent to seedings rates of 17.5, 8.8, 4.4 or 2.2 kg/ ha respectively). The trial was of randomised block design with 5 replicates. Four months after sowing, the trial area was sprayed with herbicides (2,4-D, bentazone and ethofumesate) to control broad-leaved weeds, clovers and *Poa annua* L. At 7, 8½ and 12 months after sowing, numbers of plants were counted and plots were cut to a height of 3cm. Dry weight of herbage from each plot was determined.

RESULTS

TRIAL 1

Treatment of seed with captan or thiram increased numbers of plants and DM yields from plots of all cultivars 3 months after sowing (Table 1). Maximum increases in DM yields from plots sown with captan or thiram treated seed were: Ruanui, 33%; Manawa, 51%; Paroa, 51%; and Moata 104%. Treatment of seed with benomyl significantly decreased numbers of plants and DM yields of Ruanui.

For individual cultivars, the effects of seed treatment on numbers of plants and DM yields were similar, and correlations between plant numbers and DM yields were highly significant in each case.

TRIAL 2

Captan seed treatment increased numbers of plants in plots at all seeding rates (Table 2). About 40% of seed treated with captan had developed into plants- 12 months later while the corresponding proportion for untreated seed was about 20%. Seed treatment significantly ($P < 0.01$) increased total DM yield from plots at each seeding rate except for the second lowest. Total DM yield from plots sown with untreated seed at the highest rate (equivalent to

17.5 kg/ ha) was not significantly different ($P < 0.01$) from that from plots sown with **captan** treated seed at the lowest rate (2.2 kg/ha).

TABLE 2: TRIAL 2. MEAN NUMBERS OF PLANTS AND MEAN TOTAL DM YIELDS 12 MONTHS AFTER SOWING PLOTS WITH DIFFERENT NUMBERS OF UNTREATED OR CAPTAN TREATED RUANUI SEEDS

Number of seeds sown	Approx. number of viable seeds sown	Number of plants		Total D.M. (g)	
		untreated	captan	untreated	captan
400	340	64	148**	349 BC†	527 A
200	170	36	73**	281 CD	408 B
100	80	19	39**	238 CD	341 BC
50	40	12	20**	178 D	304 BC

** indicate means significantly different from untreated seed at the same seeding rate ($P < 0.01$), LSD test.

† Means followed by the same letter not significantly different ($P < 0.01$), Duncan's multiple range test.

Analysis of single plant yields at 7 months showed that plants growing from **captan** treated seed yielded significantly more dry matter than plants from untreated seed. At the two later harvests this effect had disappeared. Yield increases from plots sown with **captan** treated seed were greater at the 7 and 8½ month harvests than at 12 months. This was particularly obvious at the highest seeding rate, where plant populations were greatest. Yield increases due to **captan** treatment in these plots were 61% 7 months after sowing, 63% at 8½ months and 33% at 12 months.

DISCUSSION

The trials reported here have indicated that improved seedling establishment of ryegrasses, brought about by seed treatment with suitable fungicides, can lead to considerable improvements in forage yields from resulting swards.

Ryegrass seedlings are killed by soil-borne fungi, particularly members of the genera *Pythium* and *Fusarium*, during the 2 to 3 days after seeds begin to take up moisture (Falloon, unpublished). Fungicides on seeds protect seedlings during this period, and thus increase the numbers of seedlings that emerge from soil. Responses to fungicide seed treatments differ in different soils (Falloon, 1980; 1981), one of the reasons for this being that soils contain different pathogenic fungi (Falloon, unpublished).

The recommended seeding rate for perennial **ryegrass** is about 15-20 kg seed/ ha (W. Harris, pers. comm. 1981), similar to the highest rate used in Trial 2. At this rate, treatment of seed with **captan** increased total yield from plots over the period of the trial by about 50%. Thus, with conventional

TABLE I: TRIAL 1. MEAN NUMBERS OF PLANTS AND MEAN DM YIELDS (g) FOR RYEGRASS CULTIVARS 3 MONTHS AFTER SOWING UNTREATED OR FUNGICIDE TREATED SEED.

Seed Treatment	Ruanui		Manawa		Paroa		Moata	
	Plants	D M	Plants	D M	Plants	D M	Plants	D M
Untreated	58	8.6	52	11.6	49	17.8	30	14.5
Captan	74**	11.3**	69**	17.5**	62*	22.3*	60**	29.6**
Thiram	75**	11.4**	63*	16.1*	72**	26.9**	49*	20.4
Benomyl	46**	6.3*	44	11.0	48	17.2	28	18.2

* and ** significantly different ($P < 0.05$ and 0.01) from untreated, LSD test.

seeding rates, seed treatment can considerably improve grass yields. Seed treatment also increased yields from plots sown with much lower rates of seed. Treated seed sown at the equivalent of 2.2 kg/ ha gave yields that were not significantly different from those sown with untreated seed at 2, 4 or 8 times this rate. Improved seedling establishment from fungicide treated seed could therefore be utilized in one of two ways: either by obtaining higher grass yields using conventional seeding rates, or by reducing seeding rates without reducing yields.

The effects of seed treatment on yield of perennial ryegrass were disappearing towards the end of Trial 2 in plots with higher numbers of plants. This was probably a result of increasing competition between plants. It is likely that competition effects could occur sooner in swards of the faster growing annual and hybrid ryegrasses. Brougham (1954) reported that for hybrid ryegrass, competition occurred sooner in swards sown at high seeding rates than in swards sown at lower rates, and that competition between plants was apparent 6-10 months after sowing. The benefits of seed treatment may therefore be for shorter periods in ryegrasses with higher growth rates than R uanui.

The trials reported here were with pure ryegrass swards established in small plots using a single seed sowing method. The effects of seed treatment upon grass establishment should be studied in mixed pastures, using sowing methods common in agricultural practice. Nevertheless, improved establishment from treated seed has been achieved at several different sites (Falloon, 1981) and can lead directly to improved grass production. Routine treatment of ryegrass seed with suitable protectant fungicides could give considerable improvements in pasture establishment.

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