EVALUATION OF SEED TREATMENT CHEMICALS FOR THE CONTROL OF SEEDLING BLIGHT OF BARLEY[1]

H.A.H. Wallace and J.T. Mills[2]

Abstract

Eighty-six seed treatment chemicals were tested for their efficacy in controlling seedling blight of barley caused by Cochliobolus sativus, using 100%-infested seed. Based on emergence and disease ratings 4-6 weeks from sowing, mercury compounds generally gave the best results. Among the mercurials, Hoechst 2874 and Pennsalt TD 8538 were of merit, while Morton EP 433 and Busan 72 were phytotoxic at the dosages used.

Introduction

In 1942 Greaney & Wallace (2) tested available fungicidal seed treatment compounds for control of seedling blight of barley caused by Cochliobolus sativus (Ito and Kurib. ex Kurib.) Drechs. ex Dastur. No further work was done at Winnipeg until 1968, when a severe infestation of barley in eastern Canada in 1967 gave an opportunity to evaluate with diseased seed the performance of current registered and experimental fungicides and fungicide-insecticide combinations. The effectiveness of available chemicals for control of seedling blight and their potential for control of common root rot caused by soil-borne C. sativus and other fungi was determined.

Barley (Hordeum vulgare L. 'Herta') seed obtained from Charlottetown, Prince Edward Island, was used throughout the experiments. One hundred percent of the seeds were infected with C. sativus; the seed also carried spores of Alternaria, Cephalosporium, Cladosporium, Streptomyces and other fungi.

The source, formulation, and composition of the 86 seed treatment chemicals used are given in Table 1. Each chemical was applied to 200 g of seed at the indicated dosage (Tables 2-5) and shaken well in a 1-quart glass jar. The jars were kept sealed for 2 days to allow the vapor, if any, to act and then lots of 200 seeds were packaged in envelopes. Envelopes that contained seed from the same treatment were then placed in polyethylene bags and stored at 15C until seeding 28 to 48 days later. One of the compounds, SWF 2000, was used as a slurry prepared by adding 4.2 ml of water to each gram of wettable powder. Because of the large number of treatments the trial was split for convenience into four tests described in Tables 2 to 5.

Test 1 was sown at Brandon and Morden, and tests 2 to 4, at Brandon, Morden, and Winnipeg, Manitoba. The one-row plots were 12 feet long, 9 inches apart, and replicated four times at each location. Two hundred seeds were sown in each row; the plants were pulled 4-6 weeks after seeding and the percentage emergence was recorded. One hundred of the emerged plants from each row were rated for seedling root rot using a 0-5 scale (1). The disease rating percentage for each treatment was determined by the following formula:

$$\text{Disease rating percentage} = \frac{\text{average of numerical ratings of individual plants} \times 100}{5}$$

Results and discussion

Emergence ranged from 32.6% to 84.5% depending on the treatment. Emergence in the untreated checks was relatively constant, about 60% for all tests (Tables 2-5); therefore any large increases or decreases in emergence were probably caused by the treatment. Twelve chemicals at one or more dosages gave significantly lower emergence than the untreated checks. Phytotoxicity was apparent with Busan 72 (treatment nos. 133, 147, 149) and E P 433 (nos. 56 and 57), where emergence decreased as dosage was increased. The reasons for the low emergence associated with the other chemicals could not be established.

Twenty-eight chemicals gave significantly greater emergence than the checks. Panogen 15B (nos. 32, 58, 90) gave the best emergence with 79.2%, 80.1%, and 84.5% compared to 61.5%, 59.0%, and 60.5%, respectively, in the checks. Some non-mercurials, notably Vitavax (no. 2) with 78.0%, SWF 910 (no. 93) with 78.2%, and Hoechst 2874 (no. 60) with 76.0%, also increased emergence appreciably compared to 58.8%, 60.5%, and 59.0% in the respective checks.

The disease rating percentage of the emerged plants in the untreated checks ranged from 20.0 to 43.6; with two exceptions they were in the range

---

1 Contribution no. 345, Research Station, Canada Department of Agriculture, Winnipeg, Manitoba.

2 Plant Pathologists.

Table 1. Source, product name, and composition of seed treatment materials used in the four tests

Treatment no.	source*	Product name	Chemical name
1	Du Pont	Ceresan M	ethyl mercury-p-toluene sulfonanilide
2	Uniroyal	Vitavax (D735)	5, 6-dihydro-2-methyl-1, 4-oxathiin-3-carboxanilide
3	Niagara	Puraseed	phenylmercury formamide (5.5%) t phenylaminocadmium dilactate (2.5%)
4	Morton	Panogen PX	methylmercury dicyandiamide
5	Rohm & Haas	Dithane M45	zinc co-ordinatedmanganese ethylenebis (dithiocarbamate)
6	Green Cross	3922	RD8684 (15%) t hexachlorobenzene (5%)
7	Chipman	53-64	maneb (50.0%)
8	Green Cross	RD8684 t maneb	RD8684 + maneb
9	Chemagro	4497 (50%)	bis (1, 2, 2-trichloroethyl) sulfoxide
10	Green Cross	SWF 790	identity not available
11	Niagara	Polyram (80%)	zinc activated polyethylene thiuram disulphide
12	Morton	E P 277	identity not available
13	Green Cross	RD8684	identity not available
14	Uniroyal	G696	2, 4-dimethyl-5-carboxanilido thiazole
15	Chipman	TF56-67	maneb (18.25%) t zineb (18.25%)
16	Olin	Terracoat	quintozene (2%) t 5-ethoxy-3-trichloromethyl-1, 2, 4-thiadiazole (1.0%)
17	Green Cross	SWF 810	identity not available
18	Green Cross	SWF 1040	identity not available
19	Chemagro	Dexon (70%)	p-diniethylaminobenzenediazo sodium sulfonate
20	Green Cross	Res-Q	hexachlorobenzene (20%) t captan (20%) t maneb (15%)
21	co-op	Hexa	hexachlorobenzene
22	Green Cross	SWF 800	identity not available
24	Uniroyal	F427	2, 3-dihydro-5-ortho-phenyl-carboxanilido-6-methyl-1, 4-oxathiin
25	Uniroyal	Plantvax (F461)	2, 3-dihydro-5-carboxanilido-6-methyl-1, 4-oxathiin-4, 4-dioxide
27	Green Cross	SWF 850	identity not available
28	Niagara	Polyram (53.5%)	zinc activated polyethylene thiuram disulphide
29	Green Cross	SWF 840	identity not available
30	Uniroyal	G696	2, 4-dimethyl-5-carboxanilido thiazole
31	Green Cross	SWF 860	identity not available
32	Morton	Panogen 15B	methylmercury dicyandiamide
33	Morton	Panogen PX	methylmercury dicyandiamide
34	Morton	E P 279B (73.0%)	identity not available
36	Morton	E P 431 (25.0%)	identity not available
37	Morton	E P 411A (27.5%)	identity not available
38	Morton	E P 405A (25.0%)	identity not available
39	Morton	E P 411 (62.5%)	identity not available
40	Morton	E P 347 (54.7%)	identity not available
41	Morton	E P 431 (25.0%)	identity not available
42	Morton	E P 407A (25.0%)	identity not available
43	Morton	E P 339A (25.0%)	identity not available
44	Morton	EP 432 (25.0%)	identity not available
46	Morton	E P 342A (25.0%)	identity not available
47	Morton	E P 339A (25.0%)	identity not available
48	Morton	E P 430 (25.0%)	identity not available
49	Morton	E P 405A (25.0%)	identity not available
50	Morton	E P 342A (25.0%)	identity not available
51	Morton	E P 432 (25.0%)	identity not available
52	Morton	E P 406A (25.0%)	identity not available
53	Morton	E P 407A (25.0%)	identity not available
54	Morton	E P 406A (25.0%)	identity not available
55	Morton	E P 430 (25.0%)	identity not available
56	Morton	E P 433 (25.0%)	identity not available

Table 1 (continued)

Treatment no.	Source"	Product name	Chemical name
57	Morton	E P 433 (25.0%)	iidentity not available
58	Morton	Panogen 15B	methylmercury dicyandiamide
59	Morton	Pandrinox A	methylmercury dicyandiamide (0.72) t aldrin (2.5 lb/gal.)
60	Hoechst	2874	identity not available
61	Hoechst	2874	identity not available
62	Hoechst	2874	identity not available
63	Chipman	26-68	identity not available
64	Chipman	23-68	identity not available
65	Chipman	28-68	identity not available
66	Chipman	19-68	identity not available
67	Chipman	33-68	identity not available
68	Chipman	22-68	identity not available
69	Chipman	30-68	identity not available
70	Chipman	34-68	identity not available
71	Chipman	24-68	identity not available
72	Chipman	27-68	identity not available
73	Morton	E P 371A (37.5%)	identity not available
74	Morton	E P 279C (12.5%)	identity not available
75	Chipman	32-68	identity not available
76	Morton	EP 279B (23.0%)	identity not available
77	Morton	S 91 (53.570)	identity not available
78	Morton	E P 279C (12.5%)	identity not available
80	Morton	E P 411A (27.5%)	identity not available
81	Morton	E P 411 (62.5%)	identity not available
82	Morton	EP 371D (31.25%)	identity not available
83	Morton	S 91 (53.5%)	identity not available
84	Morton	E P 347 (54.7%)	identity not available
85	Morton	E P 402 (43.2%)	identity not available
86	Morton	E P 408 (38.0%)	identity not available
87	Morton	E P 408 (38.0%)	identity not available
88	Morton	E P 409 (25.0%)	identity not available
89	Morton	E P 410 (75.0%)	identity not available
90	Morton	Panogen 15B	methylmercury dicyandiamide
91	Green Cross	Tillex DB	ethoxy ethyl mercury hydroxide
92	Green Cross	Tillex DB t lindane	ethoxy ethyl mercury hydroxide t lindane
93	Green Cross	SWF 910	identity not available
94	Pennsalt	TD 8538	identity not available
95	Niagara	BEI-07	identity not available
96	Green Cross	SWF 910	identity not available
97	Green Cross	SWF 580	identity not available
98	co-op	BL	identity not available
99	Rohm & Haas	RH 575	identity not available
100	co-op	BL	identity not available
101	Green Cross	SWF 1040	identity not available
102	Green Cross	SWF 2000	identity not available
103	Niagara	BEI-07	identity not available
104	Niagara	Polyram t Furadan	zinc activated polyethylene thiuram disulfide (26.7%) t 2, 3-dihydro-2, 2-dimethyl-7-benzofuranyl N-methylcarbamate (25.0%)
105	Green Cross	SWF 1080	identity not available
106	co-op	BL	identity not available
107	Green Cross	RD 19693	identity not available
108	Chemagro	Bay 33172 (50%)	identity not available
109	Green Cross	SWF 1090	identity not available
110	Niagara	BEI-06	identity not available
112	Rohm & Haas	RH 575	identity not available

Table 1 (continued)

Treatment no.	Source*	Product name	Chemical name
113	Green Cross	SWF 910	identity not available
114	Niagara	Polyram t Furadan	zinc activated polyethylene thiuram disulfide (26.7%) t 2, 3-dihydro-2, 2-dimethyl-7-benzofuranyl N-methylcarbamate (25.0%)
115	Rohm & Haas	RH 058	identity not available
116	Niagara	Polyram t aldrin	zinc activated polyethylene thiuram disulfide (26.7%) t aldrin ST (25.0%)
117	Niagara	Polyram	zinc activated polyethylene thiuram disulfide (53.5%)
118	Green Cross	SWF 990	identity not available
119	Niagara	BEI-07	identity not available
120	Green Cross	SWF 2000	identity not available
121	Rohm & Haas	RH 893	identity not available
122	Green Cross	SWF 1040	identity not available
123	Niagara	Polyram t Furadan	zinc activated polyethylene thiuram disulfide (26.7%) t 2, 3-dihydro-2, 2-dimethyl-7-benzofuranyl N-methylcarbamate (25.0%)
124	Green Cross	SWF 910	identity not available
125	Rohm & Haas	RH 575	identity not available
126	Niagara	Polyram t lindane	zinc activated polyethylene thiuram disulfide (26.7%) t lindane ST (25.0%)
127	Rohm & Haas	RH 058	identity not available
128	Niagara	Polyram ST	zinc activated polyethylene thiuram disulfide (53.5%)
129	Rohm & Haas	RH 058	identity not available
130	Buckman	Busan 70	identity not available
131	Buckman	Busan 70	identity not available
132	Green Cross	SWF 990	identity not available
133	Buckman	Busan 72	identity not available
134	Green Cross	SWF 1040	identity not available
135	Green Cross	SWF 1040	identity not available
136	Rohm & Haas	RH 893	identity not available
137	Green Cross	SWF 990	identity not available
138	Rohm & Haas	RH 893	identity not available
139	Green Cross	SWF 850	identity not available
140	co-op	BD	identity not available
141	Green Cross	SWF 990	identity not available
142	Buckman	Busan 70	identity not available
143	co-op	BD	identity not available
144	co-op	BD	identity not available
145	Green Cross	SWF 850	identity not available
146	Green Cross	SWF 850	identity not available
147	Buckman	Busan 72	identity not available
148	Green Cross	SWF 850	identity not available
149	Buckman	Busan 72	identity not available

* E. I. Dupont de Nemours & Co., Inc., Wilmington, Delaware: United States Rubber Co., Naugatuk, Connecticut; Niagara Brand Chemicals. Burlington. Ontario; Morton Chemical Co., Woodstock, Illinois; Rohm & Haas Co. of Canada Ltd., West Hill, Ontario: Green Cross Products, Montreal Québec; Chipman Chemical Ltd., Hamilton, Ontario; Olin-Mathieson Chemical Corp., Little Rock, Arkansas; Chemagro Corporation, Kansas City, Missouri; Interprovincial Cooperatives Ltd., Winnipeg, Manitoba; American Hoechst Corp., North Hollywood, California; Pennsalt Chemicals of Canada Ltd., Vancouver, British Columbia; Buckman Laboratories Inc., Memphis, Tennessee.

20.0 to 26. 2. The disease rating percentage for treated seed ranged from 7.6 to 45.6, demonstrating that no treatment gave complete control of C. sativus. Although EP 433 (nos. 56 and 57) gave the lowest ratings, this chemical treatment was phytotoxic, as noted previously. Low disease rating percentages were also found with the mercurials Panogen 15B (nos. 32, 58, 90), Panogen PX (no. 33), Tillex DB (no. 91), Pandrinox A (no. 59), Tillex DB t lindane (no. 92), and the non-mercurial Pennsalt TD 8538 (no. 94).

Generally compounds containing mercury gave the best overall results with high emergence and low disease ratings. Two non-mercurial compounds, however, were of merit: Hoechst 2874 (nos. 60, 61, 62) gave high emergence but tended to have higher disease ratings than the mercurials, and Pennsalt TD8538 (no. 94) gave lower emergence but about the same disease rating as the mercurials.

As shown by emergence data (Table 3). the performance of fungicides that contain mercury and

Table 2. Test 1 - Results of field trials at two locations for control of seedling blight of barley

Treatment no.	Product name and formulation†		Dosage (oz/bu)	Emergence†† (%)	Disease rating†† (%)
1	Ceresan M	WP	0.75	78.2"	40.5
2	Vitavax (D735)	WP	1.00	78.0"	45.0
3	Puraseed	L	0.75	77.2"	41.9
4	Panogen PX	D	2.00	76.3"	41.6
5	Dithane M45	WP	2.00	70.6"	40.6
6	3922	D	2.00	69.3"	41.3
7	53-64	D	2.00	69.0"	39.1
8	RD8684 t maneb	D	2.00	68.3"	43.5
9	4497 (50%)	WP	1.00	67.5"	40.9
10	SWF 790	WP	2.00	65.6"	41.0
11	Polyram (80%)	WP	2.00	65.2"	39.3
12	EP 277	Sn	2.00	64. 1	41.2
13	RD8684	D	2.00	63.8	45.4
14	G696	WP	2.00	63. 6	42. 6
15	TF 56-67	D	2.00	62.8	38.0
16	Terracoat	L	6.00	61.4	41.3
17	SWF 810	WP	2.00	60.6	42. 7
18	SWF 1040	WP	2.00	60.2	44.7
19	Dexon (70%)	WP	1.00	59. 6	42. 6
20	Res-Q	WP	2.00	59.3	40.9
21	Hexa	D	0.50	59.3	44.7
22	SWF 800	WP	2.00	58.8	41.0
23	Untreated check			58. 8	42.1
24	F427	WP	1.00	58.6	42.3
25	Plantvax (F461)	WP	1.00	58.1	44.4
26	Untreated check			57.8	43. 6
27	SWF 850	WP	2.00	56.9	43.8
28	Polyram (53.5%)	WP	2.00	56.4	41.6
29	SWF 840	WP	2.00	55.2	44.0
30	G696	WP	1.00	54.7	44.3
31	SWF 860	WP	2.00	52. 6	45. 6
	Least Significant Difference			6. 1	NS

† Formulation code: D = dust, WP = wettable powder, Sn = solution, L = liquid.

†† Means of tests at Morden and Brandon.

* Significant at the 5% level.

Table 3. Test 2 - Results of field trials at three locations for control of seedling blight of barley

Treatment no.	Product name and formulation†		Dosage (oz/bu)	Emergence†† (%)	Disease rating†† (%)
32	Panogen 15B	Sn	0.75	79.2"	11.2*
33	Panogen PX	D	2.00	75.7"	12.3"
34	E P 279B (23.0%)	Sn	0.50	63.9	25.5
35	Untreated check			61.5	23.1
36	E P 431 (25.0%)	WP	12.00	61.2	20.0
37	E P 411A (27.5%)	Sn	1.00	59.8	24.a
38	E P 405A (25.0%)	WP	4.00	59.6	24.6
39	E P 411 (62.5%)	WP	0.50	59.5	22.9
40	E P 347 (54.7%)	WP	0.75	59.3	26.2
41	E P 431 (25.0%)	WP	6.00	59.2	25.6
42	E P 407A (25.0%)	WP	4.00	58.5	22.9
43	E P 339A (25.0%)	WP	0.75	58.2	24.6
44	E P 432 (25.0%)	WP	4.00	58.1	25.2
45	Untreated check			58.1	24.1
46	EP 342A (25.0%)	WP	8.00	57.8	23.5
47	E P 339A (25.0%)	WP	1.50	57.3	27.2
48	E P 430 (25.0%)	WP	6.00	56.7	25.3
49	E P 405A (25.0%)	WP	8.00	56.3	25.a
50	E P 342A (25.0%)	WP	4.00	56.2	22.0
51	EP 432 (25.0%)	WP	2.00	56.1	22.1
52	E P 406A (25.0%)	WP	6.00	55.2	26.0
53	E P 407A (25.0%)	WP	2.00	55.0	23.0
54	E P 406A (25.0%)	WP	12.00	52.8	25.3
55	E P 430 (25.0%)	WP	12.00	52.1	21.5
56	E P 433 (25.0%)	WP	6.00	45.2	7.6"
57	E P 433 (25.0%)	WP	12.00	32.6	10.3"
	Least Significant Difference			4.7	3.9

† Formulation code: D = dust, WP = wettable powder, Sn = solution

†† Means of tests at Winnipeg, Morden, and Brandon

* Significant at the 5% level.

Table 4. Test 3 - Results of field trials at three locations for control of seedling blight of barley

Treatment no.	Product name and formulation†		:Dosage (oz/bu)	Emergence†† (%)	Disease rating††' (%)
58	Panogen 15B	Sn	0.75	80.1"	10.2"
59	Pandrinox A	Sn	2.00	78.5"	12.3"
60	2874	WP	2.00	76.0"	18.7
61	2874	WP	1.50	75.8*	23.0
62	2874	WP	2.50	75.5"	17.3
63	26-68	D	2.00	71.8"	16.2
64	23-68	D	2.00	70.2"	14.4"
65	28-68	D	2.00	69.0*	15.1
66	19-68	D	2.00	66.4"	15.7
67	33-68	D	2.00	66.2"	18.5
68	22-68	D	2.00	65.6"	14.7"
69	30-68	D	2.00	65.3"	21.0
70	34-68	D	2.00	65.0"	20.7
71	24-68	D	2.00	64.8"	20.0
72	27-68	D	2.00	63.9	18.8
73	EP 371A (37.5%)	P	2.00	62.9	24.0
74	EP 279C (12.5%)	P	2.00	62.7	23.0
75	32-68	D	2.00	62.5	18.4
76	EP 279B (23.0%)	Sn	1.00	61.4	23.2
77	S 91 (53.5%)	P	3.00	60.5	16.6
78	EP 279C (12.5%)	P	1.00	60.5	21.0
79	Untreated check			59.0	20.0
80	EP 411A (27.5%)	Sn	2.00	58.5	21.2
81	EP 411 (62.5%)	WP	1.00	57.5	20.5
82	EP 371D (31.25%)	P	2.00	56.7	20.2
83	S 91 (53.5%)	P	1.00	56.1	19.9
84	EP 347 (54.7%)	WP	1.50	55.9	22.4
85	EP 402 (43.2%)	Sn	2.00	55.7	22.9
86	EP 408 (38.0%)	Sn	1.00	54.8	21.0
87	EP 408 (38.0%)	Sn	2.00	54.3	19.1
88	EP 409 (25.0%)	P	2.00	53.8	20.0
89	EP 410 (75.0%)	P	2.00	53.0	22.0
	Least Significant Difference			5.0	5.1

† Formulation code: D = dust, P = powder, WP = wettable powder, Sn = solution.

†† Means of tests at Winnipeg, Mordon, and Brandon.

* Significant at the 5% level.

Table 5. Test 4 - Results of field trials at three locations for control of seedling blight of barley

Treatment no.	Product name and formulation†		Dosage (oz/bu)	Emergence†† (%)	Disease rating†† (%)
90	Panogen 15B	Sn	0.75	84.5"	10.5"
91	Tillex DB	WP	1.00	81.4"	12.6"
92	Tillex DB t lindane	WP	2.00	79.6"	15.0"
93	SWF 910	WP	2.00	78. 2"	17.7"
94	TD 8538	WP	2.00	71.8"	9.4"
95	BEI-07	WP	3.00	68.0"	20.2"
96	SWF 910	WP	1.50	67.6"	21.6
97	SWF 580	D	2.00	65.1	22.6
98	BL	L	4.00	65.0	21.5
99	RH 575	WP	1.92	64.8	24.5
100	BL	L	2.00	64. 2	25.8
101	SWF 1040	WP	1.50	62. 2	21.5
102	SWF 2000	D	2.00	61.6	21.1"
103	BEI-07	WP	2.00	61.6	19.7"
104	Polyramt Furadan	WP	4.00	61.5	24. 7
105	SWF 1080	D	2.00	61. 3	22. 8
106	BL	L	6.00	61.0	20.5"
107	RD 19693	D	2.00	60. 7	25.0
108	Bay 33172 (50%)	WP	2.00	60. 6	26.8
109	SWF 1090	D	2.00	60.5	21.7
110	BEI-06	WP	2.00	60.5	18.5"
111	Untreated check			60. 5	26. 2
112	RH 575	WP	0.96	60. 3	24.5
113	SWF 910	WP	1.00	60.0	22.9
114	Polyramt Furadan	WP	3.00	60.0	24.2
115	RH 058	L	1.32	59.7	21.3"
116	Polyram t aldrin	WP	2.00	59.5	26. 8
117	Polyram	WP	2.00	59.5	23. 1
118	SWF 990	WP	1.50	59.0	28.8
119	BEI-07	WP	1.00	59.0	22.9
120	SWF 2000	SL	2.00	58. 8	19.4"
121	RH 893	L	1.32	58. 7	21.3"
122	SWF 1040	WP	2.00	58. 7	22.8
123	Polyram t Furadan	WP	2.00	58. 6	22.8
124	SWF 910	WP	0.50	58. 1	23. 6
125	RH 575	WP	0.48	57.8	25.3
126	Polyram t lindane	WP	2.00	57. 6	22.3
127	RH 058	L	0.66	57.5	24.6
128	Polyram ST	WP	1.00	56.9	22.2
129	RH 058	L	0.33	56. 2	25.3
130	Busan 70	L	1.20	55.9	23.9
131	Busan 70	L	0.45	55.6	23.4
132	SWF 990	WP	1.00	55.5	30.9

† Formulation code: D = dust, WP = wettable powder, SL = slurry, Sn = solution, L = liquid.

†† Means of tests at Winnipeg, Morden and Brandon.

* Significant at the 5% level.

Table 5. (Cont'd.)

Treatment no.	Product name and formulation†		Dosage (oz/bu)	Emergence†† (%)	Disease rating†† (%)
133	Busan 72	L	0.30	54.7	25.6
134	SWF 1040	WP	0.50	54.3	26.1
135	SWF 1040	WP	1.00	54.3	24.1
136	RH 893	L	0.33	54.1	22.4
137	SWF 990	WP	0.50	53.6	28.0
138	RH 893	L	0.66	53.4	22.8
139	SWF 850	WP	2.00	53.0	28.2
140	BD	D	2.00	53.0	23.3
141	SWF 990	WP	2.00	52.6	26.4
142	Busan 70	L	0.75	52. 6	22.9
143	BD	D	6.00	52.1	24.2
144	BD	D	4.00	51. 7	22.3
145	SWF 850	WP	1.50	50.9	26.9
146	SWF 850	WP	1.00	49. 6	25.5
147	Busan 72	L	0.45	49.4	24.4
148	SWF 850	WP	0.50	49.4	27.9
149	Busan 72	L	0.90	48. 7	24. 7
	Least Significant Difference			5.4	4.8

maneb approximates that obtained in laboratory tests (3, 4) with the same seed treated for control of C. sativus. The discrepancy in disease ratings between test 1 and the others is thought to be because the former were made by one person and the latter by another.

Acknowledgments

The writers wish to thank the staff of the Brandon and Morden Research Stations for making land available for these trials.

Literature cited

1. Greaney, F.J., J.E. Machacek. and C.L. Johnston. 1938. Varietal resistance of wheat and oats to root rot caused by Fusarium culmorum and Helminthosporium sativum. Sci. Agr. 18:500-523.

2. Greaney, F.J., and H.A.H. Wallace. 1943. New and standard seed treatments in the control of certain seed-borne diseases of wheat, oats and barley. Phytopathology 23: 1064-1070.

3. Mills, J.T., and H.A.H. Wallace. 1968. Determination of selective action of fungicides on the microflora of barley seed. Can. J. Plant Sci. 48:587-594.

4. Mills, J.T., and H.A.H. Wallace. 1969. Effect of fungicides on Cochliobolus sativus and other fungi on barley seed in soil. Can. J. Plant Sci. In Press.