Wisconsin Department of Agriculture, Trade and Consumer Protection

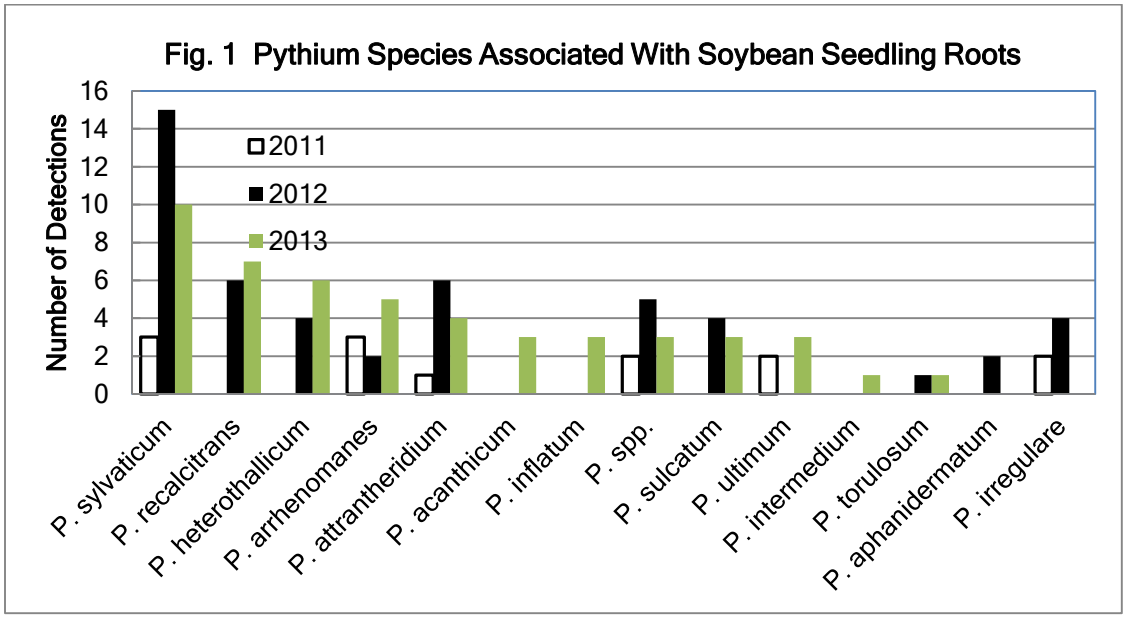
Wisconsin Pest Survey Report

PYTHIUM SPECIES ASSOCIATED WITH SOYBEAN SEEDLINGS

Pythium is a fungus-like organism that causes damping-off in soybean seedlings and seed. As plants mature they become more resistant but non-lethal root infections can reduce plant growth and yield. This three year survey documents the great variety of Pythium species present in Wisconsin soybean fields. From 2011 to 2013, thirteen different species of Pythium were identified in 111 out of 116 sampled fields (96%). Phytophthora root rot (Phytophthora sojae) was also present in 13% to 16% of fields. More information about the Phytophthora survey can be found in the pest survey report "2008-2013 Early Season Root Rot Survey "on this website.

In a state-wide survey DATCP plant pathologists collected soybean seedlings in the vegetative to early reproductive stages from 52 soybean fields in 2013, 49 and 15 fields in 2012 and 2011 respectively. From each randomly chosen field, seedlings were carefully dug up, selecting symptomatic plants or plants from areas prone to flooding or soil compaction. A combined sample consisting of 20 seedlings from each field was taken to the Plant Industry Laboratory for diagnosis. Seedling roots were washed thoroughly before root tissue was tested for Pythium using gene based methods such as PCR and sequencing (1). This allows for quick and accurate identification to species level without performing time consuming culturing and morphological observations necessary for classic pathogen id.

Figure 1 lists all identified Pythium species by survey year. A combined total of 116 root samples were tested from 2011 to 2013. One hundred eleven samples tested positive for the genus Pythium, 101 samples could be identified to species level. In ten samples Pythium was identified to genus level (P. spp.) only. In some cases this may be due to roots in the same sample being infected with several species.



Pathogenicity of Pythium species to soybean is very variable and some species are opportunists that grow only on seedlings that have already succumbed to other pathogens or environmental factors. Several of the species detected in this survey are too new to science to be fully understood. In recent years several new species of Pythium have been reported on corn and soybeans by Ohio researchers (2). Six Pythium species found in Wisconsin soybean fields overlap with the Ohio study *(Pythium attrantheridium, P. inflatum, P. irregulare, P. sylvaticum, P. torulosum* and *P. ultimum*). *P. attrantheridium* and *P. inflatum* were first reports of these pathogens of soybean and corn in Ohio.

The most frequently found species in Wisconsin, *P. sylvaticum,* present in 25% of fields, was determined to be highly pathogenic on soybean and moderately pathogenic on corn, in Ohio, capable of infecting seed and roots in either host. The next most frequently identified species, *P. recalcitrans* (11.7%) and *P. attrantheridium* (9.9%), have as far as we know never been reported in Wisconsin soybean fields. The effect of P. *recalcitrans* on corn and soybean remains to be determined. It was reported on carrots in Michigan in 2010 (5), grapes in South Africa and beets in Spain in 2008 (6).

Some of the species we detected in soybeans are generally associated with other hosts: such as *P. arrhenomanes* with corn and *P. heterothallicum* with wheat (3, 4). Species like *P. aphanidermatum* are considered very pathogenic and infect a large variety of hosts, especially greenhouse plants (3, 4).

Pythium species detected in Wisconsin soybean roots from 2011 to 2013
P. acanthicum
P. aphanidermatum
P. arrhenomanes
P. attrantheridium
P. heterothallicum
P. inflatum
P. intermedium
P. irregulare
P. recalcitrans
P. sulcatum
P. sylvaticum
P. torulosum
P. ultimum

Identification of Pythium to species level has become more feasible for diagnostic laboratories since gene-based methods have become more readily available and affordable. Although our testing was limited to identifying one species in each field, and may not account for multiple species present, this survey documented a remarkable diversity of Pythium species in Wisconsin soybean fields.

Variability in species and multiple species infections can complicate effective control. In fields with a history of seedling disease an integrated management approach may be needed to control disease, including consideration of rotation strategies, given the reported host range of several of these species.

Newly detected Pythium species need to be studied further to evaluate their potential for causing disease and affecting soybean and corn production. For further information on soybean seedling diseases please see the University of Wisconsin Field Crops Pathology website http://fyi.uwex.edu/fieldcroppathology/.

References:
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4. Van Der Plaats-Niterink, J. 1981. Studies in Mycology. No 21. Monograph of the Genus Pythium.
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