

Evaluation of seed piece fungicides for control of seed-borne *Fusarium* dry rot of potatoes.



P. S. Wharton, D. Berry, and W. W. Kirk. Department of Plant Pathology, Michigan State University, East Lansing, MI 48824.

Results

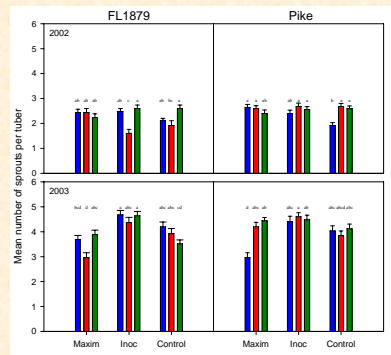


Figure 2. Mean number of developing sprouts per tuber. In 2002 for “FL1879”, there were no significant differences between treatments with means 2.12-2.6 (a), 1.92-2.48 (b), and 1.6-2.12 (c). For “Pike”, there were no significant differences between treatments with means 2.4-2.68 (a), and 1.92-2.4 (b). In 2003, There were no significant differences between treatments with means 3.84-4.68 (a), 3.68-4.48 (b), 3.52-4.36 (c), and 2.96-3.84 (d).

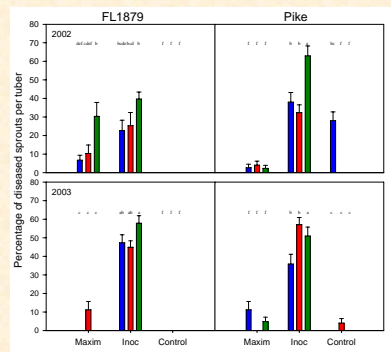


Figure 3. Percentage of diseased sprouts per tuber. In 2002, there were no significant differences between treatments with means above 63% (a), 25.3-39.7 (b), 10.3-28 (c), 6.7-25.3 (d), 4-10.3 (e), 0-10.3 (f). In 2003, there were no significant differences between treatments with means 47.3-57.1 (a), 35.9-50.9 (b), 0-11.1 (c).

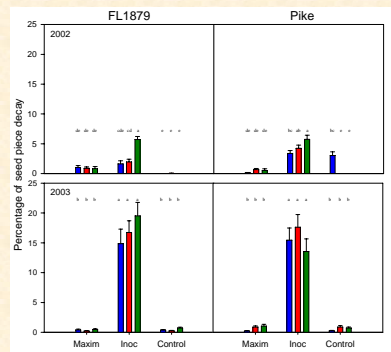


Figure 4. Percentage of seed piece decay. In 2002, there were no significant differences between treatments with means 4.24-5.72 (a), 3.04-4.24 (b), 1.64-3.4 (c), 0.68-1.64 (d), 0-0.88 (e). In 2003, there were no significant differences between treatments with means 13.52-19.52 (a), 0-1.04 (b).

Legend

- Treatment applied to seed 2 days before planting.
- Treatment applied to seed 5 days before planting.
- Treatment applied to seed 10 days before planting.

Maxim: Maxim® fungicide seed treatment; Inoc: Seed inoculated but not treated; Control: Seed non-inoculated, untreated



Figure 1. (A) Potato seed piece (cv. FL1879) inoculated with *Fusarium sambucinum* and treated with Maxim fungicide seed treatment 2 days before planting (DBP). (B) Potato seed piece inoculated with *F. sambucinum* but not treated with fungicide 2 DBP. (C) Potato seed piece not inoculated or treated with fungicide 2 DBP. Note that the fungicide treated seed (A) has as many healthy sprouts as the non-inoculated control (C).

Introduction

Fusarium dry rot caused by *Fusarium sambucinum* Fuckel (tel. Giberella pulicaris), is one of the most important diseases of potato (*Solanum tuberosum* L.), affecting immature plants after planting and tubers in storage. Dry rot infection occurs mainly through wounds produced during harvest and transportation and the first symptom of infection is usually a dark depression on the surface of the tuber. Control of dry rot has traditionally been achieved by postharvest application of benzimidazole fungicides. However, many strains of *F. sambucinum* have become resistant to the benzimidazole fungicides resulting in poor control of dry rot. The objectives of this investigation were to evaluate the effectiveness of fungicidal seed treatments at various times prior to planting for the control of seed-borne dry rot.

Materials and Methods

- Experiments were carried out in 2002 and 2003 with potato cultivars, “Pike” and “FL1879”.
- Potato seed tubers were cut, inoculated with *F. sambucinum* (isolate ATTC S602) and treated with fungicidal seed treatment Maxim® MZ (a.i. 0.5% Fludioxonil + 5.7% Mancozeb) 2, 5 and 10 days before planting (DBP).
- Controls in which potato seed were cut but not inoculated, and inoculated but not treated were included at each cutting time.
- *Fusarium sambucinum* cultures were grown on PDA for 14 days prior to inoculation.
- Seed pieces (160/treatment) were sprayed with 200 ml of conidial suspension (1×10^5 conidia ml⁻¹), to give a final dosage of about 1 ml per tuber.
- Seed was planted at the MSU Montcalm Potato Research Farm in single-row by 9 m plots (ca. 22 cm between plants) replicated four times in a randomized complete block design.
- Treatments were evaluated by incubating non-planted samples (n=25) at 8°C (95% RH) in controlled environment chambers for 14 days and then evaluating the total number of healthy and diseased sprouts, and percentage of seed piece decay.
- The final plant stand, rate of emergence and rate of canopy closure (RAUCCC) and yield were also measured.
- Data from each year was analyzed separately using four way analysis of variance for all combinations of treatments common to the two cultivars using JMP (SAS Institute, Cary, NC).
- Treatment means were compared using the Tukey Multiple Comparison test in JMP (P = 0.05).

Conclusions

The incidence of dry rot was higher in 2003 than in 2002. Treatment of seed pieces with Maxim at 2, 5, or 10 DBP significantly reduced the percentage of diseased sprouts and seed piece decay, and fungicide treatments were not significantly different from the control (Fig. 1). In 2003, fungicide treatment had a significant positive effect on the final plant stand, rate of emergence and rate of canopy closure and these results were not significantly different from the negative control. In 2002, the effects were not as pronounced. Overall, there was no significant differences among treatment timings and these results suggest that applying a seed treatment up to 10 days prior to planting can provide effective control of *Fusarium* dry rot.

Results

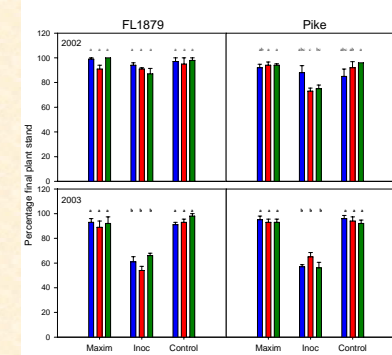


Figure 5. Percentage final plant stand. In 2002 for “FL1879”, there were no significant differences between any of the treatments. For “Pike”, there were no significant differences between treatments with means 85-96 (a), 75-92 (b), and 73-88 (c). In 2003, there were no significant differences between treatments with means above 89 (a), and from 54-65 (b).

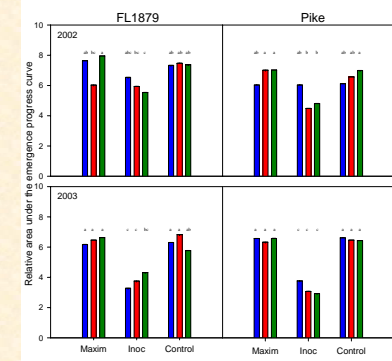


Figure 6. Relative area under the emergence progress curve (RAUEPC). In 2002 for “FL1879”, there were no significant differences between treatments with means 6.53-7.95 (a), 5.94-7.64 (b) and 5.53-6.53 (c). For “Pike”, there were no significant differences between treatments with means 6.03-7.02 (a), and 4.48-6.12 (b). In 2003, there were no significant differences between treatments with means 5.77-6.82 (a), 4.31-5.77 (b), and 2.93-4.31 (c).

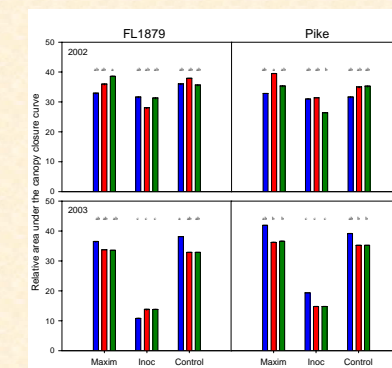


Figure 7. Relative area under the canopy closure curve (RAUCCC). In 2002, there were no significant differences between treatments with means 28.08-39.50 (a), and 26.39-37.98 (b). In 2003, there were no significant differences between treatments with means 31.33-38.15 (a), 28.20-33.74 (b), and 10.81-13.84 (c).