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Winter annual grass-legume bicultures for efficient nitrogen management in no-till corn

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Abstract

Winter annual cover crops may be an effective tool for managing inorganic N in the sandy soils of the Atlantic Coastal Plain when summer droughts can result in relatively high residual fertilizer N levels. A field experiment was conducted from 1992 to 1994 on a Norfolk loamy sand to determine the effect of (1) previous corn fertilizer N rate (150 or 300 kg ha⁻¹) on dry matter (DM) and N accumulation in rye, crimson clover, and hairy vetch monocultures and respective rye-legume bicultures; (2) the respective cover crops on residual soil inorganic N levels; and (3) cover crops on corn grain yield. Compared to the preplant corn N rate of 150 kg ha⁻¹, the 300 kg N ha⁻¹ rate resulted in greater profile soil inorganic N contents on subsequent sampling dates in both years. Concomitant with these greater residual soil N levels were increases in cover crop DM and N accumulation compared with low residual soil N levels. Averaged over 2 year,

cover crop DM accumulation by April was in the order of rye > rye-vetch = rye-crimson clover > hairy vetch > crimson clover. The corresponding cover crop N content ranking was hairy vetch > rye-hairy vetch > crimson clover = rye-crimson clover > rye. Before corn planting in Apr, rye monoculture reduced soil inorganic N content an average of 62% in 1993 and 37% in 1994 compared to legume monocultures. Soil inorganic N content under the rye-legume bicultures was reduced an average of 44% and 15% for the same dates. Inadequate rainfall during both corn growing seasons resulted in poor corn yields (1.18 to 2.50 Mg ha⁻¹) that were generally unaffected by cover crop or prior N rate. The results from this study demonstrated the ability of rye and rye-legume bicultures to scavenge residual soil inorganic N following a summer corn crop, thereby minimizing the leaching of N from the plant rooting zone.



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Keywords

Grass-legume; Cover crops; Nitrogen cycling

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