Evaluation of new fungicides as soil and foliar treatments for control of *Phytophthora capsici* on watermelon

Pingsheng Ji (*Principal Investigator*)
Assistant Professor, Department of Plant Pathology, Coastal Plain Experiment Station, University of Georgia, P. O. Box 748, Tifton, GA 31794. Tel.: 229-386-3160, fax: 229-386-7285, e-mail: pji@uga.edu

Alexander S. Csinos (*co-Principal Investigator*)
Professor, Department of Plant Pathology, Coastal Plain Experiment Station, University of Georgia, P. O. Box 748, Tifton, GA 31794. Tel.: 229-386-3163, fax: 229-386-7285, e-mail: csinos@uga.edu

Justification for research:

Phytophthora capsici, the causal agent of Phytophthora root, crown and fruit rot, is responsible for serious yield and quality losses in the production of watermelon and a number of other important vegetable crops in the U.S. The pathogen causes seed decay, crown and root rot, leaf blight, plant wilt, fruit rot and other damages. Fruit rot on watermelon is often the most damaging which begins as a dark, water-soaked, depressed lesion that expands quickly along with powdery, wet mold occurring over the infected area and fruit become completely rotted. In addition to damage in the field, many instances have occurred when farm workers have harvested seemingly healthy fruit in the field only to find those fruit to later become rotted in storage or after shipping. In such cases the grower loses the investment in growing the crops, the shipping costs, and future market.

Current strategies for control of *P. capsici* on watermelon are limited. Commercial watermelon cultivars resistant to fruit infection are not known to be available. Crop rotation is a recommended strategy; however, the efficacy of crop rotation is hampered by the wide host range of the pathogen and the ability of long-term survival of the pathogen in the soil. As a soilborne pathogen, *P. capsici* surviving in the soil can initiate underground and foliar infections by direct contact or by splashing water to spread the pathogen from soil to foliage. Hence, effective management of this disease can not rely on foliar treatment only but requires both efficient soil and foliar treatments.

Application of effective fungicides continues to be a significant component in developing efficient programs for managing this disease. Traditionally mefenoxam has been the fungicide commonly used for control of the disease. While mefenoxam-resistant *P. capsici* strains have been found in several states in the U.S., mefenoxam is still recommended for control of *P. capsici* where resistant strains have not been identified due to lack of effective alternative fungicides. A few newer fungicides have become available for control of *P. capsici*, such as fluopicolide and mandipropamid that were newly registered and initium that is expected to be registered in a year or so. Although these new fungicides have demonstrated similar or superior efficacy, compared with mefenoxam, when used for foliar applications on vegetables such as squash and bell pepper, the efficacy of these products on watermelon especially for soil treatment is largely unknown. Hence the proposal to evaluate these products as soil and foliar treatments for control of *P. capsici* on watermelon is highly worthwhile with the potential to develop effective programs to significantly reduce losses caused by this major disease.

Objective of the study: To determine the efficacy of new fungicides, which are effective when used for foliar applications for control of *P. capsici* on vegetables such as squash and bell pepper, to be used for soil and foliar treatments for control of *P. capsici* on watermelon.

Procedures and locations of the research:

Efficacy of mandipropamid, initium, and fluopicolide used for soil and foliar treatments will be evaluated in comparison to mefenoxam. The field experiment will be conducted at University of Georgia Coastal Plain Experiment Station in Tifton in summer 2010. The experiment will be conducted in the *Phytophthora capsici* study nursery heavily infested with *P. capsici*. Plant beds (6-inch-high by 30-inch-wide centered 6 ft apart) will be formed using a commercial tractor-drawn bed-former. Black polyethylene plastic mulch will be used and a single drip tape will be installed 1-2 inch below the surface in the center of the beds as the plastic mulch is applied. A seedless watermelon cultivar (e.g., Sakata 'SSX-7401' as female, and '8662' as pollenizer) will be used in the study. The seedlings will be planted 3 ft apart in a single row, placing one pollenizer plant every two female plants. Each treatment plot will be 36 ft long and a randomized complete block design with four replicates will be employed. Fluopicolide, mandipropamid, initium, and mefenoxam will be applied through drip tape at transplanting. Two weeks after transplanting additional applications of the products will be made through drip tape. Foliar applications of the fungicides will start either one week or three weeks after transplanting. The experiment will include the following treatments:

1) Mandipropamid (8 fl oz/acre), soil treatment
2) Mandipropamid (8 fl oz/acre), soil treatment + foliar sprays (3, 4, 5, 6 weeks)
3) Mandipropamid (8 fl oz/acre), foliar sprays (1, 2, 3, 4, 5, 6 weeks)
4) Fluopicolide (4 fl oz/acre), soil treatment
5) Fluopicolide (4 fl oz/acre), soil treatment + foliar sprays (3, 4, 5, 6 weeks)
6) Fluopicolide (4 fl oz/acre), foliar sprays (1, 2, 3, 4, 5, 6 weeks)
7) Initium (14 fl oz/acre), soil treatment
8) Initium (14 fl oz/acre), soil treatment + foliar sprays (3, 4, 5, 6 weeks)
9) Initium (14 fl oz/acre), foliar sprays (1, 2, 3, 4, 5, 6 weeks)
10) Mefenoxam (1 pt/acre), soil treatment + foliar sprays (3, 4, 5, 6 weeks)
11) Mefenoxam (1 pt/acre), foliar sprays (1, 2, 3, 4, 5, 6 weeks)
12) Non-treated control

Phytophthora root, crown and fruit rot incidence will be measured weekly after first appearance of symptoms. Fruit will be hand-harvested when mature and marketable and non-marketable fruit will be evaluated according to USDA standards. Disease and yield data will be analyzed statistically using the ANOVA or GLM procedures of SAS.

Timetable: start in March 2010 and complete in October 2010.

Early March: seed watermelon in greenhouse
April: field preparation and transplanting
May-August: cultural practices, fungicide programs, disease and yield data collection
September-October: data analysis and final report.

Potential benefits:

Potential benefits of the project include identifying more effective fungicides than mefenoxam for control of the disease, reducing the risk of using mefenoxam to which *P. capsici* has developed resistance in some watermelon production areas, and developing more efficient disease management programs integrating soil and foliar treatments. Cost/benefit analyses will be conducted for the field study to determine the management strategies that yield the greatest financial return to the grower. An economic analysis showing all cost/benefits will be conducted, using yield and input cost data collected from the experimental field for each management strategy selected, to quantify the incremental economic value of the different fungicides relative to mefenoxam. Results of the study will be published in Plant Disease Management Report (PDMR) and a refereed journal.

Budget: $10,000.00

Personnel: $4,500 are requested for a part-time student worker to help with the field study.
Supplies: $4,000 are requested for field supplies.
Travel: $1,500 are requested to cover travel to field plots and partially cover expenses of the PI to attend the 97th Annual National Watermelon Association Convention to present research results.

In addition to the financial support provided through salary of the above personnel, the University of Georgia has the available resources and facilities to conduct this project.