Nitrogen Application Method and Timing For Corn Production on Clay Soils

(GHSCIA – Interim Report)

Purpose:

Considerable adoption of broadcast (spraying) of UAN exists in certain areas of the province. At planting time this often occurs as a flat fan application in combination with soil applied herbicides. Later in the season there is increasing use of streamer nozzle techniques to apply UAN when the corn is in the 3-6 leaf stage.

The purpose of this project is to evaluate the impact of applying UAN at various times and with various application (broadcast vs. injected) strategies.

Methods:

Six field scale plots were initiated across different previous crops and tillage systems. The sites were on unimproved loam soils with a poorly drained clay subsoil. 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 (planting to emergence) coulter inject
2. Early (planting to emergence) broadcast (fan nozzle)
3. Late (sidedress timing) coulter inject
4. Late (sidedress timing) 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.

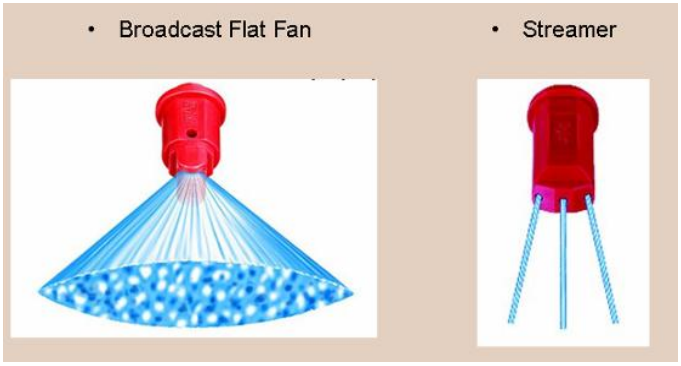
A 15 foot wide, skip row liquid fertilizer applicator was built utilizing an old six row corn planter frame (Figure 1.). Three fertilizer application coulters were mounted to the frame and plumbed to an added fertilizer tank. A ground driven spray boom was mounted at the back of the unit and the nozzles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

Results:

This is the third year of the project; summarized results from all three years are highlighted in Table 1. In one of the three years the early inject treatment yielded more than the early flat fan application. In this case since there was no crop injury to consider the yield reductions are almost certainly due to N losses from the soil surface after

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



application. In two of the three years sidedress timing injection out yielded streamer nozzle applications. In this situation there are three possible explanations for the streamer nozzle yield reduction: 1) N loss, 2) Leaf burn 3) N not getting to the roots with surface application in years with low rainfall in June/July.

Table 1. Impact of UAN application timing and method on corn yield over the three years (2009, 2010, 2012).

Method	2009		2010		2012	
	Corn yield – bu/acre					
At Plant – Flat Fan	140	nsd	120	c	147	b
At Plant - Injected	142		129	b	149	ab
Sidedress - Streamer	141		131	b	146	b
Sidedress - Injected	138		140	a	153	a

In this project we have tentatively concluded that the leaf burn associated with streamer nozzle applications (see Figure 3) does not appear to result in any significant yield loss. The dry weather impact is a possibility in some years, however in general we believe the dominant risk with streamer nozzle application on 3-6 leaf corn is the potential N loss due to volatilization compared to soil injection.

Overcoming these N losses from streamer applications hinges on two strategies 1) watch rainfall predictions and delay streamer nozzle application to the days prior to a likely rainfall and/or 2) use a volatilization inhibitor (i.e. Agrotain) in situations where rainfall is unlikely and especially where significant plant material is located on the soil surface.

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

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:

Maximum N use efficiency is most likely is obtained when spit applications of N are utilized. High speed (streamer nozzle) application strategies may make this more appealing. Further research should investigate leaf burn and N losses (with and without Agrotain) across a wider range of leaf stages and soil surface conditions. This was the final year of 3 year project but further data analysis and interpretation along with collaborating experiments are required to fully complete the project.

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