# Plant Pathology Seminar Series

## "Characterization of Metalaxyl-resistant *Pythium ultimum* from Chickpea Fields in the US Pacific Northwest"

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Chickpea is an important crop in many parts of the world. In the US Pacific Northwest, chickpea has become an important rotational crop in the cereal-based production system. *Pythium* species are ubiquitous, and many *Pythium* species are plant pathogens and frequently cause seed rot and damping-off on many agronomic and horticultural crops. Metalaxyl, a fungicide specific for Oomycetes, has been used successfully in seed treatment to protect chickpea from seed rot and damping-off for more than 30 years. In recent years, however, seed rot and damping-off has occurred widely in metalaxyl-treated chickpeas in the US Pacific Northwest. This study was aimed at identifying the cause of the emerging chickpea seed rot and damping-off and finding potential solutions to the problem.

A total of 221 isolates were obtained from soil samples collected from inside and outside disease foci, and were characterized as either metalaxyl-resistant (MR) or metalaxyl-sensitive (MS) based on ability to grow on metalaxyl-amended (50 PPM) medium. Most (67%) of the 187 isolates obtained from soil samples from inside disease foci were resistant to metalaxyl, whereas only a few (3%) of the 133 isolates from soil samples outside of the disease foci were resistant to metalaxyl. Seven *Pythium* species were identified based on morphology and DNA sequences of the nuclear ribosomal DNA internal transcribed space region. *P. ultimum* is the most abundant species with 115 isolates, followed by *P. irregulare* (39 isolates), *P. abappressorium* (28 isolates), *P. paroecandrum* (5 isolates) *P. attrantheridium* (2 isolates), and one isolate each of *P. apiculatum* and *P. heterothallicum*. Notably, all the identified 109 MR isolates belonged to *Pythium ultimum* except one isolate which was *P. irregulare*. These results showed that presence of MR isolates is correlated with seed rot and damping-off of chickpea. $ED_{50}$ values of MR isolates ranged from 10 to 50 ppm, while $ED_{50}$ values of MS isolates ranged from 0.01 to 2 ppm. Metalaxyl resistance as measured by $ED_{50}$ values is a stable trait since the $ED_{50}$ values of 10 randomly selected MR isolates did not change over ten generations in the absence of metalaxyl. Relative fitness of MR and MS isolates were investigated based on growth rate and reproduction (ability to produce propagules). No significant differences in growth rate (either colony diameter or mycelial dry weight) were detected between MR and MS isolates of *P. ultimum*, although isolates of *P. ultimum* grew faster than isolates of other *Pythium* species (*P. irregulare* and *P. abappressorium).* The ability to produce propagules varied greatly among the isolates, but is not related to metalaxyl resistance. Because of the stability of the metalaxyl resistance trait and no fitness cost associated with metalaxyl resistance, active management of the chickpea seed rot and damping-off caused by the MR *Pythium* is required. Pathogenicity tests showed that seed treatment with metalaxyl can protect chickpea seeds from seed rot caused by MS isolates, but not by MR isolates. However, seed treatment with ethaboxam can protect chickpea seeds from seed rot caused by either MR or MS isolates of *P. ultimum*. This study showed that the emerging seed rot and damping-off of chickpea was caused by metalaxyl-resistant *Pythium* populations and the disease can be managed by including ethaboxam in seed treatments.

11 am | Tuesday, April 16 | Johnson Hall 343

*MS Exit Seminar*

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