CONTROL OF ROOT DISEASE IN PEAS ON IRRIGATED LAND BY SEED TREATMENT

F. R. Harper [1]

Abstract

The effect of seed treatment with seven fungicides on emergence, yield, and root rot of peas (Pisum sativum L.) was determined on irrigated land. Emergence and yield were significantly greater from treated than from untreated seed. Results were generally better for peas treated with captan, Hercules 3944X, Bayer 47531, and HRS 1591B than for those treated with thiram, dichlone, and Chemagro 4497. Severity of root rot was essentially unaffected by seed treatment.

Introduction

Seedling and root diseases cause severe damage to peas (1, 4, 5). In southern Alberta Pythium is the important pathogen of pea seedlings, whereas Fusarium, Pythium, and Rhizoctonia are the important root pathogens of older plants (4). In 1964 and 1965 several registered and experimental fungicides were evaluated as seed treatments for their effect on peas on irrigated land in this area. The results are given here.

Materials and methods

The fungicides tested were 65% captan, 75% thiram, 50% dichlone, Bayer 47531 (70% N'-(dichlorofluoromethylthio)-N, N-dimethyl-N'-phenylsulphamide)[2], Chemagro 4497 (50% of a halogenated sulfur-containing aliphatic product of undisclosed formula)[2], HRS 1591B (ethylenebis(tetrahydrothiophenonium)-dibisulfate)[3], and Hercules 3944X (30% 5-chloro-4-phenyl-1, 2-dithiol-3-one + 40% captan + 20% hexachlorobenzene)[4]. Pea seeds were treated in bulk and subdivided for sowing. The fungicides were applied as slurries at the lowest and highest rates recommended by the manufacturer.

Experiments were conducted each year at Taber, Alberta, on land abandoned for commercial production of peas because of severe root rot, and at the Canada Department of Agriculture Research Station, Lethbridge, Alberta, on land cropped with peas each year since 1960. 'Early Sweet 11' peas were sown at 160 seeds/row in randomized blocks with 6 replicates. Plots were single 20-foot rows, 1 foot apart. Each replicate contained two untreated plots and one plot of each treatment.

Emergence counts were taken 3 weeks after sowing. Yield was expressed as fresh weight of plants per row at processing maturity (about 60 days after sowing). Root rot was estimated at the same time on a 0 to 5 scale using 50 plants per treated row in each of 6 replicates in 1964 and 2 replicates in 1965. In this rating 0 denoted no root rot and 5 a dead plant.

Differences among treatments were evaluated by Duncan's multiple range test (2).

Results

Emergence counts of 'Early Sweet 11' peas were greater ($P<0.01$) from seed treated with fungicides than from untreated seed (Table 1). In all three tests where there were statistically significant differences in emergence among the treated plots, captan at 3 and 6 ounces and Hercules 3944X at 2 and 4 ounces were the most effective fungicides. In the 1964 test where there were statistically significant differences in emergence among treated plots, Bayer 47531 at 6 ounces and thiram at 4 ounces were among the most effective fungicides. In the 1965 experiments HRS 1591B at 2 and 5 ounces was among the most effective fungicides in both tests. Dichlone at 4 ounces and Chemagro 4497 at 2 ounces were among the most effective fungicides only in one of the two tests in 1965.

Yield of peas from treated seed was higher ($P<0.05$) than from untreated seed (Table 2). Generally the treatments with the highest emergence counts also had the highest yields. The treatments with the lowest emergence in each experiment had the lowest yield.

Emergence and yield in 1964 for peas treated with Bayer 47531 and thiram generally confirm those for 1963 reported previously (4).

Severity of root rot in untreated peas from the 4 experiments was as follows:-

Location	1964	1965
Taber	4.11	3.76
Lethbridge	3.64	3.60

There was no appreciable differences in severity of root rot between treated and untreated peas except at Lethbridge in 1964 when there was less ($P<0.01$) root rot in peas treated with captan and Bayer 47531 at 6 ounces than in the untreated peas,

Phytotoxicity to peas was not encountered with any of the seven fungicides in these experiments.

---

[1] Plant Pathologist, Canada Agriculture Research Station, Lethbridge, Alberta.

[2] Chemagro Corp., Kansas City, Mo.

[3] Hooker Chemical Corp., Niagara Falls, N. Y.

[4] Hercules Powder Co., Wilmington, Del.

Table 1. Emergence of 'Early Sweet 11' peas following seed treatment.

Seed treatment	Rate oz/cwt	Emergence, %[1]			
		Taber		Lethbridge	
		1964	1965	1964	1965
Captan, 65%	3.0	85.5a[2]	94.2a	87.7ab	92.1abc
	6.0	88.9a	94.0a	93.8a	93.8ab
Bayer 47531	1.0	79.4a		84.5bc	
	6.0	90.3a		93.3a	
Hercules 3944X	2.0	87.7a	91.5ab	88.8ab	91.7abc
	4.0	88.2a	94.1a	91.8a	95.1a
Thiram, 75%	2.0	76.8a		78.2c	
	4.0	83.2a		90.1ab	
HRS 1591B	2.0		89.5ab		94.9a
	5.0		94.3a		94.7a
Dichlone, 50%	2.0		84.8b		86.6cd
	4.0		89.1ab		88.5bc
Chemagro 4497	0.5		64.7c		79.8d
	2.0		85.3b		91.9abc
Untreated	-	37.8b	14.3d	21.7d	49.0e
	-	29.Ob	14.9d	19.4d	52.9e

1 Mean of 6 replicates.

2 Means in each column followed by the same letter do not differ from each other at P = 0.01

Discussion

Seed treatment protected germinating peas from seed rot and seedling blight but was not effective in controlling root rot of older plants. Yields were related to emergence but not to root rot. McCallan (6) and Cruikshank (1) also reported no reduction in root rot of peas by seed treatment. At present there appears to be no practical chemical control of pea root rot although Lockwood (5) and Haglund (3) have reported a reduction of root-rot severity by soil application of fungicides in the greenhouse.

Table 2. Fresh weight of plants at harvest of 'Early Sweet 11' peas following seed treatment.

Seed treatment	Rate oz/cwt	Yield/row, g[1] Taber 1964	Taber 1965	Lethbridge 1964	Lethbridge 1965
Captan, 65%	3.0	1102ab[2]	2152ab	1591ab	1214ab
	6.0	1138ab	2321a	1641ab	1157ab
Bayer 47531	1.0	999ab		1616ab	
	6.0	1256a		1772a	
Hercules 3944X	2.0	1265a	1867ab	1546ab	1086ab
	4.0	1124ab	1913ab	1501b	1130ab
Thiram, 75%	2.0	940b		1483b	
	4.0	1214ab		1591ab	
HRS 1591B	2.0		2053ab		1198ab
	5.0		1966ab		1253a
Dichlone, 50%	2.0		1947ab		1108ab
	4.0		2078ab		1196ab
Chemagro 4497	0.5		1717b		1034b
	2.0		2112ab		1142ab
Untreated	-	426c	358c	405c	552c
	-	298c	342c	352c	620c

1 Mean of 6 replicates.

2 Means in each column followed by the same letter do not differ from each other at P = 0.05.

literature cited

1. Cruikshank, I. A. M. 1951. Fusarium-foot-rot of peas in New Zealand. N. Zealand J. Sci. and Technol. A 33 (3): 62-65.
2. Duncan, D. B. 1955. Multiple range and multiple F tests. Biometrics 11: 1-42.
3. Haglund, W. A. 1965. Greenhouse evaluations of soil fungicides for the control of pea root rot. Plant Disease Reptr. 49: 793-796.
4. Harper, F. R. 1964. Control of root disease in peas by seed treatment in southern Alberta. Can. J. Plant Sci. 44: 531-537.
5. Lockwood, J. L. 1961. Soil fungicides for control of pea root rot in greenhouse tests. Plant Disease Reptr. 45: 569-571.
6. McCallan, S. E. A. 1947. The pea-seed-treatment method of evaluating fungicides in the greenhouse. Phytopathology 37: 15.