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Brown stem rot of soybean – understanding and managing this vexing disease

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Introduction

Brown stem rot (BSR) is a common and important soilborne disease of soybean in the North Central U.S. and Canada. BSR can reduce yields over 25%, but losses are typically lower due in part to crop rotation and the use of resistant cultivars. Some have suggested that BSR may be the most undermanaged soybean disease in parts of the North Central Region and it doesn't get the respect it deserves. Although this could be debated, the fact remains that since BSR was first discovered in Illinois about 70 years ago it has been a persistent yet erratic drag on soybean yields in many areas. The BSR pathogen infects the inner stem and can cause damage to leaves, but symptoms often do not develop on leaves and then BSR may be overlooked in the field.

Basics of the disease and pathogen

BSR is caused by the fungal pathogen *Cadophora gregata*. This pathogen is common in the North Central U.S. For example it has been detected widely in fields in Illinois, Iowa, and Minnesota, and also occurs in surrounding states. The fungus infects through the roots and stem early in the growing season. Symptoms often don't appear until late pod-filling stages in mid-August. The infection is focused on the inner stem and vascular tissues where the pathogen damages the vascular tissues, disrupts water and nutrient flow, and produces toxins that damage the plant. A key symptom of BSR is brown discoloration of the pith in the lower stem. Leaves may also develop brown and yellow discoloration between the veins, and plants may appear to mature early. The leaf symptoms can be confused with SDS symptoms, but SDS does not cause the internal stem browning.

Disease development is influenced by rainfall, temperature, soybean cultivar, soybean cyst nematode, and type of the pathogen. Yield loss due to BSR tends to be greatest when weather is cool and wet during the pod-fill stage and then becomes dry and hot. Two types of the BSR pathogen are known in North America that are differentiated by genotype and by the reaction of infected plants. Type A produces internal stem browning as well as leaf chlorosis and necrosis, whereas type B (= type M) typically causes only internal stem symptoms. Both types can cause premature defoliation and simultaneously infect a single plant or different plants in a field.

Management of BSR

The use of resistant soybean varieties and crop rotation to non-hosts such as corn are the two most important tactics for managing BSR. Also, because the soybean cyst nematode (SCN) may make BSR more severe, managing SCN and planting soybean varieties with resistance to SCN may also help to reduce BSR. Multiple research studies have addressed the importance of crop rotation in managing BSR, and new information helps us to understand complexities with using rotation as a disease management tool. Recent information on the plant and pathogen sides of disease development helps to illustrate why resistance may not always work as expected and may give use clues to understanding and improving resistance. In conclusion, in the decades since BSR was first reported, this disease has persisted but its impact on soybean yields can be reduced with knowledge and focused disease management.

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