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Determining the role of soybean cyst nematode in monoculture yield decline and impacts of crop rotation on soil ecology

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Corn and soybean are the most common rotation partners in the Midwestern United States. Yield declines when either crop is grown in monoculture, a phenomena known as monoculture yield decline. Soybean cyst nematode (SCN, *Heterodera glycines*) is the major pathogen of soybean in the Midwest whereas corn is a non-host for SCN. Many non-parasitic, beneficial nematodes also reside in agricultural soil. These beneficial nematodes cycle nutrients, help suppress pathogen populations, and serve as indicators of soil ecosystem functioning. The purpose of this study was to determine the role of SCN in soybean monoculture yield decline and the impacts of crop rotation on beneficial nematodes. Research was conducted at a long-term experimental field site in Waseca, Minnesota. Treatments were crop sequences in 1 to 5 years of corn monoculture following 5 years of SCN-susceptible soybean, 1 to 5 years of SCN-susceptible soybean following 5 years of corn, continuous monoculture (since 1982) of each crop, and continuous monoculture (since 1982) with non-*Bt* corn cultivar or SCN-resistant soybean since 2010. Granular nematicides (terbufos and aldicarb) have been applied to half of each plot since 2010 to minimize nematode populations across crop sequences as a way to determine the role of SCN in monoculture yield decline. SCN abundances increased in soybean monoculture and decreased in corn monoculture indicating corn is a good rotation crop to help manage SCN. Nematicide was moderately effective across all crop sequences, so nematicide application did not conclusively demonstrate if SCN had a role in monoculture yield decline. Nematicide also decreased abundances of non-target, beneficial nematodes. Beneficial nematode abundances, and thus soil ecology, were significantly different in corn compared to soybean cropping systems. Soybean production shifted the soil ecosystem toward enrichment-opportunist organisms that thrive with abundant, chemically-simple food resources.