

TILLAGE, CEREAL RYE COVER CROP, AND N PLACEMENT EFFECTS ON CORN AND SOYBEAN

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ABSTRACT

Although conservation tillage and cover crops can improve soil health, producers are hesitant to adopt these practices due to concerns about potential yield reductions. We conducted field experiments for four years (2020-2023) near Urbana, Illinois, to explore how these practices affected corn and soybean yields. The experiment was conducted on a Flanagan silt loam soil, with corn and soybean following one another on two sides of the same field. Treatments were arranged in a RCBD with four replications. There were four tillage treatments: conventional tillage (CT, fall chisel plow + spring field cultivator), spring field cultivator (SpFC, one-pass before planting), no-till (NT), and fall strip-till (ST). Except for CT, each tillage strip was split with and without cereal rye (CR) cover crop. In corn only, tillage × CR plots were split, and nitrogen as UAN solution was applied after planting at 200 kg N ha⁻¹ either all injected between rows, or with half surface-dribbled near the rows and half injected between rows. Tillage and CR treatments remained on the same plots throughout the experiment. Over 4-years, corn without CR was significantly higher with SpFC than NT (10.9 vs. 10.4 Mg ha⁻¹), but equivalent to ST (10.8 Mg ha⁻¹) and CT (10.7 Mg ha⁻¹). The inclusion of CR significantly lowered yields from 0.5 Mg ha⁻¹ (NT) to 1.2 Mg ha⁻¹ (SpFC). Neither N placement nor tillage × CR × N placement effect was significant, but across 4 years the tillage × Npl interaction was significant and splitting N application significantly increased yield under ST (+ 0.3 Mg ha⁻¹), but not in NT and SpFC. Over the 3-years (no soybean trial in 2020), there was no tillage or tillage × CR interaction effect on soybean yield. However, using CR before soybean significantly decreased yield by 0.2 Mg ha⁻¹ across tillage treatments. We conclude that, for both crops, yields can be maintained with reduced tillage, and even at modest levels of biomass, CR cover crop lowered yield of both corn and soybean in this study. While such effects may be amplified by removal of water by cover crops when soils are dry after planting, continued testing in production fields may be helpful in weighing possible yield effects against benefits of cover crops.