True PERFORMANCE

2022

AGRONOMY SUMMARY

2022 AGRONOMY SUMMARY

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More Grain per Plant: Harvest Index Implications for Grain and Silage Yields

Background

I remember as a kid, when the first grain corn harvesting began to happen in our area (circa 1967), I was shocked to learn that we would only be harvesting the grain. It seemed like such a waste to leave what I thought was the majority of the crop lying in the field. Had someone explained Harvest Index to me at that time, they could have reassured me that at least 45-50% of the total weight of the crop was indeed going into the bin. Harvest Index is determined by taking the grain weight (0% moisture) and dividing it by the entire above-ground plant dry weight (grain and stover). For many decades, grain corn had very stable (or stubborn) Harvest Index measurements of about 50%.

However, over the last decade or so, we have been measuring significant increases in Harvest Index, and these changes are having big impacts on corn yields. In 2022 we returned to the field to check Harvest Index values and how they related to grain yields in a relatively dry year and how they might impact silage quality and silage/grain corn ratios.

More Yield

The Maizex plots were grown and harvested at Alstein Farms near Embro, Ontario. **Table 1** lays out the results and illustrates Harvest Index values approaching 60%. Notice what the yield would have been if Harvest Index values were at the traditional 50% figure. You can see why improving the ratio of grain corn to total plant weight has been such a game changer when it comes to improving yields.

Hybrid	CHU Rating	Harvest Index	Grain Yield	Predicted Grain Yield if Harvest Index was 50%
MZ 3505DBR	2850	58.9%	249.8	212.1
MZ 3930DBR	2950	57.6%	257.0	223.1

Table 1: Corn yield and Harvest Index values as measured at Embro, Ontario, 2022.

It should be noted that when Maizex conducts Harvest Index measurements, 10 consecutive plants are carefully selected for uniform spacing and uniform emergence and size. The plants are cut right at the soil surface, and the grain and non-grain components are separated and oven dried to 0% moisture. One noticeable observation is that when plant stands are less uniform, and you notice plants that have been poor early performers and have smaller ears, then Harvest Index and yield both drop significantly. This reinforces the idea that to maximize yield, a grower needs to optimize ear count and ear uniformity, which starts with field preparation and decisions made at planting.

Grain Corn in a Ton of Silage?

Silage producers should have particular interest in the amount of grain that is present in a ton of a silage. Mostly because increasing the Harvest Index means increasing the starch levels and net energy of the silage. Secondarily, silage growers have been traditionally asked to convert silage tonnage to equivalent bushels of grain corn either for the purposes of calculating the value of the silage or for reporting yields in bu/ac to Crop Insurance.

Historically the conversion factor was 7 bu (15.5%) per ton of silage (2000 lbs at 65% moisture). In 2006, Joe Lauer, University of Wisconsin, reported that 7.5 bu per ton was the average value in his Wisconsin trials. Lauer then updated the conversion factor in 2017 for a 200 bu/acre crop to be about 8.3 bu/ton. USDA set out a conversion factor of 7.94 in a 2020 document.

In our 2022 Embro plots, we evaluated the conversion factors from grain to silage by harvesting both in paired plots. Table 2 illustrates the possibilities for silage conversion measured at 4 distinct locations in the field. We know that in these areas, Harvest Index values were in the 58 to 59% range. The range of conversion factors in these plots was from 7.9 to 8.5 with an average of 8.1. If we prefer to express it in bushels per metric tonne of silage, it would come in at 8.9. Ah, the beauty of our blended Metricperial system!

The Upper Limit

It is important to be a bit careful when trying to calculate the maximum theoretical conversion factor for bushels of corn in a ton of silage. This is because corn grain mass increases by about 10% after silage harvest, and of course a portion (i.e., 4-6%) of the stover biomass does not get harvested with a silage cutting height of 30 cm (12"). However, in a very uniform, high-yielding corn field where the Harvest Index reaches 60%, the math would arrive at a maximum where 1 ton of corn silage at 65% would be represented by 9 bushels of corn at grain harvest time. In more practical, real-field estimates, it seems that relatively high yield corn fields have conversion factors in the 8.0 to 8.5 range.

Site within field	Silage Yield Tons/acre 65%	Silage Yield Tonnes/acre 65%	Grain Yield Bu/acre 15.5%	Ratio Bu / Ton	Ratio Bu / MT
1	31.4	28.5	247	7.9	8.7
2	27.6	25.1	234	8.5	9.3
3	30.7	27.9	245	8.0	8.8
4	31.7	28.8	256	8.1	8.9
Average	**30.4**	**27.6**	**246**	**8.1**	**8.9**

Table 2: Silage and grain yields, and resulting ratios of grain per tonne of silage at the Embro site 2022. Results are from side-by-side plots where silage was harvested on September 23 and grain corn was harvested on October 25, 2022.

Moving Forward

The corn industry needs to appreciate how changes in harvest index influences yields, silage quality, and silage to grain conversion factors. Growers can maximize the genetic advantages of higher grain ratios by improving stand uniformity and by refining other agronomic strategies that enable corn plants to optimize grain mass potential.

Acknowledgements

This article was written by Greg Stewart, Maizex Seeds. Appreciation is expressed to Alstein Farms (Albert and Nathan Renkema) and Laura Johnston, Maizex Seeds, for help with plot work and harvesting. Maizex gratefully acknowledges assistance from Ben Rosser, OMAFRA Corn Specialist, for assistance in processing the harvest index samples.

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http://corn.agronomy.wisc.edu/AA/pdfs/A045.pdf
(Univ. of Wisconsin, Agronomy Advice)

https://hayandforage.com/article-1513-predicting-grain-yields-from-corn-silage-metrics.html
(Hay and Forage Grower)

Foliar Fungicide Impacts in a Dry Year

Background

For years, in Maizex trials we have compared the yield improvements from three approaches to intensifying management in corn: 1) Increase the Population - move from 32,000 to 36,000 plants per acre, 2) Increase Nitrogen Rates - move from 160 lbs/acre to 210 lbs/acre, and 3) Apply a Foliar Fungicide at VT tassel stage. For the most part, VT applications of fungicide have proven to have the highest and most consistent return on investment of the three approaches. In years when rainfall was more than adequate, canopies dense, yields high, and at least some leaf disease present, we came to expect yield increases in the range of 8-12 bushels/ac along with better late season plant health.

The arrival of significant Tar Spot pressure in 2021 made 2022 a marked year for leaf disease concerns. Some growers who had not been using foliar fungicides decided in March of that year that 2022 was the year to spray every acre of corn. Many were already convinced, and so an additional leaf disease to worry about strengthened their resolve to use fungicides.

2022 Growing Season

Trying to look at the fungicide big picture was challenging as we entered the 2022 growing season. Disease concerns and high corn prices combined with the crop being off to an amazing start all made fungicide use seem more than reasonable. By June 10, some were predicting that another record-breaking corn crop was in the wings! Then rainfall began to be very scarce in many parts of the province, and finding early evidence of disease in corn canopies was very rare. These factors sparked an interest in some in reevaluating the disease triangle (see **Figure 1**) to assess the risk of significant disease pressure and thus warranting a VT fungicide.

Were we missing some key components of the triangle? If things are dry and no one is reporting any disease, do you still drive on and spray fungicide as planned? This was one of the big questions from the 2022 season.

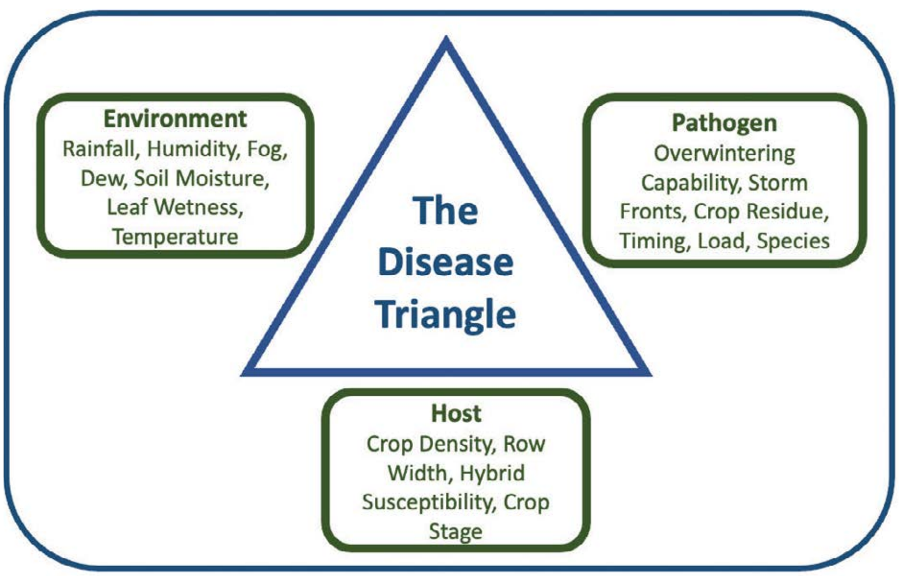


Figure 1: Three factors need to be present to create significant disease in a crop.

Figure 2 illustrates the yield results from Maizex trials at Elora and Waterloo. It should be noted that these sites were particularly dry throughout late June and all of July. Yields were good but 50 bushels off of last year's numbers. Dry conditions did cause these yield results to be more variable than usual, and one can see that in the graphs. However, on average it was clear that fungicides generally caused no improvement in yields and that despite dry conditions MZ 2982DBR had a tremendous year.

Impact of Fungicide – Elora and Waterloo, 2022

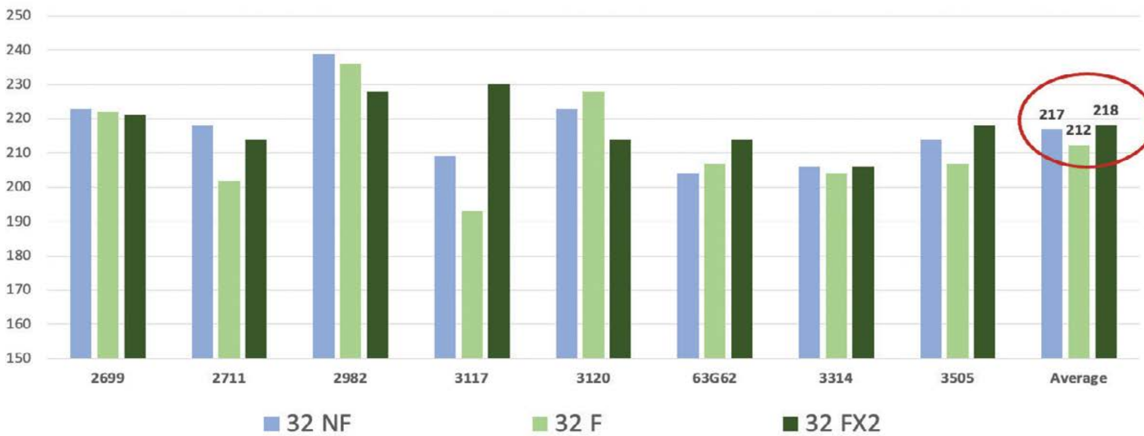


Figure 2: Impact of fungicide applications on grain yield of 8 Maizex hybrids.
32 NF = 32,000 plants per acre , no VT fungicide
32 F = 32,000 plants per acre, Delaro Complete™ applied at VT/R1
32 FX2 = 32,000 plants per acre, Delaro Complete™ at VT/R1, followed by Veltyma™ 10 days later

At Exeter and Belmont, rainfall was a bit more abundant, and yield levels were higher than expected (see **Figure 3**). However, the impact of foliar fungicide was largely insignificant. The exception would be several hybrids that, when pushed to the higher population of 36,000, did respond with extra yield when the fungicide was applied. This phenomenon has been observed in other sites over other years, that is, when populations are increased, yields may often not increase unless accompanied by fungicides and/or additional nitrogen.

Impact of Population and Fungicide – Exeter and Belmont, 2022

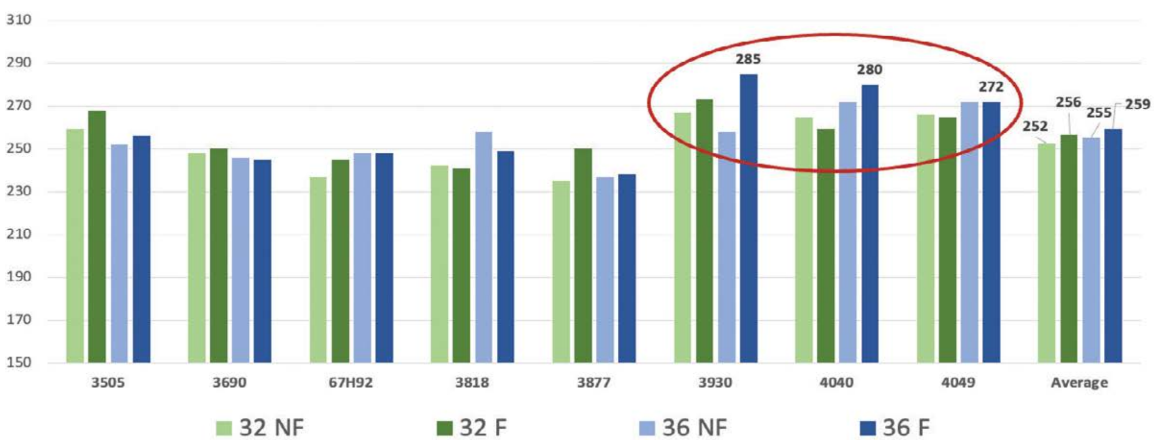


Figure 3: Impact of fungicide application and plant populations on 8 Maizex hybrids.
32 NF = 32,000 plants per acre; no VT fungicide
32 F = 32,000 plants per acre; Delaro Complete™ at VT/R1 stage
36 NF = 36,000 plants per acre; no VT fungicide
36 F = 36,000 plants per acre; Delaro Complete™ at VT/R1 stage

Finally, the results from Dresden and Ridgetown reflect similar results to other sites already mentioned. **Figure 4** illustrates that little benefit was gained from either a single or double fungicide application. There were two exceptions that are noteworthy. MZ 4158DBR is a hybrid that has an amazing capacity to add kernel weight and yield in the last 30 days of grain filling. Give that hybrid a fungicide or two to help with stay-green and you often get rewarded with top yields. MZ 4608DBR has exceptional yield potential and tremendous resistance to ear moulds and DON, but its resistance to leaf diseases is only average. **Table 3** shows some significant yield improvement on that hybrid from the second application of fungicide 10 days after R1.

Impact of Fungicide – Dresden and Ridgetown, 2022

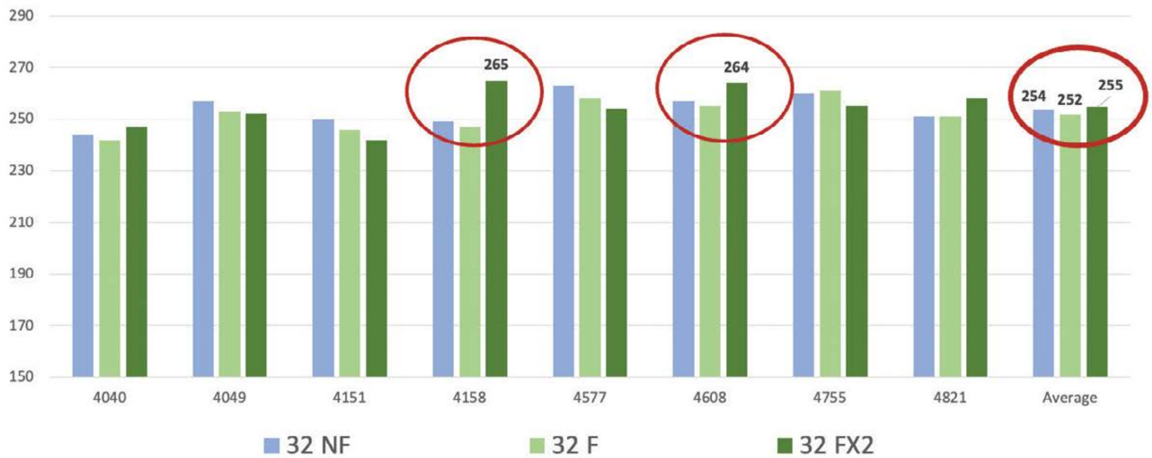


Figure 3: Impact of fungicide applications on grain yield of 8 Maizex hybrids.

32 NF = 32,000 plants per acre , no VT fungicide

32 F = 32,000 plants per acre, Delaro Complete™ applied at VT/R1

32 FX2 = 32,000 plants per acre, Delaro Complete™ at VT/R1, followed by Veltyma™ 10 days later

Moving Forward

Over the years, a VT fungicide application has made a significant contribution to yield. However, we cannot ignore the fact that, in a dry year like 2022, the conditions that allow diseases to get a foothold on the crop did not exist in many areas. In some instances, VT fungicides appear to help plants withstand stress even in a dry year, though your own experience may have been different in 2022. Nevertheless, moving away from an approach of fungicide on every acre all the time was probably a good move in many situations from both an economic viewpoint as well as looking towards the long-term sustainability of the fungicide technology.

Acknowledgements

This article was written by Greg Stewart, Maizex Seeds. Appreciation is extended to Bayer Crop Science for support of the fungicide research conducted in 2022.

Kernel Weight versus Test Weight: Observations and Updates

Background

Test weight has been something we have measured as farmers for generations. In doing so, some have come to believe that test weight is a significant factor in determining yield. Test weight is a measurement of density, or how well kernels fit together and pack into a given space or volume. Many would theorize that corn with heavy kernels would also have high test weight, but in many circumstances, this is not the case. This is particularly true if the test weight is being measured on big kernels at relatively high moistures. Here, test weights will be modest even on hybrids that have very high yields because they have very heavy kernels that do not pack well together. There can be some correlation between test weight and kernel weight, but the principal reason for focusing more on kernel mass is that it is a direct component for calculating yield and understanding yield in a field or a hybrid.

Ear Count x Rows Around x Ear Length x Kernel Weight = Yield

The Count

This past 2022 growing season, Maizex spent considerable time measuring both 1000 kernel weight and test weights for selected hybrids. Using our Mini-Gac moisture testers, we were able to take moistures and test weights of hybrids, providing us with insight into their density. To learn more about our hybrids, and to compare to test weights, Maizex also took 1000 kernel weight samples. When measuring kernel weights, 1 or 2 samples were taken, and their kernels were counted by using an app called **Count Things** (see **Figure 1**). The Count Things app works by taking a digital image with a phone and processing it by counting all the kernels in the image. Maizex used the template 'Grapes, Beans, Cherries and Berries' which provided accurate (within 1-2%) kernel counts when kernels were spread evenly in a black tray. Once the counting was completed, that sample of kernels was weighed on a small scale. Once we had kernel number, kernel total weight, and the moisture from the Mini-Gac, we were able to complete a calculation to give us 1000 kernel weight with kernels at 15.5% moisture:

(Kernel Weight / Kernel Number) X ((100 – Moisture)/ (100 – 15.5)) X 1000 = 1000 Kernel Weight

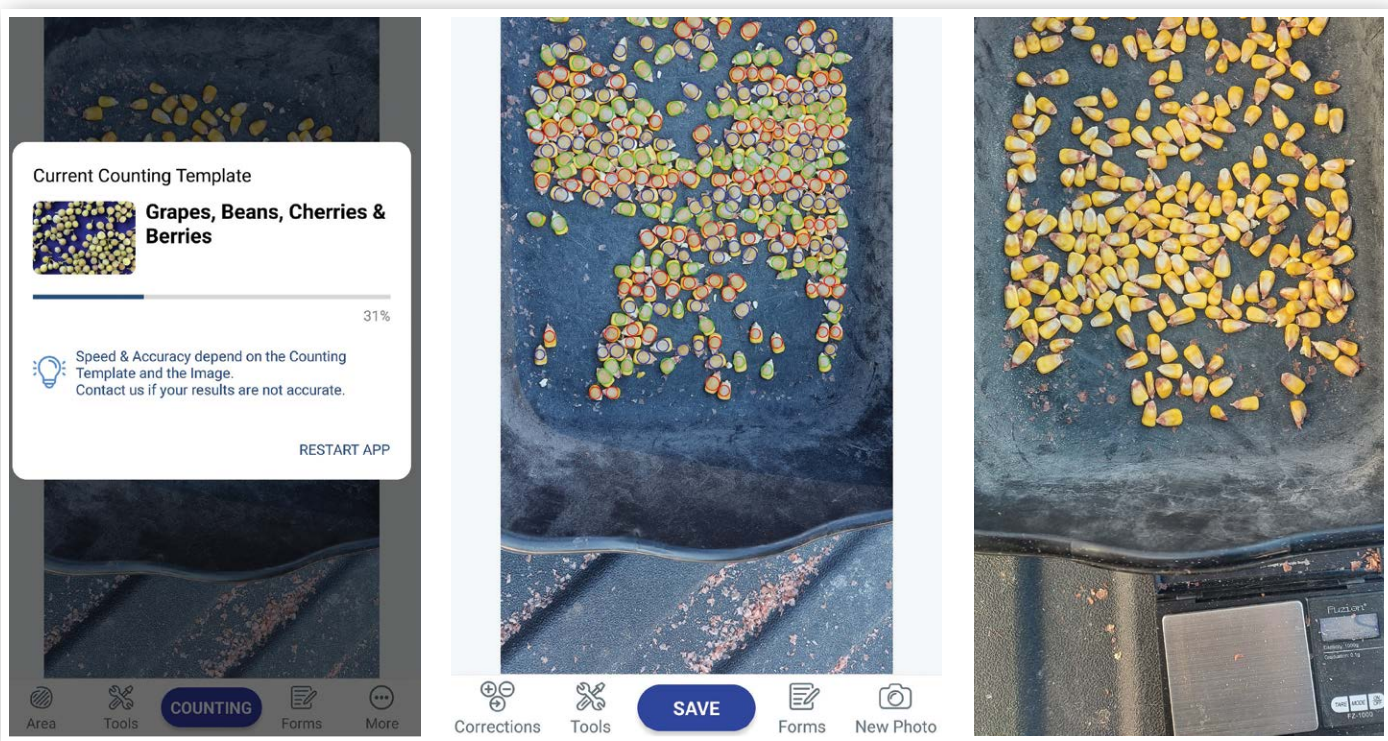


Figure 1: For rapid kernel counting, in order to determine TKW (Thousand Kernel Weight) Maizex used the **Count Things** app to process a digital image of kernels in a black tray.

2022 Results

As an example of how Test Weight and 1000 Kernel Weights are used, we will examine the results from Maizex test plots in Dunnville, ON. At this site, yield was highly correlated to 1000K weight. Our top 5 yielding products at those locations had the top 5 (out of 11) 1000K weights and dramatically outyielded the rest of the hybrids (see **Figure 2**). The bottom 6 yielding hybrids had the 6 worst 1000K weights respectively. At this location there was one 'outlier'; MZ 4608SMX placed 6th out of 11 hybrids but finished dead last in 1000K weight. One may conclude that MZ 4608SMX was able to 'kernel number' itself to high yield. In other words, it had so many kernels that the 1000K weight didn't matter as much. This was likely the case as MZ 4608SMX routinely had the highest kernel counts of many of the Maizex hybrids. At Dunnville there was also a correlation between test weight and yield (see **Figure 3**), but not nearly as strong as the correlation between TKW and yield. We remain convinced that 1000 Kernel Weight generally gives us a better understanding of yield in a hybrid than test weight.

One may ask in what ways could these findings be applied? It's fair to assume that using 1000K weights is a helpful tool for farmers when choosing hybrids. Hybrids can be chosen from different pools: ones that bring yield from kernel number or hybrids that bring yield from kernel weight. Choosing hybrids in such a manner may help to spread risk, depending on the year and season you are given. MZ 4608SMX and MZ 4821DBR are a great example of this kind of package. MZ 4608SMX routinely 'kernels' itself to the top of many fields whereas MZ 4821DBR relies heavily on the finish for heavy kernels to top plots and fields.

Note that growers in short season areas often are at risk of too much grain price deduction if test weight slips due to a low CHU season or early frosts. At Maizex, we understand this concern and will continue to report test weight for these reasons.

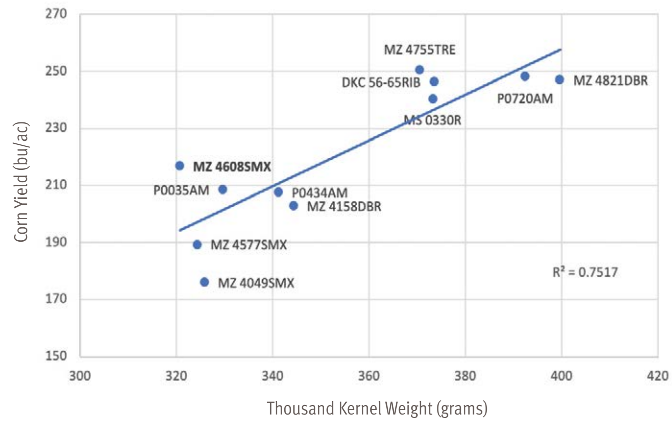


Figure 2: 1000 kernel weight relationship with yield; explains 75% of the variability in yield.

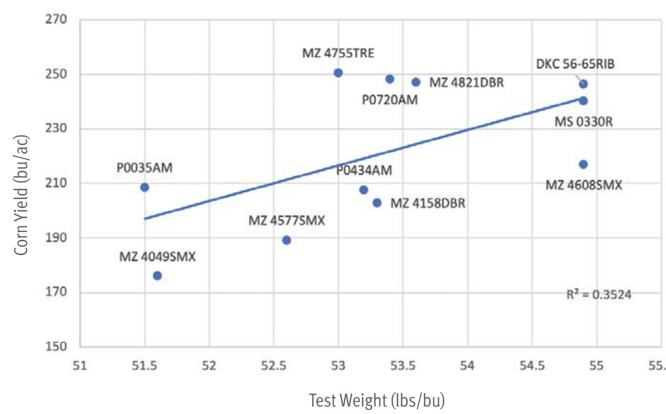


Figure 3: Test weight relationship with yield; explains 35% of the variability in yield.

Moving Forward

When it comes to understanding yields and the components of yield from a range of hybrids, we are excited about the information we gain from 1000 kernel weight measurement and how much more useful it can be to the industry compared to the traditional test weight measurement.

A rapid technique for counting kernels and arriving at 1000 kernel weight, as we used in 2022 for the first time, is important to make the data gathering more efficient.

Acknowledgements

This article was written by Henry Prinzen, Maizex Seeds.

High Soil Nitrate Tests: A Sign to Stop Sidedressing Nitrogen or Not?

Background

Soil nitrate testing has been around for decades. In its most common form, it generated results under what was referred to as the Pre-Sidedress Nitrogen Test (PSNT). In the PSNT the idea was to evaluate how much residual nitrogen was in the soil when sampled at 12" deep or perhaps 24" deep in stone-free ground! The aim was to recommend how much sidedress nitrogen was required based on the level of soil nitrates measured when the corn crop was at the 4 to 6 leaf stage. In this situation, the sampling done was to avoid any fertilizer N that was applied in bands by the planter and was calibrated for fields that had not received any broadcast nitrogen ahead of the sampling date.

The challenge with this approach is that there are few fields that qualify under these restrictions: Zero Broadcast N, some starter N in bands on the planter (that can be avoided with the soil probe), and then all the rest of the nitrogen to be applied with the sidedresser. Rather than abandon the N test, many have kept using it even with the knowledge that it is not necessarily accurate when sampling into recently applied N fertilizer.

K. Janovicek (University of Guelph) had done a good job of recalibrating the N test for different yield expectations and different prices of both fertilizer and corn, and so we added this tool to the Maizex N Tracker. For years now, we have continued to provide guidance on sidedress N recommendations, even when some broadcast N has been applied up-front.

In 2022, we had a particular question for our nitrogen research plots: If the soil nitrate tests were high (traditionally, high meant over 35 PPM), was that a clear and reliable signal that no additional nitrogen was required?

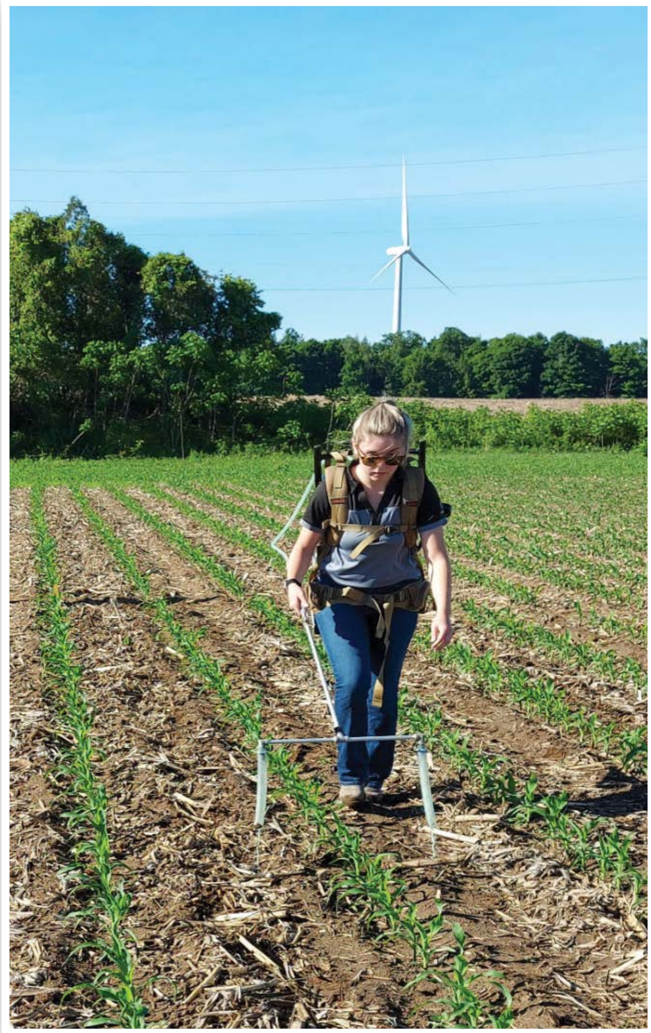


Figure 1: A Maizex summer intern applies sidedress nitrogen to corn plots in 2022. Calibration of the UAN application is accomplished with a CO_2 backpack sprayer. UAN, stabilized with Anvol™ , is applied in surface dribble bands on either side of the row.

2022 Results

Throughout the season, we worked with 30 different cooperators in 12 different counties, evaluating various approaches to nitrogen management. In this article we will focus on those sites that ended up with relatively high nitrates when sampled at the V4 to V6 stage, such that the N recommendation called for zero additional sidedress nitrogen.

The results are illustrated in **Figure 2**. The bars in **Figure 2** represent corn yield under both the producer-applied full rate and the yield from neighbouring plots where an additional 40-50 lbs of N was applied (topped up). It is apparent that when soil nitrates were in the range of 32 to 46 PPM there was some significant corn yield response to additional nitrogen. Only when soil nitrates were approximately 50 PPM or higher did the response to additional N mostly disappear.

Moving Forward

Evaluating soil nitrate status, when integrated with a broader look at nitrogen recommendations, can help fine-tune nitrogen application rates in the sidedress window. Many growers realize that, because of previous crops, manure applications and up-front nitrogen applications, they have considerable nitrogen in the soil matrix by mid-June. The question persists with these growers, however, whether a final top-up of 50 lbs of additional nitrogen is warranted. Soil nitrate testing should help answer this question. This work from 2022 indicates that a threshold of more than 35 PPM, perhaps as high as 50 PPM, is required to ensure that no additional N is required. The threshold levels will need to be re-evaluated in future growing seasons.

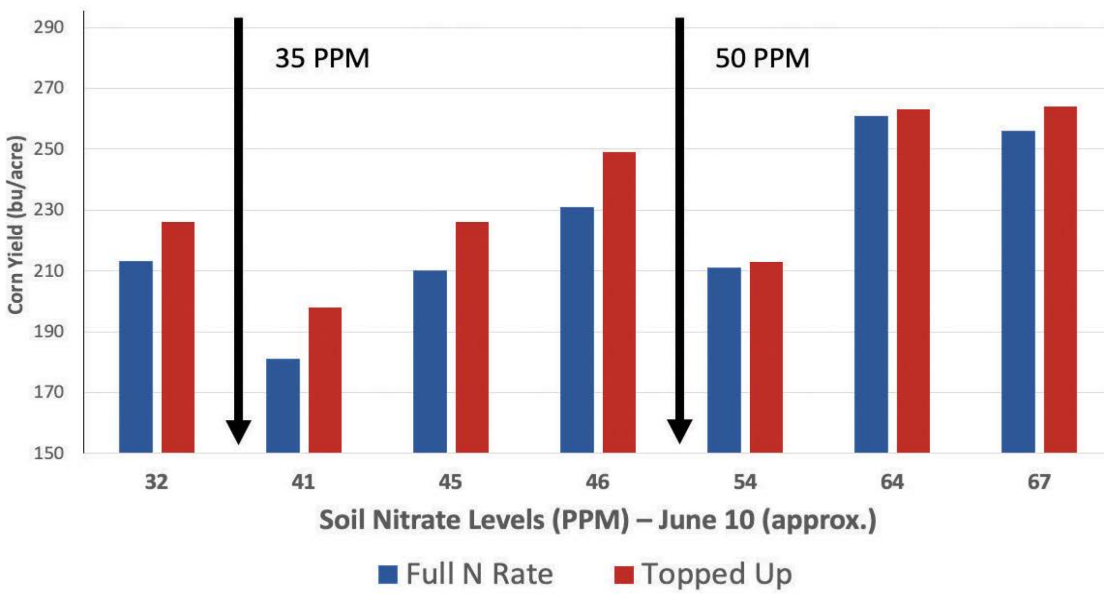


Figure 2: Corn yield response as related to soil nitrate levels across 7 Ontario fields in 2022.

Full N Rate implies total N applied to the crop ahead of the soil nitrate testing; no additional N was applied.

Topped Up implies that 40-50 lbs of additional N was applied at sidedress time to these plots in addition to that received on the Full Rate Plots.

Acknowledgements

This article was written by Chuck Belanger, Maizex Seeds. Special thanks to the cooperators that allowed nitrogen blocks to be arranged across their corn fields! Thanks also to Maizex interns Morgan Anderson, Lexi Johnston, Anna Stephen, and Landyn Bowen, who helped with soil sampling, nitrogen applications, and plot harvesting in 2022.

Can Nematodes Reduce Corn Rootworm Feeding in Corn after Corn?

Background

Recently, research has emerged highlighting the idea that certain types of nematodes may be able to reduce corn rootworm larvae feeding on corn roots in a corn-on-corn cropping system. The nematodes are referred to as 'entomopathogenic' (EPN). These EPN nematodes have been the subject of testing by Cornell University (Ithaca, NY). Maizex has participated with Dr. Jocelyn Smith, University of Guelph – Ridgetown Campus to evaluate the EPN nematodes, as well as insecticides and genetic traits in combatting corn rootworm and in particular combatting the development of resistance in corn rootworm populations to corn rootworm Bt traits. In 2021 we set up two corn-on-corn sites and applied the EPN nematodes. EPNs were applied in 50 gallons of water per acre in a sprayer with all strainers, screens, and tips removed. Spraying was completed in the evening to prevent the EPN from drying out in the sun before being able to enter the soil.

2022 Results

In 2022 we returned to these same sites, one near Auburn, ON and one near Molesworth, ON and established test plots in the same area. Hybrids planted were MZ 3117DBR (no rootworm trait) and MZ 3120SMX (rootworm trait). In addition, testing included 1250 Poncho seed treatment and Force 3G in-furrow insecticide. The Auburn site had particularly high corn rootworm pressure in 2021 (see photos in **Figure 1**) and in 2022.

With the EPN nematodes applied in 2021 (and therefore given a year to colonize and multiply in those blocks), the intent was to observe any impact on the amount of corn root feeding that would be present in 2022. **Figures 2 and 3** show some visual differences in the amount of feeding when looking at the non CRW hybrid both with and without the presence of EPN nematodes.

> Importantly, when the university technicians dug and rated the corn plants for evidence of reduced feeding, it appeared that both hybrids had statistically lower root feeding in the presence of EPN nematodes compared to the plots that had no nematodes applied in 2021 (See **Figure 4**).

Figure 1: Auburn, ON corn rootworm (CRW) test location in 2021. The site was continuous corn for more than 15 years. Note lodging caused by rootworm feeding earlier in the season; both MZ 3120SMX and MZ 3117DBR planted in side-by-side plots; heavy CRW adult pressure later in the season with more than one adult per plant and feeding evident on corn leaves. *Photos: G. Stewart - Maizex Seeds.*

Figure 2: Rootworm feeding examples on Non-Bt Rootworm (MZ 3117DBR) with nematodes applied.

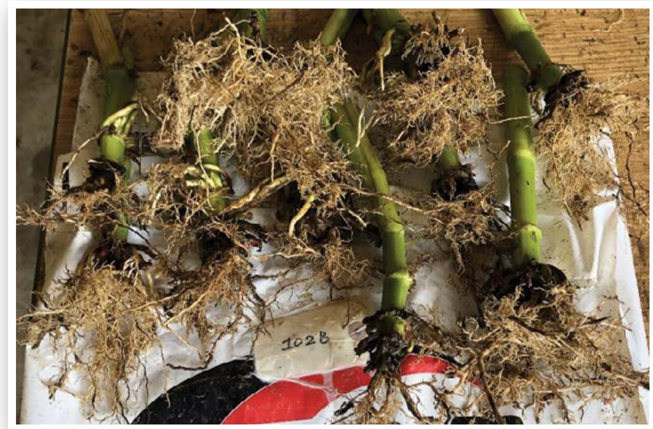
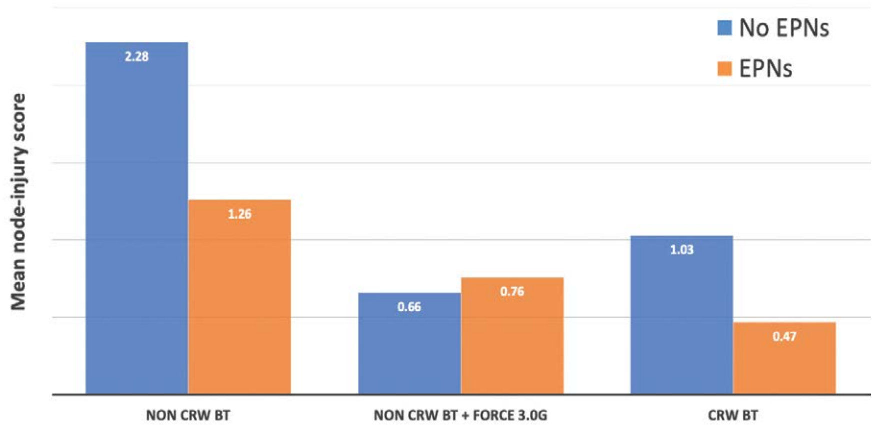


Figure 3: Root feeding examples on Non-Bt Rootworm hybrid (MZ 3117 DBR) with no nematodes applied. *(Photos: J. Smith – U. of Guelph)*

Figure 4: Corn root injury scores on

- a non-CRW Bt hybrid (MZ 3117DBR),
- the non-CRW Bt hybrid with Force 3.0 G applied in furrow, and
- the CRW Bt traited hybrid (MZ 3120SMX).

Higher numbers mean more nodes injured by feeding. Scores include with and without the presence of previously applied entomopathogenic nematodes (EPNs). Data is from the 2022 Auburn site only.



The reduced root feeding observations are encouraging. However, it was noted that the amount of eventual goose-necking in the plots measured at the R3 stage of the corn was similar in both EPN and non-EPN plots.

Yield was not assessed at the Auburn site. Wet planting conditions in the spring followed by dry conditions during the growing season resulted in significant variability throughout the experiment that would have confounded the experimental treatments. Soil bioassays to evaluate the persistence of EPNs across years at these sites are ongoing.

Moving Forward

It should be noted that both the non-CRW Bt hybrid and the CRW Bt hybrid showed significant damage from the rootworm feeding. This highlights the ongoing concern that there are strains of corn rootworm that are now resistant to the CRW Bt traits. Growers need to be aware of this development and attempt to use the Bt CRW technology as prudently as possible and to use other control measures, mainly crop rotation, to reduce the possibilities of increasing resistance development. Maizex will continue to participate in the evaluation of EPN nematodes. It would be an exciting development if these nematodes could be added to a grower's toolbox for managing corn rootworm damage in their corn fields.

Acknowledgements

This article was written by Greg Stewart, Maizex Seeds. Appreciation is extended to Dr. Jocelyn Smith, University of Guelph – Ridgetown Campus for leading this project and for all the data, pictures, and insights.

OMAFRA Soybean Agronomy Trial Results (2022)

1) Are longer maturing varieties (higher CHUs) better suited when planting wide rows?

Purpose: Lower seeding cost, less white mould, and better emergence have led some growers to move away from seed drills in favour of planters. However, wide rows are known to have slightly lower yields. This yield reduction comes from slower canopy closure which reduces the amount of sunlight captured by the crop. For maximum yield potential, 95% light interception must occur by early pod set. It takes 10 to 14 days longer for 30" rows to fill the canopy compared to 15" rows. One way to minimize this reduction in light interception might be to plant longer maturity group varieties (higher CHUs). These varieties would have additional time to 'catch up' because they mature later in the fall allowing them to use more of the growing season's sunlight. This project assessed the performance of four varieties with different maturities in both 15" and 30" rows. Two planting dates were also assessed to determine if the yield gap of wide rows could also be reduced with earlier planting.

Picture 1: June 22, 2022. Tavistock, ON. The larger rows on the right side of the picture were planted on May 11. The smaller rows on the left were planted on June 2. The leaf area of the May planting date is at least triple compared to the June planting during the first part of the growing season.

Summary: Averaged across all three sites, each variety on both planting dates showed a lower yield when planted in 30" rows compared to 15" rows. See **Table 1**. The yield reduction was similar for both planting dates. This demonstrates that early planting alone cannot eliminate the yield loss associated with wide rows. However, there was a trend showing that shorter maturity group (MG) varieties suffered the greatest yield reductions. This suggests that careful variety selection is essential if planting in 30" rows. A longer MG variety appears to be more suited to 30" rows. This is likely because these varieties have additional time in the fall to catch up for sunlight 'lost' during the first part of the growing season. It must also be noted that 'bushy' varieties are better suited to wide row production, so MG is not the only criteria for variety selection.

	Variety	Row Width	Maturity Group (CHU)	Seeding Rate*	Planting Date	Yield bu/ac	Loss to 30" Rows (bu/ac)
1	Viper R2X	15"	0.8 (2725)	165	May	75.7	
2	Viper R2X	30"	0.8 (2725)	140	May	69.5	-6.2
3	Harrier E3	15"	1.3 (2850)	165	May	75.2	
4	Harrier E3	30"	1.3 (2850)	140	May	70.0	-5.2
5	Cyclone R2X	15"	1.5 (2900)	165	May	75.2	
6	Cyclone R2X	30"	1.5 (2900)	140	May	71.9	-3.3
7	Cougar E3	15"	1.7 (2950)	165	May	73.9	
8	Cougar E3	30"	1.7 (2950)	140	May	71.9	-2.0
9	Viper R2X	15"	0.8 (2725)	165	June	71.7	
10	Viper R2X	30"	0.8 (2725)	140	June	65.6	-6.1
11	Harrier E3	15"	1.3 (2850)	165	June	68.5	
12	Harrier E3	30"	1.3 (2850)	140	June	65.5	-3.0
13	Cyclone R2X	15"	1.5 (2900)	165	June	71.3	
14	Cyclone R2X	30"	1.5 (2900	140	June	67.5	-3.8
15	Cougar E3	15"	1.7 (2950)	165	June	70.3	
16	Cougar E3	30"	1.7 (2950)	140	June	67.6	-2.7

Table 1: Soybean Yields When Planted in 15" and 30" Rows

*Seeding rates were 165,000 and 140,000 seeds/ac. Planting dates were May 10 and June 2 for Elora, May 11 and June 2 for Tavistock, and May 7 and May 30 for Winchester. Yields are averaged across 3 site locations. Each location was replicated 3 or 4 times.

2) Can the yield loss associated with wide rows be ‘won back’ with the addition of starter nitrogen and foliar fungicides?

Purpose: Starter nitrogen can help ‘fill’ the canopy faster, and foliar fungicides will keep leaves healthier. A larger and healthier canopy should reduce the yield loss associated with wide rows. Therefore, wide rows may be more responsive to inputs such as starter N and foliar fungicides. Ten gallons of 28% UAN were applied at planting time on the soil surface on top of the row. The foliar fungicide applied was DELARO Complete and was applied at growth stage R2.5.

Picture 2: June 30, 2022. Tavistock, ON. The larger rows on the right side of the picture received 10 gallons of 28% N. These rows were darker green in colour and filled the canopy faster.

Summary: The yield loss associated with wide rows could be ‘won back’ with a combination of starter N fertilizer and a foliar fungicide. For example the 30" rows planted in May yielded 71.9 bu/ac. This yield was increased to 75.8 bu/ac with the addition of starter N and a foliar fungicide. This yield is essentially equal to the 15" rows which yielded 75.2 bu/ac. However, it must be noted that the 15" rows also increased in yield with the addition of inputs resulting in a final yield of 78.3 bu/ac.

The June results were similar although the yield gains associated with these inputs were smaller. Most of the yield gain came from the foliar fungicide, not the starter nitrogen. This study does not suggest that wide rows are more responsive to the inputs tested. Both row widths showed similar yield gains.

	Variety	Row Width	Treatment Input*	Seeding* Rate	Planting Date	Yield bu/ac	Gain of Input (same row width)
1	Cyclone R2X	15"	none	165	May	75.2	
2	Cyclone R2X	30"	none	140	May	71.9	
3	Cyclone R2X	15"	28%	165	May	76.2	1.0
4	Cyclone R2X	30"	28%	140	May	73.5	1.6
5	Cyclone R2X	15"	28% + Fungicide	165	May	78.3	3.1
6	Cyclone R2X	30"	28% + Fungicide	140	May	75.8	3.9
7	Cyclone R2X	15"	none	165	June	71.3	
8	Cyclone R2X	30"	none	140	June	67.5	
9	Cyclone R2X	15"	28%	165	June	71.7	0.4
10	Cyclone R2X	30"	28%	140	June	68.0	0.5
11	Cyclone R2X	15"	28% + Fungicide	165	June	74.1	2.9
12	Cyclone R2X	30"	28% + Fungicide	140	June	69.5	2.0

Table 2: Soybean Response to Starter N and Foliar Fungicides

*Input = 10 gallons/ac of 28% UAN applied on soil surface at planting streamed on the row. Foliar fungicide = DELARO Complete at growth stage R2.5

Acknowledgements

This article was written by Horst Bohner, OMAFRA Soybean Specialist. The author acknowledges Grain Farmers of Ontario and Maizex Seeds Inc. for sponsoring the trials.

Soybean Seed Treatment Innovation

Background

The product performance of Maizex soybean varieties is driven by many factors. Some of these factors include: high yielding germplasm from an extensive testing program, high quality seed production, and offering the latest and best seed treatment options. There are numerous options when it comes to seed treatments to help protect the loss of yield potential from a variety of diseases, insects, and other pathogens.

> Our job at Maizex is to work with industry partners to evaluate and select the best treatment options so that we can maximize our customers' return on investment.

Maizex has focused on protection from the largest and most prominent yield robbers which include ***Phytophthora*, Soybean Cyst Nematode (SCN), Sudden Death Syndrome (SDS), and White Mould (WM)**. Researchers have been able to develop genetic tolerances to these pests, but genetics alone will not fully control any of these pests. This is where seed treatments add another layer of yield protection. Our role then is to extensively test to both select the best genetics and the best treatment options to maximize yield.

Phytophthora is a soil-borne water mould caused by the *oomycete Phytophthora sojae* which can infect plants at any reproductive stage throughout the season (Dorrance, A.E. et al, 2007). Symptoms are often seen a couple of weeks following heavy rains, especially in poorly drained soils. Selection of varieties with Rps genes has been key to managing this disease. The most common Rps genes include Rps 1a, 1b, 1c, 1k, 3a, 6, and 8, and although there have been many other genes identified, none of these have yet been adapted into commercial varieties. Rps 3a and 6 protect against the most common pathotypes found in our soils, and having a stack with two genes (like 1k/3a) adds protection to a wider array of pathotypes. The next layer of protection comes from fungicide seed treatments.

Historically, the fungicide metalaxyl has been used to help protect from early season infection, but many pathotypes have adapted to this fungicide and are no longer controlled or require very high use rates to have efficacy. New fungicides have been developed including Lumisena™ from Corteva and Vyantis™ from Syngenta. We have tested these extensively over the past number of years and have adopted these into our base fungicide package. Data shows both offer excellent early season protection, higher stand counts, and increased yield, especially in high pressure locations.

White Mould is a major yield robber that affects many growing regions across Canada. Wet and cool weather during flowering is required for the disease to develop, and plant populations, row spacing, fertility, and other factors can influence the development of the disease (University of Minnesota, 2018). **SDS** is a disease found mainly in Southwestern Ontario. The mould infects seedlings early in the spring, but symptoms are not visible until later in the season when the toxins move from the roots up into the leaf tissue and present as interveinal necrosis.

2022 Research

In 2022 we tested a product called Heads Up® which is registered on soybeans for suppression of root rot and post-emergence damping-off, white mould, and sudden death syndrome. The product mode of action uses systemic acquired resistance to activate the plant's own genetic resistance early on before disease pathogens attack. By signaling the plant defences early, the plants can reduce disease infection naturally and reduce the amount of disease infection which in turn reduces yield loss.

Ontario data from 6 strip plots and 5 replicated trials showed an average yield gain of 0.81 bu/ac with a win rate of 80% (see **Figure 1**). Additionally, there were some early season vigour differences observed at a few locations (see **Figure 2**), and in a controlled growth chamber environment planted with Cyclone R2X, there were noticeably greener plants from the Heads Up® treated seed versus the untreated (**Figure 3**).

Yield Difference (bu/ac), Heads Up® vs Standard

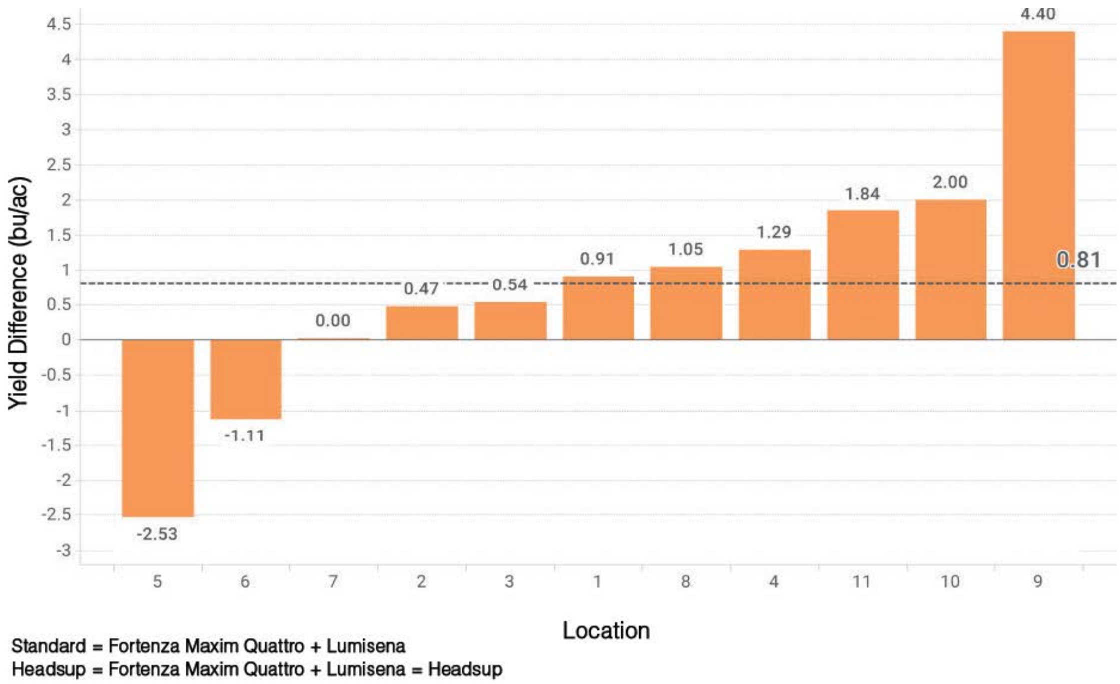


Figure 1: Soybean yield differences for Heads Up® seed treatment. Bars represent Heads Up® treatment yield minus standard treatment yield. 11 Ontario sites conducted in 2022.

Figure 2: Maizex Badger R2X soybeans with Heads Up® seed treatment (left plot) showing some early season vigour advantage compared to a traditional seed treatment package (right plot).

Figure 3: Visual growth improvements in a greenhouse trial where Heasdup seed treatment was used on the pot on the left compared to an untreated plant to the right.

Moving Forward

Testing results from 2022 trials of **Heads Up®** were very encouraging, and we will expand our testing in the 2023 season to cover a larger geography and with larger field scale trials. Be sure to contact your local Maizex representatives to look at how this new seed treatment option can improve vigour and yield in your soybean fields.

References:

Dorrance, A.E., D. Mills, A.E. Robertson, M.A. Draper, L. Giesler, and A. Tenuta, 2007. *Phytophthora* root and stem rot of soybean. The Plant Health Instructor. DOI: 10.1094/PHI-I-2007-0830-07 Reviewed 2012.

University of Minnesota Extension, 2018, Sclerotinia stem rot (white mould) on soybean, accessed January 13, 2023, https://extension.umn.edu/

Acknowledgements

This article was written by Jeremy Visser – Product Development Manager at Maizex Seeds.

Soybean Aphid Control Revisited

Background

Soybean aphids first became a serious pest in Ontario following their arrival in the early 2000s. For the first few years after their arrival, infestation levels were such that populations could quickly reach 10,000 to 20,000 aphids per plant when not controlled (see **Figure 1**). In subsequent years, a balance between soybean aphids and their natural enemies reached an equilibrium to the extent where aphids were still present, but populations seldomly reached a control threshold.

Figure 1

Current Situation

More recently, some areas of the province are once again seeing aphid populations surpass the economic injury level, which is the point where the cost of control is equal to the damage aphids are causing to the soybean crop. In 2021 and 2022, mid-level aphid infestations were found across most of eastern Ontario and in a few parts of western Ontario. While aphid numbers were not as high as in the 2003-2008 period, areas with infestations often saw aphid numbers climb into the 500 to 3,000 aphids per plant range (**Figure 2**).

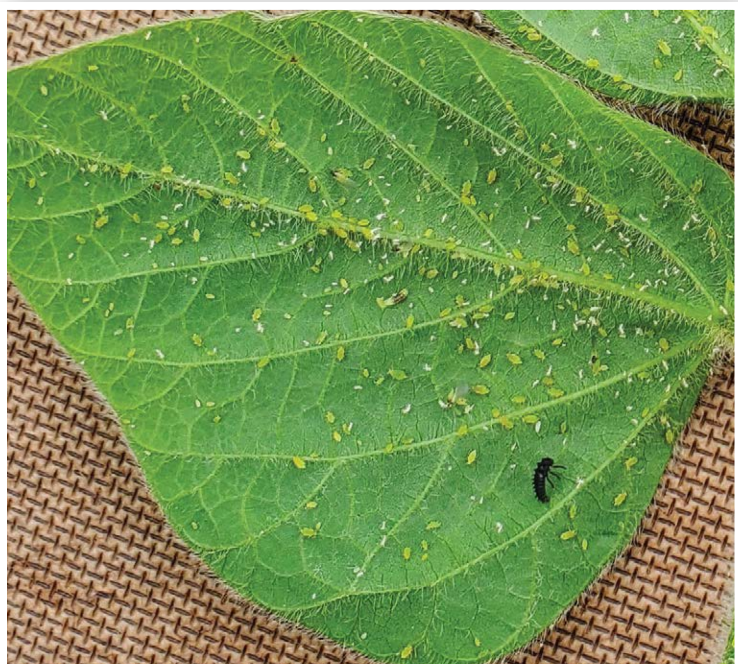


Figure 2

Key Questions

1. What is the impact of mid-level (500 to 3,000 aphids per plant) infestations on soybean yields?
2. Given today's higher soybean yields and higher commodity prices, should the original economic injury level be revised downward? The economic injury level was originally determined to be around 660 aphids per plant.

Yield Impact of Soybean Aphids

In 2021 and 2022, small plot, replicated trials were conducted at the Winchester Research Station to assess the impact of mid-level aphid populations on soybean yields.

Trial Results

In 2021, the insecticide treatments (**Figure 3**) were applied to a decreasing aphid population. The aphid population reached a high of 900 aphids per plant at growth stage R2.5. The insecticide treatments were applied at growth stage R3, at which time the aphid population had naturally dropped to 500 aphids per plant. No yield gain (**Figure 4**) was obtained by applying an insecticide treatment to the decreasing, mid-level aphid population.

Treatments	Yield Bu/a
Check	60.3
Matador	60.1
Sefina	60.3

Products	Application Rate
Matador	34 mL/acre
Sefina	81 mL/acre

Products	\$8 - \$14
Application	\$0 - \$13
Tramping	0 - 2 Bu/a

Figure 4: Soybean yield response to insecticide treatments – 2021.

In 2022, the insecticide treatments were applied at growth stage R2.5. At the time of application, the aphid population was at 800 per plant and rapidly increasing, as seen in **Figure 5**. Aphid control with Matador provided a 6.6 bu/ac yield gain and control with Sefina provided an 8.4 bu/ac gain (**Figure 6**).

Soybean Aphid Control Trial
Winchester Research Station UoG 2021

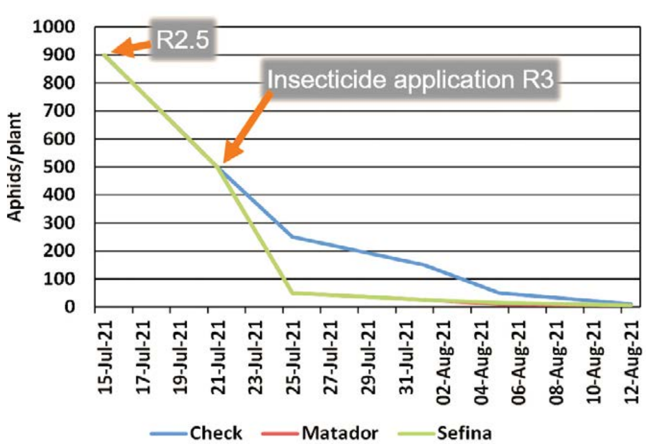


Figure 3

Soybean Aphid Control Trial
Winchester Research Station UoG 2022

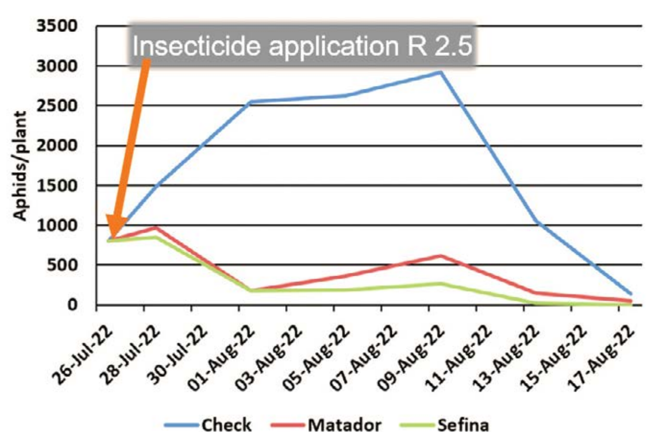


Figure 5

Treatments	Yield Bu/a	Yield Diff
Control	56.3	
Matador	62.7	6.4
Sefina	65.8	9.5
Matador	63.1	6.8
Sefina	63.5	7.2

Products	Application Rate
Matador	34 mL/acre
Sefina	81 mL/acre
Products	$8 - $14
Application	$0 - $13
Tramping	0 - 2 Bu/a

Figure 6: Soybean yield response to insecticide treatments – 2022.

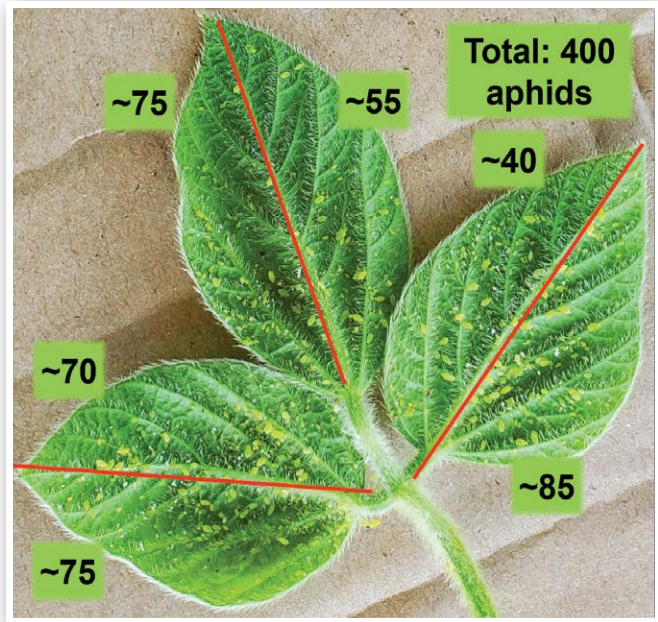


Figure 7

Moving Forward

- Soybean aphids can still be a serious pest. Start scouting for aphids when soybeans reach the R1 growth stage (first flower). Scout by checking 20 to 25 random soybean plants, avoiding field edges. Continue scouting every 7 to 10 days until the end of the R5 growth stage (seeds in top 4 pods are 0.3 cm or 1/8" long). Scout every 3 to 4 days if aphid populations approach 250 aphids per plant on 80% of the plants in the field.
- It is easy to significantly underestimate the aphid population, especially once aphids start to move down the soybean plant (see **Figure 7**).
- The economic injury level for soybean aphid infestations was originally determined to be around 660 aphids per plant. Given that soybean yields and commodity prices are now significantly higher than in the early 2000s, the current economic injury level for soybean aphid infestations is closer to 400 aphids per plant.
- It rarely pays to apply an insecticide to a decreasing aphid population.

Acknowledgements

This article was written by Gilles Quesnel, Independent Agronomist, Winchester. Appreciation is expressed to the Winchester Research Station staff for plot support as well as Ottawa Valley Seed Growers and Grain Farmers of Ontario for funding support.

Do Foliar Applications of Nutrients Work in a Dry Year?

Background

In follow-up to last year's article 'Foliar Feeding: Fact or Fancy,' we set out to further test foliar feed products, monitoring results from 22 sites over 10 counties this season. The products tested this season were FertiBoost-D™, TruPhos Platinum™ and BoronMax™ from NutriAg Ltd.

2022 Results

Treatments were replicated 3 times at each location. Each plot was 4 rows wide x 100 ft in length. See **Figure 1** for a typical plot layout. All foliar treatments were applied with calibrated back-pack CO2 sprayers. All products were applied with 60 litres of water per acre.

All sites were harvested resulting in a total of 269 data points. This season was much different than that of 2021, which was a very good year with ample moisture and lots of heat. It was, many would agree, a perfect year for growing corn. 2022 was distinctly different. Although we had good amounts of heat, moisture was lacking for most of June, July, August, and September at many locations. Last season, TruPhos Platinum™ + Boron Max™ produced the best results. This season, that treatment resulted in some marginal yield improvement, but FertiBoost D™ gave better overall results (see **Table 1**). FertiBoost D™ had reasonable consistency with its yield being the highest in the trial at 55% of the trials. **Figure 2** lays out the yield performance of all three treatments across each of the 22 sites.

Foliar Trial		
Fertiboost D 1.0 L/ac	Truphos Plat + Boron 0.7 L/ac + 0.5 L/ac	Control
Truphos Plat + Boron 0.7 L/ac + 0.5 L/ac	Control	Fertiboost D 1.0 L/ac
Control	Fertiboost D 1.0 L/ac	Truphos Plat + Boron 0.7 L/ac + 0.5 L/ac
4 Row Plots (10 FT) X 100 ft – Total width 30 ft		

Figure 1: Typical layout for a Maizex foliar fertilizer trial in 2022. Harvesting consisted of hand pulling all ears within a 17'5" length of row (1/1000th of an acre). Rows 3 and 4 were always used, and the first ear was pulled at 25 ft into the plot. This yield sampling was replicated twice in each plot .

Plot Treatment	Timing	Rate	Harvest Moisture (%)	Yield (bu/ac)	Yield Gain over Control (bu/ac)	% Wins
FertiBoost D™	V4	1L/ac	23.1	229.0	7.5	55
TruPhos Platinum™ + Boron Max™	V8	.7L/ac & .5L/ac	22.9	224.8	3.3	31
Control			23.1	221.5	N/A	14

Table 1: Impact of foliar fertilizer treatments on corn yield and harvest moisture. Results are averages from 22 sites in 2022.

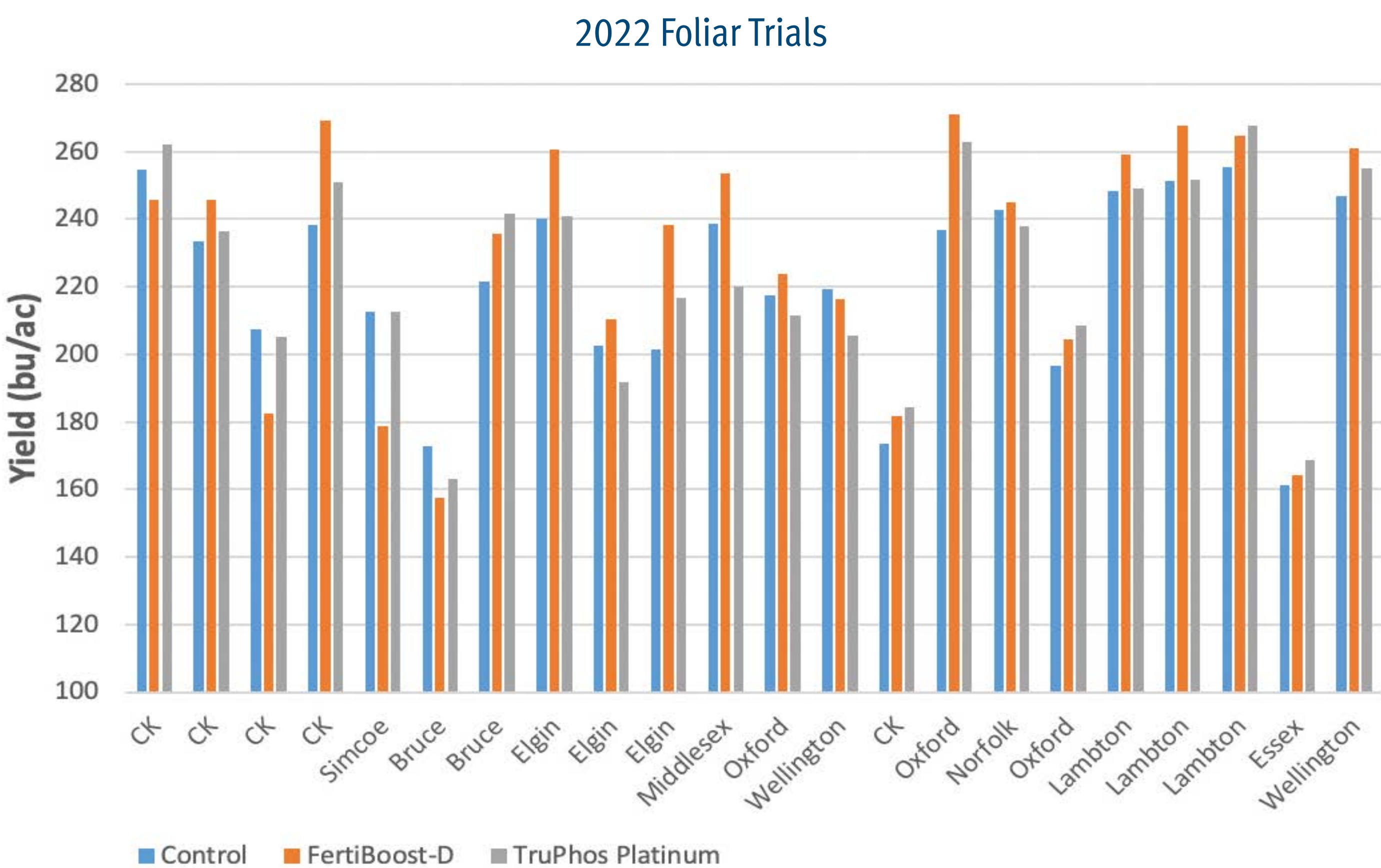


Figure 2: Illustration of all corn yields, by county site, for the three foliar treatments used at each site in 2022.

Moving Forward

In 2022, the second year of trials, once again showed a positive response to the application of a liquid foliar fertilizer in the V4 to V8 stages. The response was not as high as observed last season, but the Fertiboost D™ product did show an average yield gain of 7.5 bu/ac with some consistency.

The SRP (Suggested Retail Price) for FertiBoost-D is $13.51/acre therefore needing +1.7 bu @ $8.00 corn, and SRP for TruPhos Platinum and Boron Max is $23.72/ac therefore needing +3.0 bu @ $8.00 corn. These numbers do not consider application cost. Responses may have been better with FertiBoost since it was applied when there was still moisture available at V4-V6 and plants were still aggressively growing. At V8 timing, moisture was more limited at some sites, and plants may have been stressed. Stressed plants, with stomates less open, may result in reduced uptake of foliar applied nutrients.

After the second year of trials, it seems that there is a response to at least one of these foliar products. Innovation and promotion of foliar fertilizers is not going to go away. I'm of the feeling that if you are making a pass to apply a herbicide, and can therefore eliminate any applications costs, it is a practice worth investigating. (Always check labels and test for antagonism between herbicides and foliar products.) I challenge everyone to do a trial and determine if foliar fertilizer has a fit on your farm.

Acknowledgements

This article was written by Chuck Belanger, Maizex Seeds. Special thanks to NutriAg for supporting this research and supplying the foliar products.

Product Information

FertiBoost D™ Analysis: 3-0-3 (NPK), 2% Zn, 2% Mn

TruPhos Platinum™ Analysis:
5-18-2 (NPK), 0.4% Mg, 0.8% S, 0.8% Zn, 0.1% Fe, 0.1% Cu, 0.1% B, 0.05% Mo, 0.05% Co. 0.04% Mn

Boron Max™ Analysis: 0-0-0 (NPK), 8.1% Boron

Drought Avoidance in Modern Hybrids

Background

For a few years now, but perhaps most noticeably in 2022, we noticed silks emerging before any tassels were visible (out of the last leaf in the whorl) and before any pollen shed. Historically, the silks normally emerge in corn when the last tassel branch appears. For the most part, drought stress at pollination has been centered on poor synchronization between pollen shed and silk receptiveness. But the issue was that pollen supply was ahead of the silks, and with the stress of dry weather, growers worried that pollen supply might dry up before silks were out and pollinated. An old strategy to increase pollen supply and duration was to mix in a few cups of a longer season hybrid to ensure pollen supply covered the entire silk emergence window even in a dry year.

2022 Observations

This summer we noticed that there were silks up to 4 or 5 inches long before tassels were out! This caused some concern that we might have issue with silks possibly drying up before pollen was available (see **Figures 1 and 2**), therefore causing poor pollination. However, in none of the fields that we monitored did this result in poor pollination. It appears that as we breed to tighten or close the tassel-to-silk window, it actually takes some of the drought risk away.

We do know that one of the prime corn breeding goals is to produce stress-tolerant hybrids. Improving the synchronization between tassel and silk emergence, with silks out even ahead of the pollen supply in some cases, is another way to make hybrids more tolerant to unfavourable conditions.

Figure 1: 4" of silk, very little pollination.

Figure 2: Silks emerged 3 days prior to tassel clearing the last leaf.

Thinking About Drought

If you are concerned about more radical weather, including droughts that could impact corn yields, it is comforting to know that genetic improvement, stress tolerance, and tighter pollinating windows are working in your favour. But is there another consideration about pollination timing? In 2022 it appears that in some of our research sites with the driest conditions, hybrids that pollinated earlier had a yield advantage over later hybrids that pushed five more days into drought before pollinating.

Are there any advantages to deliberately trying to spread out the pollination window across all of our acres? If we continue this line of thought, maybe we should ask ourselves if there is a way that we can protect our cropping results by doing something differently at planting time. Should we be looking at not only spreading our maturity risk but also our flowering risk, meaning planting a blend of early and late flowering hybrids?

Below (**Table 1**) is a list of important Maizex hybrids with both CHUs to Maturity and CHUs to Silk Emergence. Consider an example where a grower plants MZ 3877SMX first, then plants MZ 3930DBR and MZ 3818DBR, and then finshes up his last fields with MZ 3505DBR or MZ 3314SMX. If this planting lasts over a two-week period and the long season hybrids get planted first and the shorter season hybrids last, the odds that silking dates (that differ by 100 CHU) may end up right on top of each other is fairly high. To be clear, if conditions are great at the time, the grower wins!

Hybrid	Overall CHU to Maturity	CHU to Silk Emergence
MZ 3314SMX	2775	1622
MZ 3505DBR	2850	1632
MZ 3818DBR	2925	1698
MZ 3930DBR	2950	1698
MZ 3877SMX	2925	1723

Table 1: Some key Maizex hybrids and their CHU ratings to maturity and to silk emergence.

If we wanted to protect ourselves by spreading out the flowering window, we would need to plant a blend of earlier and later flowering hybrids early in the planting window as well as a blend of earlier and later flowering hybrids later in the planting window.

Of course, this strategy is not without some risks as well. We can't guarantee that the early-planted MZ 3314SMX will outyield the mid-planted MZ 3818DBR or the late-planted MZ 3930DBR. But, it will spread the pollination window out to try and spread out the risk of having all your corn fields pollinating at the peak of a dry spell.

Moving Forward

With a warmer climate and the potential for less moisture, I believe we need to manage risk going forward. This past season was much drier than normal, but excessive heat was not an issue. This may be why we still produced average to above average yields in most areas of Ontario. A combination of high heat and low moisture could have led to disastrous yields as it did in a couple of regions. Spreading our risk and rethinking our planting strategy, as well as planting at the right time in a good seed bed, could help with spreading our flowering timing. Have the conversation with your Maizex seed dealer about silking timing, and consider a strategy that spreads some of the risk Mother Nature presents us with every year.

Acknowledgements

This article was written by Chuck Belanger, Maizex Seeds, with input from Shawn Winter, Product Development Manager - Corn, Maizex Seeds.

The Great Debate: Do Higher Yields Need More Nitrogen?

Background

It is intuitively appealing to say, as your corn yields increase, the crop must take up more nitrogen to get there. However, the more important question has become: are higher yields necessarily driven by higher nitrogen fertilizer application rates? Here things are more complicated. Consider a bunch of corn nitrogen trials from a range of backgrounds: some corn after soys, some corn after corn, some on loams, and some on sands. If we put all of those results on a graph, do we see a nice relationship where higher yields required more nitrogen fertilizer? The answer is no. You could imagine that some high yielding fields of corn after soys needed less nitrogen for the same yield as a corn after corn field. Similarly, getting 200 bu/acre out of a sand might require 200 lbs of N, while on a loam that 200 bu/ac was achieved with 150 lbs. Throw all these together, add some weather noise, and you end up with essentially no relationship between final achieved yield and the amount of nitrogen it took to get there.

N Recommendation Systems

When Ken Janovicek (U. of Guelph) and I worked on the Ontario N Calculator, Ken took the approach that only when you sorted out the fields with the same soil texture, previous crop, CHU rating, etc. could you decide whether increased yield meant increased nitrogen requirement. The conclusion was yes, yield mattered and so yield expectation exists as an input, but only in the context of describing the field correctly for other factors.

Other jurisdictions have not arrived at the same conclusion. That is, when you look at the response of corn to nitrogen after soybeans in Ohio they see no relationship with yield and so growers looking for the official Ohio State recommendation for growing corn don't even get asked for yield expectation. The inputs are: 1) corn after soys or corn after corn, 2) price of corn and 3) cost of nitrogen; full stop.

Most Economic N Rate Recommendations $8.00 Corn and $800 UAN

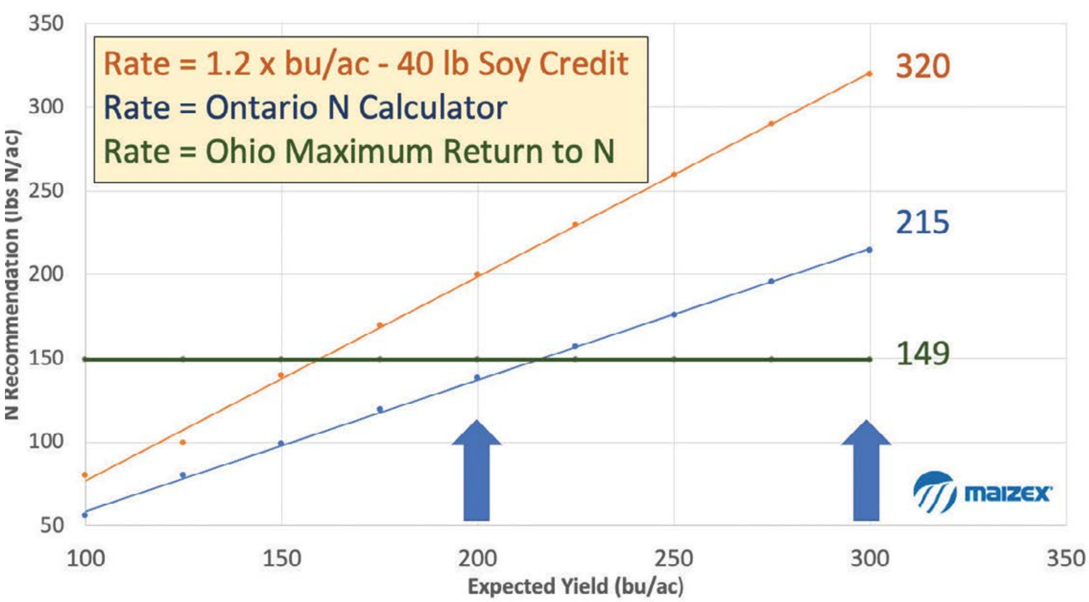


Figure 1: Three distinctly different N rate recommendations for corn in 2023. Various Field Descriptions (if required) are as follows: 1) Corn After Soybeans, 2) Loam Soil, 3) 3000 CHU, 4) N All Applied at Planting, 5) $ 8.00/bu corn, 6) $ 800/tonne 28% UAN 7) Yield Expectation, on graph.

One can contrast the Ohio approach to historical approaches to nitrogen recommendations where yield expectation was the key driver. Consider a tool where the formula is 1.2 x Yield Expectation less 40 lbs for a soybean credit, when soybeans were the previous crop. **Figure 1** lays out how these three recommendation systems compare across a range of yield possibilities. At a 200 bu/ac yield expectation, the recommendations are significantly different, but as yield increases towards 250 or 300 bu/acre, they become huge. In these three systems we have a tool (Ohio) where yield is omitted completely; a tool (1.2 Factor) where yield expectation dominates; and a tool (Ontario N Calculator) where yield adjustment is included but buffered by other factors.

As yields continue to increase, growers will have to wrestle with how much fertilizer nitrogen it actually takes to grow 250 to 300 bu/ac of corn. For growers who had 220 to 260 bu/acre on 180 lbs of nitrogen in 2021 and 2022, it may not seem much of a stretch to think that 215 lbs might indeed be enough to get to 300 bu/acre if other factors lined up! However, if you go to the Maizex N Tracker (our slightly updated version of the Ontario N Calculator) and describe a field that is clay loam (not loam), 3.0% organic matter (not 3.6%), and corn follows grain corn (not soybeans), the 2023 recommendation, if you still thought 300 bu/ac was obtainable, goes up by 57 lbs/ac.

Genetics are playing a big role in increasing yield and perhaps in increasing yields with relatively less nitrogen fertilizer. In **Figure 2** we attempt to capture the idea of how newer genetics might be changing the way yield is generated from nitrogen. The orange line represents a simplistic relationship between yield and nitrogen for old hybrids. The bottom blue line suggests that, at low nitrogen rates, newer hybrids yield no more than older hybrids, but they tend to produce more yield as nitrogen rates go up, and to maximize their yields, they need to move to overall high nitrogen rates. They have another yield gear, so to speak, but they need N to find it.

The upper blue line is a different relationship; notice that yields are elevated compared to the old hybrids at all N rates, even the very lowest. And notice that higher yields are reached at the same N rate that optimized the old hybrids. Another yield gear that didn't take extra N to find.

> One of the key things any grower can do to better understand how genetics and other factors are influencing their nitrogen requirements is to establish some blocks or strips where Zero N or Starter N Only is applied and compare them to fully fertilized blocks close by. **Table 1** goes over the advantages of Zero N blocks.

Genetics, Nitrogen, Both

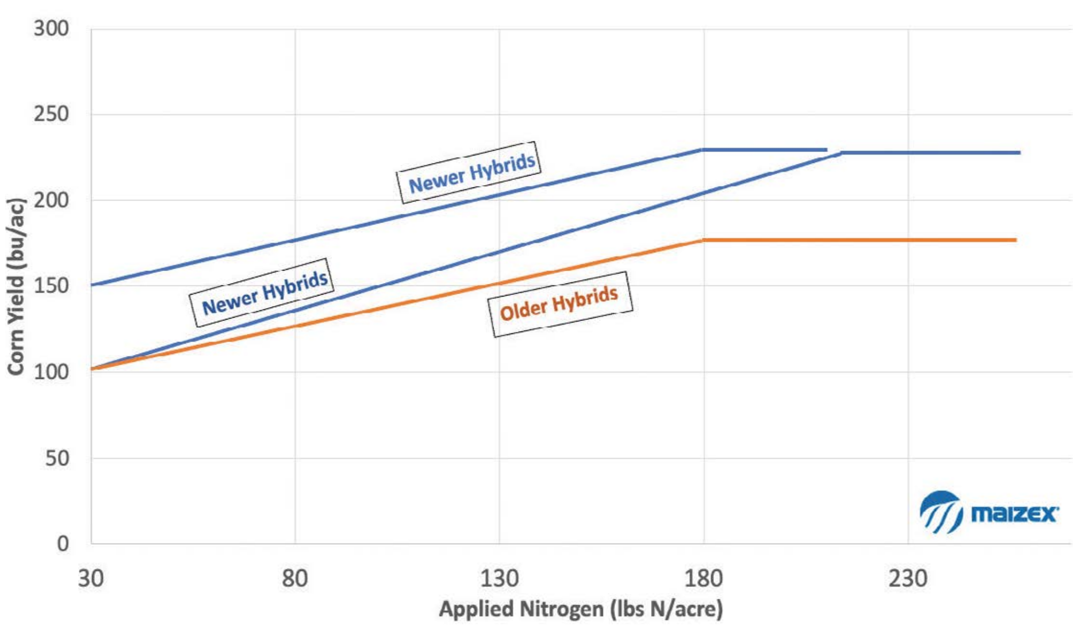


Figure 2: How are new genetics bringing more yield to the field compared to older genetics? In some cases (lower blue line),it might be that hybrids respond to more nitrogen with more yield. In other cases, hybrids may give additional yield at the same rates of nitrogen (upper blue line).

The Advantages of Zero N Blocks	
1	**Excellent Ability to Measure Background Soil Nitrate** Soil sampling for nitrates can capture overwintering changes, impacts of spring weather, and contributions from manures and cover crops; values often are easier to interpret when not confounded by sampling into recently applied fertilizer N.
2	**True Understanding of How Much Yield is Generated by Fertilizer N** Removes the focus on fertilizing for overall yield expectation (a combination of genetics, nitrogen, management, and weather) and focuses on fertilizing for yield increase that is derived from nitrogen fertilizer additions.
3	**Assesses Impact of Improved Genetics over Time** Answers these critical questions: Do modern hybrids have another yield gear that can only by accessed with more N? Or do modern hybrids have another yield gear that is independent of nitrogen rate?
4	**Yield Measurements Estimate What the Actual Optimum N Rate for that Field Was** Yield differences between Zero N plots and neigbouring Fully Fertilized plots, when entered into a U. of Guelph formula, do a good job of estimating optimum N rates for that season. Without this information, you probably enter next year no more informed about optimum N rates than you were the year before.

Table 1

Moving Forward

Higher yields may need more nitrogen, but it will be more subtle than you anticipate. Nitrogen decisions should be made in conjunction with accurately evaluating the field for manure credits, previous crops, soil texture, price ratios, and N application timing. The Maizex N Tracker is a good place to get started with your N rate determinations for 2023.

As painful as it may seem, some Zero N blocks can go a long way to fine-tuning N rates as we continue to move into higher yield levels. The Delta Yield tool can help estimate the optimum N rate when you input the yields from those zero and full rate blocks. Both it and the Maizex N Tracker can be found at:
https://maizex.com/agronomy-centre/

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This article was written by Greg Stewart, Maizex Seeds. He can be reached at greg.stewart@maizex.com or at 226-820-2203.

Reducing Urea Volatilization: Lessons and Questions from a 2022 Maizex Demonstration Site

Background

The heightened interest in nitrogen rates, nitrogen emissions, greenhouse gases, and nitrogen stabilizers showed up everywhere in 2022. At Maizex we take a keen interest in nitrogen management, and so we started to investigate. For starters, it was surprising to find such a wide range of nitrogen stabilizer products available in Canada, many with claims to be able to reduce ammonia volatilization, or to slow nitrification, or both, and many with a wide range of active ingredient concentrations and application rates. Then, when a government program administered in Ontario by the OSCIA came along and offered to pay a portion of the costs of these stabilizers for growers interested in using new technology, we thought it made for a perfect research/demonstration project for our Great Ontario Yield Tour Event at Derks Elevators in eastern Ontario.

The Demo

The demonstration evaluated how placement and nitrogen stabilizers could influence ammonia loss from urea fertilizer sources. We used both granular urea and UAN as N sources, but for accuracy's sake, we only employed the two nitrogen stabilizer products (both aimed at reducing urea volatilization) in the UAN and used our CO_2 backpack sprayer to accurately apply the UAN in a band as shown in **Figure 1**.

The Results: Some Answers – Some Questions

The ammonia loss results are illustrated in **Table 1**. We noticed that very shallow incorporation of either UAN or granular urea had no impact on reducing the ammonia loss compared to surface applications. This level of incorporation would be similar to a drag harrow operation and much less than a grower would typically obtain with a cultivator or disc. The next observation was similar; making a trench and laying the UAN in the bottom of the trench, but then not covering the trench, was also quite inefficient at reducing N loss. We likened this to a UAN application using a coulter and a pencil jet applicator, but where the unit generally did not cover the trench with soil. UAN left exposed in the bottom of a slot, perhaps exposed to more soil moisture, would be at risk of increased volatilization, perhaps even greater risk than if the UAN had been surface-applied if the soil surface was very dry. Placing the UAN at the bottom of the trench and covering it with a full 2" of soil did have a dramatic reduction in volatilization. Numbers fell from 600 to 475 to 60 PPM as we moved from surface, to open trench, to covered trench applications.

We employed two nitrogen stabilizers and they both resulted in a significant reduction in ammonia volatilization regardless of how the nitrogen fertilizer was placed.

Figure 1: Experimental set-up for measuring ammonia volatilization, August 2022. The dosimeter tube (see below) is placed under the recycling box about 10 inches above the soil surface after N application. It measures exposure to ammonia in parts per million. Note: At this site, the soil was pre-wetted to maximize potential volatilization. Ammonia exposure was measured for five days after nitrogen application.

Treatment	Ammonia Level (PPM)
UREA, Surface Applied	800
UREA, Surface Applied, Shallow Incorporation (less than 1")	800
UAN, Surface Applied	475
UAN, Surface Applied, Shallow Incorporation (less than 1")	600
UAN, Surface Applied	600
UAN, Surface Applied, Stabilizer A	150
UAN, Surface Applied, Stabilizer B	100
UAN, Applied in Open Trench	475
UAN, Applied in Open Trench, Stabilizer A	90
UAN, Applied in Open Trench, Stabilizer B	70
UAN, Applied in Closed Trench, 2" of Soil Cover	60
UAN, Applied in Closed Trench, 2" of Soil Cover, Stabilizer A	0
UAN, Applied in Closed Trench, 2" of Soil Cover, Stabilizer B	0

Table 1: Ammonia volatilization level measurements from a range of treatments including various N sources, nitrogen stabilizers (volatilization inhibitors), and depth of placement. Winchester - August 2022.

It appears that if you had a side-dresser that didn't do a good job of covering the UAN, using a nitrogen stabilizer additive would be recommended to reduce potential N loss. However, it also appeared that if you truly covered the UAN with 2" of soil, the vast majority of the N loss could be eliminated without a stabilizer. The other question that came up was from the shallow incorporation. It seems clear that very shallow incorporation did nothing to reduce volatilization. But what about a field cultivator set at 3" deep? Does that amount of tillage bury urea deep enough to eliminate ammonia loss if application and cultivation is followed by 10 days with rainfall? Our guess, based on this and a few other similar studies, is probably not.

Moving Forward

Growers should be attentive to the need to reduce N losses by managing urea with either tillage, injection, or nitrogen stabilizers that inhibit urea volatilization. It is true that a rainfall event that provides at least 0.4 inches (10 mm) can incorporate urea into the soil matrix and eliminate volatilization risks. However, it is also true that if the rain event tracks slightly north of your farm and delivers 0.1 inches (2.5 mm), it may provide just enough moisture to significantly enhance losses from unprotected urea/UAN. Maizex agronomy will expand its N loss research in 2023 to cover off a wider range of soil incorporation options and N stabilizer products. If you have any question about the material covered in this article, please reach out to us at Maizex.

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