

**Progress Report to the Agriculture Research Foundation  
Oregon Potato Commission  
1996-1997**

**Title:** Seed piece treatments for suppression of potato late blight

**Project Leader:**

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**Funding History:**

Funding for 1995-96; 12,000 this donor

**Objectives:**

1. evaluate the efficacy of Section 18 fungicides applied to seed tubers for protection of developing sprouts from tuberborne inoculum of *Phytophthora infestans*.
2. evaluate the efficacy of Section 18 fungicides applied as a seed treatment for protection of emerging sprouts from infection by airborne inoculum of *P. infestans*.

**Significant Accomplishments:**

1. Seed piece treatment with DPX-T3217 (50% cymoxanil), and the Section 18 fungicides, Curzate M-8, Tattoo C, and Acrobat MZ, increased sprout emergence from tubers inoculated with *P. infestans*. This is the first report that Section 18 fungicides can be effective as a seed piece treatment for the control of tuberborne late blight. Our findings may be useful to chemical companies in development of a fungicide seed treatment protocol.
2. Seed piece treatment with Section 18 fungicides did not protect the emerging sprouts of Shepody and Russet Burbank potatoes from airborne inoculum of *P. infestans*. These two potato varieties are known to differ in susceptibility to late blight and this was apparent as early as two weeks after emergence.

**Procedures:**

1. Greenhouse experiment.

In December 1996, potato tubers of the varieties, Shepody and Russet Burbank, were rinsed under tap water to remove adhering soil. Melon ball-sized seed pieces were scooped from tubers and stored in moist vermiculite for 7 days. Seed pieces were then soaked in either a fungicide solution or distilled water for 15 min. Fungicide treatments were DPX-T3217 (50% cymoxanil), Curzate M-8, Tattoo C, Acrobat MZ at rates of 1000 and 10,000 ppm active ingredient. After soaking, seed pieces were air dried at least 2 hr before inoculation with *P. infestans*.

Inoculum of *Phytophthora infestans* (genotype US-8) was grown on plates of rye agar at 18 C for 2 wk. Plates were washed with sterile, distilled water to dislodge sporangia. The sporangial suspension was kept at 4 C for 2 hr to encourage zoospore release.

Seed pieces were stabbed with a 200 ml pipet tip and then inoculated with 50 ml of the sporangial suspension (2000 sporangia/ml) of *P. infestans* or distilled water for the control. After inoculation, seed pieces were planted in 24 oz waxed paper cups lined with plastic bags. Cups were filled with a steam pasteurized mixture of soil, peat and pumice (1:1:1). Drainage holes were provided. One seed piece was placed in each cup and covered with 3 cm of the soil mix. Treatments were arranged in a randomized block design and replicated two times. Each experimental unit had 10 seed pieces. Cups were watered daily. Four weeks from planting, plants were evaluated for sprout emergence. Percent emergence was calculated from the 10 seed pieces of each replicate for each treatment.

A preliminary experiment of a single replication was performed in the spring of 1996 using only Russet Burbank tubers and following the same protocol as above.

## 2. Field experiment.

Seed tubers of Russet Burbank and Shepody were kept in cold storage until the end of July. At that time, healthy tubers were selected and cut into 50-100 g seed pieces. Fungicide treatments were applied 24 hr later on 1 Aug. Seed pieces were soaked for 15 min in one of the following fungicide solutions: Curzate M-8, DPX-T3217, Tattoo C and Acrobat MZ at 3000 ppm. Half of the treated seed was then dusted with Tops 2.5G. A nontreated control and a treatment of Tops alone were also included in the study. Treatments were a 2x5 factorial combination of with and without Tops combined with Curzate, DPX-T3217, Tattoo, Acrobat and nontreated control. Seed pieces were planted at the Lewis-Brown Farm near Corvallis, OR on 2 Aug. Treatments were arranged in a randomized complete block design. Five seed pieces were planted per plot and spaced 25 cm apart in row. Rows were 3 m apart and surrounded with a border row. Dyfonate and 15-15-15 fertilizer were incorporated before planting and Sencor was applied immediately following planting. Ten days after planting, the border rows were inoculated with an aqueous suspension of *P. infestans* (genotype US-8). Individual plants were evaluated for symptoms of late blight two weeks after 50% emergence on 3 Sept. The number of lesions per plant was recorded. Data were analyzed by analysis of variance.

## Results and Discussion:

### 1. Greenhouse experiment.

The preliminary nonreplicated experiment showed with no fungicide treatment, 0% of the sprouts of inoculated seed pieces of Russet Burbank emerged compared with 100% of the noninoculated seed pieces. At 10,000 ppm ai of these fungicides, the proportion of sprouts of inoculated seed pieces that emerged was 100, 100 and 40% for Curzate, Acrobat, and Tattoo, respectively.

Similar results were obtained when the experiment was repeated with Russet Burbank and Shepody in December. At 10,000 ppm ai, the proportion of sprouts of inoculated seed pieces that emerged was 90, 82, 58 and 55% for DPX-T3217, Curzate, Acrobat and Tattoo, respectively

(Fig 1). There was a significant ( $P \leq 0.001$ ) effect of fungicide concentration on emergence. Mean emergence was 71, 29 and 8% at 10,000, 1000 and 0 ppm ai, respectively.

Sprout emergence was similar between Russet Burbank (45%) and Shepody (46%); however, a significant interaction was observed between variety and fungicide treatment (Fig 2). The proportion of seed pieces with sprout emergence was 41 % less for Shepody compared with Russet Burbank when treated with Curzate. The Shepody X Curzate overall mean was suppressed because none of the sprouts emerged from Shepody seed pieces treated with 1000 ppm Curzate. When seed pieces were treated with 10,000 ppm of Curzate, 75% of the sprouts emerged. This experiment is being repeated to determine if this interaction was an anomaly or actual varietal difference in response to a fungicide.

## 2. Field experiment.

No significant differences were observed among the fungicide treatments. The number of lesions per plant where the tubers were treated with Tops was 3.4 compared to 2.8 where no Tops was applied. All Section 18 fungicide treatments failed to protect emerging plants from late blight infection (Table 1).

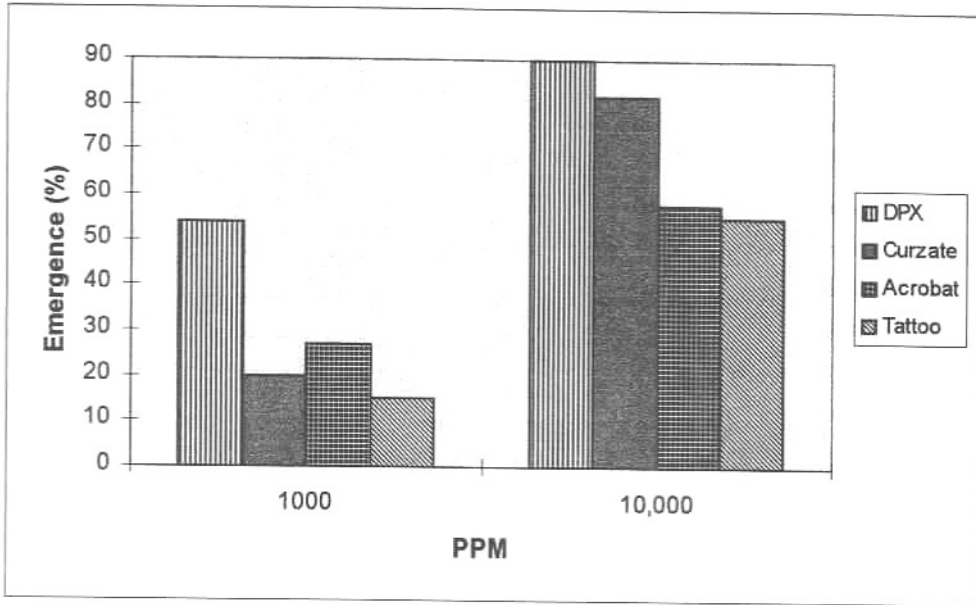
There was a significant difference between the varieties Shepody and Russet Burbank for the number of late blight lesions/plant. Shepody was more severely infected with late blight (4.2 lesions) than Russet Burbank (2 lesions). These two varieties are known to differ in their susceptibility to late blight and this was apparent as early as two weeks from emergence.

These results indicate a fungicide seed piece treatment immediately prior to planting offers no protection against late blight infection after emergence.

**Table 1.** Effect of fungicide treatment to tubers prior to planting on late blight infection with airborne inoculum

Treatment	Late blight lesions/plant
Control	3.2
DPX-T3217	3.7
Curzate	2.9
Acrobat	2.5
Tattoo	3.4

**Fig. 1.** Effect of fungicide and rate on sprout emergence of potato seed pieces inoculated with late blight.



**Fig. 2.** Effect of fungicide and variety on sprout emergence of potato seed pieces inoculated with late blight.

