TILLAGE AND N RATE INFLUENCE ON RR/Bt COTTON ON COASTAL PLAIN SOILS

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Abstract

Fate of nitrogen in the environment, especially ground water, is a critical issue that the increasingly urban population of Florida is demanding an answer to. Cotton (Gossypium hirsutum L.) acreage increased rapidly from 1993 to 1996 in areas that had traditionally grown soybeans. As cotton was grown in these new areas, higher N rates were being used as compared to the traditional cotton growing areas of the state. Higher N rates were often necessary because of sandier soils in the new production areas. As with most crops that respond to N application, timing, and rate is important. Both will vary under different soil types, cover crops, and management strategy. We initiated a field study in the fall of 1995 on a Dothan fsl (fine-loamy, siliceous, thermic Plinthic Kandiudult) located at the University of Florida, North Florida Research and Education Center to determine response of cotton to N rates, tillage, and cover crops. Cover crops planted in the Fall were wheat (Triticum aestivum L.), crimson clover (T. Incarnatum L.) and fallow from either soybean [Glycine max (L.) Merr.} on two replications and bermudagrass (Cynodon dactylon L.) on two replications. Cover crops or winter fallow growth was terminated each spring with an application of glyphosphate. Soil samples were taken to a depth of 4 feet prior to planting cotton to determine residual N in the root zone. Soil samples were then taken each fall and spring to depths of up to 8 feet to determine movement of nitrate that was leached out of the root zone. Transgenic cotton was planted using extension service recommendations for production practices. Nitrogen as ammonium nitrate was side dressed at rates of 0, 60, 120, and 180 lbs. N per acre approximately 6 weeks after planting. The highest N rate was split into two applications of 120 followed by 60 lbs./A N three weeks later. Petiole nitrate was monitored to determine optimum levels for the crop throughout the growing season Tillage for cotton was conventional followed by ripping in row as compared to strip tillage. Rate of N for best yield varied over the three years, with best yields being at 60 to 120 lbs/A depending on residual N in the soil. In each of the first two years, approximately 90 lbs./A residual soil N produced about a bale and half of cotton. This generally agrees with literature, that 60 lbs./A N is required to produce a bale of lint. Cover crop made little difference in yield as did tillage over the three years of the study. Knowledge of residual N is very beneficial to decision making on amount and timing of N applications. Other plant factors increased by N application were boll weight to the 60 lbs./A N, boll number at either 60 or 120 lbs./A depending on the year, and plant height at the 60 lb/A rate. Data from the three years of petiole sap nitrate indicate that levels of nitrate should be 2000ppm or above the first week of bloom and fall no more than 500ppm per week for the next four weeks for optimum yield. Soil nitrate-N was between 4 and 6ppm for all N treatments in the 0 to 3 feet depth range before applying N fertilizer in the spring of 1998. At 4 to 7 feet there was no difference between the N treatments of 0 and 60 or 120 lb/A, but soil nitrate-N was 50% greater for the 180 lb./A rate. This would indicate that some N was leached below the root zone from the previous two cotton crops at this rate of N. Fall samples after the third year, in the fall of 1998, showed little difference in soil nitrate-N at the low rate and shallow depths. However, at 3 to 8 feet, soil nitrate-N was 67% more at the 120 lb. N rate than the zero rate and the 180 lb./A rate had 91% more nitrate-N than the check. Wheat cover crop had a caused a slight reduction in nitrate-N while crimson clover increased it. This data suggests that soil samples could be collected 4 weeks after planting for nitrate analysis, and if nitrate-N is more than 7ppm, reduce N application by 20 lb/A for each 3ppm above 7ppm.

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