

Public Abstract

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Title:Soil Characteristics and Subsequent Corn Development Following Partial Corn Residue Removal in a No-till, Corn-soybean Rotation

If producers employ corn (*Zea mays* L.) residue removal for ethanol production, soil and subsequent corn development characteristics could be affected. Little research has evaluated partial corn residue removal from baling followed by the use of a cover crop to mitigate potential changes to soil characteristics and corn development. Research is needed to determine the effects of corn residue removal and establish residue management recommendations for producers to prevent a decline in soil and corn productivity. This three year study evaluated the effects of Baled (60% residue removal) and Not Baled (0% residue removal) corn residue treatments in combination with None and Rye (*Secale cereal* L.) cover crop treatments on 14 soil characteristics and 25 corn development characteristics in a no-till, corn-soybean rotation. The Baled treatment reduced magnesium concentrations at the 0 to 5 cm and 5 to 20 cm soil depths, increased soil water content at corn silking (R1), had less nitrogen in corn residue the following spring and accumulated more rye biomass than Not Baled treatments. The Rye treatment increased soil ammonium-N concentration, soil water content at R1, minimum and average soil temperature at corn emergence (VE). A cover crop X year interaction occurred for corn stand density. Only calcium concentration at the 5 to 20 cm soil depth had a significant residue X cover crop interaction. A year X residue X cover crop interaction was found for corn height at 6 weeks after emergence, fall residue yield, total corn yield and harvest index. Early, median and late emerging corn plants of each residue and cover crop treatment were also tracked throughout the growing season to evaluate how emergence order affected 24 plant development characteristics. Average length of emergence period in 2010 and 2011 was eight and four days. Significant differences occurred among Early, Median and Late emergence classes for days after planting to VE, days after planting to R1, length of vegetative development, length of lifecycle, stalk diameter, and corn residue cellulose content. Residue treatment only affected the plant height of emergence classes. Cover crop treatment only affected the length of lifecycle for emergence classes. The results of this study demonstrate that 60% corn residue removal is feasible in a no-till, corn-soybean rotation causing minimal affects to soil and corn development characteristics. A small amount of biomass was established with rye as a winter cover crop, providing few benefits to soil quality and corn development.