CONTROL OF RHIZOCTONIA STEM CANKER IN POTATO

L.V. Edgington and L.V. Busch[1]

Abstract

Two isomers of the oxathiin systemic fungicides were evaluated for control of rhizoctonia on potato in field tests. Chemicals were applied as 10 percent dust on seed pieces and as 5 percent granules in the furrow. The best control was obtained with F461, the sulfone isomer. The most effective method of application was as a dust on seed pieces.

Introduction

The fungus, Rhizoctonia solani Kühn, infects the young germinating shoots of potato, frequently girdling them and causing delayed emergence and "skips". The resulting poor stands are of considerable concern to the growers. The pathogen also attacks roots, rhizomes and tubers and probably causes greater losses than generally realized.

Although many fungicides have been evaluated and several proposed for the control of stem canker on potato, no chemical has attained widespread acceptance. The oxathiin fungicides, which are systemic in plants and toxic to R. solani (1, 2), offer promise of control. Consequently, we evaluated these new fungicides in field plot tests.

Materials and methods

Two isomers of the oxathiins were evaluated: D735, 2, 3 dihydro-5-carboxanilido-6-methyl 1, 4 oxathiin; and F461, 2, 3 dihydro-5-carboxanilido-6-methyl 1, 4 oxathiin 4, 4-dioxide. Each compound was tested as a 10 percent dust applied to the seed pieces at the rate of 1 lb. per 100 lb. of potatoes. The actual amount of compound used for eighteen seed pieces planted in 15-foot rows was 2.3 g. As the rows were three feet apart this could be equivalent to about 4.7 lb. actual chemical per acre. Each compound was also used as a 5 percent granular compound applied in the furrow at planting at the rate of 20 lb. actual chemical per acre, or 187 g of the granules (9.4 actual) per 15 foot row.

Three isolates of R. solani obtained from potatoes, were grown individually on autoclaved wheat, the inoculum then dried, ground and applied to the furrows immediately before planting the seed pieces. Each of the isolates, designated R-90, R-6, and R-112, was placed in a separate row in each plot. Seed pieces of the potato, variety 'Cherokee', were planted by hand May 30 in the open furrow and immediately covered by means of a rake. Seed pieces for the rows inoculated with R-90 were planted twice as close as the others to permit the removal of alternate plants for the rating of stem cankers.

The disease was rated when plants were about 4 inches in height on a scale of 0–4 with 0 representing no cankers present and 4 where the shoot was killed. Each shoot from a plant was scored and the mean canker index for each row calculated. The alternate plants from the row inoculated with the R-90 isolate and all of the plants from the row inoculated with the R-112 isolate were dug and the disease rated.

The plots were harvested October 13, graded to 'Canada #1 standards and a 20-tuber sample from each plot washed and rated for black scurf, the sclerotial bodies of R. solani on potato tubers.

Results

Table 1 shows the canker index and the number of shoots per seed piece. Isolate R-112 was much more pathogenic than R-90 and caused moderate to severe cankers on untreated check plants. Treatment of seed pieces with the 10 percent dust formulation of the chemicals, particularly F461, caused a significant reduction in the canker index. Shoots arising from seed 'pieces treated with F461 were virtually all free of cankers. The chemicals, applied as 5 percent active granules in the soil, did not give effective control of disease.

Treatment of the seed pieces with the chemicals, particularly F461, caused a marked increase in the number of shoots arising from each seed piece. The chemicals applied as soil granules did not cause an increase in the number of shoots. The vigor of individual shoots, as indicated by thickness of the stem, was decreased with the stimulation in the number of shoots per seed piece.

Some phytotoxicity was apparent during the early part of the growing season where F461 was applied as granules in the soil. Plants in these plots were slightly stunted and the leaves were smaller than normal.

No significant differences were observed in either yield or amount of scurf on harvested tubers with any of the treatments.

Discussion

While F461 is less fungitoxic than D735 (1), it is more effective, possibly because D735 might be adsorbed or decomposed in the, soil.

The method of application of the fungicides is very important. Seed treatment proved to be super-

[1] Associate Professors, Department of Botany, University of Guelph, Guelph, Ontario.

Table 1. Effect of oxathiin fungicides on stem canker and number of shoots per potato seed piece.

Treatment	Stem Canker[a] Index		Shoots per seed piece	
	R-90	R-112	R-90	R-112
	(Fungal isolate)			
Check	0.8	2.2	3.3	3.9
D735 Seed Dust	0.7	0.8	5.0	5.2
F461 Seed Dust	0.2	0.4	6.6	6.6
D735 Soil Granules	1.4	1.2	3.7	3.6
F461 Soil Granules	0.7	0.8	3.8	3.8
L.S.D. 19:1	0.2	0.9	0.5	0.9

[a] Stem cankers were rated on a scale of 0 to 4 with 0 = no disease, 1 = mild cankers, 2 = moderate cankers, 3 = severe cankers, and 4 = shoot killed.

ior to granular application in furrows. Even though about 4 times the amount of active chemical was applied per acre by granular application to soil than by seed treatment, the best disease control with both materials resulted from the latter method. Furthermore, the higher concentration applied as granules caused some phytotoxicity. Apparently, the seed treatment permits rapid contact with the emerging roots and shoots and results in a rapid uptake of the chemical at the stage when infection is occurring.

The increase in the number of shoots per seed piece is probably due to an inhibition of apical dominance of the initial buds. We doubt whether this physiological effect is causally related to the reduction in the canker index. The oxathiins are known to be fungitoxic to R. solani.

The harvested plots did not exhibit severe disease resulting in a reduction in yield. Hence, we cannot measure the attributes of the treatments in terms of yield.

Literature cited

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