



CHICKPEA DAMPING-OFF DUE TO METALAXYL-RESISTANT PYTHIUM: AN EMERGING DISEASE IN THE PALOUSE

By
Weidong Chen, Legume Disease Specialist, USDA-ARS, **Stephen Van Vleet**, Regional Extension Specialist, Washington State University

Chickpea Damping-off due to Metalaxyl-Resistant *Pythium*: An Emerging Disease in the Palouse

Background

Pythium species are a group of ubiquitous plant pathogens, existing in almost all agricultural soils. They can persist in soil for many years and affect a wide range of crops, including legumes, cereals, and *Brassica* crops. In cold spring conditions that favor *Pythium* damping-off, the only currently reliable control is seed treatment with the systemic fungicide metalaxyl (Cook and Zhang 1985; Brantner and Windels 1998).

Legumes, *Pythium* Management, and Current Issues

Legumes and large-seeded (Kabuli-type) chickpeas are highly vulnerable to *Pythium* damping-off when planted in cold, wet soil in the spring due to their thin seed coat and amount of fluid released during germination. For decades, the preferred and only available seed treatment for reliable control of damping-off was metalaxyl. Seed treatments including metalaxyl have been the silver bullet for protecting chickpea seed from *Pythium* damping-off. Recently in some notable cases, metalaxyl has been losing its effectiveness because *Pythium* species in Palouse soils are developing resistance to it. In May, 2014, and again in 2015, we observed germination failure of large-seeded chickpeas in fields near Colton, Washington (Figures 1 and 2). Subsequently in 2015, it was also discovered that chickpea in fields near Kendrick and Juliaetta, Idaho, failed to germinate. *Pythium* isolates (*Pythium ultimum*) obtained from non-germinated seeds in Colton were tested through lab tests. The isolates obtained from the seed were found to be highly resistant to metalaxyl, similar to those found in potato production areas (Porter et al. 2009).

In addition, soil samples were collected within (infected) and outside (uninfected) the chickpea damping-off area. These soil samples were used to determine the incidence of resistance in the problem soils. *Pythium* isolates from within and outside the area where damping-off occurred were then used to test for resistance on media containing metalaxyl. Soils sampled from the areas where there was poor germination consistently had *Pythium* isolates with high levels of resistance to metalaxyl (Table 1). Under controlled conditions, metalaxyl treatments failed to protect chickpea seeds from damping-off inoculated with metalaxyl-resistant *Pythium* isolates. All evidence shows that the poor germination of Kabuli chickpea is due to the presence of metalaxyl-resistant *Pythium* populations.

Recommendations

To reduce the likelihood of seed rot and damping-off and in the absence of alternative effective treatments, growers are advised to plant smaller seeded chickpea varieties and to plant later, when the soil is warmer and drier in fields where metalaxyl-resistant *Pythium* is known to be a problem. Scientists from USDA-ARS, Washington State University, and the University of Idaho are working together to determine field prevalence of metalaxyl resistance in chickpea production areas, identify alternative fungicides that can control or manage metalaxyl-resistant *Pythium*, and investigate mechanisms of metalaxyl resistance in *Pythium*. Currently, there is promise for the fungicide ethaboxam, proposed for labeling, as an alternative for the management of metalaxyl-resistant *Pythium*.

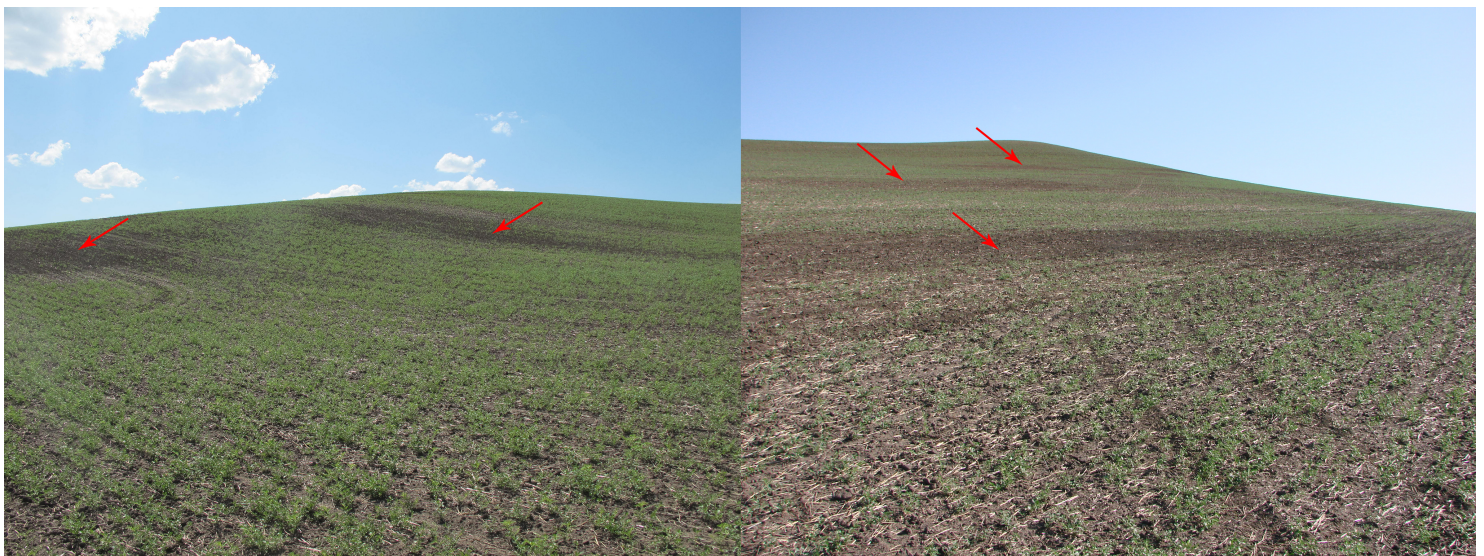


Figure 1. Seed rot and damping-off of chickpea caused by *Pythium ultimum* resistant to metalaxyl. Arrows point to patches that had high levels of resistant *Pythium*. (Photos: Left, W. Chen; Right, S. Van Vleet.)



Figure 2. Chickpea seeds covered with soil containing *Pythium* (left) and chickpea seeds and seedlings showing *Pythium* infection after being washed. *Pythium* damping-off symptoms are pointed out by arrows. Note: some of the seeds are completely decayed, mushy, and damping-off (right). (Photos: W. Chen.)

Table 1. Numbers of *Pythium* isolates resistant or susceptible to metalaxyl from paired samples collected from areas where chickpea did or did not germinate.

	Soil samples collected within field infected area		Soil samples collected outside field infected area	
	Total #	Resistant #	Total #	Resistant #
Soil pair 1 – Colton	23	18	20	0
Soil pair 2 – Colton	22	20	21	0

References

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