University of Idaho
College of Agriculture
Cooperative Extension Service
Agricultural Experiment Station

Current Information Series No. 381
March 1977

Rhizoctonia Disease Of Potato And Its Control

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Growers have expressed much concern over rhizoctonia disease of potato. This disease is caused by *Rhizoctonia solani*, a soilborne fungus. The causal organism survives in soil saprophytically (lives on dead tissue) from year to year and may also survive on seed surfaces as compacted masses of fungus cells called sclerotia. Sclerotia appear as small black bodies on the surface of potato tubers. These sclerotia are pathogenic and can produce all of the symptoms on potato that are produced by soilborne inoculum. Sclerotia on potato seed frequently provide a greater source of infection than soilborne inoculum.

The growing tips of sprouts are particularly susceptible to *R. solani* infection and may be killed before emergence from the soil. In severe cases, a potato stand can be reduced. Lesions that are reddish-brown in appearance occur on underground stems and stolons. Symptom severity may vary from superficial lesion development to a complete cut-off of stems and stolons. Since the plant becomes increasingly more resistant with maturity, the effects of the disease are generally more important before emergence than after. Severe infection of underground stems may restrict the downward movement of carbohydrates. As a result of this restriction, aerial tubers may develop. With severe disease development, plants may be stunted and apical leaves may have a pinched, rosette shape and appear purple in color. Because of the striking effects that commonly appear on below-ground parts, concern is understandable.

Control and Disease Suppression

Chemical control of rhizoctonia in Idaho has generally produced no significant yield increases. Results suggest either that rhizoctonia has no appreciable effect on potato yield or that the effects on yield are too low to be measured by conventional methods. Table 1 shows yield changes in 10 field experiments. A high level of disease control was achieved with all tests. Several methods of disease control have been used and all have provided significant disease suppression, but none have provided consistent yield benefits.

This apparent lack of yield benefit may be attributed to an increase of stolons, resulting in more but smaller potatoes under the hill. This relationship may be likened to fruit thinning. If tree fruits are not thinned, the desirable larger size is generally not obtained. Rhizoctonia disease can do an excellent job of thinning potatoes below ground and because of this, in some cases, tubers are larger. Although stem infection and lesions may be extensive on the surface, the fungus frequently fails to penetrate deep enough to cut through conducting tissues. In most instances, the fungus causes no appreciable loss of stem function.

In addition to chemical control, proper crop management may decrease disease and the use of clean potato seed (free of seedborne inoculum) may significantly reduce infection.

Crop Management

Good cultural practices should be followed. A potato crop should be preceded by cereal crops — barley, wheat, corn — and not by sugarbeets, alfalfa or legume pasture crops. Rhizoctonia disease thrives when conditions are unfavorable for plant emergence. To reduce conditions that favor the disease, farmers should pay close attention to irrigation and tillage. Avoid soil compaction and irrigation practices leading to ponding of water. Shallow planting followed by gradual "hilling up" is also recommended. This speeds emergence and reduces damage.

Potato Seed

If there is a choice between clean seed and *Rhizoctonia*-infested seed, the cleanest seed should be purchased. Use of a seedpiece treatment capable of controlling seedborne inoculum (sclerotia) would be highly desirable. University of Idaho research has shown certain seedpiece treatments to

Table 1. Effect of PCNB on Potato Yield (Russet Burbank).

Year of test	Location	% Yield change with PCNB treatment when compared with untreated plots[1]			
		Total yield		Smooth tubers > 4 oz	
		Increase	Decrease	Increase	Decrease
1970	Rising River	17.1	-	11.9	-
1970	Idaho Falls	-	11.3	3.2	-
1970	Blackfoot	2.7	-	26.0*	-
1971	Rising River	-	3.5	-	7.0
1971	Raft River	4.3	-	18.3	-
1972	Raft River	-	1.0	-	4.7
1972	Rising River	12.4	-	8.9	-
1973	Blackfoot	-	2.0	-	1.5
1973	Fort Hall	8.6*	-	2.4	-
1974	Aberdeen	-	1.0	-	3.9

[1] Percentage yield changes are not significant at the 95% probability level unless followed by a star (*).

be effective for rhizoctonia control, but all treatments either are not registered for use, are impractical for large scale commercial use, are too expensive, or require more research before a recommendation can be made.

Pentachloronitrobenzene (PCNB)

Rhizoctonia may be controlled with a preplant treatment of PCNB which is sold under the brand name Terraclor. In addition to rhizoctonia control, PCNB also provides the added advantage of controlling common scab *(Streptomyces scabies).* Our results* have consistently demonstrated from year to year and site to site that excellent disease control may be achieved with this product. When applied by broadcast application, PCNB is effective with rates ranging from 18 to 25 pounds active ingredient (a.i.) per acre. However, equivalent disease control may also be achieved at less cost when PCNB is applied as an 18-inch band over the seedbed area. The label recommendation for banding is 10 pounds a.i. PCNB per 12,400 linear feet of row at 36-inch spacing.

The possible disadvantage of this technique is the requirement for special equipment. Band application is done by proper spray equipment attached to the front of a rototiller. Spray nozzles on the front of the rototiller are adjusted to provide treatment in 18-inch bands over seedbed areas. The rototiller is then able to incorporate PCNB to a depth of 5 or 6 inches while bed shapers behind the rototiller shape the seedbed with simultaneous marking of rows. Potatoes are then planted in the beds. Bed shapers must be used when applying band applications.

* Davis, J.R., M. D. Groskopp, and R. H. Callihan, 1971. Seed and soil treatments for control of rhizoctonia on stems and stolons of potato. Plant Disease Reporter 55(6):550-554

Problems with PCNB Application

On occasion, problems have occurred with this product. Lack of satisfactory control with PCNB soil treatment may frequently be traced to inadequate incorporation:

1. **Wrong Implements.** PCNB must be thoroughly incorporated into soil. Incorporation with the planter, hilling disc, harrows, rippers or other such devices is not acceptable for this purpose. The chemical must be incorporated with a rototiller or by cross discing to a depth of 8 to 10 inches. Our studies have shown no difference between rototiller incorporation and cross-disc incorporation.

2. **Wrong Soil Preparation.** PCNB is most uniformly incorporated when applied on a flat surface. Application over furrowed land is not acceptable.

Fall Application vs. Spring Application

All University of Idaho tests with PCNB to date have involved spring application, so statements regarding effectiveness of this material are based on results of spring treatments. Although disease control with fall application may be possible, the risk of losing effectiveness is greater. PCNB is broken down in the soil by microbial action. Under conditions of moderate soil temperature, the half-life (time required for half of the chemical to decompose) generally approximates 6 weeks.

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