SEED TREATMENTS FOR ONION SMUT CONTROL IN MANITOBA[1]

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Abstract

Captan, 4 products containing thiram, and 11 products containing hexachlorobenzene were compared in the field and greenhouse for their ability to control onion smut and for phytotoxicity to onions sown thickly for set production. Anticarie 80, Ortho 80, Captan 50-W, Arasan, Panoram D-31, and Dclsan A-D, when pelleted with the seed, were the most effective. Captan and thiram preparations plus 50% heptachlor were safe and effective whereas only one hexachlorobenzene preparation was both effective and safe.

Introduction

Recommendations for the control of onion smut, Urocystis cepulae Frost (U. colchici (Schlecht.) Rabenh.), by seed treatment fungicides differ in various parts of the United States. In New York, Arasan applied to seed previously coated with a methocel sticker gave good control in onions sown at a low rate to produce bulbs (4). 'Larson and Walker (3) obtained better control with Arasan in Wisconsin, when the seed was sown at a heavy rate to produce sets, by applying the chemical to dry seed rather than to methocel-moistened seed. Arasan and Captan pelleted with the seed increased yields on smut infested land in Minnesota (1). In 1959, Duran and Fischer (2) reported that in eastern Washington Anticarie 80 (80% hexachlorobenzene) pelleted with onion seed was more effective against smut than either Arasan or Captan. Some formulations of 40% hexachlorobenzene were phytotoxic,

Losses from smut occur annually in the onion crops grown in'the Winnipeg area. Little effort has been made to control the disease as sufficient smut-free land has been available when fields become badly infested. The acreage sown to onions for set production has increased recently, however, and more interest has been shown in seed-treatment fungicides. The experiments reported here were conducted to determine the effectiveness of Captan and Arasan in controlling smut in southern Manitoba and to compare the phytotoxicity and smut-control properties of products containing hexachlorobenzene and available in Canada.

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Materials and Methods

The following seed treatment fungicides were used:

Captan 50-W -- 50% captan. Stauffer Chemical Co. of Canada Ltd. Vancouver, B. C.
Arasan 75 -- 75% thiram. E. I. du Pont de Nemours & Co. Wilmington, Del.
Delsan A-D -- 60% thiram and 15% dieldrin, E. I. du Pont de Namours & Co. Wilmington, Del.
Panoram D-31 -- 56.2% thiram and 18.8% dieldrin. Panogen Inc. Ringwood, Ill.
Heptachlor-Thiram -- Experimental sample, composition unknown. Green Cross Insecticides. Montreal, Que.
Anticarie 80 -- 80% hexachlorobenzene. H. P. Rossiger Co., Inc. New York, N. Y.
Anticarie 80 -- 80% hexachlorobenzene. French Dyestuffs Ltd. Hamilton, Ont.
Ortho 80 -- 80% hexachlorobenzene. California Spray-Chemical Corp. Maryland Heights, Miss,
HCB 100 -- 100% hexachlorobenzene. French Dyestuffs Ltd. Hamilton, Ont.
Bunt-no-more -- 40% hexachlorobenzene. Green Cross Products. Winnipeg, Man.
No Bunt -- 40% hexachlorobenzene. Chipman Chemicals Ltd. Winnipeg, Man.
Co-op Hexa -- 40% hexachlorobenzene. Interprovincial Co-operatives Ltd. Winnipeg, Man.
Anticarie 40 -- 40% hexachlorobenzene. H. P. Rossiger Co., Inc. New York, N. Y.
Shell Aldrin-Hexachlorobenzene -- Experimental sample, composition unknown, Shell Oil Co. of Canada, Toronto, Ont.
Dual Purpose Bunt-no-more -- 13% hexachlorobenzene and 40% heptachlor. Green Cross Products, Winnipeg, Man.
Sanocide -- 40% hexachlorobenzene. California Spray-Chemical Corp. Maryland Heights, Miss.
Chemagro B-1843 -- Experimental sample, composition unknown. Chemagro Corp. New York, N. Y.
Bayer 22555 (Dexon) -- p- Dimethylaminobenzenediazo sodium sulfonate, Chemagro Corp. Kansas City, Miss.

Onion seed of the variety Ebenezer was treated by mixing equal weights of fungicide and seed in a 250 ml flask, All but 5 of the treatments were applied to seed previously wetted with a 2% methyl cellulose (400 centipoise) solution. To control onion maggots in the field experiment, 50% heptachlor (2.25 mg per 9 g of seed) was mixed with the fungicide and seed in all treatments which were not fungicide-insecticide combinations. After thorough mixing in the flaslc the contents were emptied into a sieve to remove excess chemical not adhering to the seed. The total weight of fungicide and seed

was determined to calculate the rate of application. This varied between products as some adhered to the seed more readily than others.

Field and greenhouse experiments were carried out with the various seed-treatment fungicides. The land used for the field experiment had produced the previous year a crop of onion sets which were severely infected with smut. Three grams of seed of each of 18 treatments were sown in 6-ft. rows randomized in each of 3 replicates. In the greenhouse experiment 20 treatments randomized in each of 4 replicates were compared in soil artificially infested with a spore suspension of U. cepulae. The seed was planted at a rate of 1.5 g per 44-in, row. The onions were harvested, washed, and examined for smut 2 months after planting.

Results

The results of these tests are shown in Table 1. F values obtained from analyses of variance were not significant for replicates but were significant at the 1% level for stand and smut percentages (transformed to degrees) in both tests. No damage from onion maggot was evident and the significant stand reductions were attributed to phytotoxicity of the pesticide.

Formulations containing 80% hexachlorobenzene successfully controlled smut and increased stand. Although some of the products containing 40% hexachlorobenzene gave good control of smut, considering the lower rate of application, further tests should be made because Duran and Fischer (2) found variations in phytotoxicity between lots of the same brand manufactured in different years. Two of the products containing hexachlorobenzene, Dual Purpose Bunt-no-more and Sanocide, were phytotoxic.

Captan and products containing thiram, when pelleted with the seed, were also satisfactory. Of the latter group, only the experimental sample of Heptachlor-Thiram was phytotoxic as indicated by the significant reduction in stand. Captan applied to dry seed effectively controlled smut for the reason suggested by Larson and Walker (3) that the amount of fungicide applied with seed sown at a heavy rate for set production approximates that applied in the furrow by Newhall et al (5) for smut control. The percentage of smut in the best treatments in the greenhouse appears high but most of the plants rated smutty in these treatments were only lightly infected and would probably re-Cover, as reported by Duran and Fischer (2). Counts were made on 2 replicates of each treatment in the greenhouse and the percentages of severely smutted plants ranged from 2 to 7% in the rows planted with seed pelleted with Captan, Arasan, and 80% hexachlorobenzene.

Chemagro B-1843 and Bayer 22555 (Dexon) are not recommended for smut control but were included on a trial basis. Each was phytotoxic when pelleted with onion seed.

Table 1. The Effect of Seed Treatment Fungicides on Smut Infection and Stand in Onions Sown for Set Production

Treatment	Field			Greenhouse			Ratio of fungicide to seed
	Stand	Smut		Stand	Smut		
		Per cent	Degrees 1/		Per cent	Degrees	
Check	412	13.1	21.2				
Talc (P) 2/	368	23.5	28.8	301	83.1	65.8	
Heptachlor (P)	279	11.2	19.4	301	86.3	68.5	
Captan 50-W	520	2.6	8.8				
Captan 50-W (P)	326	3.7	9.8	354	31.1	33.8	8:100
Arasan 75	523	7.4	15.6	353	26.5	31.0	65:100
Arasan 75 (P)	317	3.6	10.6	302	50.5	45.3	8:100
Delsan A-D (P)				335	20.7	27.0	62:100
Panoram D-31 (P				301	25.3	29.3	41:100
Heptachlor-Thiram (P)	105	2.3	8.6	338	26.8	31.0	45:100
Anticarie 80 (Ros) (P)	335	2.0	6.6	358	15.1	23.0	58:100
Anticarie 80 (FD) (P)	293	2.6	9.0	354	28.9	32.8	76:100
Ortho 80 (P)	333	3.6	10.5	352	27.8	31.8	18:100
HCB 100 (P)	284	6.4	14.5				
Bunt-no-more (P)	421	8.3	16.0	351	29.0	32.5	23:100
No-bunt (P)	250	4.6	12.1	321	38.5	38.0	18:100
Co-op Hexa (P)	433	6.2	14.0	321	32.7	35.0	23:100
Anticarie 40 (P)	330	3.8	10.6	339	40.2	39.3	16:100
Shell Aldrin-HCB (P)				219	43.1	41.0	6:100
Dual Purpose Bunt-no-more (P)	46						
Sanocide (P)	8						
Chemagro B-1843				299	42.1	40.5	25:100
Chemagro B-1843 (P)				151	37.2	37.5	46:100
Bayer 22555				200	54.0	47.5	0.2:100
Bayer 22555 (P)				1			13:100
L.S.D. (.01)	165		9.1	50		12.3	

1/ Degrees obtained from angular transformations of smut percentages

2/ (P) = pelleted

Literature Cited

1. American Phytopathological Society. 1955. 1954 fungicide tests. Agric. Chem. 10 (6): 55.
2. DURAN, R., and G. W. FISCHER. 1959. The efficacy and limitations of hexachlorobenzene for the control of onion smut. Plant Dis. Reptr. 43: 880-888.
3. LARSON, R. H., and J. C. WALKER. 1953. Thiram for smut control in onion set plantings. Phytopathology 43: 596-597.
4. LINN, M. B., and A. G. NEWHALL. 1948. Comparison of two methods of pelleting onion seed in the control of smut. Phytopathology 38: 218-221.
5. NEWHALL, A. G., W. A. RAWLINS, and M. J. SLOAN. 1952. Control of onion maggot and smut by one treatment at seeding time. (Abst.) Phytopathology 42 : 15.

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