MCGA On-Farm Trials: Assessing the Effects of Split Nitrogen Application in Corn

Ron Tone P. Ag CCA[1], Jordan Karpinchick CCA[1], Liz Karpinchick Tech. Ag CCA[1], John Heard P. Ag CCA[2]

[1] Tone Ag Consulting Ltd., St. Pierre-Jolys, [2]Manitoba Agriculture, Carman

TONE AG CONSULTING

Background

There is a growing demand in Manitoba for research in the best management practices to ensure sustainability of the corn industry and profitability for farmers.

After years of wet conditions during the growing season, there has been an increased interest in side dressing nitrogen for corn production to help mitigate early season nitrogen losses.

There is a need for organized on-farm collection of quality data to determine if this is a beneficial and profitable practice. These trials were set up to determine yield response when nitrogen applications were split between seeding and in-crop (between V4-V6) versus all nitrogen being applied in the spring at seeding.

Method

➢In 2017, 9 on-farm trials were setup across the Red River Valley

➢Treatments were set up in 12 replicated and randomized strips across the field (usually ½ mile in length) comparing the farmer's Base rate of N in spring versus Base - 40N in spring plus a sidedress (SD) application of 40N between V4 and V6.

➢The trials were scouted during each growing stage to monitor emergence, plant population, insects, disease, row closure, vegetative reflection, and rainfall. In-season scouting tools used included spring soil tests, Greenseeker, pre-sidedress nitrate test (PSNT) and corn stalk nitrate samples.

➢RGB and NIR images were taken between August 24th and 29th. NDVI colour maps were created to detect any vegetative differences between the two treatments [Figure 1]. Areas that were drowned out (ditches, planter skips etc.) were removed from the trial using the imagery.

➢Yields were obtained using a calibrated scale.

➢Simultaneously, traditional small plot research plots examined a range of N rates and splits in corn at 10 Manitoba locations the past 2 years.

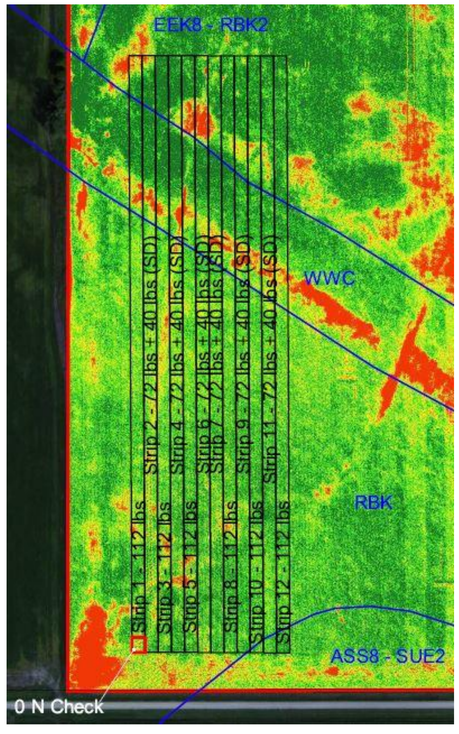

Figure 1 – NDVI image of the Macgregor trial. No differences observed between the two treatments.

Observations

➢Seeding dates ranged from May 2 – May 10. See Table 1 for summary of trials.

➢Nitrogen rates ranged from 80 to 175 lbs N/ac applied. Rates were based on soil test recommendations or farmers normal practices. Sidedress N applications of UAN were streamed, injected, broadcasted and dribbled [Figure 2]. The Roland trial applied an extra 26 lbs/acre N at sidedress timing as it was the farms normal practice.

➢Rainfall ranged from 5.1" – 8.4", with the majority occurring in June. There was some wind damage a week before harvest of Westbourne trial location [Figure 3]. Corn header was lowered to ground to mitigate any potential effect on trial results.

➢Niverville trial had statistically different yields between the two treatments. Sidedressed N application was done at V8, almost three weeks later than the first applications. There is a trend showing that sidedressed strip yields declined as N was applied later in season (mid June vs. early July)

➢Selected small plot results are displayed in Figure 4. At 5 sites there was no yield response to added N and there was a yield increase at the other 5 sites. There were no significant differences in yield between the base N rates of 80 lb N/ac vs. the 40N & 40N split or base rates of 120N vs 40N & 80N or 80N & 40N splits.

Table 1 – Summary

	Location Name	Date Seeded	N Rate Applied (actual lbs/acre)	N Application Date (Spring)	N Type (Spring)	N Application Date (SD)	N Type (SD)	Sidedress Stage	Days Before Rainfall After SD*	Total Rainfall (Seeding - Maturity) (in)	Split App Yield (bu/ac)	Base N Yield (bu/ac)	Yield Difference (bu/ac)
1	Bagot	5/2/2017	145 vs. 105 + 40 SD	5/1/2017	UAN (B+I)	6/16/2017	UAN (Y-Drop)	V5	5	8.4	179.2	173.3	5.9
2	MacGregor	5/3/2017	112 vs. 72 + 40 SD	5/1/2017	UAN (Banded with A/S)	6/16/2017	UAN (Y-Drop)	V4	5	8.2	168.4	165.3	3.2
3	Aubigny	5/5/2017	100 vs. 60 + 40 SD	5/12/2017	UAN + Agrotain Plus (B)	6/20/2017	UAN (Streamed)	V4	1	5.3	140.8	141.5	-0.7
4	St. Pierre	5/5/2017	100 vs. 60 + 40 SD	5/12/2017	UAN + Agrotain Plus (B)	6/20/2017	UAN (Streamed)	V4	1	5.8	135.5	135.7	-0.2
5	New Bothwell	5/10/2017	80 vs. 40 + 40 SD	5/10/2017	NH3 (Banded with A/S)	6/21/2017	UAN (Streamed)	V4	0	5.3	122.8	125.8	-3.0
6	Roland	5/10/2017	142 vs. 168 (102 + 66 SD)	5/10/2017	Urea (B+I)	6/22/2017	UAN (Coulter Injection)	V5	6	7.0	121.2	126.6	-5.3
7	Landmark	5/5/2017	150 vs. 110 + 40 SD	5/4/2017	Urea (B+I)	6/27/2017	UAN (Y-Drop)	V5	1	5.1	130.2	135.9	-5.7
8	Westbourne	5/4/2017	100 vs. 60 + 40 SD	5/4/2017	Urea (Banded with A/S)	7/4/2017	UAN (Broadcast)	V6	5	6.6	101.1	96.7	4.4
9	Niverville	5/9/2017	175 vs. 135 + 40 SD	5/10/2017	Urea + Agrotain (B)	7/10/2017	UAN (Dribbled)	V8	1	5.2	117.2	126.0	-8.8
								AVERAGE	2.8	6.3	135.2	136.3	-1.1

B = Broadcast B+I = Broadcast + Incorporation

SD = Sidedress

*Rainfall > 0.3"

Indicates Statistical Difference

Figure 2 – Sidedress application of UAN with custom y-drop hoses

Figure 3 – Wind damage at Westbourne trial during harvest

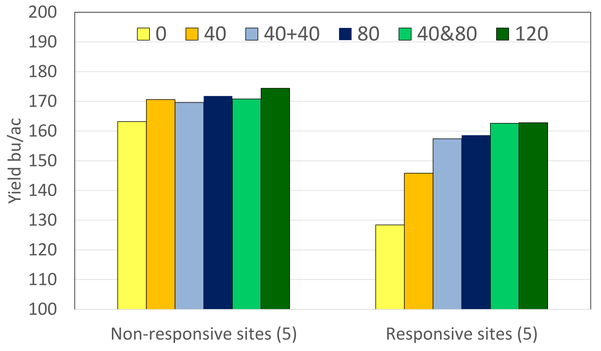

Figure 4 – Corn yield response to base N applications and split N applications (2016-17). Selected base N rates of 0, 40, 80 and 120 are compared to split N applied at either V4 or V8 with average response displayed here.
Leaf burn due to poor Y-drop streaming tended to reduce yields at one site.

Conclusions

1. The trials showed on average, there was no yield differences between the spring applied base N and the split nitrogen application in 2017.
2. Niverville trial yield difference was most likely due to the sidedressed N being applied too late (V8 with dry conditions), resulting in poorer yields. This year's data suggested that earlier applications of the SD N (V4-V5) was less risky than delaying application and danger of N being stranded at the soil surface when dry.
3. Further on-farm research under wetter conditions with higher risk of N loss may determine if split applying nitrogen provides an economic return to the farmer.

Acknowledgements

MANITOBA CORN GROWERS ASSOCIATION INC.

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