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Cereal Rye Cover Crops, Allelopathy and Corn

By Bob Hartzler, Department of Agronomy

Planting cereal rye as a cover crop provides numerous short- and long-term agronomic and environmental benefits. Although inconsistent, under certain situations the yield of corn planted into the residue of a rye cover crop may be reduced.

Many people attribute the inhibition in corn growth by rye to allelopathy, the release of chemicals by one plant that inhibits the growth of adjacent plants. While rye does produce chemicals that can inhibit plant growth, under most situations the rye biomass on the soil surface is responsible for suppression of weeds rather than the release of phytotoxic chemicals. The chemicals produced by rye probably have little influence on corn growth. Research has shown that susceptibility to allelochemicals is indirectly related to seed size – the smaller the seed the more susceptible the plant. The large seed of corn and its relatively deep planting depth should minimize the impact of any chemicals released by the cover crop.

The specific reason for rye's negative effect on corn is unknown, but several factors might be involved.

1. The presence of rye mulch on the soil surface alters the soil environment in a way that inhibits corn growth. The mulch may delay soil warming and drying, creating a less favorable environment for corn.
2. The decaying rye biomass may tie up soil nitrogen.
3. Rye may act as a 'green bridge' for plant pathogens. The dying rye could serve as a host for pathogens that move to corn seedlings after the rye dies. Dr. Tom Kaspar (USDA/ARS) is currently investigating this phenomenon.

The role and relative importance of these factors probably vary from field to field.

Proper management reduces the risk rye poses to corn production. Terminating rye 10 to 14 days prior to planting corn greatly minimizes the chance of a negative impact. Burndown herbicides also are more consistent at killing rye when applied to small plants; however, much of the benefit in suppressing weeds will be lost when treating the rye while it is small. Soybean can tolerate heavy amounts of rye residue, thus early termination is not as critical when planting soybean following cereal rye. Termination of rye cover crops can be done up to the date of soybean planting.



Photo 1. Spring growth on cereal rye

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