

NITROGEN AVAILABILITY TO CORN FOLLOWING SMALL GRAINS

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ABSTRACT

Nitrogen rate recommendations for corn are generally reduced following legumes compared to following corn or small grains. A 4-yr field study was conducted on a Plano silt loam soil in southern Wisconsin to evaluate the capability of soil NO₃ tests to predict N availability to corn following small grains. Previous crop small grains included winter wheat, winter rye, and oats harvested for grain and straw. Nitrogen fertilizer was applied to corn at rates of 0 to 180 lb/a in 30 lb increments. Grain yields were obtained and economic optimum N rates were determined. Optimum N rates following small grains ranged from 0 to 90 lb/a and were substantially lower than the N rate usually recommended for corn following corn (160 lb/a). End-of-season soil profile NO₃-N contents were about 100 lb/a lower where observed optimum N rates were applied compared to the standard N rate recommendation. Early-season soil NO₃-N contents in the top 3 ft increased by 70 to 90 lb/a between preplant and presidedress (PSNT) sampling times indicating high net soil N mineralization during this period. Current N rate recommendations based on the PSNT correctly identified the economic optimum N rate in one year and recommended excessive N rates in two years. The amount of excess N recommended based on the PSNT was related to early-season soil temperature. Lower soil temperatures resulted in higher excess N recommendations based on the PSNT. These results suggest that the PSNT can accurately predict optimum N rates following small grains, but an adjustment for early-season soil temperature is needed in years with below normal temperatures. Consideration of early-season soil temperature will likely improve the accuracy of PSNT N recommendations regardless of the previous crop or management system. In addition to corn yield benefits from small grains in crop rotations, small grains may also enhance soil N availability thus potentially reducing the fertilizer N needs to corn.

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