OPTIMIZING NITROGEN MANAGEMENT ACROSS COTTON CROPPING SYSTEMS

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Abstract

In long-term cover crop research conducted in the Southern High Plains of Texas, cotton lint yield is consistently less or not different following a rye cover compared to conventional tillage. With no-tillage and a rye cover soil moisture has been determined to not be the greatest limiting factor to yield, and it is hypothesized that N availability may be the greater limiting factor. Availability of N is critical to cotton yield, and N immobilization following cover crop termination is a major concern in cotton producing regions. Immobilization will decrease N availability to plants negatively impacting yield. Bronson et al. (2004) determined that an additional 30 lb. N/acre is required for optimal cotton lint yield with no-tillage and a wheat cover crop in a semi-arid environment. However, farm operating budgets may not always allow for additional N fertilizer input costs. The objective of the presented research was to evaluate the effect of N fertilizer application time on lint yield of cotton planted following a rye cover crop and after a fallow period following wheat harvest. A trial was initiated in 2018 to evaluate the effect of N fertilizer application time on lint yield of cotton (DP 1522 B2XF) following a rye cover crop, in rotation with wheat, and in a conventional tillage/winter fallow system. The N treatments were replicated within each cropping system, and included: 1) check, AG-CARES practice (described above); 2) additional 30 lb. N/A applied at preplant; 3) additional 30 lb. N/A applied three weeks after emergence; and, 4) additional 30 lb. N/A applied at pinhead square plus 2 weeks.

Lint yield differences were determined within the continuous cotton (winter fallow) and continuous cotton with a rye cover crop in 2018 but only in the continuous cotton, rye cover in 2019. In 2020 lint yield and N use efficiency (NUE) differences amongst treatments were not determined; however, trends are similar to 2018 and 2019 with greater response to added N applied preplant or shortly after emergence. In 2019 an additional 30 lb. N/A applied during the growing season in the conventional tillage system did not significantly increase lint yield compared to the farmer practice (check). While in the continuous cotton with a rye cover crop system, applying an additional 30 lb. N/A preplant resulted in greater yield compared to the check followed by 30 lb. N/A applied 3 weeks after emergence. There was no yield difference between the check and the 30 lb. N/A applied at 2 weeks after pinhead square. Similar trends were observed for NUE.

Results indicate that the timing of N application can potentially influence N mineralization and immobilization processes following a cover crop and thereby affecting lint yield and NUE. The lack of response to added N fertilizer in the wheat-fallow-cotton rotation indicates that N is not limited due to the 11-month fallow period allowing sufficient time to reach the point of net mineralization. However, the yield response to added N applied early in the season following a rye cover would indicate that net immobilization and reduced N availability is likely the reason for the yield reduction following a grain cover crop such as rye or wheat in sandy soil of semi-arid environments. The next phase of this research will be to evaluate N uptake by collecting plant samples throughout the growing season.