CONTROL OF POWDERY MILDEW OF WHEAT BY SYSTEMIC SEED TREATMENTS[1]

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Abstract

Field experiments carried out for 2 years showed that damage from powdery mildew of wheat may be reduced by seed treatment with two systemic fungicides. In 1970 and 1971 the highest yields of Opal wheat were obtained through the use of ethirimol [5-butyl-2-(ethylamino)-6-methyl-4-pyrimidinol] at the rate of 1.0 lb per acre. Yields of Selkirk wheat in 1970 and 1971 were greatest with ethirimol treatment at 2.0 and 1.0 lb per acre respectively. Mildew severity was reduced more by ethirimol than by benomyl; however, ethirimol tended to reduce yield at higher concentrations.

Introduction

Powdery mildew of wheat incited by *Erysiphe graminis* DC. ex Mérat f. sp. *tritici* Marchal causes significant yield reduction of spring wheat in the Maritime Provinces and is considered the major wheat pathogen in this area (2, 3). Control of the disease is inadequate at this time since no commercial licensed cultivar possesses a high degree of resistance. Cultural methods of control are unsatisfactory and commercially available seed treatment fungicides are not effective against powdery mildew.

Several experimental fungicides have potential for controlling cereal mildews, but data on their usefulness as seed treatments under Maritime disease conditions are lacking (1, 3). The field experiments reported herein describe the efficacies two such fungicides, ethirimol and benomyl, used as seed treatments for the control of powdery mildew of wheat.

Materials and methods

Field trials were conducted in 1970 and 1971 at Charlottetown in which the systemic fungicides Milstem 50% 'COL', 50% ethirimol [5-butyl-2-(ethylamino)-6-methyl-4-pyrimidinol] (Chipman Chemicals Ltd.); and Benlate 50% W.P., 50% benomyl (DuPont of Canada Ltd.) were applied to the seed for evaluation of their effectiveness for controlling foliar invasion by *E. graminis* f. sp. *tritici*. Seed was treated in 200 g lots in quart jars in which the seed was left for 24 hr before packaging into row weights. Rates of active ingredient for ethirimol were 0.5, 1.0, and 2.0 lb/acre in 1970 and 0.75, 1.0, and 1.5 lb per acre in 1971. Benomyl was applied at rates of 0.75 and 1.0 lb active per acre each year. Seeding was at the rate of 2 bushels per acre for both 'Opal' and 'Selkirk' spring wheat. These cultivars were selected because they are recommended in the Maritime Provinces and because Selkirk is very susceptible while Opal possesses a moderate degree of resistance to powdery mildew. A randomized block design was used, with plots replicated four times and consisting of eight rows 9 inches apart and 10 feet long. For yield determinations, the center 8 ft of each of the center four rows of each plot were harvested. Disease severity was measured at the time of flowering (growth stage 10.5) according to the assessment scale of Large and Doling (4), with the degree of infection being reported as a percentage of leaf area mildewed on the flag and second leaf blades. Ten main tillers per plot were selected at random from the center four rows for each reading.

Results and discussion

In 1970, ethirimol was found to be more effective than benomyl for the control of powdery mildew, as evidenced by reduction in mildew lesioning (Table 1). Benomyl decreased mildew on Selkirk, but not to the degree that was evidenced by ethirimol. Although a reduction in mildew severity on Selkirk brought about significant increases in yield, the moderately resistant cultivar Opal did not respond in a similar manner: with Opal only ethirimol induced a reduction in leaf lesioning but without a corresponding increase in yield.

A greater degree of control was evidenced in the second experiment, conducted in 1971 (Table 2). Yields of Selkirk were again

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Table 1. Influence of ethirimol and benoyml seed treatment on yield and on severity Of powdery mildew in Opal and Selkirk wheat in 1970

Treatment (lb a.i./acre)	Opal Yield (bu/acre)	Opal Leaf infection %	Selkirk Yield (bu/acre)	Selkirk Leaf infection %
Ethirimol 0.5	34.2	45.0*	23.1**	71.3**
1.0	35.2	39.5*	23.7**	65.8**
2.0	31.6	34.1**	26.2**	53.8**
Benomyl 0.75	31.2	45.3	23.0**	75.0*
1.0	32.4	45.8	25.9**	69.2**
Check	30.7	47.0	20.0	80.8

Asterisks indicate a significant difference between treatments and check; the absence of asterisks indicates the difference is not significant; *P = 0.05, **P = 0.01.

Table 2. Influence of ethirimol and benomyl seed treatment on yield and 1000-kernel weight of Opal and Selkirk wheat, and on severity of powdery mildew infection in 1971

Treatment (lb a.i./acre)	Opal Yield (bu/acre)	Opal 1000-kernel weight (g)	Opal Leaf infection %	Selkirk Yield (bu/acre)	Selkirk 1000-kernel weight (g)	Selkirk Leaf infection %
Ethirimol 0.75	31.2	27.3**	38.5**	27.6"	32.2**	71.0**
1.0	35.3*	28.9**	36.8**	30.8**	34.5**	70.9**
1.5	33.8	29.5**	34.3**	27.5*	29.5	65.5**
Benomyl 0.75	31.2	29.2**	45.8	23.8	29.2	80.5
1.0	32.2	28.8**	49.0	24.3	30.6**	78.3
Check	26.7	26.0	48.5	22.6	29.7	78.0

Asterisks indicate a significant difference between treatments and check; the absence of asterisks indicate the difference is not significant! *P = 0.05, **P = 0.01.

increased by ethirimol, although the highest treatment rate, 1.5 lb per acre, appeared to be slightly phytotoxic; no phytotoxicity symptoms were present on the leaves, but both yield and seed size were reduced at this rate of treatment. Opal responded to a greater degree than in the 1970 test, in that yield was increased by the medium rate and seed size by all three rates of ethirimol. Benomyl treatment resulted in greater seed size but not increased yield in both Selkirk and Opal. In both cultivars ethirimol was more effective in reducing mildew lesioning in 1971 than in 1970.

The results reported herein indicate that, in the absence of wheat cultivar possessing a high degree of resistance to powdery mildew, seed treatment with certain systemic fungicides may offer an effective method of control. The value of such systemics could be enhanced by using them in larger field-sized plots where there would be fewer spores to invade treated areas, since untreated plots, the major source of secondary inoculum, would not be randomized within treated plots. The larger the treated area the more effective these materials should be through their reduction of leaf lesioning and sporulation (1). However, since these compounds are not registered for this purpose and are of unknown cost, their economic value to growers cannot be predicted at present.

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