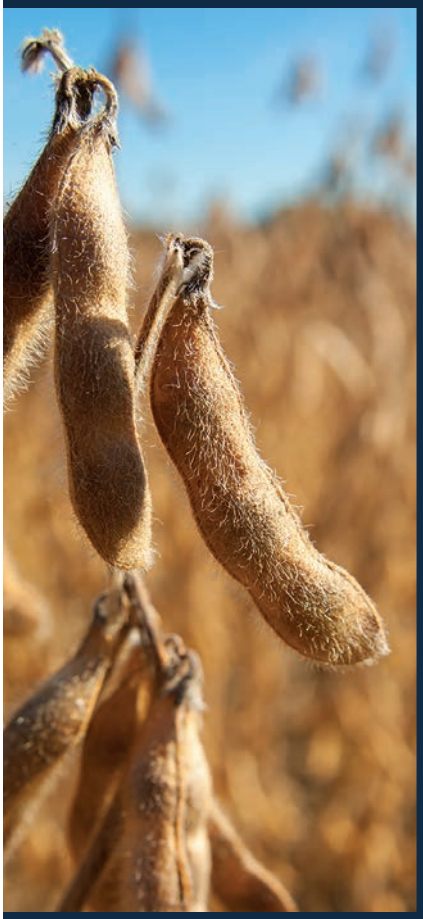
2023
AGRONOMY SUMMARY



FIELD BY FIELD

2023 AGRONOMY SUMMARY

TABLE OF CONTENTS

Sulfur impact on soybeans 3

Looking at seed weight in soybeans 6

Can yield loss from wide rows be won back? 8

Can early planting improve wide row performance? 10

What we learned from white mould in 2023 12

Nitrogen stabilizers: Do they work? 14

Delta Yield: Making MERN work for you 17

High soil N test a sign to stop side-dressing N? 19

2023 intensive management results 23

The importance of kernel weight on yield 26

Digging deeper into DON 29

Surveying some smoking yields in 2023 31

Intensive silage management results 34

Biological stimulants: A new approach to increasing yields 37

Sulfur impact on soybeans

Background

In the winter of 2023, Maizex Seeds hosted a call with Professor Shaun Casteel of Purdue University. Casteel had extensively studied the impact of sulfur on soybean yields on deeper Prairie soils: in other words, soils with higher cation exchange capacities than that of the sands where we expect to see sulfur responses. Casteel had seen that ammonium sulfate applied prior to planting or soon after planting has consistently yielded strong yield responses on soybeans. In spring of 2023, Maizex established a trial to further analyze these responses on our own Ontario and Quebec locations and soil types. Trial locations included the following: Simcoe, Jarvis and Tupperville, ON and St. Hyacinthe and St. Augustine, QC. Soils varied from low CEC sands in Simcoe, to heavy high CEC clay in Jarvis and moderate soils in Tupperville, St. Hyacinthe and St. Augustine.

Varieties & treatments

Two varieties were established at each site:

- Energy E3 (2.8RM) and Ocelot E3 (2.1RM) in Ontario
- A combination of Maris R2X (1.0RM), Viper R2X (0.9RM) and Badger R2X (00.2RM) in Quebec.

Five treatments:

A) Control, untreated
B) Fungicide at R3.5 (Delaro Complete),
C) 100lbs of AMS at planting,
D) 100lbs of AMS + Fungicide at R3.5,
E) Full package 100lbs of AMS + 100lbs PurYield (ESN) + Delaro Complete at R3.5.

Economics of the treatments

Fungicide: $18.50 + $12 application, $850/tonne AMS, $1275/tonne PurYield (Spring 2023 pricing)

Treatment	Cost of Fungicide and Application	Cost of AMS	Cost of PurYield	Net cost of treatment
A	$0.00	$0.00	$0.00	$0.00
B	$30.50	$0.00	$0.00	$30.50
C	$0.00	$38.63	$0.00	$38.63
D	$30.50	$38.63	$0.00	$69.13
E	$30.50	$38.63	$57.95	$127.08

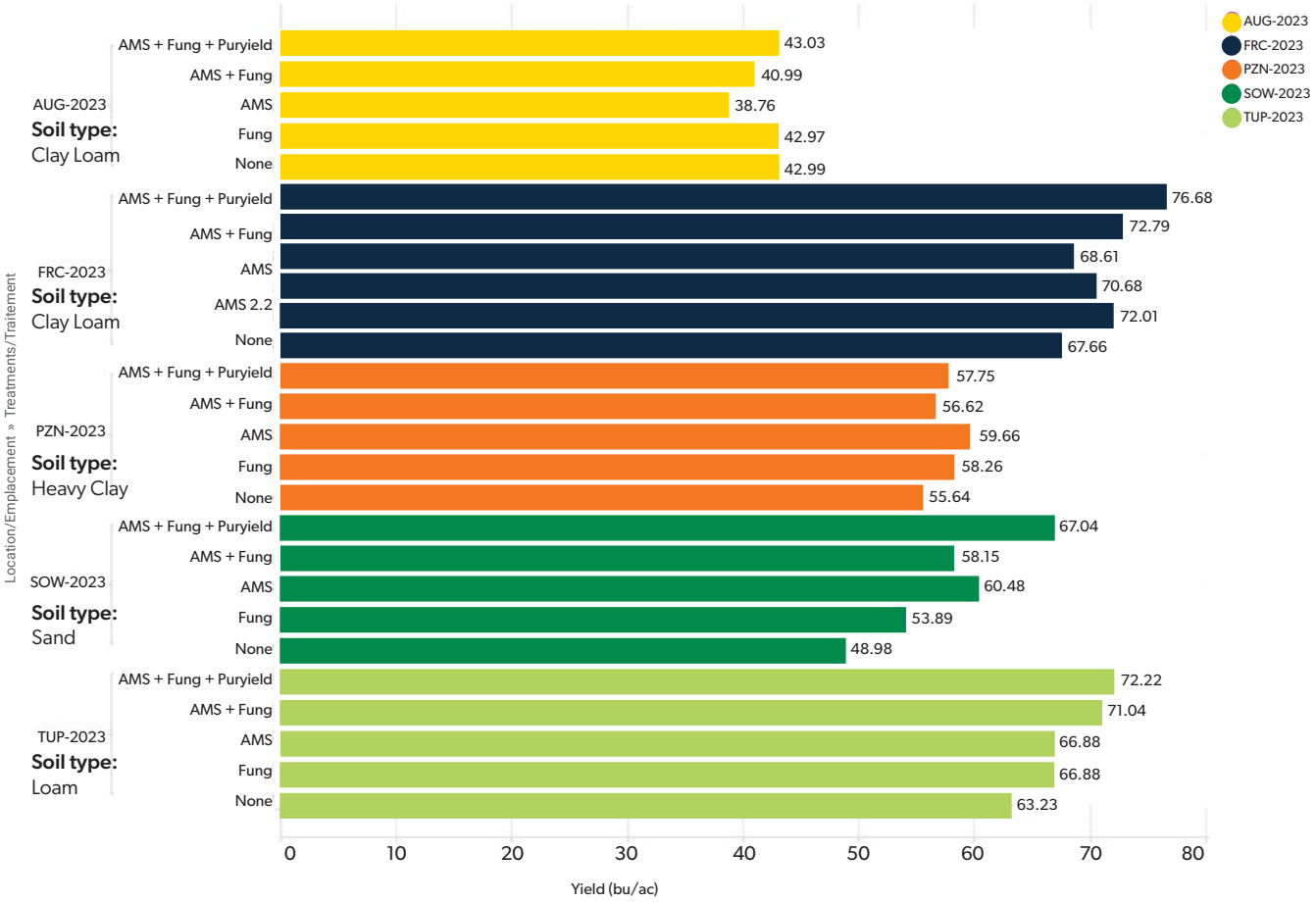
Net return on treatments (all sites):

Treatment	Yield (bu/ac)	Gross revenue ($16.50/bu)	Treatment Cost / Acre	Net Revenue / Acre	Advantage / Acre over Standard
A	54.37	$897.10	$0.00	$897.10	$0.00
B	57.33	$945.95	$30.50	$915.45	$18.35
C	57.79	$953.54	$38.63	$914.91	$17.81
D	58.49	$965.09	$69.13	$895.96	($1.14)
E	61.86	$1,020.69	$127.08	$893.61	($3.49)

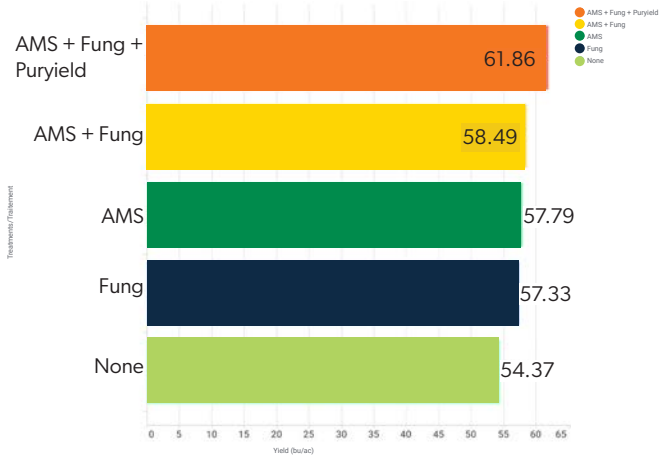
Net return on treatments (responsive sites):

Treatment	Yield (bu/ac)	Gross revenue ($16.50/bu)	Treatment Cost / Acre	Net Revenue / Acre	Advantage / Acre over Standard
A	58.42	$963.93	$0.00	$963.93	$0.00
B	62.71	$1,034.72	$30.50	$1,004.22	$40.29
C	64.66	$1,066.89	$38.63	$1,028.26	$64.33
D	66.23	$1,092.80	$69.13	$1,023.67	$59.74
E	71.04	$1,172.16	$127.08	$1,045.08	$81.15

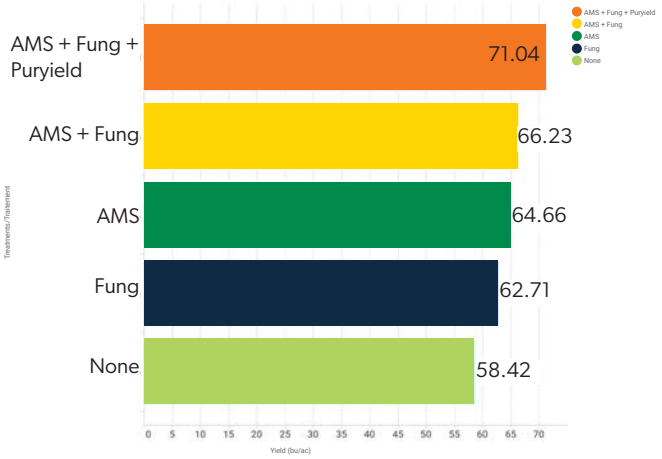
Yield responses for each site and treatment



Average yield of each treatment across all sites



Average yield at the three responsive locations



Side-by-Side Comparison

Energy E3
Standard

Energy E3
AMS

Energy E3
AMS + PurYield + Delaro

Image from Simcoe, ON CEC level: 8.3

Further analysis via tissue sampling

According to research done by Casteel at Purdue, the following are the critical levels at which a soybean crop will likely respond to sulfur. These levels were to be used as a guide to whether it is worthwhile applying sulfur on soybeans in the future on that farm or field.

a. 0.25% or lower sulfur concentration in the leaves - Goal: above 0.32%
b. 18:1 or higher N:S rations in the leaves - Goal: 15-17:1
c. 5.4% and lower nitrogen concentration in the leaves - Goal: 5.5%

Our Testing:

	N %	S %	N/S
Sowden - 8.3 CEC			
Control	4.50	0.20	22.63
AMS	5.24	0.28	19.05
PurYield	5.60	0.31	18.06
Tupperville - 17.6 CEC			
Control	5.22	0.26	19.86
AMS	5.49	0.29	18.81
PurYield	5.52	0.33	16.97
Prinzen - 30.4 CEC			
Control	4.75	0.30	15.65
AMS	5.09	0.31	16.50
PurYield	5.44	0.33	16.74

Analysis

Our three most responsive sites had CECs of the following: 8.3, 17.6 and 22.4 at the Quebec location. We also had response to application at a site near Stratford where only tissue testing was done to see if we could 'move the needle' on the N:S ratio inside the plant. These responsive sites that had CECs around 20 would indicate that sulfur is not only needed on sandy soils but there may be a fit on many other soil types and locations across Ontario and Quebec.

These findings would suggest that tissue testing at R2-R3 could indicate whether or not a site would be responsive to AMS. Seen in the Prinzen site, which had no response at all, N:S ratios were in the good range and consequently no response was recorded while the other two sites in Ontario where tissue testing was done show an imbalance in the N:S ratio which led to a response. Three of five sites had a response, and the two sites that had no response had no real response to any of the treatments. At the three responsive sites the full package had the best economic and yield returns of $81.15/ac and +12.62 bu/ac.

Considering the expense of fertilizer this past spring, this is very promising. As fertilizer prices return to a new normal, the economics of this treatment will likely improve even further. Economics favoured AMS alone as the second most profitable application followed by AMS + Fungicide and Fungicide at the responsive sites. When considering all sites, the only positive treatments economically were Fungicide and AMS. We incurred a small loss in comparison to the standard when treating with AMS + Fungicide and the full AMS, Fungicide and PurYield package.

Going forward

The Maizex team continues to move forward with our independent agronomy work and will follow up with this trial in 2024, likely adding a few more small plot locations. Our team will be interested in working with growers as well to set up a few field scale trials to further this research. If you are interested, please reach out to our team. Key things to consider before choosing a site or location for a trial would be field history (manure etc.), uniformity of the location and soil type.

Soils with higher proportions of sand will have a higher likelihood of response. However, do not rule out heavier soils. Our research showed responses at sites with considerably higher CECs than that would have been considered obvious locations for response to sulfur. At locations on sharp sands, lower than 10 CEC, applications with the addition of nitrogen could be considered.

Response to nitrogen was by far greatest at the sand location with a +18.06 bu/ac response and a +6.56 bu/ac advantage over the next most responsive treatment of AMS alone.

Acknowledgements:
This article was written by Henry Prinzen CCA-ON Market Development Agronomist, Maizex

Looking at seed weight in soybeans

Introduction & background

Building on the kernel weight vs test weight debate in corn and the research conducted by Maizex Seeds, it seemed clear that more work needed to be done studying the yield components of soybeans, specifically seed weight.

Just like corn, yield components of soybeans are easy to study. Soybean yield components include plants per acre, pods per plant, seeds per pod, and seed weight. As we all know, soybean size at planting varies quite drastically from 2,000 seeds/pound to 3,000 seeds/pound. Similarly, varieties have their own genetic capabilities in producing large- or small-seeded soybeans, being impacted by weather conditions.

In 2023 it was clear that there were varieties that performed at a higher level than others, leaving us wondering why these key varieties were outperforming other varieties by such a large margin.

Yield = Soybean Plants/Acre x Pod Count x Seeds/Pod x Seed Weight = Yield

How was it done?

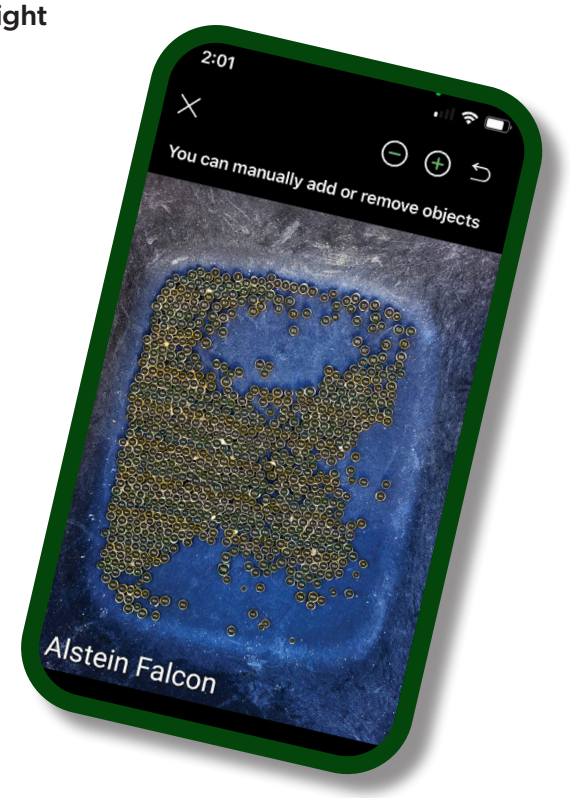
Like the counts done for corn by Maizex in 2022 and 2023, we used Artificial Intelligence (AI) technology via an app called Count This, to determine seed counts.

Count This can analyze an image of soybean seeds in a black tray and give an accurate count of the picture within 2%.

Then, we would take the moistures, test weights, and the actual weight of the sample within the picture to analyze the actual 1,000 seed weight.

Once weights, count and moisture were taken, we adjusted them all to 13.5% moisture for uniform comparison. In most cases, two counts and two weights were recorded to ensure a balanced sample.

(Seed Number / Weight of Seeds) x ((100 – Moisture)/(100 – 13.5)) x 1000 = 1000 Seed Weight



The Count This app can generate a seed count that is accurate within two per cent.

Results in 2023

In 2023, it was clear when sifting through the data that 1,000 seed weight had a large influence on yield in plots. Viper R2X was consistently topping plots, even outside its adapted maturity zone.

When we looked at Viper's 1,000 seed weight, it was clear this variety was able to use 'seed flex' to increase its yield. Viper R2X topped nearly every plot both in yield and in seed weight. Avalanche XF, another very large-seeded bean, also performed very well in the 2023 season. Soybeans like Eagle E3 and Falcon E3 trailed in many plots. It was also clear these varieties lacked seed weight.

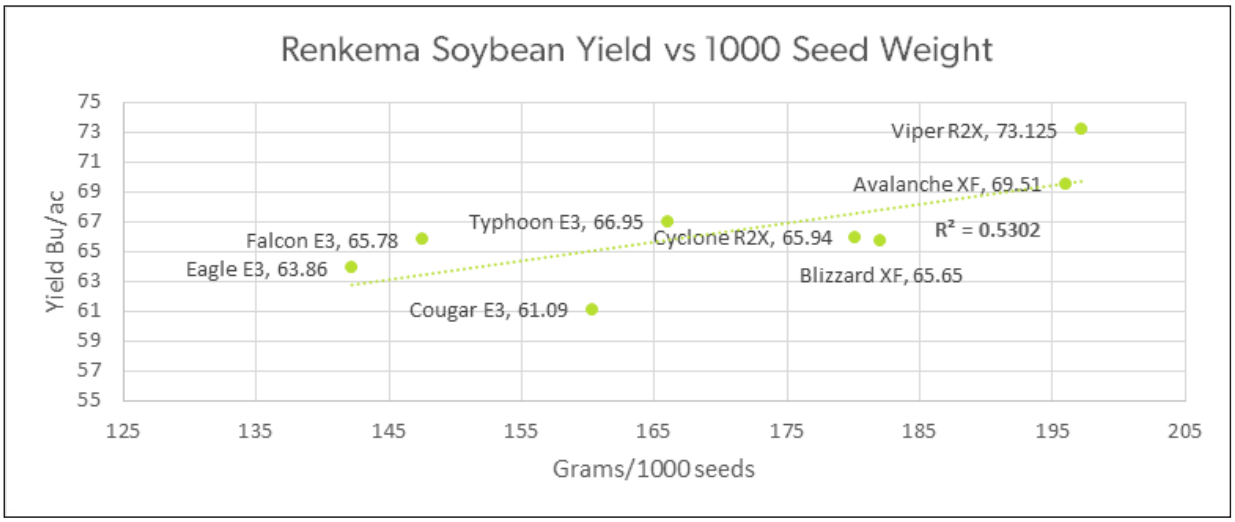
One location near Embro was plotted with yield vs. grams/1,000 seeds. As seen below, the R2 was 0.53, meaning 53 % of the yield was explained by the variation in seed weight. When we combined this location with another location near Belmont, the R2 increased to over 0.6 when looking at the varieties that occurred in each plot, making a strong case that 1,000 seed weight was incredibly crucial to soybean yield performance in 2023.

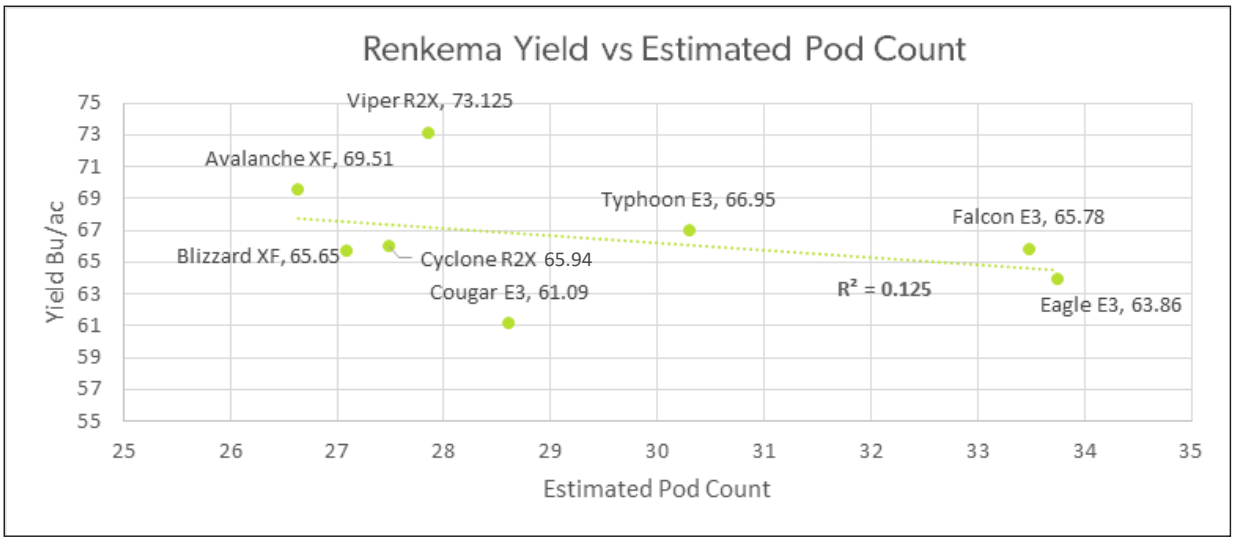
R2 is a statistical measure of how well the regression line (line of best fit) approximates the data. R2 above 0.5 have strong correlation and ones lower than 0.5 are weaker. R2 always is between 0-1 and can be used as a measure of how well the given regression explains the data displayed.

For example an R2 of 0.53 would mean 53% of the variation in the data is explained by the variables used within the regression.

One of the other key yield components in soybeans is pod count. Pod count is variety-specific, and weather has an impact on pod count as well. To measure pod count, populations were assessed. Using 2.2 beans per pod as a standard divisor, we were able to estimate how many pods each plant would have had.

Pod Count = Yield in Grams / 1000 Seed Weight x 1000 / 2.2 / Population





In 2023, pod count had little to no weight on determining final yields as seen on the previous page. At the same site, you can see that in this location, pod count had a negative correlation to yield, albeit very small. An R2 of only 0.125, or 12.5% of the variation in yield, can be explained by pod count.

However, this is likely not the case every season. Last year, Maizex did not take 1,000 seed weights of our soybean varieties, but yields were collected as usual.

In 2022, Viper R2X had a good season but was not as dominant in yield as it was in 2023, and that could be partially due to the pod count in 2022. Maris R2X is a small-seeded bean that seems to handle stress well and has a high number of pods, leading to high yields last year.

In 2023, at one location near New Hamburg, ON, we saw Maris R2X yield 58 bu/ac in comparison to Viper R2X at 65.3 bu/ac. The difference in seed weight was nearly 40 grams/thousand at 210.05 grams for Viper R2X and 170.2 grams for Maris R2X. Maris's 1,000 seed weight was only 81% of Viper's, but yield was about 89% of Viper's due to its pod count being about three pods/plant higher.

One may wonder why this matters, considering it still lost in yield, but, in 2022, Maris R2X outyielded Viper R2X by 1.64 bu/ac over 27 locations and won 56% of the time, while in 2023 Viper R2X outyielded Maris R2X by 2.1 bu/ac and won 61% of the time.

Moving forward

Analyzing why a soybean variety yields the way it does can be important. When it comes to understanding yields in soybeans, it's fair to consider multiple factors such as multiple years of yield data, emergence, and disease tolerance.

It's evident that some varieties are 'seed weight' varieties that excel with high yield associated with heavy seed weights. There are also varieties that look like they excel as they are 'pod count' varieties, and the pod is their way to higher yields.

This can be important to distinguish, as a poor late season finish through R3-R6 is likely more detrimental to a variety that relies on seed weight to yield in comparison to a 'pod count' variety that has a lot of its yield components built in by R3.

Like corn, it is prudent to spread risk and use diverse germplasm and varieties that respond differently, as putting all your eggs in one variety basket may not always be the best way to maximize yield potential.

Acknowledgements:
This article was written by Henry Prinzen CCA-ON Market Development Agronomist, Maizex

Can the yield loss associated with wide rows be 'won back' with starter N & fungicides?

Background

Some growers prefer 30" rows because of reduced seed costs and reduced white mould pressure. But, research shows that wide rows can yield less, especially in northern climates. Previous Ontario research has shown a yield reduction of four bu/ac when comparing 30" rows to 15" or 7.5" rows. The main reason 30" rows yield less is because of slower canopy closure. This wastes sunlight early in the growing season. Starter nitrogen can help 'fill' the canopy sooner due to faster vegetative growth. Foliar fungicides keep leaves healthier and delay senescence which could further aid wide row performance. Timely planting can also improve wide row yields as plants have additional time to capture sunlight.

Field research

Six trials were conducted to improve wide row performance in 2022 and 2023. Trial locations were Tavistock, Stratford, Elora, and Winchester. In 2022, the nitrogen starter treatment was 10 gallons of 28% UAN surface applied in a stream on top of the row.

In 2023 this was changed to a broadcast application of 87 lbs/ac of urea broadcast at planting. The foliar fungicide applied was ***DELARO Complete*** applied at growth stage R2.5. Two planting dates were used. In 2022 the variety was Cyclone R2X. In 2023 Viper R2X was used.

Conclusion

The inherent yield loss associated with 30" rows can be mitigated with the use of starter N, foliar fungicides, and early planting. Starter nitrogen fertilizer and the application of a foliar fungicide reduced the yield gap of 30" rows to only 1.3 bu/ac for the first planting date and 2.2 bu/ac for the second planting date.

Picture #1: 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 5 days earlier.

The yield loss associated with wide rows could largely be 'won back' with a combination of starter N fertilizer and a foliar fungicide. The untreated 30" rows planted in early May yielded 74.3 bu/ac compared to the 15" rows which yielded 78.0 bu/ac (loss of 3.7 bu/ac). The 30" rows' yield was increased to 76.7 bu/ac with the addition of starter N and a foliar fungicide for a yield loss of only 1.3 bu/ac compared to the 15" untreated rows.

However, it must be noted that the 15" rows also increased in yield with the addition of inputs, resulting in the highest overall yield of 80.4 bu/ac. The June results were similar, although the overall yield potential was reduced in all cases compared to the early May date. Most of the yield gain came from the foliar fungicide, not the starter nitrogen. When comparing the two planting dates, the untreated 30" rows yielded the same as the 15" untreated rows seeded three weeks later.

This shows that early planting is an important factor in getting the most out of wide rows. This study has demonstrated that wide rows can perform well, but 15" rows still outyielded 30" rows in every comparison when planted on the same day.

Acknowledgements:

This article was written by Horst Bohner
Soybean Specialist, OMAFRA
These trials were supported by Maizex and Grain Farmers of Ontario.

Table #1. 2022 & 2023 Soybean Response to Starter N and Foliar Fungicides.

	Row Width	Treatment*	Seeding Rate	Planting** Date	Yield bu/ac	Loss of 30" rows Compared to 15" Untreated (bu/ac)
1	15"	Untreated	165	Early May	78.0	
2	30"	Untreated	140	Early May	74.3	- 3.7
3	15"	N	165	Early May	78.4	
4	30"	N	140	Early May	74.9	- 3.1
5	15"	N + Fungicide	165	Early May	80.4	
6	30"	N + Fungicide	140	Early May	76.7	- 1.3
7	15"	Untreated	165	Late May	73.4	
8	30"	Untreated	140	Late May	69.1	- 4.3
9	15"	N	165	Late May	72.8	
10	30"	N	140	Late May	70.6	- 2.8
11	15"	N + Fungicide	165	Late May	76.7	
12	30"	N + Fungicide	140	Late May	71.2	- 2.2

***N = 10 gallons/ac of 28% UAN applied on soil surface at planting streamed on the row in 2022. 87 lbs/ac of urea broadcast in 2023. Fungicide = DELARO Complete at growth stage R2.5. **Early May = the first planting window when the soil was fit. (May 7-16) Late May = (May 30 – June 2).**

Can early planting and longer maturing varieties improve wide row performance?

Background

Lower seeding cost, less white mould, and better emergence have led some growers to move away from seed drills in favour of row planters. However, wide rows are known to have slightly lower yields in Ontario. 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. 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 assessed to determine if the yield gap of wide rows could be reduced with earlier planting.

Field research

Six trials were seeded in 2022 and 2023. Wide rows (30") performed well at each site but yielded 2.0 to 9.6 bu/ac less than 15" rows depending on the variety. This yield reduction was similar for both planting dates, but the worst wide row performance was in the later planting date. This demonstrates that early planting alone cannot eliminate the yield loss associated with wide rows.

There was a trend showing that shorter maturity group (MG) varieties suffered the greatest yield reductions in 2022. 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	Early	75.7	
2	Viper R2X	30"	0.8 (2725)	140	Early	69.5	-6.2
3	Harrier E3	15"	1.3 (2850)	165	Early	75.2	
4	Harrier E3	30"	1.3 (2850)	140	Early	70.0	-5.2
5	Cyclone R2X	15"	1.5 (2900)	165	Early	75.2	
6	Cyclone R2X	30"	1.5 (2900	140	Early	71.9	-3.3
7	Cougar E3	15"	1.7 (2950)	165	Early	73.9	
8	Cougar E3	30"	1.7 (2950)	140	Early	71.9	-2.0
9	Viper R2X	15"	0.8 (2725)	165	Late	71.7	
10	Viper R2X	30"	0.8 (2725)	140	Late	65.6	-6.1
11	Harrier E3	15"	1.3 (2850)	165	Late	68.5	
12	Harrier E3	30"	1.3 (2850)	140	Late	65.5	-3.0
13	Cyclone R2X	15"	1.5 (2900)	165	Late	71.3	
14	Cyclone R2X	30"	1.5 (2900	140	Late	67.5	-3.8
15	Cougar E3	15"	1.7 (2950)	165	Late	70.3	
16	Cougar E3	30"	1.7 (2950)	140	Late	67.6	-2.7

***2022 Seeding rates were 165,000 and 140,000 seeds/ac. Early planting date = May 7-11. Late = May 30-June 2. Yields are averaged across 3 site locations. Each location was replicated 3-4 times. LSD = 2.2 bu/ac.**

Conclusion

Proper variety selection is important when growing wide row (30") soybeans. Early planting may reduce the yield loss associated with wide rows because plants have longer to fill in the row. In this study, each variety tested yielded less in 30" rows compared to 15" rows.

Averaged across varieties early planting did not reduce the yield penalty associated with wide. In 2022, there was a trend showing that longer maturing varieties had smaller yield reductions than shorter maturing varieties.

Acknowledgements

This article was written by Horst Bohner Soybean Specialist, OMAFRA

	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	Early	80.8	
2	Viper R2X	30"	0.8 (2725)	140	Early	76.6	-4.2
3	Falcon E3	15"	1.3 (2850)	165	Early	68.7	
4	Falcon E3	30"	1.3 (2850)	140	Early	65.9	-2.8
5	Avalanche XF	15"	1.4 (2875)	165	Early	73.5	
6	Avalanche XF	30"	1.4 (2875	140	Early	70.1	-3.4
7	Typhoon E3	15"	1.6 (2925)	165	Early	72.3	
8	Typhoon E3	30"	1.6 (2925)	140	Early	68.0	-4.3
9	Viper R2X	15"	0.8 (2725)	165	Late	79.6	
10	Viper R2X	30"	0.8 (2725)	140	Late	77.3	-2.3
11	Falcon E3	15"	1.3 (2850)	165	Late	68.0	
12	Falcon E3	30"	1.3 (2850)	140	Late	58.4	-9.6
13	Avalanche XF	15"	1.4 (2875)	165	Late	70.7	
14	Avalanche XF	30"	1.4 (2875	140	Late	62.9	-7.8
15	Typhoon E3	15"	1.6 (2925)	165	Late	62.4	
16	Typhoon E3	30"	1.6 (2925)	140	Late	58.9	-3.5

***2023 Seeding rates were 165,000 and 140,000 seeds/ac. Early planting date = May 11-16. Late = May 30-June 1. Yields are averaged across 3 site locations. Each location was replicated 3-4 times. LSD = 2.2 bu/ac.**

What we learned from white mould in 2023

Background

Canadian farmers, more specifically in Ontario and Quebec, are no rookies when it comes to white mould and the management tactics needed to deal with the disease.

The year 2023 was likely the worst for white mould we have had since 2008 in much of Ontario. With this year's long soybean harvest now complete, we have reflected on our soybean crop and are planning for 2024, knowing white mould will be back with a vengeance if we get similar conditions to last year.

In eastern Ontario, we saw a final yield range of 15-84 bushel per acre for soybeans, with a 15-40 bushel loss in fields that were hit with white mould. That is a huge range in yield! As we know, every year is a learning experience, so what can we do differently going forward when it comes to white mould?

White mould: The pathogen

Let's remind ourselves how the white mould infection starts.

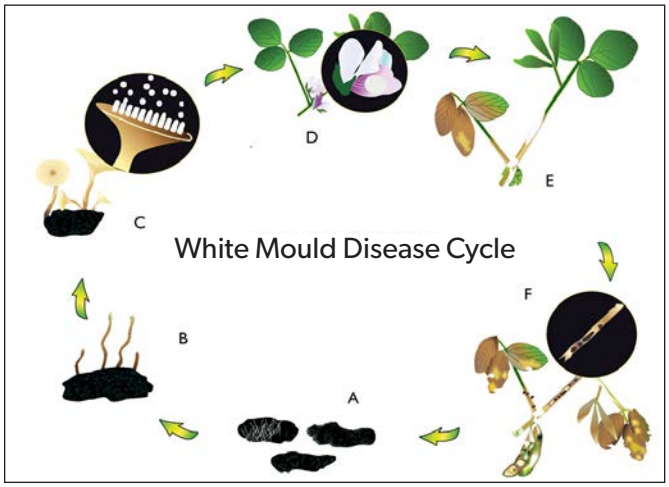


Figure 1: White Mould Disease cycle. (Source: Crop Protection Network)

The disease cycle (Figure 1) begins when the sclerotia survive in the soil from the previous year's soybean crop.

The sclerotia then germinate in the soil and produce apothecia (Figure 2).

When the conditions are right, the spores that are released from the apothecia enter the plant via the flower which then moves into the stem. The ideal conditions for white mould to develop include cool, wet, or humid environments when the canopy is closed at the time of flowering.

Figure 2: Apothecia; tan-coloured mushrooms that form on the soil surface from an overwintered sclerotia. (Leigh Hudson-Templeton, Maizex Seeds)

After one white mould infection, sclerotia can survive in the soil surface for years, and if they are incorporated into the soil via tillage, they can survive even longer.

If they are left undisturbed, the winter weather can help reduce the number of sclerotia that will survive for the following year, but ideally, fields that had a bad infection should stay out of a white mould host crop (ie. soybeans, canola, edible beans) for a minimum of two years to reduce sclerotinia pressure on the soil surface.

In the field in 2023

Some observations made this year that should be taken into consideration, include flowering timing. Planting early has been recommended for a while now, but many growers are reluctant to change because of frost risk, cold soils affecting emergence, general equipment/labour availability or 'don't plant soybeans before corn' mentality. We have seen the yield advantages associated with planting early in previous years, but this

year, we also noticed reduced white mould infection. As a general observation, the 'average planting timing' of mid-May, with an average relative maturity (RM), seemed to have the worst white mould infection rates. This occurred as white mould infection started when the crop was flowering and the canopy was closing.

Management considerations

Although a fast canopy closure is what we want, this is one of the reasons why white mould is a challenge. Fertility, weed control and uniform stand (population) are all needed for a high yield environment.

What is something we can do to protect that high yield potential? Fungicide application. However, a single fungicide application is not going to cut it when protecting high yield in a high yield environment, in a white mould year.

In high susceptibility areas, two applications should be in your crop budget because in a white mould year, we want to protect as many flowers within the canopy as possible. If you know you have a high yield environment, you likely have white mould on an annual basis in your soybean crop. A fungicide at the R1.5/R2 stage (Figure 3) is the ideal timing for a first fungicide application.

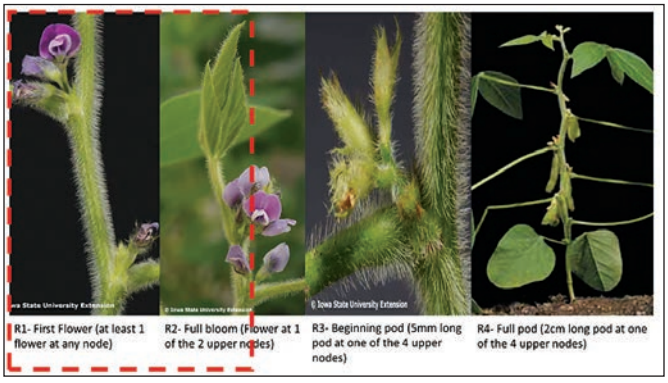


Figure 3: Ideal fungicide timing (flower + canopy closing/closure is what you are looking for).

For a second application, 10 days after the first application or R2.5 with lots of water (20 gal) and pressure (40 psi), and getting the fungicide into the canopy is key to getting adequate coverage.

Product selection is also key, as you want a multi-mode of action (MOA) white mould product for these applications (ie. Cotegra PRO, Allegro, Delaro Complete, Viatude). Fungicides are not going to eradicate your white mould pressure, but they most certainly will reduce it.

Another key consideration is population. You can achieve faster canopy closure with a denser canopy, but with today's genetics, planting at 170K is not required.

Reducing populations is a simple way of allowing greater air movement through the stand, reducing your white mould pressure, or alleviating it altogether. Very rarely is this the only risk management tool used when it comes to white mould reduction. In a high-yield white mould environment, populations as low as 110K final stand should be considered as one of the white mould tools in the toolbox. Lower populations are something we continue to evaluate to see how low we can go before we sacrifice those big yields.

Moving forward

After reading these points, what is the key take home message?

Every year is different, and we know 2024 and beyond are not going to have the same weather conditions to get the crop planted, managed and harvested. But, what is one thing we can control? Risk mitigation. To do this, mindful variety selection for white mould tolerance and diversity of flowering timing will help. Whether you grow 20 or 2,000 acres of soybeans, genetics and flowering timing are things you can control that can lead to positive yield change for 2024. See you in the field!

Acknowledgements:
This article was written by
Leigh Hudson-Templeton CCA-ON
Territory Manager, Maizex

Nitrogen stabilizers: Do they work?

Background

In follow-up to our nitrogen stabilizer trial in 2022, Maizex opted to replicate some of the trials in 2023 as well as follow some commercial fields for 'real life' scenarios to evaluate nitrogen (N) loss.

There are two main categories of nitrogen stabilizers used to protect various nitrogen sources from being lost to the environment. One of the groups helps to reduce nitrogen volatilization by slowing the conversion of urea to ammonia.

The second group of stabilizers that we compared had dual modes of action; one to reduce volatilization, and the second to reduce the loss of nitrogen fertilizers due to leaching and denitrification, which is the loss associated with anerobic saturated soils.

It is important to note that the nitrification inhibitors found in the dual inhibitors help to slow the conversion of urea to nitrate. This is helpful to prevent the loss of nitrate that is at risk of leaching in sandy soils or denitrification on clay soils; both conditions influenced by excess rainfall.

In 2023, nitrogen fertilizers were at record prices, which further incentivized our reasons for conducting these trials.

Producers were concerned about protecting their nitrogen fertilizer investment and Ontario's On Farm Climate Action Fund incentivised the use of nitrogen stabilizers.

At the Canadian Outdoor Farm Show (COFS) site in Woodstock, ON, we evaluated side-dress scenarios using 28% UAN and three different stabilizers, including two dual stabilizers and one volatilization-only stabilizer.

There were three application methods used including broadcast, knife-injected UAN with an open slot, and a Y-Drop approach using a dribble band on the surface of the soil.

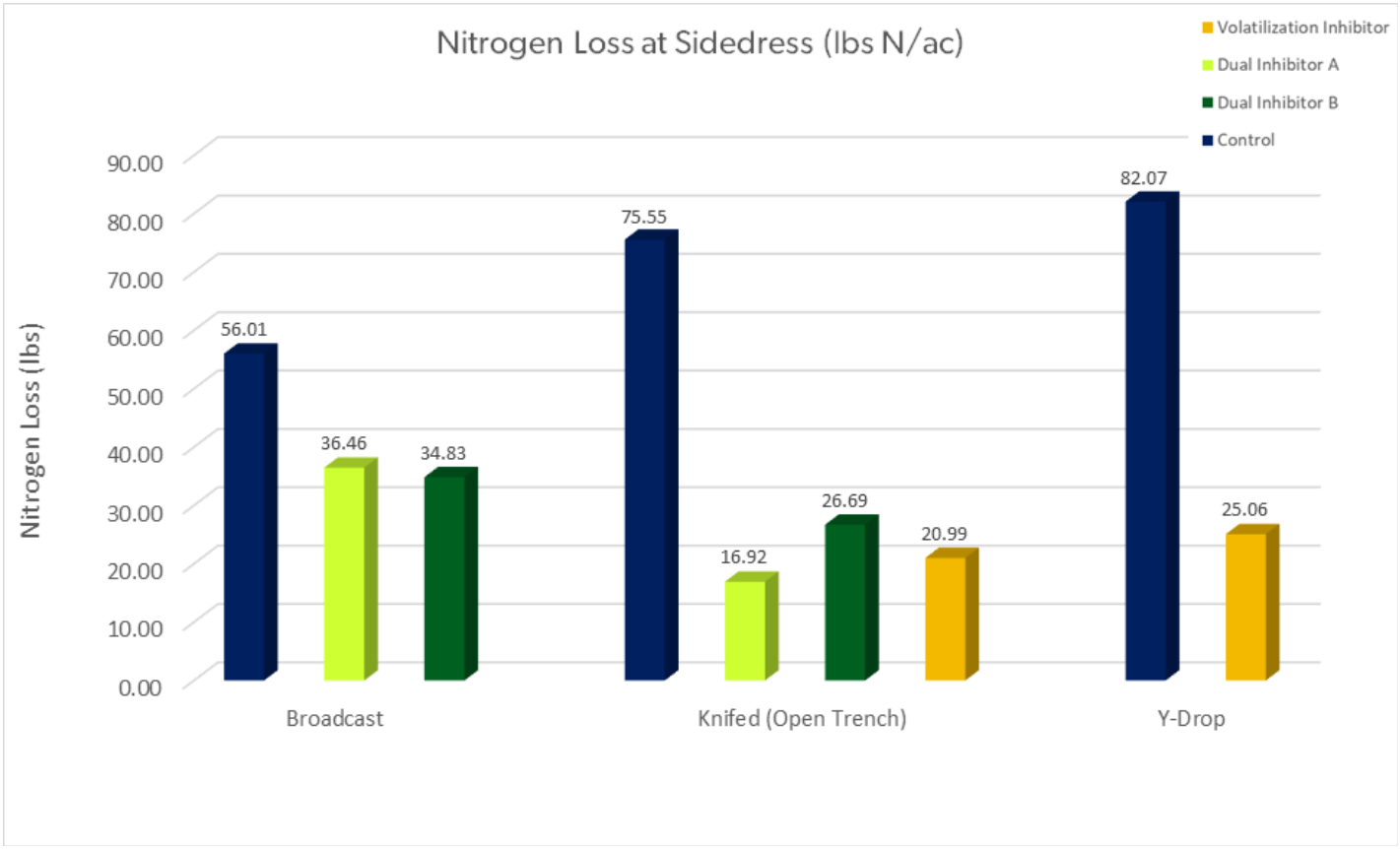
Record prices of N fertilizers prompted the Maizex agronomy team to decide to evaluate N stabilizers.

All of these were done on saturated soils to demonstrate worst case scenarios for volatilization losses. Side-dress applications were applied at 40 gal/ac (120 lbs N/ac) and the dositubes were exposed for 14 days after application.

The site received little rain until day 14 when it received 0.6" of rainfall, fully incorporating the surface-applied nitrogen.

Treatment	Dosimeter Reading NH3 PPM	Predicted Nitrogen Loss (lbs N/ ac)
		Wind Speed 1 M/s
Control Broadcast	340	56.01
A: Dual Inhibitor Broadcast	220	36.46
B: Dual Inhibitor Broadcast	210	34.83
Control Knifed in Open Trench	460	75.55
A: Dual Inhibitor Knifed in Open Trench	100	16.92
B: Dual Inhibitor Knifed in Open Trench	160	26.69
C: Volatilization Inhibitor Knifed in Open Trench	125	20.99
Control Y-Dropped	500	82.07
C: Volatilization Inhibitor Y-Dropped	150	25.06

Calculation of predicted N loss using Dosimeters. Note D is the dosimeter reading and W is the wind speed in metres per second.
(lb N/ac) = 0.89 x ((0.217Dw) - (0.034D) + 0.71)



Discussion on stabilizers

Overall, the trial demonstrated that these nitrogen stabilizers were very effective in reducing volatilization of ammonia from the surface applied 28% UAN. Conditions were simulated to produce worst-case loss scenarios.

The ground was saturated; soil and air temperatures were high and applications were surface-applied or open trench side-dressed.

Losses from surface-broadcasted 28% UAN when treated with both dual stabilizers were reduced by 1/3 from the untreated control.

Broadcast 28% UAN is not a widely used side-dress approach but is used for most spring pre-emerge 'weed and feed' applications.

When using any of the stabilizers while knifing in 28% UAN, we were able to reduce nitrogen loss by 3/4 compared to the control.

The trench after application was left open: this creates higher risk as the moist soil below and air wicking action add to greater volatilization risk. In the Y-drop application, only the volatilization inhibiter was evaluated. It was able to significantly reduce nitrogen loss by 2/3 compared to the untreated.

Field scale trials in 2023

Maizex worked with several co-operators this past spring to get a handle on potential nitrogen losses from fields across Southwestern Ontario. Dosimeters were set up within 24 to 48 hours of application and left in place until the first significant rainfall. See the next page for a list of locations and applications that were compiled, and nitrogen losses estimated.

In our field studies, we had three sites that were urea broadcast-incorporated with no stabilizers. This is a very common application method and it was useful to get some real measurements on nitrogen losses using this practice.

Although the losses were relatively low, they were not zero. It would have been unlikely that there would have been an ROI on using a stabiliser on these three fields given the losses. However, producers should evaluate their incorporation and ensure that they are completely incorporating the urea prills.

If producers are only using a min-till approach, this may not be enough to completely bury the urea. Also, if the producer cannot incorporate the urea immediately after broadcasting, there is risk for volatilization while the urea sits on top of the moist, warm soil.

Stabilizers should be considered for situations where full and timely incorporation are not possible.

Site	Dosimeter (ppm)	Lbs N Loss (@1m/s)	County	Soil Type	N Source	Trench	Stabilized
Essex	18	**3.56**	Essex	Clay	NH3	Closed	No
Woodslee	35	**6.33**	Essex	Clay	28% UAN	Closed	No
St. Joachim	22	**4.22**	Essex	Clay	28% UAN	Closed	Yes
Stoney Point	28	**5.19**	Essex	Clay	28% UAN	Open	Yes
Croton	300	**49.49**	Lambton	Clay	28% UAN	Open	No
Wallaceburg	120	**20.18**	Chatham Kent	Loam	28% UAN	Open	No
Agronomy Site: Pain Court	25	**4.70**	Chatham Kent	Clay Loam	28% UAN	Open	Yes
Agronomy Site: Pain Court	0	**0.63**	Chatham Kent	Clay Loam	28% UAN	Closed	Yes
Rockwood	45	**7.96**	Wellington	Loam	Urea	Broadcast Incorporated	No
Durham	70	**12.03**	Grey	Loam	Urea	Broadcast Incorporated	No
Hanover	15	**3.07**	Grey	Loam	Urea	Broadcast Incorporated	No
Harriston	50	**8.78**	Wellington	Loam	ESN/28%	Broadcast	No
Woodstock	75	**12.85**	Oxford	Loam	ESN	Broadcast Incorporated	No
Beachville 1A	300	**49.49**	Oxford	Loam	28% UAN	Broadcast	No
Beachville 1B	175	**29.13**	Oxford	Loam	28% UAN	Broadcast	No
Beachville 2	50	**8.78**	Oxford	Loam	28% UAN	Broadcast	No
Beachville 3	60	**10.40**	Oxford	Loam	28% UAN	Broadcast	No

All predicted nitrogen losses were calculated using a wind speed of one metre per second. It is important to note that wind speed is a critical component to the loss of ammonia from the soil surface.

Above left: Control knifed is 450 ppm Aug. 22; right: Volatilization Inhibitor Y drop was 150 ppm Aug. 22.

Acknowledgements:
This article was written by Adam Parker CCA-ON Market Development Agronomist, Maizex

Delta Yield: Making MERN work for you

Background

In 2023, Maizex set out to evaluate nitrogen rates and the MERN (Most Economic Rate of Nitrogen) using the Delta Yield calculation.

This requires applying a non-limiting or 'N rich' rate of nitrogen, as well as a zero rate of nitrogen at the same sites or in different yield zones on a field. The calculation considers the price of nitrogen and value of corn, and estimates the MERN using the difference in yield between the non-limiting and the zero N blocks.

MERN is most strongly influenced by the response in yield to nitrogen fertilizer. MERN helps us to understand what rate was most economical, but also helps us evaluate the rates we should use to avoid excessive fertilization which may cause harmful environmental impacts.

We evaluated hybrid responses at our intensive management locations in Elora and Ridgetown, as well as two field scale trials; one near Canada's Outdoor Farm Show and one in Drumbo, ON at Nithfield Agronomy and Research. Below is the MERN calculation for the average N rich and 0 N yields at Ridgetown.

Yields and inputs are entered, then the calculator runs the Delta Yield calculation which in this case delivered a MERN result of 173 lbs of N/acre.

Delta Yield - N Rate Determination for Corn				
Insert Values in the Yellow Cells				
	Imperial		Metric	
Total N Applied to High N Zone	200	lbs N/acre	224	kg N/ha
Yield from High N Zone	252.5	bu/acre	15.84	tonnes/ha
Total N Applied to Low N Zone	3	lbs N/acre	3	kg N/ha
Yield from Low N Zone	114.5	bu/acre	7.18	tonnes/ha
Delta Yield (High Zone - Low Zone)	138	bu/acre	8.66	tonnes/ha
Corn Price	$ 6.00	$ /bu	$ 236.25	$ /tonne
Corn Price (per lb or kg grain corn)	$ 0.11	$/lb	$ 0.24	$/kg
Nitrogen Source	UAN (28-0-0)		UAN (28-0-0)	
Nitrogen Source Price ($/tonne of product)	$ 750.00	$/tonne	$ 750.00	$/tonne
Nitrogen Price (per lb or kg) of actual N	$ 1.21	$/lb	$ 2.68	$/kg
Price Ratio ($ nitrogen / $ corn)	11.3		11.3	
Most Economic Rate of Nitrogen (MERN)	**173**	lbs N/acre	**194**	kg N/ha
***Note** : The formula for deriving the Most Economic Rate of Nitrogen is taken from the following research article; Janovicek et. al. Agronomy Journal 2021;113:1961-1973*				

Site	Hybrid	Zero N (bu/ac)	Non-limiting (bu/ac)	MERN (lbs N/ac)
Elora	Average of site	166.1	219.2	96
Ridgetown	Average of site	114.5	252.5	173
Ridgetown	MZ 3930DBR	117.9	251.6	169
Ridgetown	MZ 4049SMX	107.3	261.9	187
Nithfield (High Productivity A)	MZ 3930DBR	203	260	100
Nithfield (High Productivity A)	MZ 4049SMX	203	267	107
Nithfield (Low Productivity B)	MZ 3930SMX	162	255	134
Nithfield (Low Productivity B)	MZ 4049SMX	153	265	150

Using $6.00 corn and $750/MT 28% UAN

2023 summary of MERN using Delta Yield calculation.

MERN analysis & in-field application

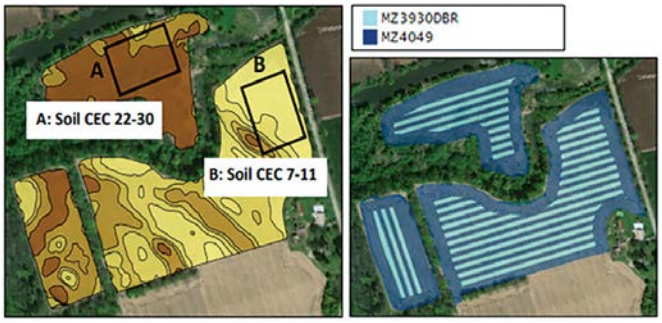
MERNs varied significantly between sites and soil types in trials in 2023. Loamier soils with better productivity, greater CECs and higher organic matter mineralized more nitrogen, requiring less applied nitrogen, and in turn had a lower MERN.

Consideration must be given to a soil's ability to mineralize nitrogen when considering fine tuning nitrogen rates for each field or zone. Our field scale location with Nithfield Agronomy and Research demonstrated this very effectively.

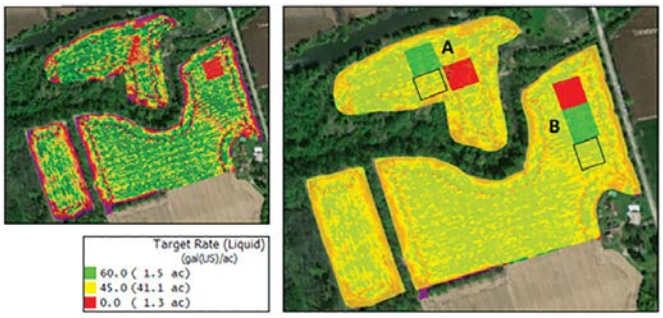
This was a highly variable farm with soils ranging from seven to 30 CEC. Two hybrids, MZ 3930DBR and MZ 4049SMX were both planted at two populations and evaluated for their MERN in high and low productivity areas.

As you can see below in the pictures from Nithfield, historically Block B, a gravelly, low CEC soil has much lower yields and Block A, a rich river bottom high CEC silt loam has tremendous yield potential. MERN varied greatly between these two blocks as block A needed an average of 104 lbs of N to achieve MERN. In contrast, Block B needed an average of 142 lbs of N to reach MERN. This further proves how in-field variability would need to also be assessed when evaluating MERN.

When comparing the two hybrids, MZ 3930DBR came out with a lower MERN, however MZ 4049SMX had the highest yield in the trial. Interestingly, most years where water is limited, Block B would yield 50 bu/ac less, but in 2023 with ample rainfall we were able to narrow the yield gap between the two zones to 5-12 bu/ac with non-limiting N, but in the 0 blocks, yields were separated by 45.5 bu/ac.



Base soil map at Nithfield Agronomy and Research and overlaid hybrid planting map.



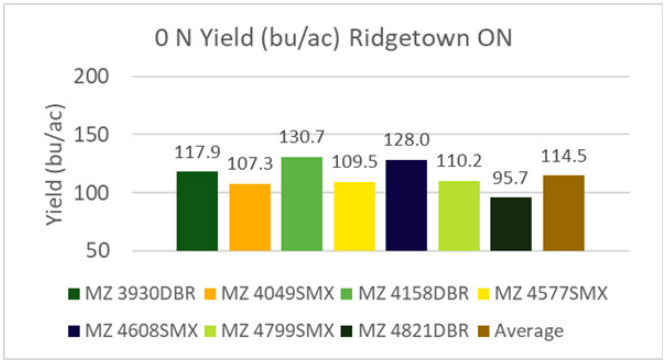
Application map for Zero, 135N and 180 lbs N layered over MZ 3930DBR and MZ 4049SMX.

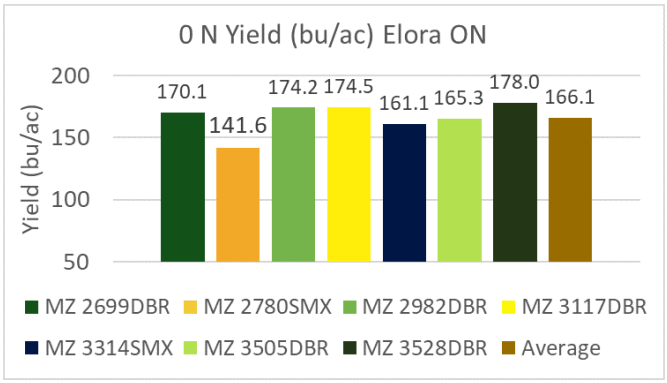
Hybrid nitrogen considerations

Besides using zero N rate blocks for evaluating MERN and the Delta Yield calculation, zero N can also be used to evaluate hybrid-specific responses.

MERN between hybrids did vary within 5-20 lbs of N, but with so many factors affecting this - field variability, weather, year-to-year hybrid performance - it seems more prudent to consider a hybrid's yield performance at zero N and not their overall MERN. When considering nitrogen rates for a field, it is still important to take into account the hybrid being positioned. Hybrid-specific responses are noted, especially in the Ridgetown site. Yields ranged from 95.7 bu/ac to 130.7 bu/ac. Hybrids like MZ 4158DBR (130.7 bu/ac) where yield is driven by length and kernel weight, which is determined during the V10 - R stages show some resilience to lack of early fertility or nitrogen.

In comparison, a hybrid like MZ 4049SMX (107.3 bu/ac), strongly driven by the girth yield component determined at V4-V8, show a stronger negative response to the lack of early nitrogen or fertility. Discussing hybrid-specific responses to nitrogen, fungicide and population with your seed dealer or agronomist is important as it can drive increased productivity by soil type on each individual farm.





Moving forward

In 2024, we plan to continue 0 N research in our intensive management trials. We also plan to refine recommendations and use this data to better understand and characterize our hybrids.

The data also shows the value that a zero N block may have on your own farm. Positioning a 0 N block and an 'N rich' block on your farm or in zones with different yield potential in a field can hold great value for your farm.

This data can be used to evaluate how much N your soil is supporting you with, and could be used in the future for variable rate nitrogen scripting. For instance, at Nithfield one may conclude that on the lower CEC soils, N rates should be 40-50lbs higher than in the loamy, high CEC soils.

In many cases though, zero N blocks may help us to see that rates actually don't need to increase but actually a reduction in nitrogen rates on very fertile soils may be the most profitable management. Useful nitrogen recommendation tools like Delta Yield and the Maizex N Tracker can be found at Maizex.com in the Agronomy section.

Acknowledgements:
This article was written by Henry Prinzen CCA-ON Market Development Agronomist, Maizex and Adam Parker CCA-ON Market Development Agronomist, Maizex
Thank you to Tony Balkwill at Nithfield Agronomy and Research for the maps, site and data in 2023.

High soil N test a sign to stop side-dressing N?

Background

In 2022, we worked to evaluate the Maizex N Tracker. The summary can be found in the 2022 Agronomy Summary. The Maizex N Tracker, combined with soil nitrate testing at V4-V5 and nitrate tissue testing at VT is a great tool to guide you in decisions on the need and timing of nitrogen for your individual fields of corn. Is this a true statement? We decided to continue to trial the Pre-Sidedress Nitrate Test (PSNT) in 2023 to see if we could see a pattern that might lead us to update the parameters when recommending nitrogen on high PSNT results.

2023 layout

This season, we ran a full-length field trial, creating a larger area for more dependable results. Trials differed from grower to grower, depending on application and harvest equipment.

There were six different cooperators this season; one in Lambton County, two in Chatham-Kent and three in Essex County.

Nitrogen Trial					
1st Replication			2nd Replication		
Starter N + 60 lbs	N Tracker Rec	Grower Rate	Starter N + 60 lbs	N Tracker Rate	Grower Rate

Essex County clay location taken September 6. Test strips are clearly visible.

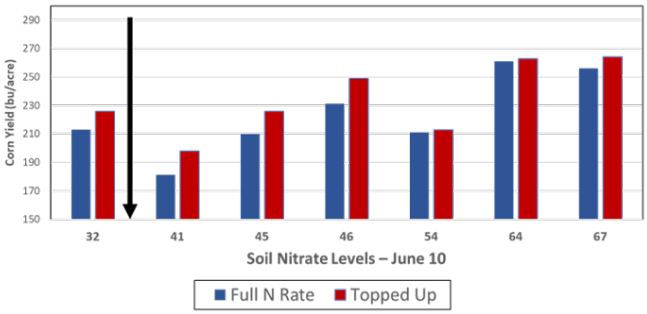
Lambton County clay location taken September 6. Test strips are clearly visible.

Wallaceburg loam location taken on September 6. Strips around centre of photo are barely visible.

Sites were set up based on the Maizex N Tracker results, using information supplied by the cooperators, the soil nitrate test results, the grower's normal application rate and a low N rate (60lbs).

This rate was used to confirm a pattern we observed last year, where a zero N recommendation coming out of the Maizex N Tracker based on a high Nitrate ppm, still showed a substantial yield increase when a small amount of additional N was applied.

Below are last year's results. The calculator establishes a zero nitrogen recommendation if soil nitrates are above 35 ppm. As you can see, we observed an increase in yield right up to 46ppm.



2023 results

The trial did not go as planned. Soil nitrate levels never went over 20 ppm given the dry start to the growing season, therefore we were not able to see if we could push the Maizex N tracker limitations higher.

Although the trial did not set out to do what we wanted, it did give us an opportunity to observe how nitrogen performed, going from a droughty situation earlier, then into a high moisture situation later in the growing season. Low N strips were very easily distinguished in the clay and clay loam trial, but barely noticeable in the loam and sand loam sites.

2023 Nitrogen Trial Results									
County	Soil Type	Soil Nitrate (ppm)	Starter + 60lbs (bu/ac)	Total N	N Tracker (bu/ac)	Total N	Grower Rate (bu/ac)	Total N	Comments
Lambton	Clay	4	141.7	95	216.2	210	210.3	175	
Chatham-Kent	Loam	18.5	NA		NA		NA		Not harvested
Chatham-Kent	Clay Loam	12.5	240.4	100	239.1	175	NA		Grower and N Tracker rate same
Essex	Clay	5	179.5	95	248.2	235	NA		Grower and N Tracker rate same
Essex	Loam	7.5	242.9	117	253.4	230	246.3	217	
Essex 3	Loam & Clay	9.5	256	120	265	235	NA		Grower and N Tracker rate same
Essex 3	Back Loam	??	266.1	120	270.1	235			Back Loam area only
Essex 3	Front Clay	9.5	244.1	120	264.1	235			From Clay area only

As you can see from the results on the previous page, regular nitrogen rates definitely made economic sense, but what was very interesting to see was that loamy, high fertility soils never reacted to higher nitrogen rates. In fact, in all cases where we were in loam soils, lower nitrogen rates made the most economic sense.

We also determined this year that the Maizex N Tracker was successful. In the two cases where we had an N Tracker replication against the grower rate used which was the lower rate, the N Tracker had the better yield.

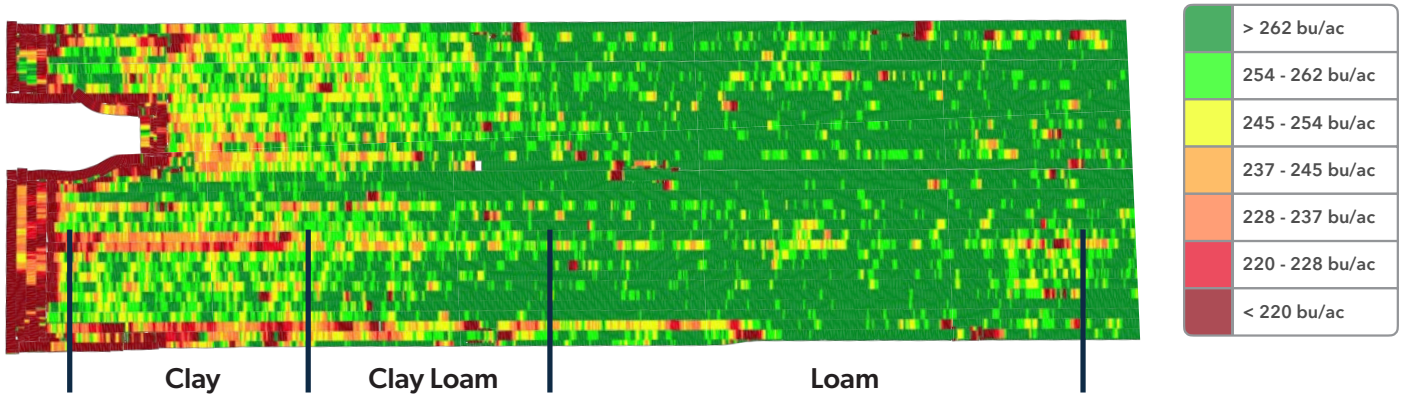
Now, if we look at the Essex 3 field in the chart to the left, this site was clay/clay loam at the front and sharp loam at the back.

The grower rate and the N Tracker rate were very close to the same. So, we decided to look at the grower starter rate of 60 lbs actual N, plus 60 lbs actual N at side-dress,to total 120 lbs actual N vs a total nitrogen pass of 235 lbs.

The yield map below, from front to back showed a 10 bushel per acre increase in the higher nitrogen pass, as seen on the table above.

Interestingly, the front clay section showed a 20-bushel difference, while the loam area at the back showed a four-bushel increase with the higher nitrogen. It's hard to convince that 115 lbs of actual nitrogen was economically efficient for a four-bushel increase.

The drone image below, taken on September 6, confirms what we saw in the results. We can see how the corn was not suffering for lack of nitrogen on the lighter soils.



Conclusion

So, what does this all mean? It likely means that given the season that was, nitrogen in many cases was not the yield-limiting factor. In soils with high OM and good mineralization potential, hybrids ran out of other yield-limiting factors first.

In many cases, this can be attributed to the lack of heat. This is evident in the lower yields seen in full season hybrids across Ontario, as these hybrids likely needed more time and heat to maximize yields. In soils with low OM or heavy clay soils that mineralize N at a lower rate, increased N was needed to reach maximum yield potential.

In most cases, the maximum yield on clay soils achieved were likely above what was expected, given said N rates and soil type, and just like every year, higher N rates are needed on the fringe soils like sand and clay which the Maizex N tracker does take into account.

Moving forward

As we move forward, we will be attempting this trial one more time to see if we can replicate what we saw in 2022 and then decide whether parameters need to be adjusted when recommending a nitrogen rate on higher Soil Nitrate Test results.

Nitrogen is very hard to understand sometimes. All we know for sure is that we need it to achieve higher yields. But, knowing exactly how much is needed under different environmental situations is a challenge.

As we saw from the results this year, different soil types have a strong effect on nitrogen efficiency. There has been a lot of work done on nitrogen over the years, and there will be more as we go forward.

Acknowledgements:
This article was written by Chuck Belanger, Maizex Seeds. Special thanks to the cooperators who allowed a block in their field that looked ugly!

2023 intensive management results

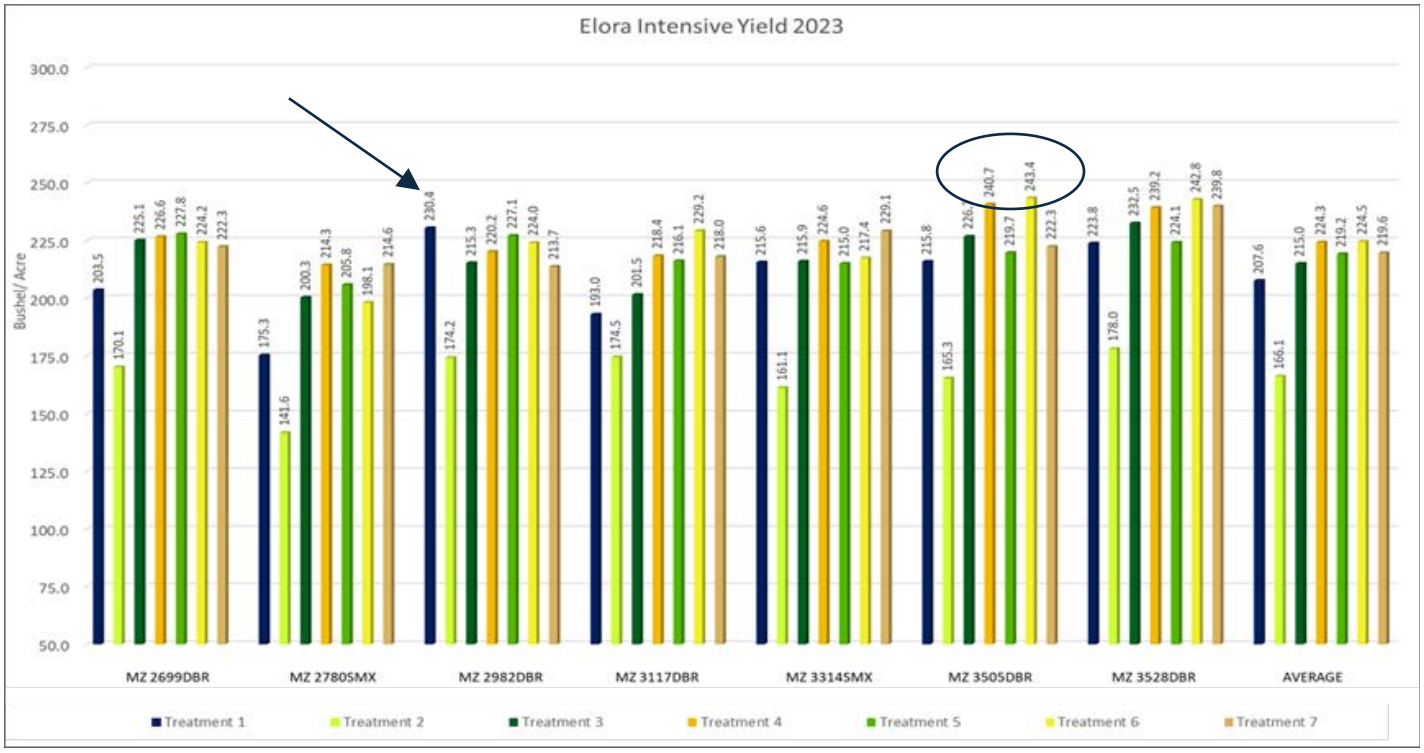
Background

Maizex has invested in yearly intensive management studies to better understand how our hybrids react under different management systems. Maizex uses this research to help characterize our hybrids to better position them field by field on our customers' farms. In 2023, we set up two locations with four replications of seven treatments to test our hybrids' responses to population, nitrogen, and fungicides. Treatments were the same at both locations. Elora, ON included hybrids from 86 CRM to 95 CRM and Ridgetown, ON included hybrids from 99 CRM to 108 CRM.

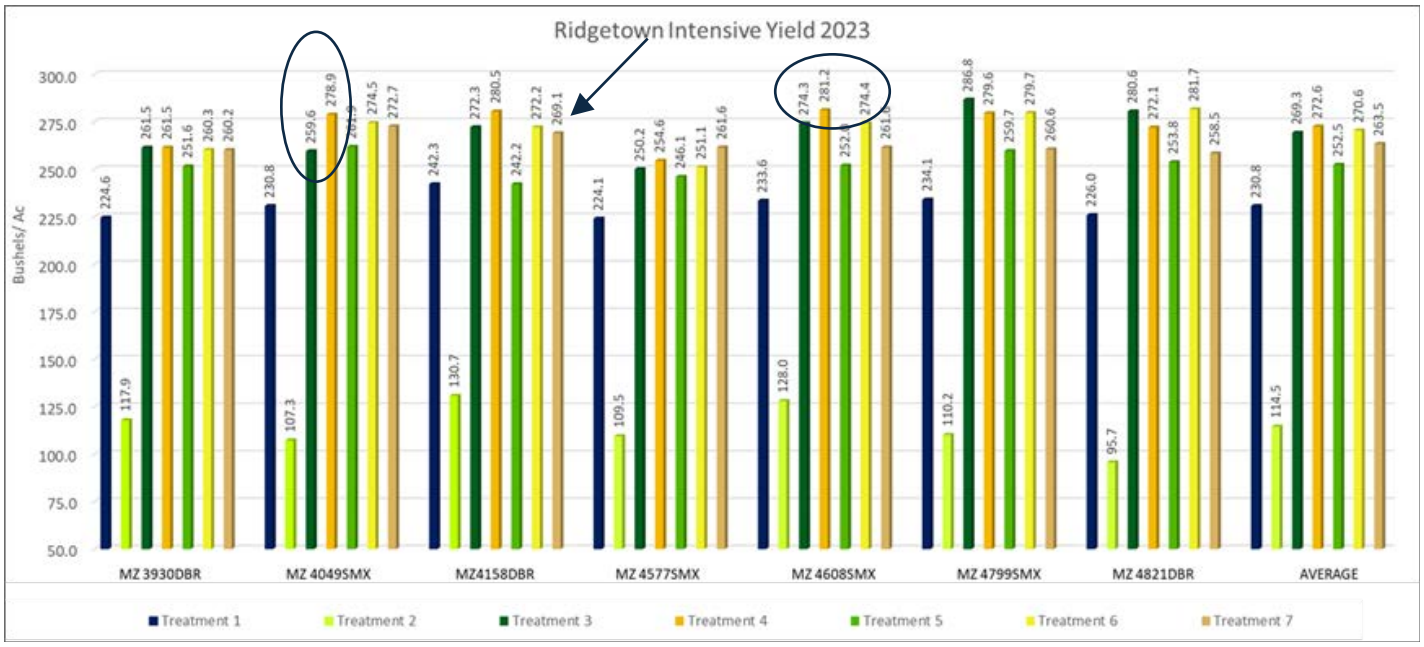
Treatments

1. 26,000ppa, 200lbs/ac N, No Fungicide
2. 32,000ppa, ZERO N, No Fungicide
3. 32,000ppa, 200lbs/ac N, VT Delaro Complete + Proline
4. 32,000ppa, 200lbs/ac N, VT Delaro Complete + Proline, R2 Veltyma
5. 32,000ppa, 200lbs/ac N, No Fungicide
6. 36,000ppa, 200lbs/ac N, VT Delaro Complete + Proline
7. 36,000ppa, 200lbs/ac N, No Fungicide

Treatment	Yield (bu/ac)	Significance	Moisture (%)	Economics (Over 32K Standard)
Ridgetown				
1	230.8	d	20.6	-$118.55
2	114.5	e	20.2	-$697.00
3	269.3	ab	23.3	$32.20
4	272.6	a	23.3	$18.65
5	252.5	c	20.8	$0.00
6	270.6	ab	22.1	$40.65
7	263.5	b	21.0	$56.50
Elora				
1	207.6	c	29.3	-$52.90
2	166.1	d	26.1	-$100.15
3	215.0	b	29.5	-$84.30
4	224.3	a	30.0	-$58.85
5	219.2	ab	28.6	$0.00
6	224.5	a	29.9	-$37.55
7	219.6	ab	28.9	-$12.40



Graph #1 – Elora, ON.



Graph #2 Ridgetown, ON

Population Response

Population responses varied this year by hybrid and by environmental conditions. Some hybrids showed very impressive yields at 26,000 plants per acre, specifically, MZ 2982DBR in Elora. MZ 2982DBR has impressive girth and kernel depth flex.

This hybrid was able to make the most of the grain-fill period with kernel depth and held rows of girth with the lower population, resulting in 26K being the highest yielding entry of all its treatments.

No other hybrid in Elora or Ridgetown had a similar response. However, in some field scenarios we have seen MZ 4049SMX, and MZ 4608SMX yield very well at reduced populations.

At Elora, the 26k averaged 207 bu/ac across all hybrids, while Ridgetown averaged 230.8 bu/ac. Even with the higher yields, Ridgetown saw positive population response from all hybrids when moving from 26K to 32K.

Ridgetown also showed a positive response to 36K for many of the hybrids. MZ 3930DBR and MZ 4799SMX showed little to no response to increasing population above 32K while MZ 4577SMX and MZ 4158DBR showed very strong response to increased population up to 36K.

At Ridgetown, the 36k population was the highest average treatment at 263.5 bu/ac while the 32k came in the middle at 252.5 bu/ac. At Elora, the 32k was 219.2 bu/ac and the 26k was 219.6 bu/ac.

Fungicide Response

Fungicides continue to be one of the inputs evaluated that shows the most consistent benefit.

In Elora this year, we saw little leaf disease with a shorter growing season that barely allowed hybrids to finish. Thus, at Elora we saw very little advantage to fungicide on an overall basis, but there were some individual hybrids with a significant response, like MZ 3505 DBR.

At Ridgetown, where heavy tar spot and northern corn leaf blight pressure were present, we had a much greater response to fungicide applications.

The average response to a Delaro Complete + Proline VT fungicide at 32K in Ridgetown was 16.8 bu/ac, but only 7.1 bu/ac at 36K. Adding a second follow-up pass of Veltyma at 32K added an additional 3.3 bu/ac on average, with the highest response being 19.3 bu/ac over the 1X fungicide in MZ 4049SMX.

This is unsurprising for this hybrid though, as it has an average leaf disease package and is a very early maturity for that area. By applying two fungicides, we were able to keep the plant green and healthy and 'push' its maturity and continue adding grain fill, noted by its 3.1% increased moisture over the 32K standard treatment.

In general, the two applications of fungicide at Ridgetown had the highest yields in our trials, with MZ 4049SMX showing the best response followed by MZ 4158DBR and MZ 4608SMX.

Grain moisture among treatments did vary this year. Elora had a 1% increase in moisture from fungicide application.

At Ridgetown there was a significant difference of 2.5% moisture with the addition of a fungicide at VT. The two applications of fungicide did not significantly raise moistures over the one fungicide treatment.

Summary

Overall, we are seeing strong responses to population and fungicide use. These are key management decisions for farmers.

Identifying Maizex hybrids that fit your management system is key to fine tuning your success. Not every hybrid or field needs high populations or a fungicide. As seen in the chart above, the most economical treatment was just a standard 32K population, no fungicide at Elora for the conditions faced this year.

The next most profitable was 36K population. Fungicides had no return on investment (ROI) in Elora with the low disease pressure and shortened season. By contrast, all treatments besides zero nitrogen and 26K had a positive ROI in Ridgetown.

Harvestability and DON concerns are not accounted for when estimating ROI of fungicides. Fungicide application provided positive ROI under all scenarios at Ridgetown. However, on average, 36K without a fungicide was the most profitable. This was followed by 36K plus a fungicide and then 32K plus a fungicide. It is important to note however, that this can vary by hybrid. With ample water supply in 2023, population had the best ROI in Ridgetown. A fungicide was also very profitable in Ridgetown, just not quite as profitable as increased population alone.

Statistically, all fungicide treatments were equal, suggesting that there was no synergistic effect between population and fungicide on average in Ridgetown in 2023, although some specific hybrids like MZ 4821DBR did respond to the combination.

Acknowledgements

This article was written by Henry Prinzen CCA-ON Market Development Agronomist, Maizex and Adam Parker CCA-ON Market Development Agronomist, Maizex

The importance of kernel weight on yield

Background

Following up on the work completed by the Maizex team in 2022, we set out to measure Thousand Kernel Weight (TKW) on many of our market development plots across Ontario.

In 2023, we saw surprisingly strong kernel weights, despite increased kernel counts over the previous season.

Overall kernel weights in 2023 were like the higher weights we recorded in 2022. For example, at Jarvis, ON, the average TKW in 2022 was 356.6g vs 353.7g in 2023. In the same Jarvis location, yields were 203.5 bu/ac and hybrids averaged 420 kernels per ear in 2022, in contrast to 242.7 bu/ac and 551 kernels per ear in 2023.

In 2022, a location near Dunnville, ON demonstrated the importance of kernel weight over hybrid test weight for determining yield. As a company, we work towards better characterizing our hybrids by yield components and as 'Kernel Number' or 'Kernel Weight' hybrids.

This encouraged us to further evaluate not only kernel weight but kernel number. We used harvest populations, kernel weights and yield to work backwards to estimate kernels per ear for each hybrid.

2022 vs 2023 season

In 2022, we saw that kernel weight was the largest driver of yield at the Dunnville location.

In 2023, kernel weight seemed to be a much weaker driver of yield than it was in 2022. In 2022, hybrids went through a stressful ear determination period throughout the vegetative growth stages and a stressful pollination, limiting potential kernel count.

This was followed by a good amount of later rainfall through the grain fill or reproductive stages of the crop, allowing for high kernel mass. In contrast, 2023 brought ample rain after a dry start. From analysis of rows round, it appears as though rain came in time for the girth determination period, V4-V8 and didn't let us down through the rest of the vegetative growth period.

This excellent ear development period, followed by cool moderate temperatures, and high amounts of rainfall allowed for near perfect pollination conditions. A later season and cooler weather may have hampered how long the kernels were able to fill, but overall, it didn't reduce kernel weight much over 2022.

Since conditions were near perfect for most of the season, hybrids with the greatest number of kernels or Kernel Number hybrids seemed to top many of the plots.

Site-specific example

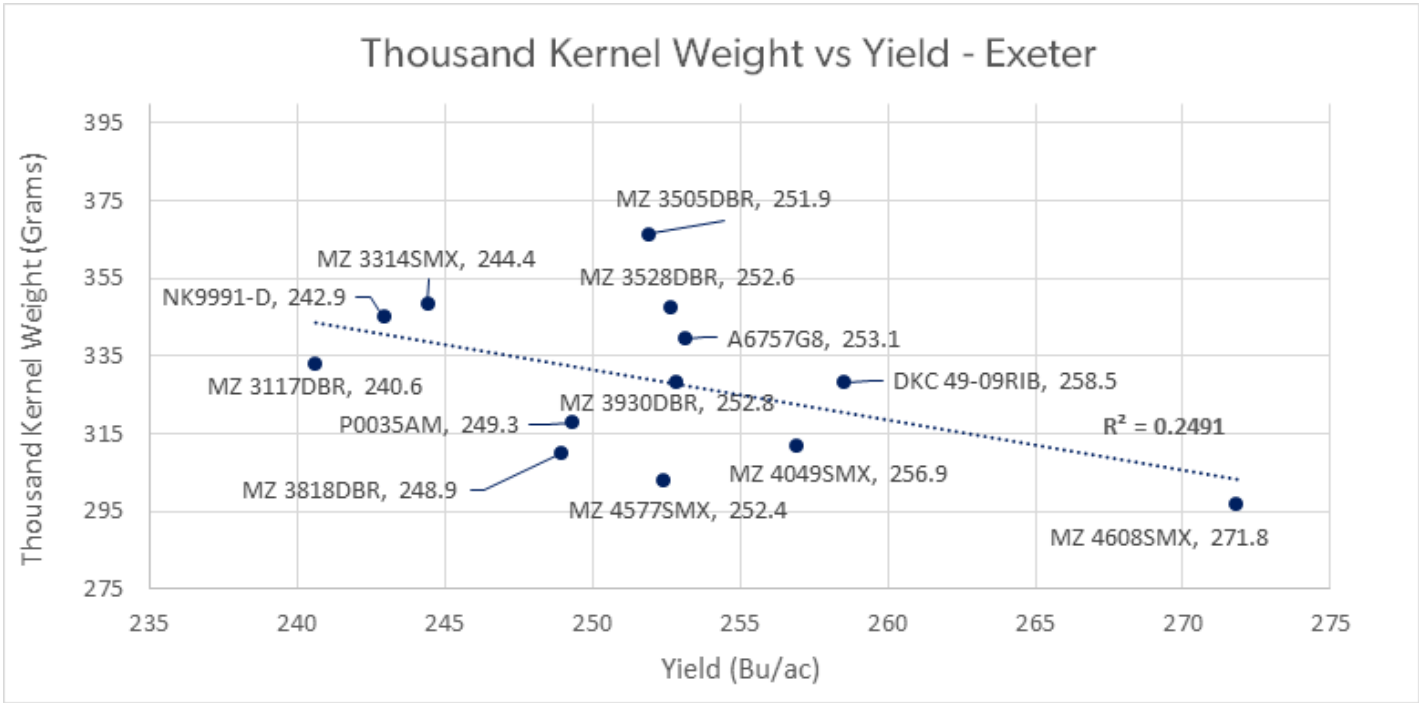
Looking at the graphs from near Exeter, ON, you can see that TKW had a weak, but negative association with yield. R^2, a measure of how well the data fits the variables being measured in the graph, was very weak at 0.249.

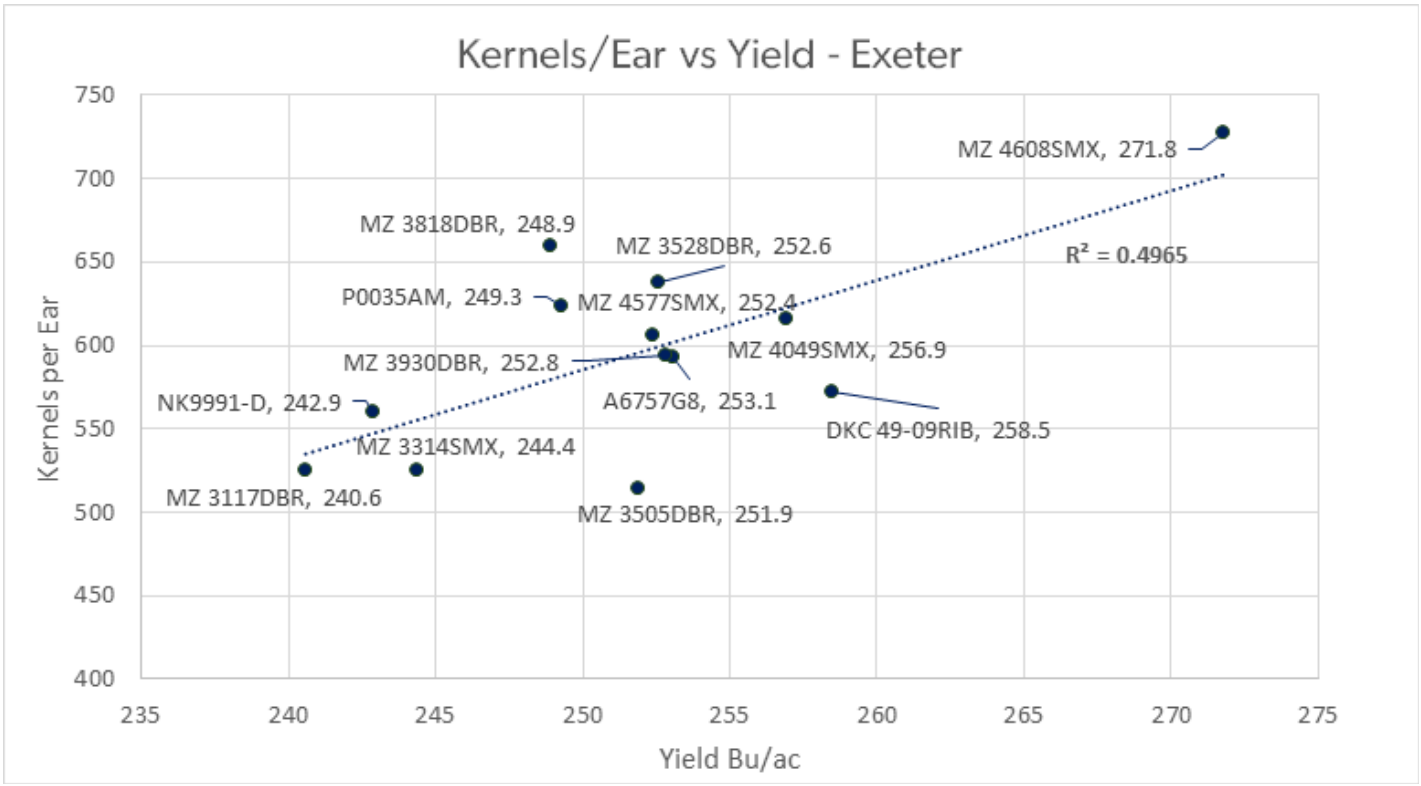
Another way to look at it would be to say that TKW explains only 24.9 % of the negative yield trend associated with this data. By contrast, in the second graph measuring Kernels per Ear vs Yield, we see a much stronger correlation.

At this same site in Exeter, Kernels per Ear had an R^2 of 0.497, meaning about 50 % of the variability in yield at this location could be explained by kernels/ear. When evaluating the graph, you can see that there are many hybrids that fall on both sides of the line.

Hybrids above the line in the second graph have above average kernels/ear, but fall below average on kernel weight. Hybrids on the bottom of the regression line have strong kernel weight, but weaker kernels/ear. In the Exeter location, our Kernel Number hybrids excelled, while hybrids like MZ 3314SMX, which has a very strong kernel weight, yielded near the bottom of the plot. MZ 4608SMX, a hybrid with consistently high kernel count, was way off at the top of the plot.

Despite having the poorest TKW, at just under 300 grams/1000 kernels, MZ 4608SMX was still over 10 bu/ac better than any other hybrid. This is accounted for by its massive estimated 728 kernels per ear.





Fungicide effect on TKW

In 2023, we also sprayed multiple research locations with Delaro Complete + Proline. This was done at Ridgetown, Exeter and Belmont. Belmont had a very good response to fungicide and had very consistent data. Instead of analysing yield alone, we evaluated TKW of all hybrids in our 'MZ C' trial. This includes some competitor hybrids, Maizex commercial hybrids and Maizex pre-commercial hybrids. In this location, fungicide application increased TKW by about 9-10 % on average, with the location yielding in the mid-200s.

It could be concluded that fungicide not only increased TKW by an average of 9-10 % but also likely yield. This means yield responses would be 20-30bu/ac for the average entry. This is not much of a stretch, since all data points to both better TKW and sometimes

improved kernel count from reducing aborted kernels with fungicide applications. Interestingly, the most responsive hybrid by TKW was also the hybrid with the highest overall TKW. Three of the top four hybrids treated with fungicide TKW had responses over 10 %, ranging from an 11-15 % increase in TKW over the standard no-fungicide application.

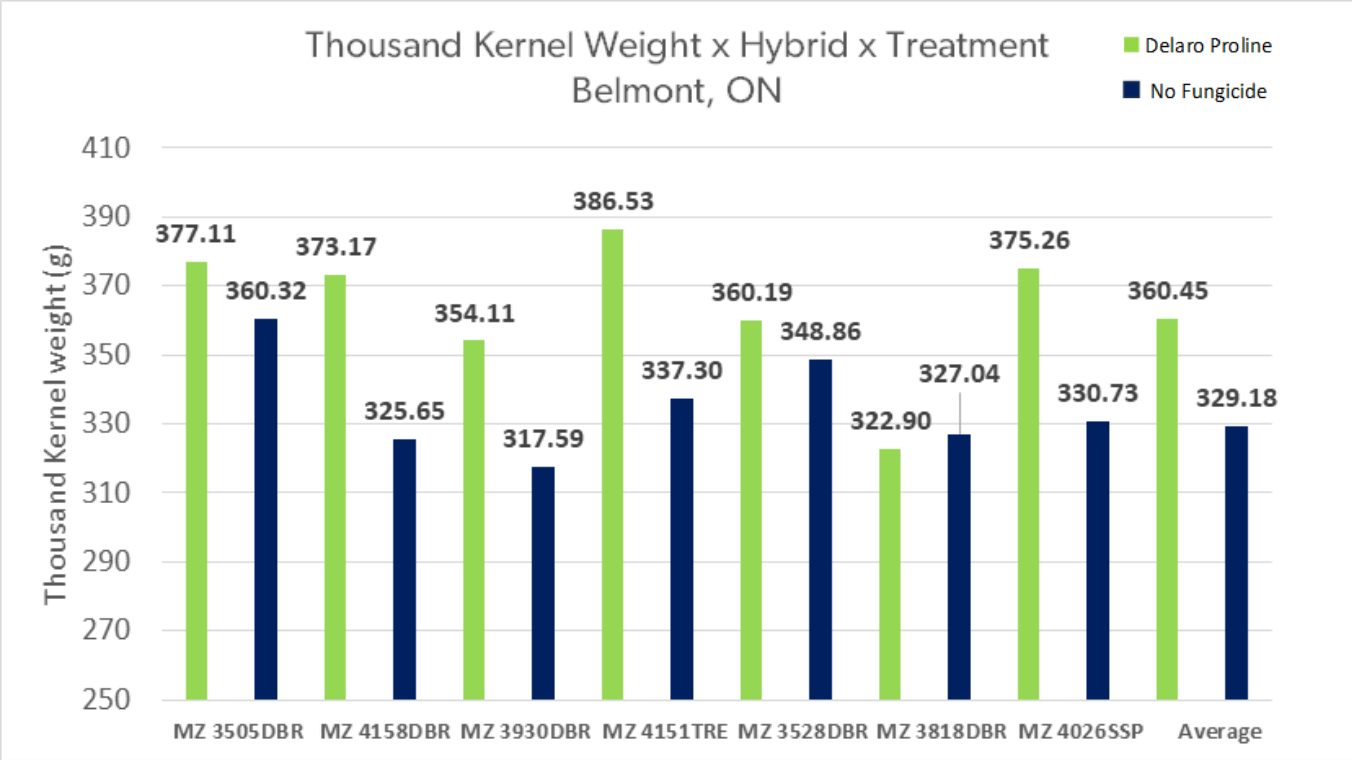
The one outlier with high TKW but a much lower response to fungicide is MZ 3505DBR. This hybrid has very strong stay-green and plant health when fertility conditions are optimized, possibly explaining its lower response of only 4.7%. MZ 3818DBR and MZ 3528DBR, two of the lowest three hybrids for TKW response to fungicide were also two of the three lowest for overall fungicide TKW.

MZ 3818DBR saw no response to fungicide, and MZ 3528DBR only had a 3.2 % increase in TKW with fungicide.

The second lowest response was MZ 3505DBR, mentioned above.

This case may strengthen the argument to classify or characterize hybrids by yield components as the hybrids with high TKW or what Maizex would classify as 'Kernel Weight' hybrids responded very strongly to fungicide applications, supporting the statement that they need the plant health and late season intactness to help pack starch in their large kernels late, to maximize yields.

In contrast, MZ 3818DBR had no response to fungicide in regard to TKW but also held the lowest overall fungicide TKW of all commercial hybrids. MZ 3528DBR seemed to follow this pattern with a lower response to fungicide, which also coincided with it having one of the lower fungicides TKW.



Going forward

In 2024, Maizex plans to follow up and continue to use thousand kernel weight and kernels per ear to better understand our hybrids. We believe that knowing where the yield of a hybrid is built is as important as what the final yield is.

Analysing hybrids' responses to various inputs will also continue to be research conducted by Maizex. Finding out which hybrids respond to which inputs, and when they do so, aids in positioning products on the right acre. We will continue to use our research to fine-tune which hybrids fit where, in our hybrid classification. Despite classification based on yield components, overall plant health and disease ratings will still be important as hybrids with significantly improved plant health or disease tolerance make a case that they can 'buck the trend' of their classification. As seen in the graph above, MZ 3930DBR still needs to be managed with fungicide, despite a lower TKW. MZ 3505DBR showed a weak response, despite having a high TKW, where we would argue a fungicide may be of greater importance because of that hybrid driving yield from kernel weight.

Acknowledgements

This article was written by Henry Prinzen CCA-ON Market Development Agronomist, Maizex

Digging deeper into DON

Background of the disease

Gibberella ear mould, that produces DON (Deoxynivalenol), is caused by the fungus fusarium graminearum. Gibberella ear mould is the most common corn ear mould experienced in Ontario. Just like other diseases, gibberella needs a host, a pathogen and a conducive environment to result in an infection.

Fusarium graminearum overwinters in corn residue every year in Ontario, resulting in inoculum present every season. Corn is a susceptible host, and Southern Ontario, especially near the Great Lakes, often provides the ideal environment for gibberella infection. Cool, wet weather, or optimal pollination weather for corn, is also the optimal environment for gibberella infection. Corn is susceptible to infection through the silk channel from two to 10 days post silk initiation.

Gibberella is also able to infect ears of corn through secondary damage from birds, western bean cutworm and hail, for example. Once infection takes place, weather through grain fill is crucial in the further development of the toxin. Warm, wet, cloudy, and humid conditions from dew or rains can increase the severity of the infection prior to harvest.

Relevance to Ontario farmers

For many corn farmers in Southern Ontario, DON has been an issue in specific pockets for a long time and in some areas can be a concern every year. In 2018, a vast swath of corn throughout the region was devastated by high levels of DON, for example.

In 2023, DON again reared its ugly head, affecting some areas that had previously been untouched, including Huron, Bruce, Dufferin and even Simcoe counties. Since the devastation DON caused in 2018, Maizex has increased DON testing within our research and pre-commercial testing. Following 2018, Maizex tried inoculating hybrids in various ways, including silk channel injection, injection into the side of the ear (to simulate Western Bean Cutworm damage), spritzing with a spray bottle and spritzing and covering with a paper bag to induce an environment that could help us differentiate DON resistance or tolerance in hybrids.

Following three years of this testing, we concluded that many of these inoculated trials did not yield results similar to natural infection. This meant that opportunistic scoring by testing locations with noticeable levels of naturally occurring DON was still the most effective way to measure the disease and DON susceptibility in specific hybrids. Maizex continues to test all pre-commercial products for DON, and we do so at any site that has a noticeable infection rate. This process is used to help us select hybrids for strong agronomics, yield and acceptable DON levels.

2023 studies and trial work

In 2023, three locations were chosen for hybrid-by-hybrid testing and our pre-commercial, commercial and competitive products were planted with four replications each.

These sites included Exeter, Ridgetown and Belmont. At these three sites, two of four replications were sprayed with Delaro Complete + Proline top-up at VT while the other two replications were not sprayed.

We carefully timed applications so that all the silks were out and viable and prior to them browning off. At harvest it was noticeable that the hybrids sprayed with the Delaro + Proline top-up were noticeably more intact and cleaner from both a leaf disease and ear mould standpoint.

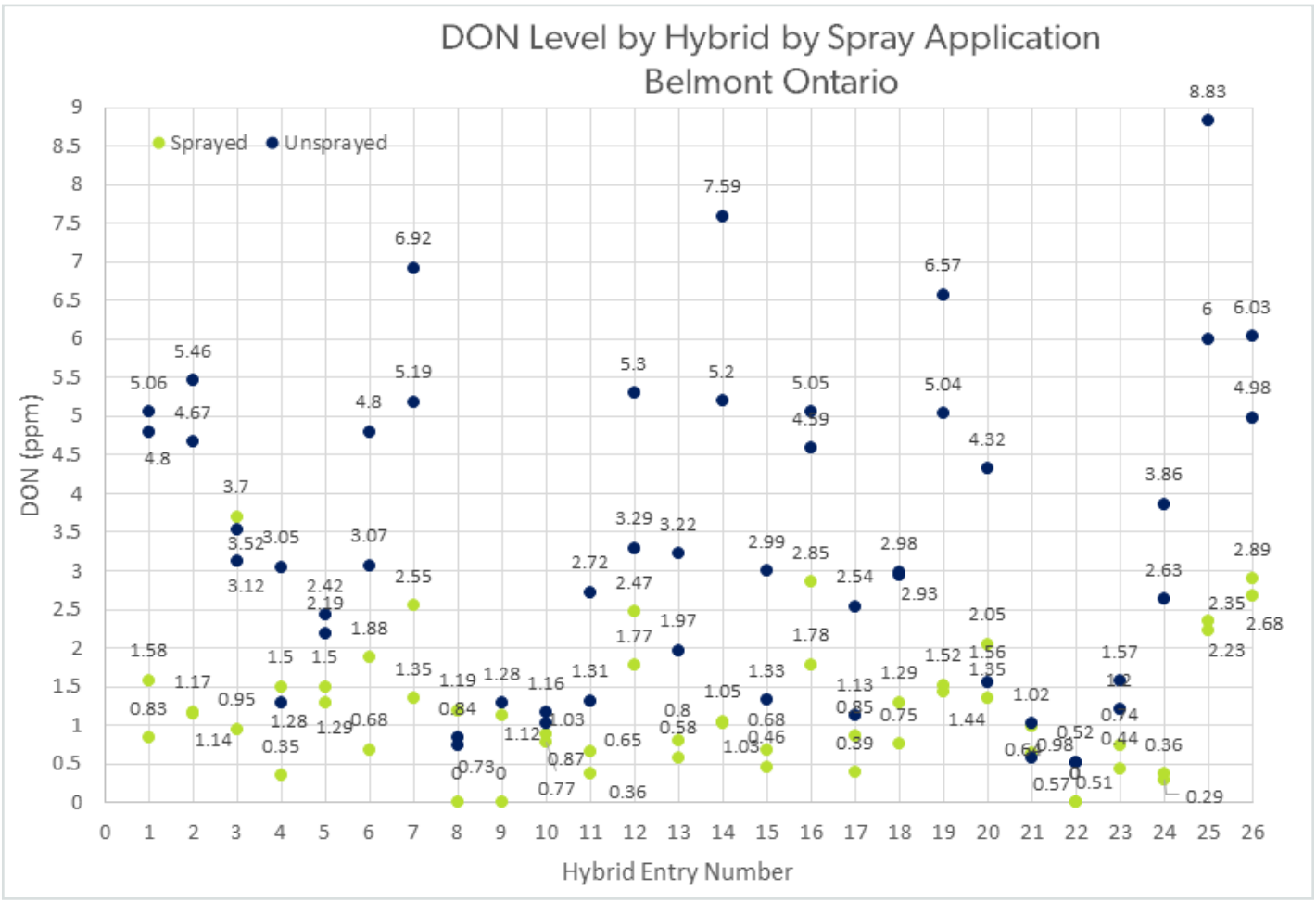
Results

Within our locations, the Exeter site was discarded as the location was too variable to collect solid DON data, while Ridgetown and Belmont both had good and measurable results. At Ridgetown we noticed a reduction of about 25% in DON levels from the untreated. We noticed that some hybrids experienced large reductions of over 50% in DON levels while others were flat or slightly increased over the untreated, which is to be expected with in field trial work. Our Belmont location yielded beyond exceptional results with 25 of 26 hybrids experiencing reductions in DON.

The one hybrid that did not have a reduction was statistically equal at 1.62 ppm vs 1.59 ppm. On average, the sprayed entries averaged 1.19 ppm and unsprayed entries averaged 3.31 ppm, a reduction of over 73% in DON levels.

Within the fungicide-sprayed entries, only one of 52 samples exceeded 3 ppm; four entries were BDL (below detectable level) and 11 of the lowest testing entries were sprayed. In the unsprayed entries, 26 of 52 (50%) of samples exceeded 3.0 ppm DON.

Forty-three of the 60 lowest testing entries came from the sprayed entries; nine of 52 entries exceeded 2.0 ppm on the sprayed entries and only 17.3% of sprayed entries resulted in tests over 2.0 ppm in contrast to 67% of unsprayed entries tested over 2.0 ppm.



Moving forward

DON continues to be a fickle beast. Through discussion with various industry people, we continue to struggle to understand why hybrids respond to ear mould infections the way they do. Hybrid selection is only a part of an integrated approach to reducing DON. Various testing and in-field findings led us to believe that selecting hybrids for open husks and light husk cover is not a definitive approach to reducing DON infection.

However, experience with these open husk and light husk cover hybrids has shown they are still susceptible to infection, but often this phenotype can reduce how severe the infection becomes. We believe this is because the loose husk cover can mitigate how optimal the environment is around the ear for infection and DON growth. Tight, long husks often lead to higher humidity around the ear, causing a worse infection than one in a hybrid with the light open husk phenotype.

Base genetics still seem key in resistance to DON. Hybrids like MS 0330R for instance, have long, tight green husks, but continually test low for DON. This is likely a result of some inherent genetic resistance within the hybrid, further suggesting that phenotypic characteristics seem only to affect level of disease and not actually prevent infection or accumulation of DON in a hybrid.

Many farmers found DON to be variable within fields and farms this season, which I attribute to multiple factors. Dry conditions at planting caused headlands and sidehills or low ground to germinate at different speeds, resulting in wide flowering windows, allowing infection to occur at different levels within a field. As well, many fields had 'micro-climates' -- areas where water sat or where air didn't move much, perhaps around tree lines, bush lots or even depressions within the field.

Going forward, DON management needs to take a holistic approach. Hybrid selection, uniform emergence (planter performance and seed bed preparation as runts drastically increase DON levels), properly timed fungicide application, and timely harvest will all be keys to managing DON.

Our work in 2023 suggested that to really reduce DON with fungicides, timing is crucial; going too early (silks less than one inch long) or too late (long silks that are not quite brown yet) seems to dramatically reduce efficacy. Proper timing on white silks 2-3" long seems to be key to maximizing the reduction in DON.

In 2024, Maizex plans to continue testing all pre-commercial hybrids for DON to aid in hybrid advancement. These advancements will focus on hybrids like MZ 4799SMX, MZ 4608SMX, and MZ 4049SMX, which deliver market-leading yield coupled with consistently low DON scores.

Acknowledgements

This article was written by Henry Prinzen CCA-ON Market Development Agronomist, Maizex

Surveying some smoking yields in 2023

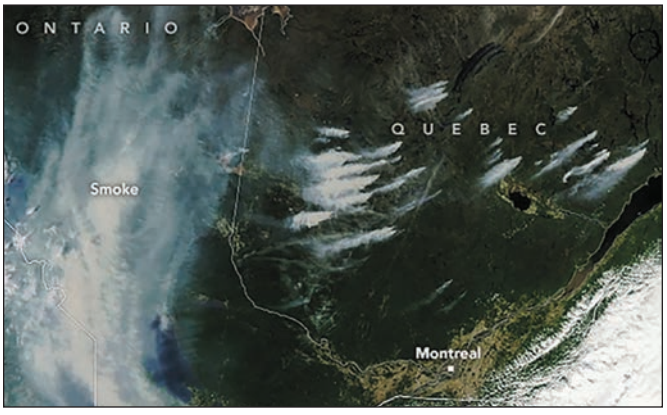
Exploring the potential impacts of smoke in 2023

In 2023 there was much discussion on the impact wildfires would have on the crop. In June 2023, many parts of Ontario were under air quality warnings issued by Environment and Climate Change Canada. Warnings reached the maximum air quality health index of 10 multiple times.

The smoke not only affected our health and day-to-day activities, but also had an impact on the corn and soybean crops. Many suggest that crops are only harmed by wildfire smoke, but there is some evidence of positive effects on corn and soybean crops and much of the impact is dependent on the timing and duration of the smoke.

Smoke reduced heat and the intensity of radiation during some key periods of water stress during the growing season. This may have reduced the impact of these short drought conditions on Ontario's crop.

Increased CO_2 levels may also have been a benefit of the smoke. Increased CO_2 levels would have increased photosynthetic capacity within the 2023 crop, stimulating growth. Dan Quinn at the University of Purdue in Illinois suggested the crop could benefit from the scattering of sunlight which is then able to penetrate the canopy of the



Smoke from wildfires in Quebec; June 3, 2023. Image: NASA Earth Observatory

crop deeper. Potential wildfire concerns included ozone burn on the leaves of both corn and soybeans. In 2023 we witnessed more ozone damage on soybeans than in many previous years.

Ozone enters through the plant's stomata and can cause tissue burning during respiration.

Quinn also suggested that higher levels of ozone can induce carbohydrate mobilization in the stalks of the corn crop, potentially impacting standability and late season plant health.

One key benefit of the smoke was likely the reduction in high leaf temperatures, reducing transpiration and stress on the crop during periods of drought stress.

In 2023, Toronto, ON only recorded two days over 30°C during the months of June, July, and August, followed by three days in the month of September, suggesting the crop was not impacted by heat stress. 2023 was a season where the crop was able to develop at a slower pace than normal.

Studies on reducing solar radiation

Yang et al. (2019) found that the greater the reduction in solar radiation, the greater the yield loss, and in this study they found the impact on yield more than doubled when shading was increased from 30% to 50%.

Per cent corn yield reduction associated with three different levels of shading (15%, 30%, and 50%) for two hybrids at three different plant densities (Yang et al., 2019).

Density (plants/acre)	Hybrid 1			Hybrid 2		
	15%	30%	50%	15%	30%	50%
	——— yield reduction (%) ———					
30,400	NS*	NS	35	13	19	50
42,500	NS	19	42	15	25	55
48,500	NS	24	51	14	29	64

The timing of the reduction in solar radiation is most important during flowering and early R stages. During the reproductive stages of the corn crop, reduction in solar radiation has a much greater impact on yield than during the vegetative growth stages *(Liu and Tollenaar, 2009; Reed et al., 1988).*

Effect of shade treatment timing on corn yield (Liu and Tollenaar, 2009.)

Shade Period[1]	Yield Reduction (%)
4 weeks pre-silking[a]	3.2% NS
3 weeks at silking[b]	12.6% **
3 weeks post-silking[c]	21.4% **

*[1]Weeks relative to silking: [a] -5 to -1, [b] -1 to +2, [c] +2 to +5. Shading treatments reduced solar radiation by 55% NS=not significant, **= highly significant, (a=0.05)*

Analysis of 2023 corn crop

The year 2023 was not without other challenges. As we cruised into late July, the corn crop flowered during a cooler weather pattern which extended silking windows. This allowed for incredible pollination conditions, but also slowed the crop's development.

The Farms.com and Maizex Great Ontario Yield Tour noted in late August that there was potential for record corn and soybean crops. Our extended pollination window led to higher kernel counts than ever before. Data collected from the yield tour saw similar populations in the corn crop to 2021's record yield, but increased kernel counts.

Rows round were at an average of 17.1 in 2023 compared to 16.9 in 2021, and kernels per row were up from 34.1 in 2021 to 34.8 kernels per row in 2023. This resulted in approximately 18.8 kernels per ear more than 2021.

This translates to about 4-7 bu/ac depending on kernel weight. Development of the crop throughout the fall was one to two weeks behind that of previous years. However, a significant heat wave in September and the first week of October led to much of the corn crop maturing normally. Much of Ontario received its first frost of the year during the week of October 23, over a week later than the average frost date. Annual data collected from over 500 Maizex strip plots in our internal data base also indicates this year has a potential for record crops of corn and soybeans. It was also evident that plots harvested in 2023 saw increased moisture levels to that of 2021, suggesting a lack of heat to move the crop to maturity as quickly as in previous years.

Below is a chart showing the average yield, moisture, and test weight of Maizex hybrids in Ontario plots:

Year	Yield (Av. yield Bu/ac)	Moisture (Average %)	Test Weight (Average Lbs./bu)
2020 (N = 618)	199.2	23.4	54.9
2021 (N = 730)	228.3	22.9	52.7
2022 (N =592)	212.1	22.9	54.9
2023 (N = 305)	228.8	26.1	54.0

When analyzing the data from all the corn plots entered in the Maizex database, two things are evident: yields are record or near record highs for corn (0.5 bu/ac), greater than that of 2021, and moisture is also elevated over the past four years and specifically the last two seasons.

The average moisture of Maizex plots was 26.1% up from 22.9% in both 2022 and 2021, an increase of 3.2% in moisture. Thomison (2017) suggested that it takes an average of 30 GDDs to lower each point of grain moisture down from 30% - 25% and 45 GDDs from 25% - 20% moisture. Three points in moisture then suggests a shortage of anywhere between 96 and 144 GDDs.

GDDs Accumulated from May 15 – November 15 for 4 years at 3 locations across Ontario:

Year	Hamilton	Ridgetown	Kemptville
2020	3091.80	3160.05	2942.35
2021	3077.40	3190.85	2971.40
2022	3037.65	3177.35	2902.30
2023	2938.95	3029.20	2902.15
Difference 2021/22	118.60	154.90	34.70

As seen in the chart above, Eastern Ontario was much closer to normal in 2023, which was noted during the yield tour. The 34.7 GDDs less than that of 2021/2022 would only attribute to a one per cent increase in moisture across the corn crop, while in comparison, Southern Ontario was lacking heat quite significantly.

In Ridgetown and Hamilton respectively, 2023 saw 154.9 and 118.6 fewer GDDs accumulated than in 2021/2022, which falls in line or exceeds the expected 3.2% increase in corn crop moisture seen in the above data set of Maizex strip plots.

Analysis of the soybean crop

The year 2023 saw high soybean yields in many areas. However, there were a few 'hiccups' along the way. Essex, Lambton, Haldimand, Niagara and Hamilton-Wentworth battled with re-plants and drought-like conditions in May and early June, impacting the soybean crop's ability to germinate or get out of the ground.

This was then followed up by a summer full of heavy rains in Middlesex, Elgin and Lambton, leading to less than desirable soybean yields. However, there was still a vast number of acres that had record yields. Eastern Ontario had either exceptional or extremely disappointing yields as white mould wreaked havoc in some areas. This was also seen at a level in the southwest that hasn't been seen for many years. Lack of sunshine heat and a lot of wet days increased the impact of white mould.

Harvest occurred later than normal in some areas, but the heat wave in late September and early October helped the crop to a timely harvest. The 2023 yield tour found the soybean crop averaged 38 pods per plant and a population of 138,758 plants per acre compared to the same number of pods per plant in 2021 but with 141,070 plants per acre, or 2,312 more. Despite this raw data, the distribution of yields and anticipated seed weight, an average yield of 53.5 bu/ac was predicted, a record by 0.5 bushels over the 2021 yield of 53 bu/ac. At Maizex, we were able to pull all the data from our strip plots, which are large field scale plots, although the number of soybean plots is always lower than corn due to the challenges of planting soybean plots.

With about 150 data points each year, 2023 shows about a one bushel increase in average yield over 2021 plots, further boosting the case for a record soybean crop in Ontario.

Year	Yield (bu/ac)	Number of Plots
2020	58.32	135
2021	58.17	219
2022	55.77	149
2023	59.25	166

Conclusion

We will still have to wait and see what the final yield numbers reported to Agricorp are in Ontario, but it looks like we may have produced another record-shattering yield. Ontario will for a second time have an opportunity to outyield some of the 'I' states in average corn yields.

The jury is still out as to whether record breaking wildfire smoke had either a negative or positive impact on Ontario corn and soybean yields in 2023. Smoke came early enough in the season that it had little effect on the reproductive stages of both corn and soybeans, likely limiting its impact.

Cooler weather and increased rainfall during July and August seem to have had a larger impact. Cool weather slowed grain fill in both crops, extending the pollination window in corn and increasing kernel counts. Soybeans felt the impact of the wet weather and cooler temperatures as seen in white mould levels.

We also saw a slightly delayed harvest for soybeans. Corn on the other hand was two to three points wetter than expected in most of Ontario. Many attributed that to the smoke, but when looking at GDU accumulation, it seems safe to say a lack of heat was the real culprit.

Acknowledgements

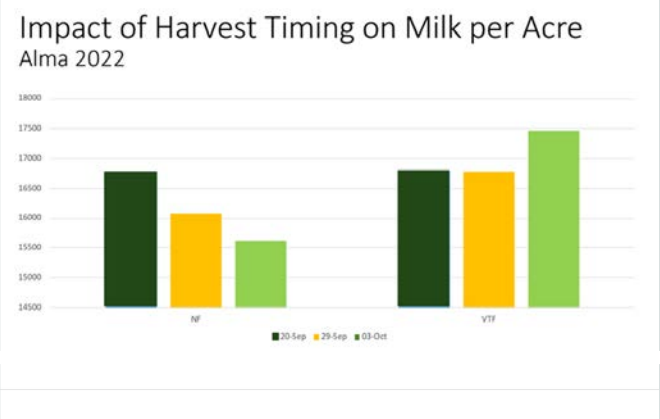
This article was written by Henry Prinzen CCA-ON Market Development Agronomist, Maizex

Intensive silage management results

2022 Alma silage harvest

Corn silage is an important feed source for dairy and beef producers, and an important area of research for Maizex Seeds. In 2022, we wanted to evaluate the impact of delaying harvest on yield and quality.

Three hybrids were compared over three harvest timings within a 20-day period. These hybrids were treated with and without Delaro Pro with the goal of seeing if a fungicide could improve yield and quality and allow for a longer grain fill window.

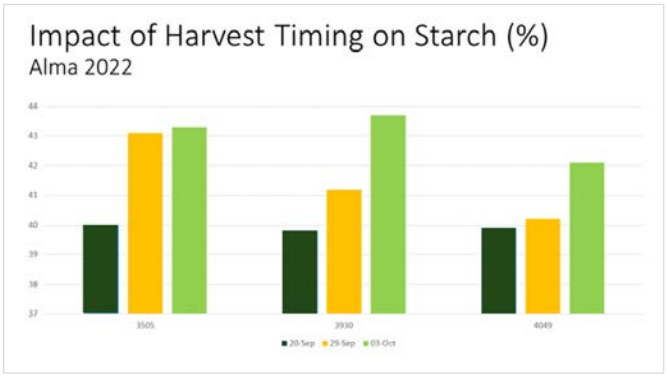


Graph shows NF- No Fungicide treatment compared to VTF - VT Fungicide and delayed harvest effects.

Milk yield per acre results

Milk per acre yield increased for all three hybrids as they matured and were harvested later. Starch levels would have increased over this period, contributing to a higher milk per ton. More dry matter accumulation in the plants would have increased tonnage as well.

When multiplied together, increased starch and increased dry matter resulted in a higher milk per acre yield. The VT fungicide appeared more beneficial when delaying harvest until later in the season. This would be attributed to better plant health and stay-green extending plant productivity. Fungicide use improved yield, helped maintain quality and offered a wider harvest window. A fungicide application has a unique fit for producers needing a wider harvest window or dealing with untimely custom harvesters. The above graph shows the impact of starch levels as harvest was delayed over 20 days.



Starch level results

As expected, starch levels increased over the 20 days. This was a result of a longer grain fill period. Starch levels are a direct measure of grain fill progress. Later maturing hybrids in the trial needed the delayed harvest timing to optimise their maturity as they have a later grain fill period than earlier hybrids.

Producers need to be aware of the hybrids they are growing and manage their harvest timing accordingly. This optimizes starch production and yield in their silage.

As the silage crop matures, plants continue to increase starch, but the optimum harvest moistures for storage may decline beyond desired levels. More mature silage risks decreasing your fibre quality and overall feed value.

Overall, our 2022 data shows real advantages to managing your crop and harvest timing. Attention to detail can improve the yield and quality of your silage crop significantly, helping the bottom line of your operation.

Elora 2023 intensive silage trial

In 2023, we wanted to push our hybrids to see how they would perform when put under intensive and ultra-intensive management. In Elora, ON, three hybrids were tested with three levels of management. The goal was to see if we could move the needle further by pushing these hybrids with additional inputs.

Standard: 30,000 final stand, 150lbs N, no fungicide

Intensive: 32,000 final stand, 200lbs N, Delaro pro + Proline @ VT

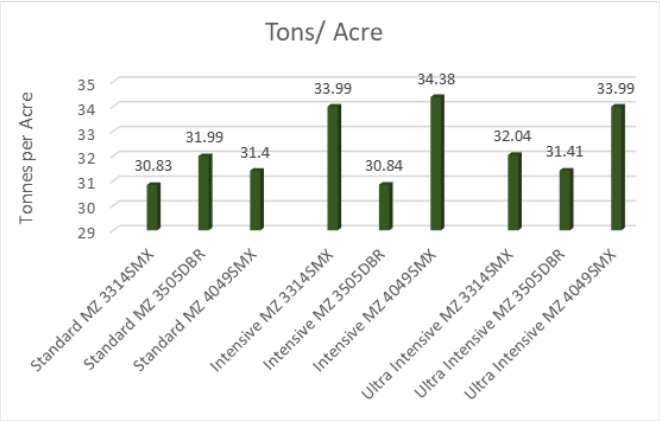
Ultra-intensive: 35,000 final stand, 200lbs N, Megafol+ K20S @ V8, Delaro pro+ Proline top-up @ VT and Veltyma sprayed 14 days after VT

Seasonal review

The growing season at Elora in 2023 was almost ideal. Planting conditions were fair, however, resulting in lower than expected final plant populations.

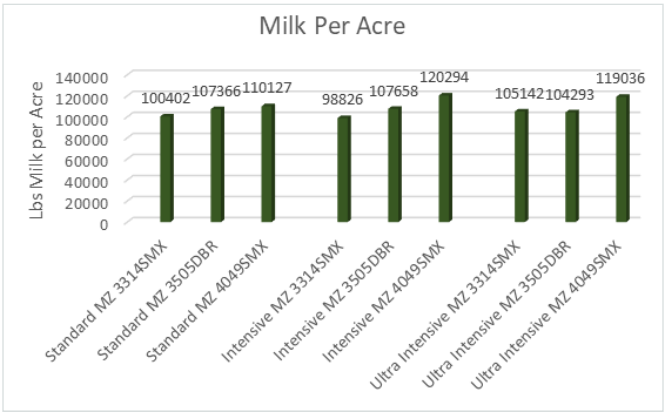
Stands were thinned to uniform populations for each treatment. This resulted in slightly lower populations for each treatment than planned. There was ample rainfall throughout the summer season, which optimised growing conditions.

In August and September, there was a stretch of cool, cloudy weather where the crop stalled out; this delayed grain fill and maturity. There were little to no leaf diseases present on the standard treatment at the time of harvest, which was completed for all treatments on Sept. 29, 2023.



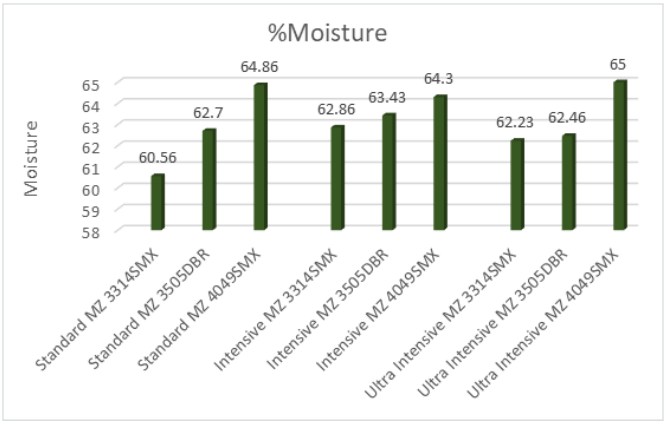
Tonnage improved over the standard when we increased the population and nitrogen rates. Ideally, populations would have been slightly higher to see a better response curve. However, we did not maximize tonnage with the highest population.

Overall tonnage was improved with the intensive treatment by 1.67 tons over the standard. Disappointingly, we got less of a response with the ultra-intensive treatment at just over one ton of additional yield. MZ 4049SMX seemed to respond the greatest given extra inputs.



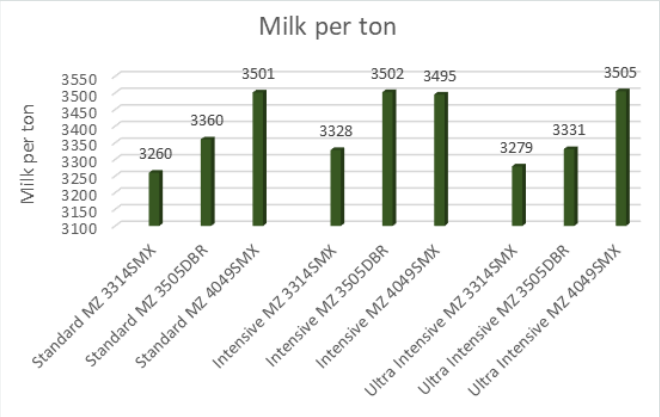
Milk per acre is a useful index to measure by: it takes into consideration the feed value used in milk/ton and is multiplied by the tons/acre of each hybrid. This index helps determine the net 'milk yield' of each hybrid over one acre. The intensive treatment increased the milk/acre by 3,000 lbs over the standard.

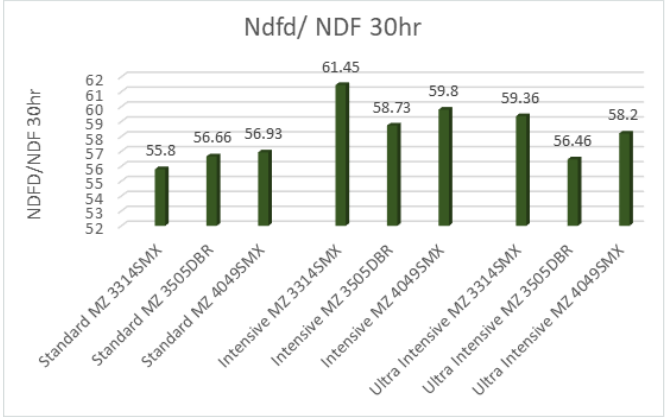
The ultra-intensive was slightly higher at 3,500 lbs milk/acre over the standard. In general, the use of a fungicide helped to improve feed quality and higher populations helped strengthen tonnage. We expected higher yields with intensive management given the added costs, but the results were not overwhelming.



Moisture increased 0.7% with intensive and 0.5% with the ultra-intensive treatments. With the use of additional nitrogen and fungicide use, this is expected.

We expected to see a higher increase in moisture with the ultra-intensive given the 2x fungicide. With little disease pressure, there was no benefit to the 2X fungicide approach.

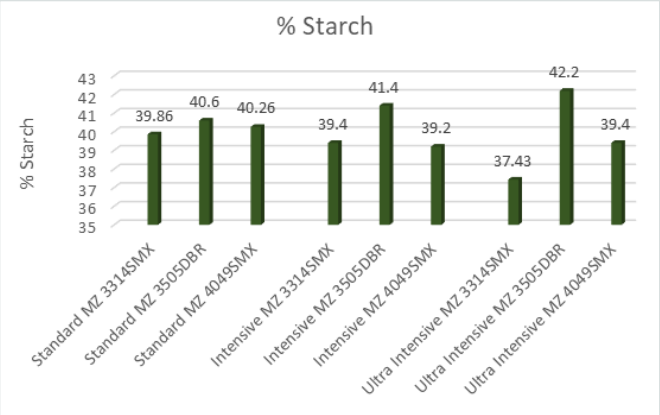




It does not appear that the intensive and ultra-intensive treatments had a significant influence on milk per ton at this trial. Each sample was tested at Honeyland Labs using the Cumberland Valley NIR lab test.

On inspection of the crop at harvest, there were little to no foliar diseases or nitrogen deficiency symptoms on the standard treatments, suggesting extra inputs were of little use.

The averages of the treatments were 3,373 lbs, 3,441 lbs and 3,371 lbs respectively. With the low disease pressure at Elora in 2023, we did not move the needle with the fungicide. If the growing season is favouring leaf disease, a fungicide would still be recommended at VT.



Starch is a direct measure of the amount of grain in the silage sample. These hybrids were harvested around 1/2 to 2/3 milk line as a guideline for harvest timing. The starch levels did not change much across the treatments with 40.2%, 39.9% and 39.7% respectively.

However, we only had one harvest date in this trial. If we had delayed or done a second harvest on the intensive or ultra-intensive treatments, we would expect a higher starch yield. The intensive treatments should lengthen the grain fill period while keeping the plants alive and green. Future work in 2024 will aim to refine this management.

When reviewing some of the fibre quality results of the tests, we did see some noticeable improvement in our treatments. Average NDFD/NDF 30hr increased over the standard with some significance.

Average NDFD/NDF 30hr were 56.45, 59.99 and 58. When discussing fiber quality in the past, we have seen responses to fungicides as they improve stay-green and prevent the plants from dying, which improves fibre quality. Populations of the silage crop can also influence fibre quality.

With higher populations you tend to see narrower stalks. These narrow stalks tend to have higher rind (the hard outer layer) to pith (the soft inner core) ratio. This can lead to higher levels of lignin in the silage and reduce fibre digestibility.

Fibre digestibility is very important for silage quality; as it influences how much can be utilized in the rumen, and also the feed intake of animals. The more feed a cow can consume in a day, the more productive they will be.

Review and next steps

We continue to recommend the use of fungicides in silage corn production as it widens your harvest window, improves feed quality and can help increase tonnage. Making sure you have adequate nitrogen will allow your crop to be optimized. Making sure you are targeting ideal populations for your hybrid, soil type and fertility will allow your crop to reach its potential. Higher populations do not always mean more tonnage, starch or milk per acre however.

Acknowledgements

This article was written by Adam Parker CCA-ON Market Development Agronomist, Maizex

Biological stimulants: A new approach to increasing yields

Background

Historically there have been some key drivers to yield gain in field crops. Genetic improvements can claim the majority of those gains; nitrogen, phosphorus and potassium fertilizers have played a major role, and synthetic chemistry used to control weeds, insects and diseases have also allowed crops to flourish.

Recently, a new class of products, broadly referred to as biologicals, has emerged to provide a new approach to increasing yields.

One of the key segments in this world of biologicals is often referred to as biostimulants. Biostimulants can be derived from a wide range of products, such as proteins, humic acids, polysaccharides, plant growth regulators, bacterial/fungal agents, compost components, extracts from other plants, etc.

One of the more intriguing ideas within biostimulants is the concept of extracting components from other plants, that when applied to field crops, can reduce temperature stress, regulate cell water against drought or flooding and/or generally stimulate better plant function.

Consider a seaweed species that survives in very harsh environments; repeatedly under water or out of the water as tides change, and under a range of temperatures back and forth over a year.

What compounds do these plants possess that allow them to thrive, and if those compounds were isolated, extracted and applied to a corn plant, can they transfer some of these same stress relieving, biostimulating effects?

Although there is still lots to learn, there are many companies and lots of investment aimed at the development of biostimulants.

2023 Results

In 2023, Maizex teamed up with Syngenta Biologicals to test a biological stimulant called Megafol. Megafol's composition is dominated by plant extracts, but has additional fertility and biological components.

It is promoted by Syngenta as a vegetative biostimulant to be applied in the early stages of growth, generally before the crop is flowering. In Maizex trials, the following hybrids and treatments were included this past season.

Hybrids: MZ3930 DBR, MZ 4049SMX, MZ 4158DBR, MZ 4608SMX

Treatments: 1) Control (no Megafol),
2) Megafol applied at V4 and V8,
3) Megafol applied at V8 and V12 &
4) Megafol applied at V12 and VT.

All other practices within the trials were consistent across all plots. The foliar application rate of Megafol at all timings was 0.5 litre/acre applied in 50 litres of water per acre. Sites included testing at Jarvis, ON and Simcoe, ON.

Figure 1 displays the yield results from both sites. The treatment that included applications at both V4 and V8 produced significantly improved corn yields over the control, as well as the other two sets of application timings.

Individual hybrids did not tend to respond differently in these trials, so yield data is averaged across the three hybrids.

If we assume that the biostimulant costs approximately $16 per litre, and at least one of the applications would have been a separate trip over the field (i.e., not able to combine it with any other herbicide or fungicide application), then the total cost of any one treatment would be

approximately $28 ($8 + $8 + $12). The early set of applications provided the only increase to corn yields at these sites.

The question that remains with these results is whether the yield improvement came because of the early timing per se, or because that coincided with the lowest rainfall and highest stress period in the 2023 crop.

This will be examined in future years with stress periods surely coming at different times. Trends in other biostimulant research tend to support the idea that to see significant yield gains, the product most likely needs to be applied more than once, as was done in these trials.

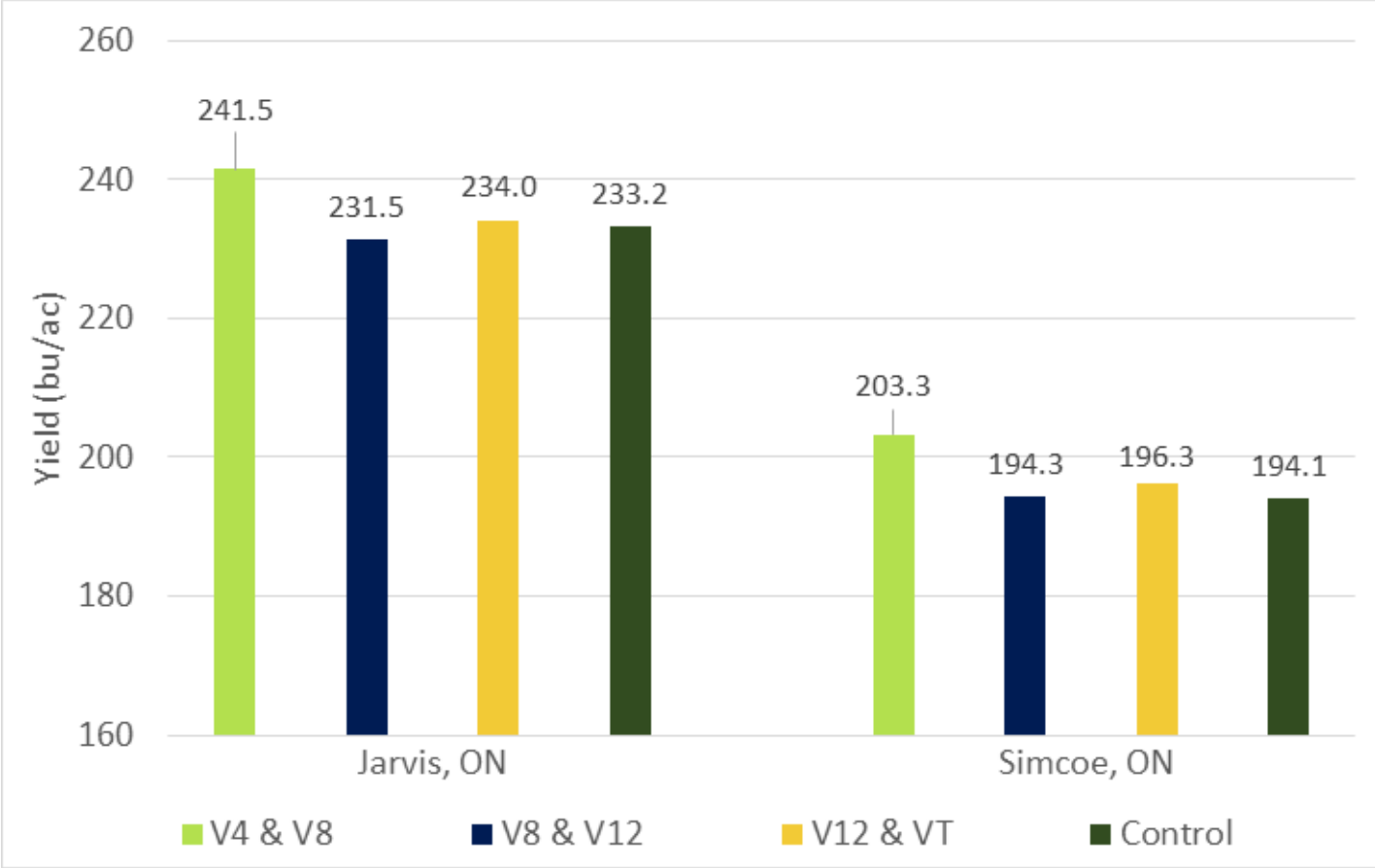


Figure 1. The impact of foliar biostimulant (Megafol™) application timings on corn grain yields in 2023. All yields are averaged across three hybrids. Megafol was applied at 0.5 litre/acre at each application.

Moving forward

In future trials, Maizex will continue to investigate any potential advantages to various biological biostimulants and application timing.

We are particularly interested in whether a hybrid that sets up yield early (kernel number hybrid) might respond to biostimulant timing differently than a hybrid that sets up yield later (kernel mass hybrid). This did not appear to be the case in 2023, but warrants further investigations.

Acknowledgements
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