Nitrogen Application Method and Timing For Corn Production on Clay Soils

Golden Horseshoe SCIA Regional Partner Grant Project

Purpose:

To evaluate the impact of applying UAN at various times after application using broadcast and injected methods.

Side dress N rates have been shown to be 20% less then preplant rates. This is likely because the N is being delievered to the crop just before it requires it as rapid stem elongation occurs and because the N is placed close to where corn roots can access it.

Growers and the fertilizer application industry have not adopted post emergent application of N across Ontario. While side dress applications are significant in south western and eastern Ontario, they are literally non existent elsewhere. Many reasons are given for the lack of adoption including timeliness, speed of application, damage to emerged crop, concern about weather preventing N application to occur in a timely manner.

Methods:

Seven field scale plots were initiated across different previous crops and tillage systems. Six of the seven sights were on unimproved clay soils. Plots were 12 rows wide by field length and were replicated 2 times. Two N application timings and 3 application methods were compared. Treatments tested included:

1. Early inject
2. Early broadcast (fan nozzle)
3. Late side dress
4. Late broadcast (streamer nozzle)

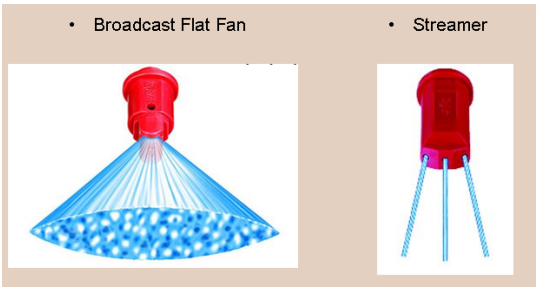
The target N rate was 85 lbs/ac of total N. Post emergence N rates were adjusted based on starter N rates so that 60 to 80 lbs/ac of N was applied.

Assessments included corn injury, yield, moisture, and NH4 losses.

A 15 foot wide, skip row liquid fertilizer applicator was built utilizing an old six row corn planter frame (Figure 1.). Three fertilizer application coulters were mounted to the frame and plumbed to an added fertilizer tank. A ground driven spray boom was mounted at the back of the unit and the nozzles were interchanged depending on the time of application. The nozzle spacing was 20”, to be analogous to standard setup on any normal spray equipment.

Figure 1. Custom Build Six Row Nitrogen Applicator with Three Fertilizer Coulters Adapted from a Used Corn Planter.

Figure 2: Post Emergent Broadcast Application of UAN to Standing Corn Using Streamer



Results:

Project results are reported in Table 1. Regardless of the timing or method of application, no differences in crop yield or harvest moisture were observed.

Treatments		Across Sites		pnr09_bs	pnr09_dj	pnr09_ga*	pnr09_hj1	pnr09_hj2	pnr09_pa	pnr09_ta
prev crop				wheat	wheat	soybean	soybean	wheat	soybean	corn
starter N				38.3	3.3	24.0	19.0	19.0	32.7	7.0
till system				conv	notill	conv	notill	conv	conv	conv
Trt	Timing	Yield	H2O	Yield	Yield	Yield	Yield	Yield	Yield	Yield
1	Early SD	141.8	29.8	177.7	142.6	120.3	134.3	156.3	141.9	119.5
2	Early Brd	139.9	29.8	179.0	144.6	111.4	133.4	154.2	136.9	120.1
3	Late SD	137.9	30.0	176.3	126.3	109.9	134.8	150.8	143.9	123.5
4	Late Brd	140.6	30.0	179.0	145.8	115.4	127.3	155.5	138.4	122.6
Sign.		nsd	nsd	nsd	nsd	nsd	nsd	nsd	nsd	nsd
cv		7.3	3.2	0.8	16.2	8.2	3.4	4.1	4.8	2.0

Although the late application of N broadcast using the streamer nozzles did cause some injury to the crop, especially on the sites where the corn was more advanced at application, no yield effects were observed.

Figure 3: Crop Injury from Post Broadcast Application of N Using Streamer Nozzles

In Figure 3, the initial injury can be seen on the corn approximately one week after application. based on the corn size it is obvious that the corn was well advanced at the time of application. The second picture shows the same field and treatment 3 weeks later and you will notice that all new growth is lush and green and no differences in the crop are observed looking across the various treatments.

Summary:

Post N applied with streamer nozzles may provide an alternative to the slow application of UAN using traditional side dress application equipment. If a wide boom field sprayer can be used with streamer nozzles to safely apply N at this stage, then producers may adopt this methodology.

Next Steps:

This was the first of a 3 year study. More work is required to determine the crop stage at which it is safe to apply post N using streamer nozzles. The injury and recovery from burn injury associated with UAN application must be determined before recommendations are made for N to be applied in this manner.

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