Liquid Nitrogen Placement in North Carolina Corn Production

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Background

Throughout central NC, corn yield could be improved with better Nitrogen (N) management. This project extends promising work being conducted by the North Carolina Cooperative Extension NEagricultural agents to our region. Research and education on placement of N at layby in the Piedmont and Coastal Plains is needed to improve production practices and ultimately overall average yield for the region. This project will provide information to central NC farmers and agents on N management that optimize both yield and economic return.

Hypothesis

Lay-by applications will greatly improve yield as compared to pre-plant only N applications. Y-Drop applied liquid nitrogen will yield similarly to N applied with a coulter.

Objectives

1. Evaluate the effect on yield of sub-surface placement and surface dribble of N at layby
2. Demonstrate benefits of side-dressing on yield to NC corn growers

Materials and Methods

Randomized Replicated Strip Trial plots were planted in Cleveland and Scotland counties. Based upon the North Carolina Realistic Yield Expectations Calculator, 150 lbs of N in the form of 32% UAN was the standard rate applied. All nitrogen was applied at the time of treatment. There was no split-applied N for the Y-drop and coulter treatments. Lay-by applications (treatments 3 and 4) were made at V4. The four treatments were as follows:

1) 0 lbs N (for demonstration only);
2) 150 lbs N pre-plant only (control);
3) 150 lbs N sub-surface center applied with coulter;
4) 150 lbs N surface dribble 4-6" from the corn stalk.

Tissue samples were taken from the ear leaf and analyzed by Waters Agricultural Labs, Inc. All strip trials were harvested and yield per acre was calculated.

Y-drop and Coulter applications were made with the same rig for simplicity of transporting equipment. The coulters did not touch the ground when making the Y-drop applications, inversely, the Y-drops were removed during the coulter treatments.

Figure 1. Yield Comparison of Coulter vs. Y-drop vs. Pre-Plant Only N applications (Scotland County)

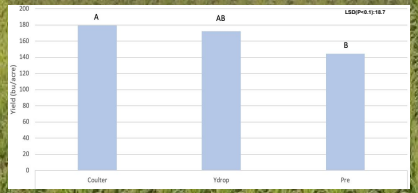
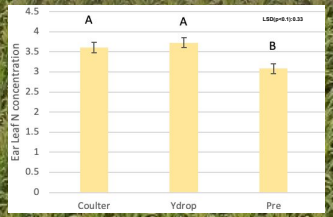


Figure 2. Ear Leaf N Analysis



Results

Figure 1 illustrates the relationship between yield of Coulter applied N, Y-drop applied N and Pre-plant applied N. The two lay-by applications (Coulter and Y-drop) greatly out yielded Pre-plant applied N. The Y-drop and Coulter treatments yield was statistically similarly.

Figure 2 illustrates Ear Leaf N taken at R1. You can see that the lay-by applications of N have much higher concentrations of N in the ear leaf, than the control and pre-plant applied treatments. Y-drop treatments showed a slightly higher concentration of N than the Coulter treatments, though this was not statistically significant.

Conclusions

- Lay by applications of 32% UAN greatly out yield pre-plant only applications of N. Applying lay-by N also greatly improves ear leaf concentrations of N as compared to applying all N Pre.
- Visual observations during the season showed that stalk diameter and visual signs of N deficiency were common in the control and Pre treatments as compared to the lay-by treatments.
- Lay-by treatments of N are common in other parts of the state, however, this is mostly done using a coulter, commonly known as a lay-by rig. This technology places liquid N between the rows, 2-4" deep, depending on the set up of the rig, grower preference and field conditions. The Y-drop method places liquid N on top of the field surface, 4-6 inches to the side of the row. Field observations show that making a lay-by application using the Y-drop technology is a faster means of application than using a coulter.

Future Research

We will be continuing this project in 2021. We will be tracking the time difference between coulter, and Ydrop applications, to compare the cost differences between these two lay-by application methods. We are also including a grower standard treatment in an effort to compare yields and profitability between grower practices, coulter, and Ydrop applications.

Extension Education

In person field days were not possible due to the COVID-19 pandemic. We created a "5-Minute Field Day" video on this project to share with our stakeholders. Access the video through this QR code.