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Soil texture and disease risk

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Soil texture and disease risk

Abstract

In the last 10 years, conservation tillage has been a popular farming practice to reduce soil erosion and production costs. There are reports of increases in some soybean diseases following the use of conservation tillage, and there is a view that use of no-till would be associated with the increase in disease risks. However, this view should be readdressed in light of site-specific production. Plant pathologists have long understood that tillage effects on diseases may be site specific. We also know that soil texture interacts with tillage practice to affect plant diseases.

Keywords

Plant Pathology

Disciplines

Agricultural Science | Agriculture | Plant Pathology | Soil Science

INTEGRATED CROP MANAGEMENT

Soil texture and disease risk

In the last 10 years, conservation tillage has been a popular farming practice to reduce soil erosion and production costs. There are reports of increases in some soybean diseases following the use of conservation tillage, and there is a view that use of no-till would be associated with the increase in disease risks. However, this view should be readdressed in light of site-specific production. Plant pathologists have long understood that tillage effects on diseases may be site specific. We also know that soil texture interacts with tillage practice to affect plant diseases.

With funding from soybean check-off dollars, we investigated how soil texture affects soybean diseases under different tillage systems. In collaboration with the State Agriculture Statistics Departments of Iowa, Illinois, Minnesota, Missouri, and Ohio, we obtained soil and stem samples from 1,462 randomly selected soybean fields that included different tillage systems, conventional till, minimum till, and no-till. We analyzed diseases, pathogens, and soil chemical and physical properties of the samples. We then grouped the fields by tillage and soil texture class, and examined how soil texture affects the risk of *Phytophthora*, brown stem rot (BSR), and soybean cyst nematode (SCN) under different tillage systems. Our results are reported herein.

The occurrence of *Phytophthora* was greatly affected by soil texture. The higher the clay content, the greater the disease risk. Fields with sandy loam soil had the lowest disease risk, and clay soils had the highest disease risk. In heavy soils, such as clay, silty clay loam, and clay loam, tilled fields had disease risk as high as the no-till fields. Tillage made no difference for soil having a high level of clay content, such as clay, silty clay loam soils. However, for soils in classes of loam and silty loam, fields with conservation (no-till and minimum-till) tillage had a higher level of *Phytophthora* than fields of conventional till.



[1] **Phytophthora damping-off.**

Conservation tillage increased brown stem rot risk (percentage of infected stems), and soil texture affected the level of risk in fields where conservation tillage was used. With the increase in clay, BSR risk generally increased if conservation tillage was used. However, the disease risk was not affected by soil texture under conventional tillage practices because the BSR fungus has to survive in soybean residues. Use of tillage accelerates decomposition of soybean residue, reduces the pathogen population, and, consequently, reduces disease risk.

Soil texture may affect soil cyst nematode populations in fields that are in no-till. Overall, soils

with less percentage of clay had much higher SCN egg population densities than lighter soils, such as clay and silty clay loam. However, the effects of soil texture on SCN egg population densities diminished if tillage was applied. In fields having high clay content, such as clay and silty clay loam soil, use of tillage may enhance the reproduction of SCN populations. This outcome is understandable because tillage practices move the soil as well as the nematode around.

This report is preliminary. We will provide detailed information in the future so that the growers can integrate it with precision agriculture production to effectively manage these soybean diseases.

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