COOPERATIVE SEED TREATMENT TRIALS – 1971[1]

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Abstract

Forty-eight seed treatment chemicals were tested for their efficacy in controlling bunt of wheat (Tilletia foetida), covered smut of oats (Ustilago kolleri), seedling blight of barley (Cochliobolus sativus), and seed rot of flax caused by a complex of seed- and soil-borne microorganisms. The results show that there are formulations in the dust, wettable powder, suspension, or liquid forms of seed treatments that could be used as substitutes for mercury, hexachlorobenzene, and pentachloronitrobenzene.

Introduction

In 1971 forty-eight seed treatment chemicals were tested for their efficacy in controlling common bunt of wheat caused by Tilletia foetida (Wallr.) Liro, covered smut of oats caused by Ustilago kolleri Wille, covered smut of barley caused by U. hordei (Pers.) Lagerh., seedling blight of barley caused by Cochliobolus sativus (Ito anh Kurib.) Drechsl. ex Dastur, and seed rots of flax caused by a complex of soil- and seed-borne microorganisms.

Materials and methods

Uninfected seed of Red Bobs wheat (Triticum aestivum L.), naturally smutted seed of Vanguard oats (Avena sativa L.), and naturally smutted seed of Herta barley (Hordeurn-distichon L.) were used. One gram of dry spores of the appropriate smut fungus was added to 200 g of the cereal seed in a quart jar and shaken well to distribute the spores over the seed. Another sample of Herta barley, 100% naturally infected with C. sativus, was used for the seedling blight tests. Noralta flax (Linum usitatissimum L.) was used for the seed rot test.

The seed treatment materials were tested in two series. Except that the two series of materials were randomized separately the experimental procedures were identical. The source, product name, and chemical name, where available, of the treatment materials are listed in Tables 1 and 2. Res-Q and Panogen 15B (Series A) and Agrox NM (Series B) were included as standards. Each chemical was applied to 100 g of seed, or to 200 g of seed if the rate (Tables 3 and 4) was less than 1 oz per bushel, by shaking the seed in a glass jar until the seed was uniformly covered. The seed was removed from the jar after not more than 3 days, and samples of 200 seeds in paper envelopes were stored in polyethylene bags at 15 C for not more than 2 weeks before seeding.

Tests with both series of materials were carried out at Brandon and Morden, Manitoba. Each treatment, replicated four times at each station, consisted of 200 seeds planted in a row 12 ft long. All rows were planted 9 inches apart and treatments were arranged in a randomized block design. Emergence data on barley infected with C. sativus and on flax were recorded 6-8 weeks after seeding. Disease ratings of the emerged barley plants were made at the same time by examining 100 plants from each row. The plants were rated on a 0-5 scale and the disease rating percentage was established according to the following:

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

The percentage of smutted heads, based on counts of 200 heads per row, was recorded after the crop had headed (when infection appeared to be heavy, assessments were based on 100 heads). The results are given as means of eight replicates, four from each planting site.

Results and discussion

Smut infection of untreated seed varied from 25% to 32% for wheat, and from 11% to 15% for oats (Tables 3 and 4). No barley smut developed and hence no barley smut data are recorded in the tables. Some chemicals gave very good control of the smut diseases of wheat and oats and appear to be satisfactory substitutes for mercury, e.g. BEB33, BEB14, BEB15, Vitaflo DB, Manzate D,

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Table 1. Seed treatment materials used in the cooperative test (Series A)

Treatment no.	source*	Product name	Chemical name
1		Untreated check	
2–3	Niagara	"BEB"	identity not available
4–6	Niagara	Liquid Polyram	zinc activated polyethylene thiuram disulfide (30%)
7–12	Niagara	"BEB"	identity not available
13	Ciba–Geigy	G20-072	identity not available
14	Ciba–Geigy	GS–22–182	identity not available
15–17	Ciba–Geigy	Amdal	identity not available
18	Ciba–Geigy	CGF 2480	identity not available
19	Ciba–Geigy	Maneb suspension	maneb (25%)
20–22	Ciba–Geigy	"SWF-"	identity not available
23–25	Uniroyal	Vitaflo MF–71	Vitavax + thiram
26–28	Uniroyal	V.E.L.	identity not available
29–31	Uniroyal	Vitaflo DB	Vitavax (40%)+ thiram (40%)
32–38	Nor–Am	"SN-"	identity not available
39–44	Merck	"S-"	identity not available
45–46	Gustafson	Merck 77	identity not available
47–49	Murphy	MC 833	N-(dimethyldithiocarbamoylmethyl) morpholine
50–52	Chemagro	B 1843	trans-1,2-bis(n-propylsulfonyl) ethylene (50%)
53–56	Canicon	Nicon PQ	methyl dodecyl benzl trimethyl ammonium chloride (20%) + methyl dodecyl xylenebis (trimethyl ammonium chloride) (5%) + 2,2-methylenebis (3,4,6-trichloro-phenol (4.5%) + 2 chloro –4– phenyl phenol (25%) + 5 chloro salicylanilide (0.5%)
57	Du Pont	Arasan 75	thiram (75%)
58	Ciba–Geigy	Res–Q	hexachlorobenzene (20%)+ captan (20%) + maneb (15%)
59	Nor–Am	Panogen 15B	methylmercuric dicyandiamide (3.7 oz/gal)
60		Untreated check	

* Niagara Chemicals, Burlington, Ontario; Ciba–Geigy Canada Ltd., Montréal, Québec; Uniroyal Ltd., Elmira, Ontario; Nor–Am Agricultural Products, Inc., Woodstock, Illinois; Merck & Co., Inc., Rahway, New Jersey; Gustafson Manufacturing Inc., Hopkins, Minnesota; Murphy Chemical Ltd., Wheathampsted, St. Albans, Hertfordshire, England; Chemagro Corporation, Kansas City, Missouri; Canicon Chemicals Ltd., Downsview, Ontario; E.I. Du Pont de Nemours & Co., Inc., Wilmington, Delaware.

the Tersan and Arasan mixture, L205, and all TF–formulations. The barley seed used for the seedling blight test had a low weight per bushel which seems to account for the low emergence (30% to 54% in the untreated checks). Seed treatment did little to reduce seedling blight of barley. Emergence of the untreated flax ranged from 50% to 56%, but in general the flax emergence was not increased by seed treatment, again showing that flax does not respond to seed treatment when soil moisture is plentiful or when the seed coat has no fractures.

Acknowledgments

I wish to thank the representatives of the chemical industry for their cooperation and the staffs of the Morden and Brandon Research Stations for their assistance in organizing plot tests.

Table 2. Seed treatment materials used in the cooperative test (Series B)

Treatment no.	Source*	Product name	Chemical name
61		Untreated check	
62	DU Pont	Manzate D	maneb (80%)
63†	Du Pont	Tersan 1991 + Arasan 75	benomyl (50%) thiram (75%)
64	Olin	SD-205	pentachloronitrobenzene (20%) + 5 ethoxy-3-trichloromethyl-1, 2,4-thiadiazole (5%)
65	Olin	L-205	quintozene (pentachloronitrobenzene) (23.2%) + 5 ethoxy-3-trichloromethyl-1, 2,4-thiadiazole (5.8%)
66-70	Chipman	"TF-"	identity not available
71	Chipman	Agrox NM	maneb (37.5%)+ hexachlorobenzene (10%)
72-77	Chipman	"TF-"	identity not available
78-79	Buckman	Cosan (TCMTB)	2-(thiocyanomethylthio) benzothiazole (30%)
80-81	Rohm & Haas	RHC 338	mancozeb (25%)
82-83	Rohm & Haas	Dithane M45	zinc coordinated mancozeb
84	Olin	Terra-Coat 24Q	quintozene (pentachloronitrobenzene) (24%)
85	BASF	3191-F	2,5-dimethyl-3-furylanilide
86	BASF	3260-F	identity not available
87		Untreated check	

* E.I. Du Pont de Nemours & Co., Inc., Wilmington, Delaware; Olin Agricultural Division, Little Rock, Arkansas; Chipman Chemicals Ltd., Hamilton, Ontario; Buckman Laboratories, Inc., Memphis, Tennessee; Rohm & Haas Co. of Canada Ltd., West Hill, Ontario; BASF Canada Ltd., Montréal, Québec.

† In treatment 63 the seed was treated twice, once with each fungicide at the rates indicated in Table 4.

Table 3. Results of cooperative seed treatment trials (Series A)*

Treatment no.	Product name	Formulation**	Dosage (oz/bu) (ml/bu)	Smutted heads (%) Wheat	Smutted heads (%) Oats	Barley seedling blight Emergence (%)	Barley seedling blight Disease rating (%)	Flax Dosage (oz/bu) (ml/bu)	Flax Emergence (%)
1	Untreated check			25.24	13.68	53.1	21.5		56.2
2	BEB 33	L	4.00 oz	1.40	0.37	52.4	22.5	4.00 oz	41.4
3	BEB 33		5.00	0.00	0.11	56.7	23.8	5.00	61.1
4	Polyram 30%	SU	1.50	0.26	8.91	53.0	22.8	1.50	51.6
5	Polyram 30%		2.00	0.50	6.84	40.9	22.4	2.00	54.8
6	Polyram 30%		3.00	0.00	2.22	55.7	20.1	3.00	60.0
7	BEB 14	D	1.50	0.04	0.00	52.1	24.6	1.50	51.2
8	BEB 14		3.00	0.80	0.00	49.8	18.4	3.00	50.9
9	BEB 14		4.00	0.00	0.00	52.6	22.2	4.00	50.1
10	BEB 15	D	1.00	0.22	0.04	54.9	21.4	1.00	49.9
11	BEB 15		2.00	0.06	0.00	54.6	23.4	2.00	56.4
12	BEB 15		3.00	0.00	0.05	46.1	23.4	3.00	53.1
13	G20-072	WP	2.00	10.30	0.76	53.1	22.4	2.00	52.8
14	GS 22-182	SL	2.00	1.15	0.40	56.2	21.7	2.00	61.2
15	Amdal 2000	L	1.00	4.07	4.38	53.9	22.6	1.00	59.1
16	Amdal 2001	L	1.00	0.28	0.00	56.5	22.0	1.00	57.9
17	Amdal 2003	L	1.00	0.36	0.00	40.9	23.5	1.00	58.2

Table 3 (Cont'd.)

Treatment no.	Product name	Formulation**	Dosage (oz/bu) (ml/bu)	Smutted heads (%) Wheat	Oats	Barley seedling blight Emergence (%)	Disease rating (%)	Flax Dosage (oz/bu) (ml/bu)	Emergence (%)
18	CGF 2480	L	4.00	7.67	8.02	39.9	23.3	4.00	56.3
19	Maneb susp.	SU	3.00	0.50	0.52	53.1	20.8	3.00	52.2
20	SWF 2330	SL	1.00	0.09				4.00	52.2
			2.00		2.77	53.2	21.4		
21	SWF 2470	SL	1.25	0.04				5.00	51.6
			2.50		1.83	46.9	25.5		
22	SWF 2350	D	1.00	1.59				4.00	59.8
			2.00		0.42	58.4	20.5		
23	Vitaflo MF 71	SU	2.50	0.66	0.22	47.1	20.3	3.00	56.9
24	Vitaflo MF 71		2.66	0.93	0.00	44.5	20.7	3.50	50.1
25	Vitaflo MF 71		3.00	1.16	0.13	52.4	24.6	4.00	51.3
26	V.E.L.	SU	2.50	0.33	0.00	48.1	25.5	3.00	43.3
27	V.E.L.		2.66	1.30	0.00	51.0	20.0	3.50	53.6
28	V.E.L.		3.00	0.94	0.00	49.4	22.8	4.00	54.9
29	Vitaflo DB	D	1.50	0.26	0.00	46.8	25.2	2.50	61.2
30	Vitaflo DB		2.00	0.34	0.00	41.9	23.4	3.00	53.4
31	Vitaflo DB		2.50	0.69	0.00	44.7	26.1	3.50	58.1
32	SN 42851	WP	0.50	4.96	0.04	40.0	21.4	1.00	54.6
33	SN 42851		1.00	2.37	0.00	43.3	20.3	2.00	51.8
34	SN 43396	WP	0.50	25.63	0.20	50.4	22.2	1.00	40.6
35	SN 43396		1.00	14.95	0.06	42.7	24.8	2.00	45.2
36	SN 11139	WP	1.00	11.34	10.59	39.4	16.9	1.00	42.0
37	SN 11139		2.00	7.32	10.03	35.7	21.4	2.00	44.8
38	SN 11139		4.00	2.92	7.69	29.2	18.7	4.00	38.1
39	S-8	L	15 ml	10.00	0.24	45.4	21.5	15 ml	45.4
40	S-8		30 ml	3.77	0.00	51.1	20.5	30 ml	48.9
41	S-8		60 ml	2.08	0.00	39.9	18.9	60 ml	40.9
42	S-9	L	15 ml	3.39	0.17	37.8	16.6	15 ml	49.4
43	S-9		30 ml	1.83	0.00	48.4	19.2	30 ml	44.2
44	s-9		60 ml	0.95	0.00	44.1	20.7	60 ml	44.0
45	5-77	L	2.00 oz	3.78	0.00	40.0	21.7	2.00 oz	45.8
46	s-77		4.00	0.46	0.04	35.9	20.8	4.00	38.1
47	MC 833 (25%WP)	WP	3.00	6.53	0.00	37.5	21.6	3.00	46.4
48	MC 833 (25%WP)		6.00	1.81	0.05	36.1	23.0	6.00	45.7
49	MC 833 (75%)	D	1.00	14.31	4.57	35.1	17.5	2.00	50.3
50	B1843 (50%WP)	WP	0.50	8.78	0.44	37.9	18.8	0.50	55.6
51	B1843 (50%WP)		1.00	3.71	0.48	45.5	19.2	1.00	48.6
52	B1843 (50%WP)		2.00	1.48	0.34	43.3	23.4	2.00	55.6
53	Nicon PQ (400 ppm)	L	15 ml	23.89	13.37	32.7	17.6	15 ml	54.6
54	Nicon PQ (400 ppm)		75 ml	16.85	14.62	32.2	19.7	75 ml	58.6
55	Nicon PQ (400 ppm)		150 ml	20.11	15.65	26.4	19.5	150 ml	50.1
56	Nicon PQ (400 ppm)		750 ml	20.25	12.88	31.1	18.7	750 ml	48.2
57	Arasan 75	WP	1.30 oz	1.40	0.55	38.9	24.1	2.00 oz	55.0
58	Res-Q	D	1.00	0.00	1.80	36.2	21.1	2.00	61.1
59	Panogen 15B	L	0.75	0.00	0.00	37.2	23.9	1.50	67.4
60	Untreated check			32.01	10.93	54.0	20.2		54.9

* Means of tests at Brandon and Morden.

** Formulation code: L = liquid; SU = suspension; D = dust; SL = slurry; WP = wettable powder.

Table 4. Results of cooperative seed treatment trials (Series B)*

Treatment no.	Product name	Formulation**	Dosage (oz/bu) (ml/bu)	Smutted heads (%) Wheat	Smutted heads (%) Oats	Barley seedling blight Emergence (%)	Barley seedling blight Disease rating (%)	Flax Dosage (oz/bu) (ml/bu)	Flax Emergence (%)
61	Untreated check			28.69	15.17	51.5	14.0		49.8
62	Manzate D	D	2.00	0.05	0.00	41.6	9.9	4.00	57.6
63	Tersan 1991 and Arasan 75	WP D	3.30 1.30	0.00	0.04	42.2	16.3		
64	SD-205	D	2.00	0.36	3.45	52.7	14.2	2.0	47.7
65	L-205	L	2.00	0.00	0.81	53.0	12.8	2.0	49.8
66	TF-3087	WP	2.00	0.31	0.90	51.8	10.6	2.0	53.7
67	TF-3088	WP	1.00	0.27				2.0	51.4
68	TF-3088		2.00	0.04	0.40	54.4	9.7		
69	TF-3089	WP	1.00	0.11				2.0	54.9
			2.00		0.00	44.4	11.6		
70	TF-3120	WP	1.00	0.00				2.0	55.2
			2.00		0.00	41.6	10.1		
71	Agrox NM	WP	1.00	0.00				2.0	52.6
			2.00		0.50	43.9	10.7		
72	TF-3088	SL(a)	1.00	0.23				2.0	52.6
			2.00		0.63	36.6	12.3		
73	TF-3088	SL(b)	1.00	0.62				2.0	55.7
			2.00		0.00	38.3	11.0		
74	TF-3089		1.00	0.04				2.0	52.7
			2.00		0.04	41.7	11.0		
75	TF-3089	SL(b)	1.00	0.34				2.0	48.7
			2.00		0.00	38.3	10.4		
76	TF-3091	D	2.00	5.13					
77	TF-3090	D	2.00	0.00	0.04	39.9	10.0	2.0	60.1
78	Cosan (TCMTB)	L	0.75	1.08	0.04	37.9	14.8	0.75	48.4
79	Cosan (TCMTB)		1.00	1.36				1.50	48.1
			1.50		0.00	36.0	14.1		
80	RHC 338	SL	1.00	1.52	7.81	36.0	13.5	1.00	52.9
81	RHC 338	SL	2.00	0.85	5.73	34.1	12.0	2.00	44.4
82	Dithane M45	D	1.00	0.00	1.15	35.6	10.8	1.00	59.7
83	Dithane M45		2.00	0.03	0.04	39.2	11.1	2.00	51.7
84	LT2	L	2.00	0.22	0.83	28.7	13.9	2.00	49.4
85	3191-F	D	1.00	0.07				2.00	51.7
			2.00		0.00	33.1	11.4		
86	3260-F	D	1.00	0.25				2.00	53.4
			2.00		0.05	32.8	11.9		
87	Untreated check			26.00	11.21	30.9	11.5		55.9

* Means of tests at Brandon and Morden.

** Formulation code: D = dust; WP = wettable powder; SL = slurry; L = liquid; (a) = water slurry; (b) = glycol slurry.