Celebrating One Hundred Years

PIONEER®
HUNDRED YEARS

2025

Northern Plains Area – SD, ND, Western MN, MT, WY

AGRONOMY SUMMARY

CORTEVA™
agriscience

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LOCAL PIONEER TEAM

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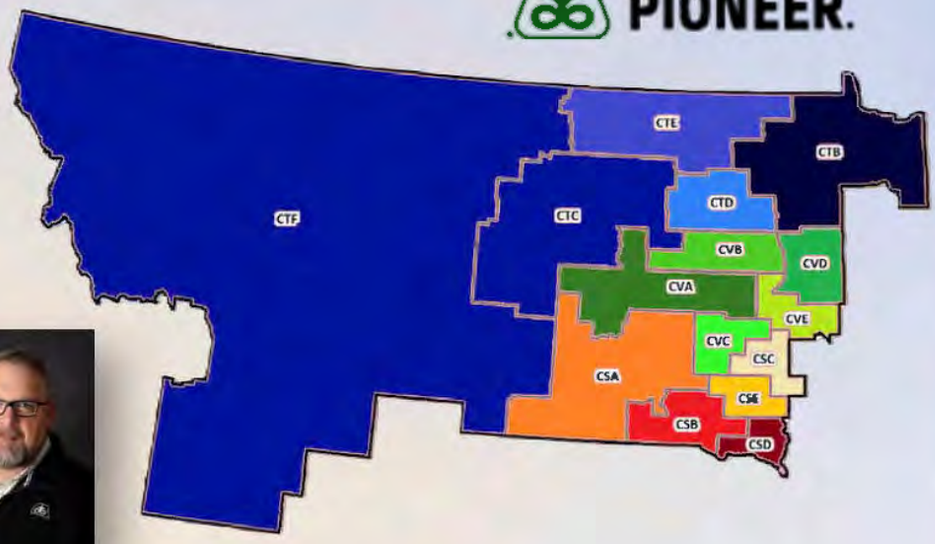

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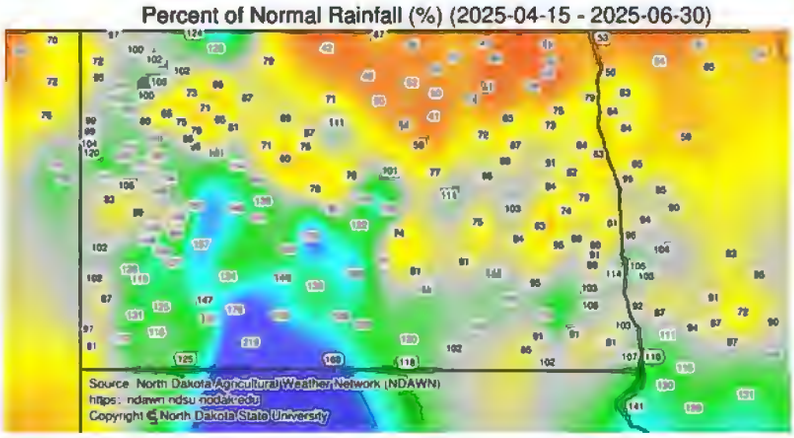
A YEAR IN REVIEW
NW Minnesota / North Dakota / Montana

Planting / Early Season Summary

Growers had an early start to the year with small grains and corn being planted from April to early May. It was an open winter again with many areas being dry. Initial concerns were drought-like conditions, especially in NE ND and NW MN. We saw abnormally warm temperatures, especially in early May with temperatures reaching 90+ degrees Fahrenheit. However, a cold, wet snap from May 15th through 25th saw temperatures down in the 30's and 2+ inches of rain for many. Planting season was delayed during that cold snap, but once the weather turned, planting progress happened quickly.



Sporadic Severe Weather throughout the Season

Temperature swings from 90 degrees down to 35 degrees in 2-3 days, along with wind, tornados, hail, and excess rain events throughout the season made 2025 the season for extremes. Eastern ND and areas in Western MN saw most of the major wind and tornado events in June, July, and August. The cold, wet snap in mid-May caused many crops to struggle with emergence. Chilling injury in the corn led to Fusarium and damping off, which reduced plant stands. Soybeans also saw a reduction in plant stands throughout the year, some due to soil conditions and others to wind and hail events. The wind and hail events caused defoliation and reduction in stands hurting weed control and, in some cases, leading to late replant situations. Low humidity, drought-like conditions in pockets along with excess moisture degrading lay-bys in other areas contributed to the weed control issues. Very little rainfall was timely. It was either too much or too little depending upon the time of year and geography. Canadian wildfire smoke caused a reduction in solar radiation leading to delayed maturity in soybeans and corn. An early September frost event took off the top-end yield in the row crops and was sporadic across the geography. Above normal warm temperatures through the end of September helped finish the corn crop and we were lucky to not see a widespread killing frost until mid-October. At the end of the year, the corn crop was able to handle the extremes much better than the soybean crop. Soybean yields varied with a lot of inconsistencies, even within short distances.

P90630AM vs P90630Q

Corn Challenges

- Corn rootworm is sneaking in and moving north into Eastern North Dakota and West central MN.
- Basal snap in corn was prevalent where early wind events occurred, and Goss's Wilt made an appearance in late August.
- Later season Fusarium is showing up in corn, mostly related to earlier storm events, but delayed harvest and slow drying corn in areas is a cause for concern.
- Reduced solar radiation and the cold snap in May, caused delayed maturity in corn. GDU's were not matching up with the maturity of the corn in the field.
- Lucky to have a late wide-spread killing frost in mid-October because most corn didn't reach black layer until late September.

A YEAR IN REVIEW
NW Minnesota / North Dakota / Montana

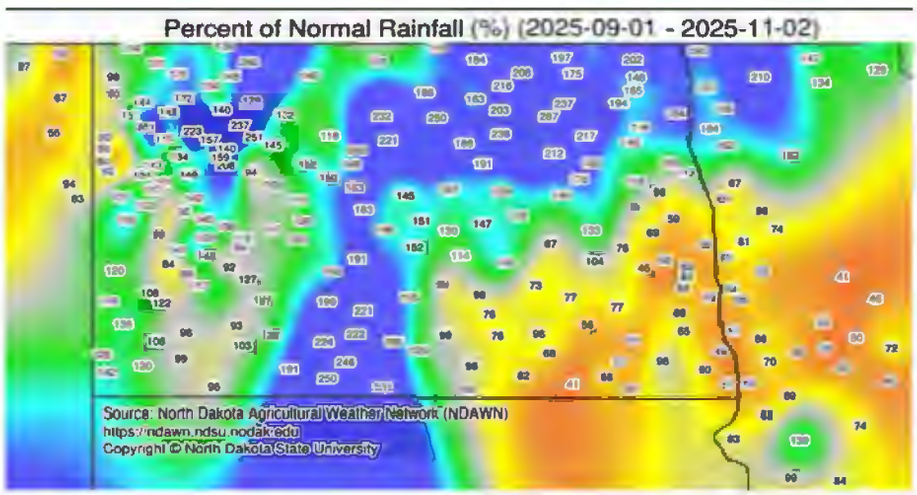
Soybean Challenges

- Weather was the biggest challenge in 2025. From emergence issues to defoliation and reductions in plant stands, they all relate back to certain weather events.
- Insects were not a big issue this year, with a few pockets of soybean aphids making their presence known.
- White mold was the biggest challenge in 2025 that we could mitigate. Damage and defoliation from weather events left plants susceptible to diseases. In northern North Dakota many did not spray because by the time the rain came, most soybeans were past the R2 stage. Some fields should have been sprayed twice, and lessons were learned.

Canola/Sunflower Challenges

- Canola Pests/Diseases – Flea beetle issues were lower than previous years. Some areas had poor emergence due to unfavorable weather conditions in mid-May. Diamondback Moth populations were up according to the trap counts, but we did not find any in-field issues where applications were warranted for control. Verticillium and blackleg incidence were up creating stalk issues for straight cutting canola in NE ND. Weather delays also contributed to stalk quality.
- Sunflower Pests/Diseases – Red Seed Weevil and banded sunflower moth were present within the geography in pockets. In the Northeast/North Central North Dakota and NW MN, white mold became a big issue later in the season with heads dropping and stalks falling over due to excess moisture and harvest delays. In Eastern ND and NW MN, excess moisture and wind caused standability/lodging issues in the sunflowers.
- Yields were above average to average overall in canola. Later in the season, Verticillium and white mold contributed to lower yields in some traditional areas.
- Yields in sunflowers varied across the geography due to weather conditions.

Season Ends with many areas sitting above normal in rainfall for the fall…

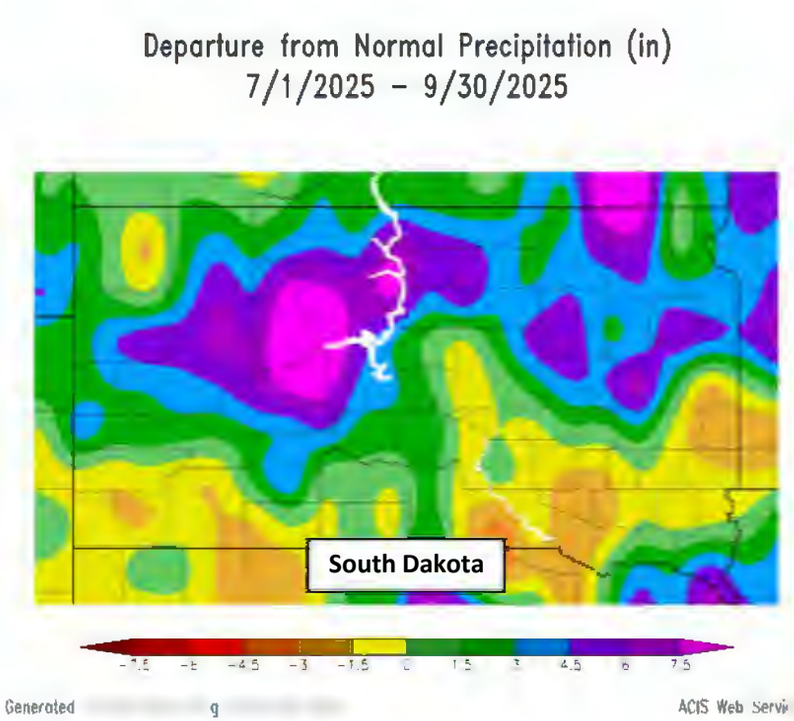


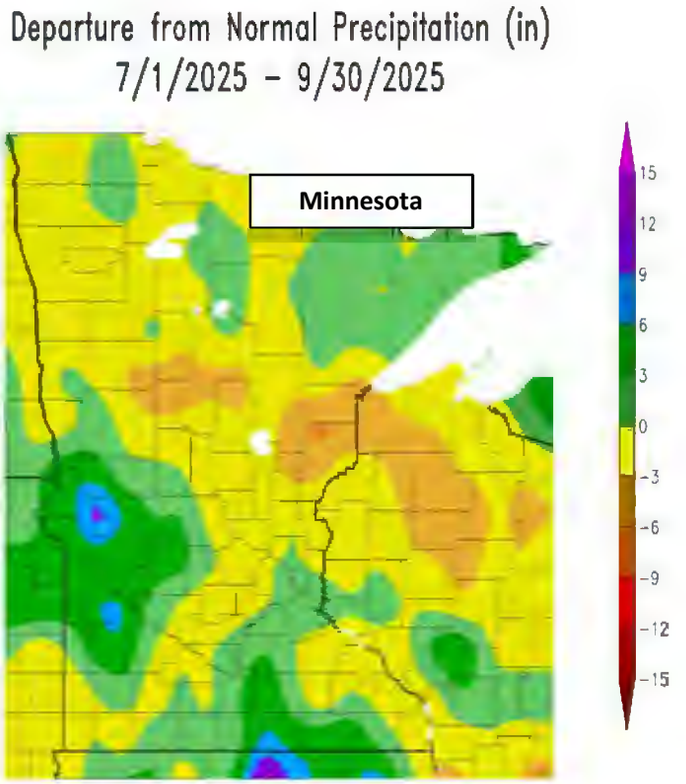
Author: Kristie Sundeen, Field Agronomist

A YEAR IN REVIEW
West Central Minnesota / Northeast SD / Southeast ND

Planting & Early Season

The 2025 planting season got off to a hot start. After a challenging saturated planting season in 2024, most operations took full advantage of the dry and mellow soil conditions in 2025. This spring may have been the fastest we've seen a crop put in the eastern Dakotas/western Minnesota. Once the crop was in the ground, the growing season brought cooler-than-average temperatures, frequent heavy rains, and a series of other challenges. Most counties in the tri-state area (ND, SD, and MN) landed in the top 10 coolest, as well as the top 10 wettest summers in the 131-year history provided by NOAA. Many counties recorded their wettest growing season ever, in combination with being 3+ degrees cooler than average throughout the summer months.





Mid-Late Season

Environmental Factors:

With saturated soil conditions and record rainfall events occurring seemingly every week, it brought some unique observations in July and August. Canada's second worst wildfire season on record resulted in Minnesota issuing air quality alerts on 33 individual days from June-August. Couple the excessive rainfall with the smoke haze, and expectations were incredibly uncertain going into reproductive timing in both corn and soybeans. Both weather factors contributed to an abnormally long pollination window in corn, resulting in some sporadic pollination timing, and in some cases aborted kernels/severe tip back. Soybean cyst nematode counts in Minnesota did not rise much according to fall sampling data, which marks the second straight year nematode counts have been kept in check due to saturated soils. While SCN counts were acceptable overall, the environmental stresses mentioned above opened the door to multiple diseases this year.

A YEAR IN REVIEW
West Central Minnesota / Northeast SD / Southeast ND

Mid-Late Season (continued)

Disease Prevalence:

Sudden Death Syndrome (SDS) of soybean developed at a record level in western Minnesota. Many farms with no SDS history watched it develop in multiple fields. Fortunately, onset was late, with most prevalence showing up in headlands, so yield loss overall was minimal. We observed very positive SDS control from ILEVO seed treatment this year. In corn, Southern Rust once again developed widespread in the tri-state area. Northern Corn Leaf Blight prevalence was high, like 2024, and Tar Spot was observed in many fields across the district. Tar spot prevalence stayed relatively low and likely did not cause widespread yield loss. Many of these diseases, along with Bacterial leaf streak, showed up significantly worse in corn fields affected by hail events. Corn rootworm continues to pose a significant challenge throughout the area. Qrome and Vorceed hybrids accounted for 18.4% of total sales in 2022 and rose to 54% of total corn sales in 2025. In 2025, west central Minnesota was roughly 65% Q/V hybrids, central and eastern South Dakota were around 55%, and southeast North Dakota was around 30%. We expect those percentages to rise again to an overall average of about 60% Q/V in 2026 to combat the ongoing CRW challenge. In areas where CRW pressure was high, we saw a noticeable yield advantage in Qrome and Vorceed products.

QR Code link to Pioneer YouTube video on Sudden Death Syndrome

Photos:

Above: Sudden death syndrome firing symptom on soybean leaves

Far left: Bacterial leaf streak (corn)

Left: CRW feeding on corn root without CRW protection (top); and root protected with BT CRW protection (bottom).

Right: Northern (top) and Western (bottom) corn root worm adults.

Harvest

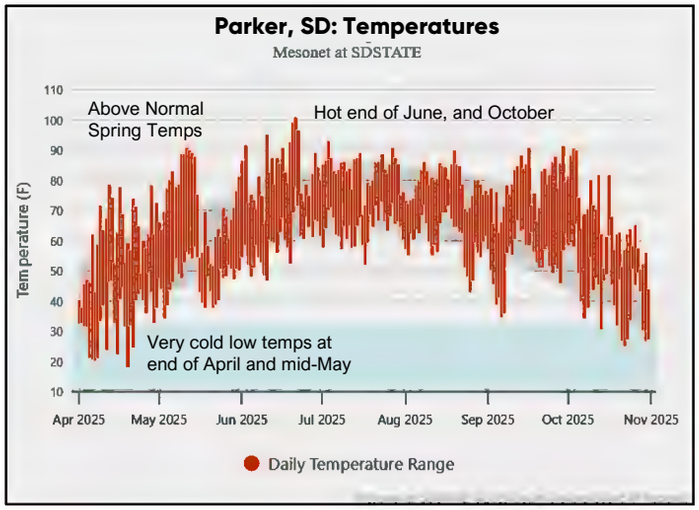
Yields in both corn and soybean were highly variable again in 2025. The weather this year caused some challenges in PKP plots and overall data collection. Many comparison plots were not taken to yield due to drown-out conditions. Soybean field averages in the highest rainfall areas yielded anywhere from the low 20's to mid-40's. As we moved out of the excessive moisture areas, yield levels jumped significantly, with many field averages in the 70's and better. Corn yields also varied greatly, with the high rainfall areas reporting yields in the 125–150-bushel range. As we move out of the excessive moisture areas, corn yields also jumped significantly. There were some impressive field averages posted this year. Despite a challenging growing season, test weights were very strong overall, and most corn was harvested in the 18-22% range. Despite extreme variability, 2025 emphasized the importance of variety/hybrid selection and management decisions in changing environmental conditions.

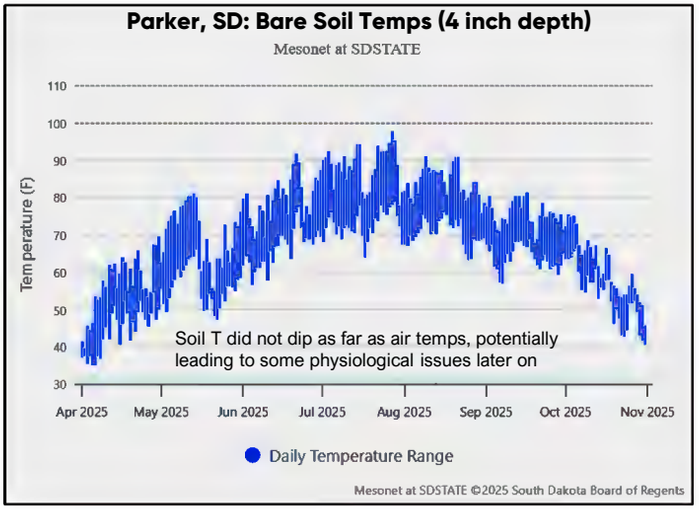
Author: Aaron Giese, Field Agronomist

A YEAR IN REVIEW:
Southeast, Central & Western South Dakota

Planting & Early Season

Above normal temperatures and dry conditions helped the region get off to a fast start. Planting proceeded rapidly in southern and southeastern areas until a late April rainstorm halted operations, at which point, temperatures turned very cold and high winds blew for several days. In several places, emerged corn was nipped with cold dry air, resulting in quite a few fields with VE-V1 stage seedlings that were set back considerably. Planting resumed in May, with most corn and soybeans in the ground by mid-month. Soybeans that were seeded early or ahead of corn, in some cases, produced uneven stands and there were some fields replanted due to emergence issues.





Air temperatures dipped into the mid-30's F and lower 40's F near the end of April and again in mid-May. Cold temps were accompanied by high sustained winds and high gusts at times. Late April and mid-May soil temps remained around or above 50 deg. F but due to the relatively dry soil condition, average soil temp cooled considerably each time (10 degrees or more each time). When air temps dip so low to damage or slow up top growth, while soil temps are still suitable for root development, plant internal chemical signals and hormones may be impacted. Some of the unique physiological issues that popped up later in the season may have something to do with these early season temperature, soil moisture, and humidity fluctuations.

Early-season weather impact

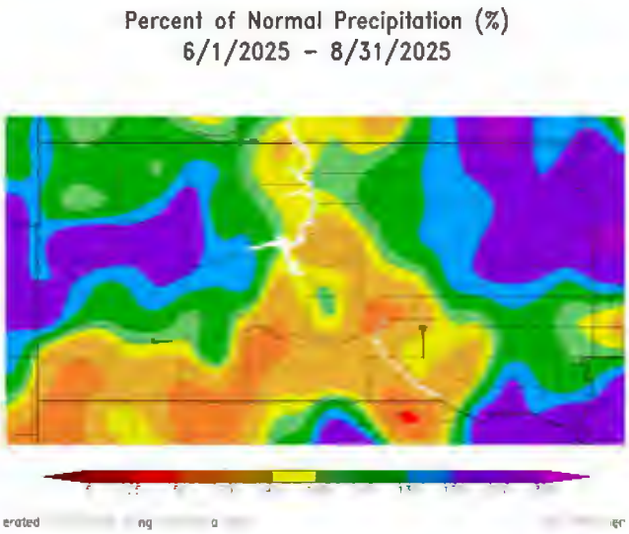
Far-left & left: corn field affected by cold-snaps in late April, with some seedlings failing to emerge properly and emerged plants remaining stunted for a couple of weeks in May.

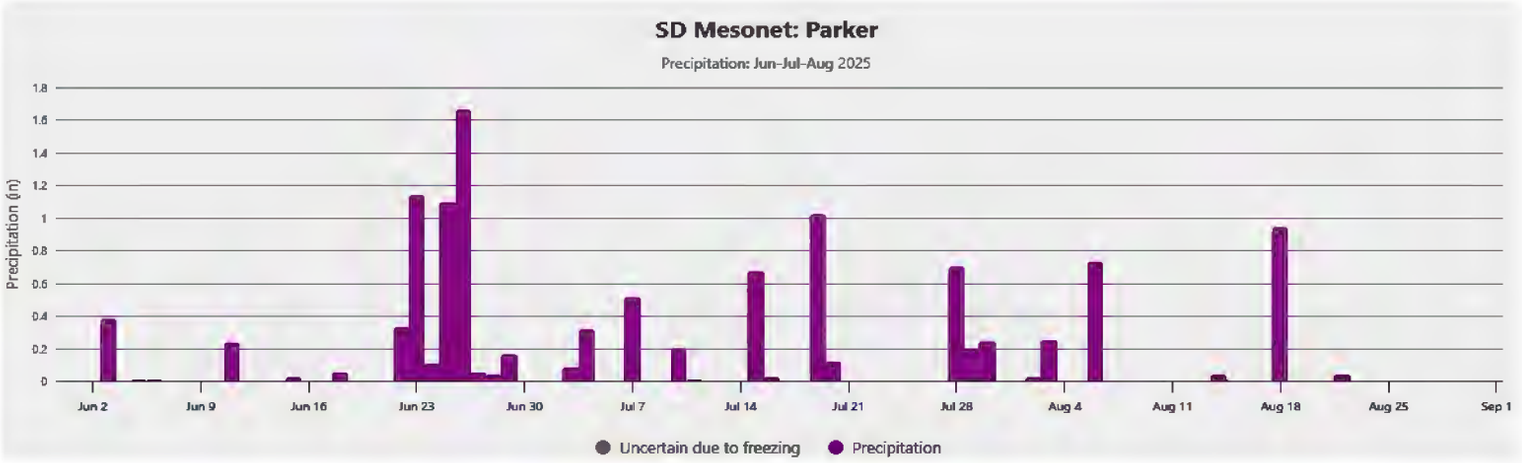
Right: soybean with thickened hypocotyl and turned back due to temperature inversion (warm soil, cold air) as well as soil crusting.

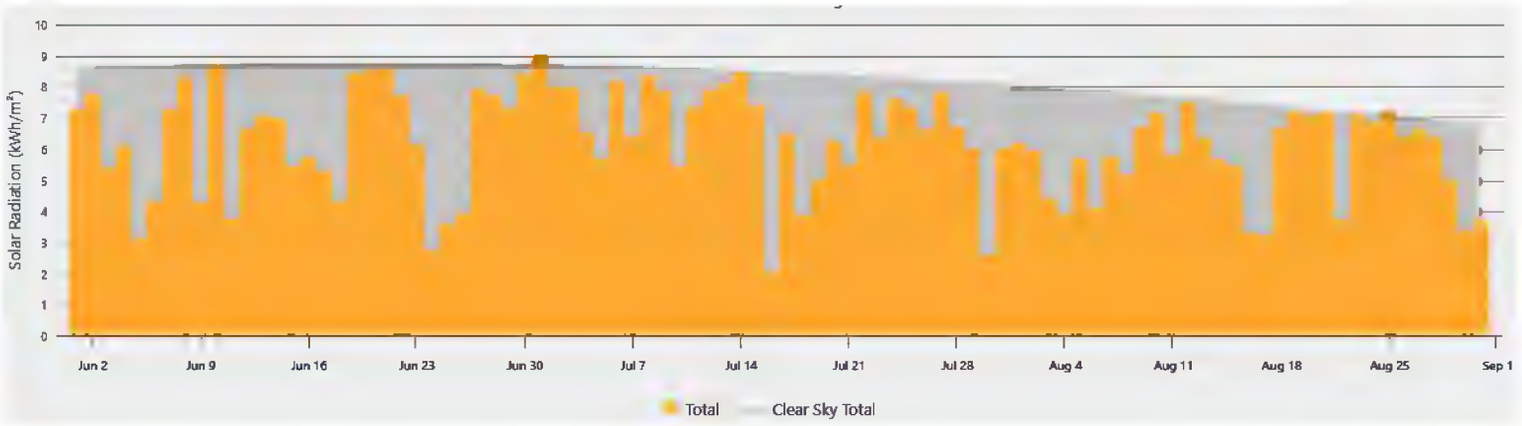
A YEAR IN REVIEW:
Southeast, Central & Western South Dakota

Timely Rainfall and Decreased Solar Radiation

Rainfall throughout the early summer, and especially mid-late June, helped fill the soil profile and get plants going in the right direction after some of the early season chilling / dry soil issues. Throughout the growing season in 2025, smoke from Canadian and other wildfires, as well as cloudy days led to a significantly reduced accumulation of photosynthetically active radiation over the season. It was counteracted by high late season temperatures allowing for a longer grain filling period. But the early season temperatures along with reduced light quality throughout the season may have influenced some physiological issues. Early in flowering, some areas experienced 'tassel wrap', or a tassel that emerged much later than silks initiated. In the end, there were relatively few pollination issues in South Dakota and yields in fields affected by the delayed tasseling tended to be very good. In other fields, ears were set quite low, some even drooping to an unacceptable level at harvest time. Ear placement can be influenced by a few changes in certain signals or hormones in the plant, and in turn these can be influenced by unusual temperature or sunlight conditions.







A YEAR IN REVIEW:
Southeast, Central & Western South Dakota

Strong Finish and High Yields with Some Variability Due to Disease Pressure

Despite some early challenges, and intermittent drought stress conditions, disease pressures and the occasional 'derecho' event, overall production was strong in most areas. Based on all connected data in Granular Insights for District CS, corn has yielded approximately 203 bu/acre over 126.5K acres, well above historical and recent averages. Soybean, similarly, are averaging well above normal for the region at around 55 bu/acre over 24K+ acres.

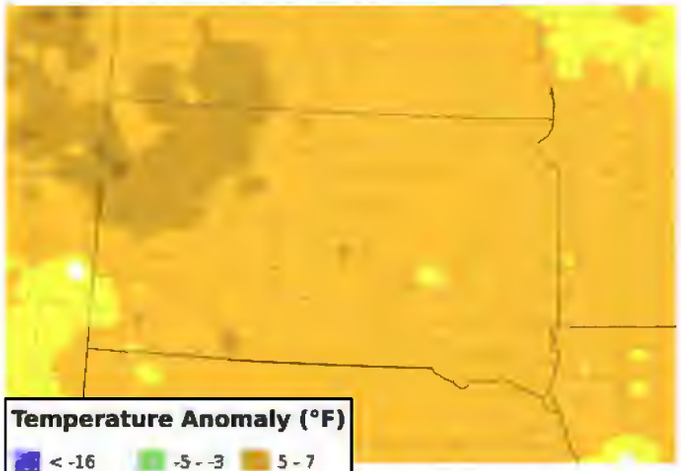
Granular Insights Connected Data
(as of 11/8/25)
2025 Corn Harvest District CS

Farms	Fields	Acres	Yield
452	1290	126.48K	203

Granular Insights Connected Data
(as of 11/8/25)
2025 Soybean Harvest District CS

Farms	Fields	Acres	Yield
97	232	24.18K	55

Dew Point Temperature Anomaly: Jul 2025 - Sep 2025



DP Anomaly of +5 to +10 degrees suggests a very high air moisture content

Issues related to high humidity in 2025

Fungal diseases like common and Southern corn rust (pictured), pod & stem blight in soybean, and ear molds were common in 2025.

Bacterial diseases like Goss's wilt/blight (pictured) and bacterial leaf streak were found in many areas.

Unusual problems like ear sprouting (pictured) and molds were found in a few places as well.

Contributors: Greg Bartmann, Field Agronomist & Larry Osborne, Agronomy Innovation Manager

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Radiational Cooling Injury in Corn

Key Points

- Radiational cooling injury can occur in corn on calm, clear nights early in the growing season.
- It is characterized by a silvery or dull gray appearance to portions of the leaves.
- Injury to the plant is largely cosmetic and has little or no impact on subsequent growth and yield.

Radiational Cooling Injury in Corn

- Radiational cooling injury, sometimes referred to as "silver leaf" is a type of chilling injury commonly observed in corn early in the growing season when night temperatures drop into the low 40s or upper 30s (°F).
- It occurs on calm, clear nights when rapid heat loss via radiational cooling causes leaf surfaces to drop below the ambient air temperature, resulting in damage to leaf tissue.
- Radiational cooling injury is characterized by a silvery or dull gray appearance to portions of leaves oriented horizontally toward the sky (Figure 1).

Figure 1. Silver/gray appearance on leaves of corn plants caused by radiational cooling injury.

What is Radiational Cooling?

- Radiational cooling is a natural process by which the surface of the Earth loses heat to the atmosphere and space.
- The sun emits shortwave radiation in the form of UV rays and visible light, which is absorbed by the Earth's surface during daylight hours.
- A portion of this radiation is emitted back into space as longwave, or infrared radiation.
- During the night, longwave radiation continues to be emitted without shortwave radiation coming in to balance out the deficit, causing the ground to cool.

Conditions that Favor Radiational Cooling

- On calm, clear nights, radiational cooling can cause temperatures near the ground to drop sharply from warm to cold in a short period of time.
- Clear skies allow heat to escape the Earth's surface more rapidly. Clouds create an insulating effect by absorbing escaping longwave radiation and re-emitting it back toward Earth. On cloudless nights, more of the longwave radiation escapes into the atmosphere and space.
- When the surface rapidly cools, it can create a layer of air near the surface that is much cooler than the air above it, a phenomenon known as an inversion layer.
- Under windy conditions, the warmer air above mixes with the cooler air near the surface, which reduces the amount of surface cooling. When there is no wind, the cool layer stays in place near the surface.

Impact on Corn

- Radiational cooling injury is largely cosmetic and has little or no impact on corn growth and yield.
- Damage is usually limited to the portions of the leaves that were oriented horizontally toward the sky during the night when the injury occurred (Figure 2).
- Injury does not restrict leaf expansion, and new leaves emerging from the whorl will not be injured or affected in any way.

Figure 2. Injury typically occurs to leaf surfaces oriented horizontally facing the sky.

Author: Mark Jeschke

Photos: Jim Ruhland

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WEATHER IMPACT
Photos From the Field

Late Replant of Wind-Damaged Soybean near Barnesville, MN, June 23, 2025

High sustained winds following a few days of unseasonably warm/dry conditions produced 'sand-blasting' and residue movement, destroying nearly all but stems in this soybean field in NW Minnesota.

Root-lodging of flowering stage sunflower field near Barnesville, MN, August 8, 2025

High wind gusts (40-50+ mph) following a fast rain event overnight caused severe root-lodging in a field of flowering-stage sunflowers in NW Minnesota.

WEATHER IMPACT
Photos From the Field

Corn damaged by July 23rd storm producing high wind & hail in central SD

Stalk lodging, brittle snap and hail damage are an ever-present possibility in the Northern Plains.

Soybeans delayed by mid-May cold snap near Volga, SD; replanted around 6/1/25

Some early planted soybeans had trouble emerging during the prolonged cool conditions in early to mid-May. Some soils crusted but largely it was mostly just prolonged emergence time due to low temps and possibly soil-air temperature inversion that kept some fields from emerging properly. Some late replant was required.

PHOTOS FROM THE FIELD – CORN DISEASES

Southern Rust & Tar Spot

In 2024 & 2025, the Northern Plains Region was affected by both of these diseases that typically were not major issues in the recent past in ND, SD, or Western MN.

Top Left and Top Right:
Southern rust (*Puccinia polysora*) is a polycyclic disease that thrives in high humidity and warmer temperatures. It greatly reduces plant stress tolerance by opening leaves to early senescence. Fungicides are a strong way of preventing and managing southern rust, which must be introduced each year from tropical area, as it doesn't overwinter in our area.

Bottom images:
Tar Spot (*Phyllachora maydis*) is a relatively new disease in the US, affecting the Eastern Corn Belt prior to arriving in the Northern Plains the last 2-4 years. Dark, nearly black raised spots develop on leaves under humid conditions, especially when temperatures are moderate, 60-70 F is ideal. Infected residue is a likely source for initial spores, but the disease, like rust, is polycyclic, meaning it continues to spread from active infections.

PHOTOS FROM THE FIELD – CORN DISEASES

Streaks & Blights & Spots & Streaks on Corn.

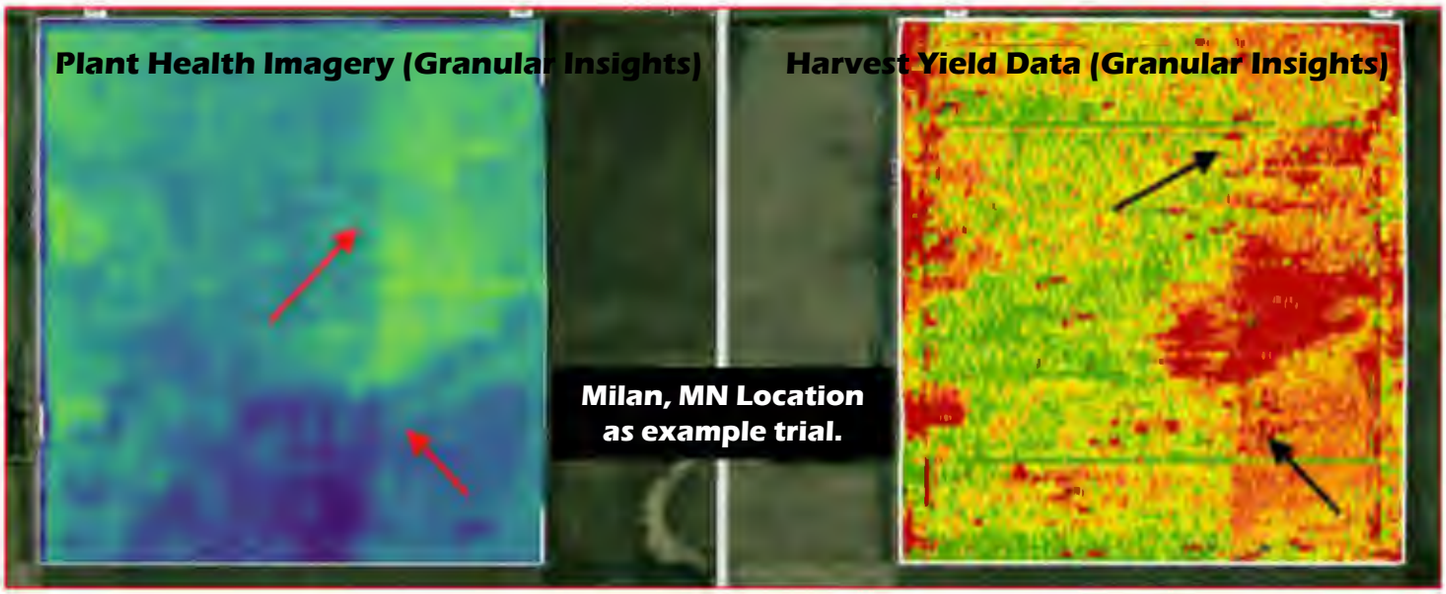
2025 provided a smorgasbord of leaf disease in corn. Clockwise from Top Left: **A & B**) Bacterial leaf streak (*Xanthomonas vasicola*), note halo when backlit); **C)** Gray Leaf Spot (*Cercospora zea-maydis*), note long rectangular lesions, nearly square ends; **D & E)** Northern Corn Leaf Blight (*Exserohilum turcicum*), long lesions, tapered ends, crosses over leaf veins; **F)** Anthracnose leaf blight (*Colletotrichum graminicola*) (unconfirmed), note brown water-soaked lesions with yellow or reddish borders. Examples could be found in many locs in SD, MN, ND. Severe leaf damage from any of these, particularly on ear leaves, can result in yield or quality losses but large losses are relatively rare here.

PHOTOS FROM THE FIELD – CORN ISSUES

Blights Part 2, and Some Unusual Ear Issues in Corn.

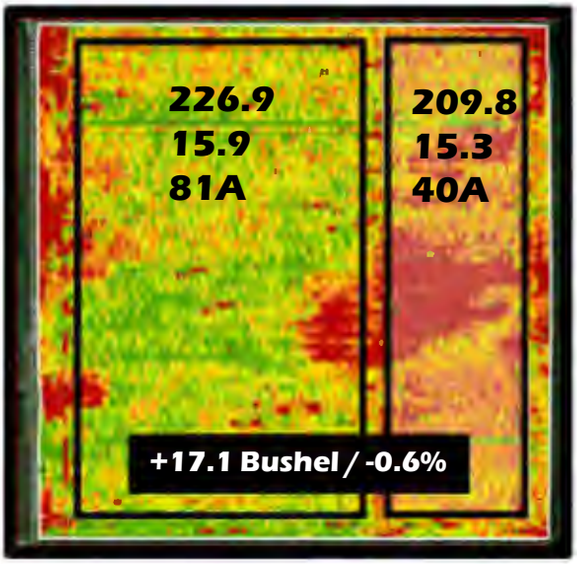
The plant disease parade continues with: **A,B,C & D**) Goss's Bacterial Wilt & Blight (*Clavibacter nebraskensis*), note long, wide legions with irregular margin and typically dark spots in or near the lesion edges, sometimes with dried or sticky dark caramel colored bacterial ooze. The shrunken ear is due to the early destruction of important leaf tissue, reducing yield; **E)** a moldy ear most likely affected by *Cladosporium spp.* but possibly also affected by toxigenic fungi due to excessive humidity, rainfall and possible sugar leakage due to abnormal weather and growth patterns; **F)** ear damage likely caused by Fall Armyworm (*Spodoptera* frugiperda) larval feeding on mature corn; and **G)** major pollination issues associated with application of an unknown combination of herbicides and additives applied at a critical growth stage. It was common this season for corn to be physiologically beyond where it is normally at certain heights. Corn at 30" may have been well beyond the 8-leaf (V8) growth stage for example, typically the cutoff for certain herbicides and adjuvants., and at risk for ear damage

Corn Fungicide Response on P9955V in West Central Minnesota, 2025 (Rice)



On-Farm Fungicide Trials

Participants were asked to use labelled rates of corn fungicide products, applied R1 to R3 growth stage on hybrid P9955V. This hybrid has been particulary high yielding but has also been shown to respond to foliar fungicide. The hybrid tends to have poorer late season stalks and some susceptibility to rusts. The trials showed increased plant health via satellite imagery, as well as significant yield increases in response to the fungicides. Data is below.



Location	Yield Advantage (treated area)	Grain Harvest Moisture Difference
Milan, MN	+17.1 bu/ac	0.6% wetter
Holloway, MN	+4.5	0.2%
Granite Falls, MN	+29.0	0.3%
Morris, MN	+11.2	1.2%
Canby, MN	+23.9	0.9%
Averages:	+17.1 bu/ac	0.6% wetter

Trial coordinator Eric Rice, Field Agronomist

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Southern Rust in Corn & Fungicide Response in Southeast South Dakota, 2025

Southern Rust in 2025

Weather conditions, and inoculum coming from southern areas early in the summer led to a rather severe epidemic of Southern corn rust (caused by *Puccinia polysora*) across large parts of the Northern Plains area. Southern South Dakota was particularly hard hit as disease likely arrived in early to mid July, around flowering time and also the time many producers make fungicide decisions. Until this point in the season, conditions had not seemed so favorable for rust.

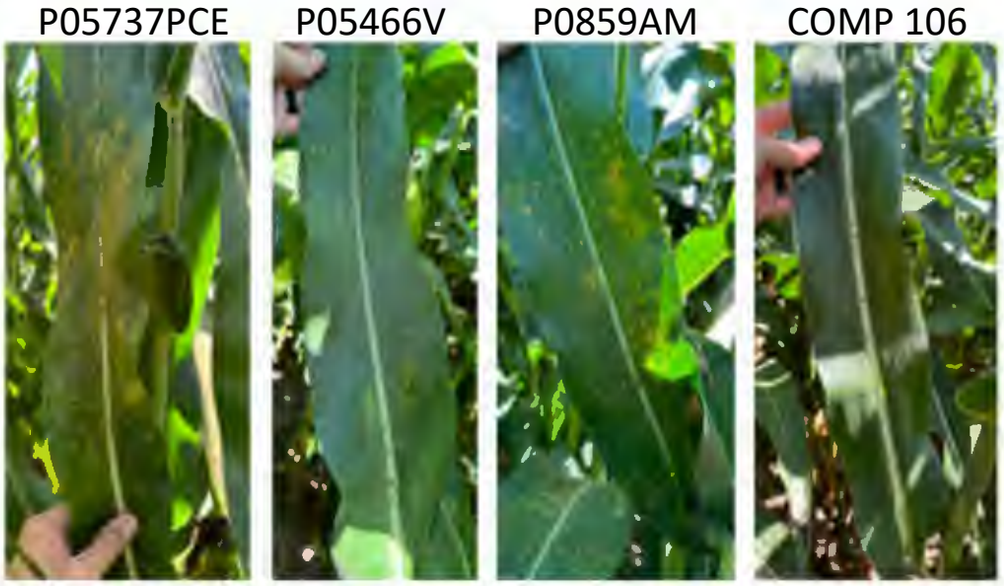
- One of the earliest observations was near Alcester, SD along the Iowa border, in mid-July
- Humidity conditions rose throughout the next several weeks.
- Precipitation and wind served to increase the distribution throughout the region.

P13777PCE vs. COMPETITOR 113 day

No fungicide was applied, and clear difference are seen in plant health due largely to differences in Southern rust tolerance. Pioneer P13777PCE was showing better resistance to the disease and maintaining better plant health.

Variation in Resistance to Southern Rust in Hybrids

Genetic resistance is of key importance when managing rust diseases in grain crops such as Southern rust in corn. P05466V and a competitor are showing stronger genetic resistance to the rust in southeast SD in 2025 compared to P05737PCE & P0859AM as shown in the photos to the right. Fungicide management was also key to preventing yield loss in 2025.



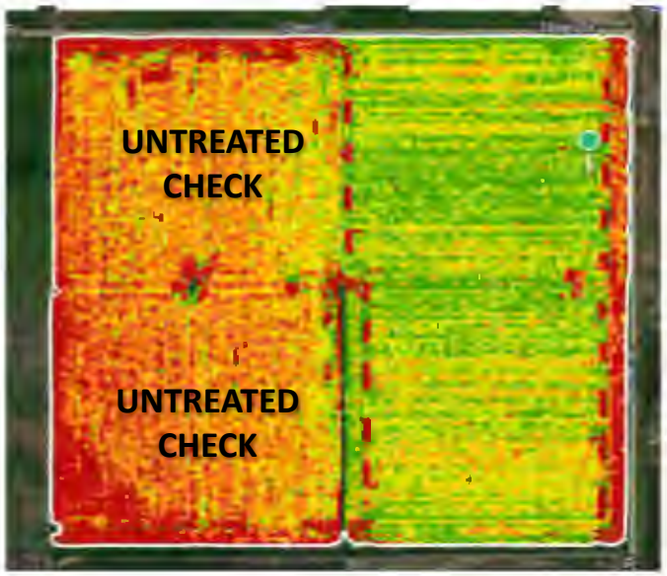
Author: Jon Olsen, Field Agronomist

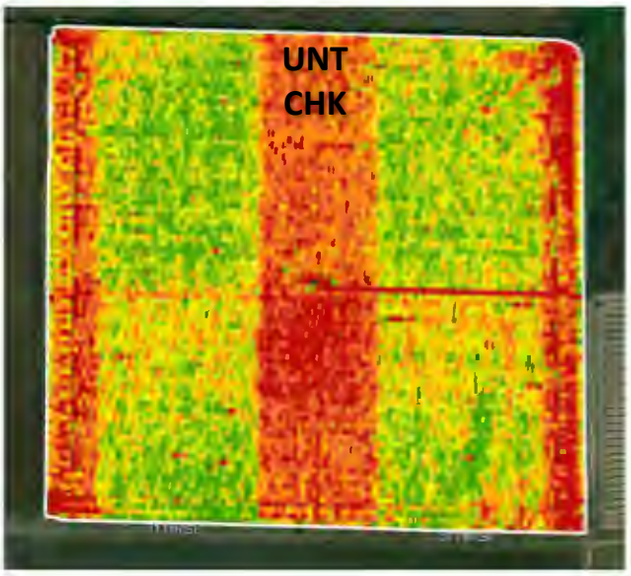
Southern Rust in Corn & Fungicide Response in Southeast South Dakota, 2025

P13050AM & P14830Q, Union Co. SD

Delaro Complete Fungicide (group 3+7+11)
10 oz rate applied by airplane
Sprayed 7/17/25 (early post-pollination)

Yield Response: P13050AM: 19.3 bu/ac
P14830Q: 21.0 bu/ac





P13476Q – Clay County, SD

Veltyma Fungicide (group 3+11)
10 oz rate applied by helicopter
Sprayed 7/29/25 (post-pollination)

Yield Response: 26.4 bu/ac

Field	Hybrid	Fungicide	Method	Applied Date	Yield Response
Clay Co 1	P13476Q	Veltyma	Helicopter	7/29/25	26.4
Clay Co 2	P1185Q	Veltyma	Helicopter	7/29/25	9.1
Union Co 1	P13050AM	Delaro Complete	Plane	7/17/25	19.3
Union Co 2	P14830Q	Delaro Complete	Plane	7/17/25	21.0
Union Co 3	P1185AM	Delaro Complete	Plane	7/17/25	15.3
Bon Homme Co	P1380Q	Aproach Prima	Plane	8/1/25	18.0
Yankton Co 1	P10625V	Aproach Prima	Drone	7/20/25	17.8
Yankton Co 2	P13050V	Aproach Prima	Drone	7/20/25	17.1
Yankton Co 3	P9955V	Aproach Prima	Drone	7/19/25	51.9
Yankton Co 4	P05737V	Aproach Prima	Drone	7/19/25	35.9
Union Co	P05737PCE	Aproach Prima	Drone	8/2/25	15.1
Lincoln Co	P08527V	Aproach Prima	Drone	8/2/25	32.3
				Average Yield Response:	**23.3 Bu/ac**

trials and data coordinated by Jon Olsen, Field Agronomist

Southern Rust of Corn

Key Points

- Southern rust (*Puccinia polysora*) is a foliar disease of corn common to the Southeastern U.S. that is now occurring with increasing frequency in the Corn Belt.
- *P. polysora* requires a living host to survive, so it does not overwinter in the Corn Belt. Spores are carried north each year from tropical areas by prevailing winds.
- Southern rust has the potential to be much more damaging to corn than common rust due to its ability to rapidly develop and spread.
- Southern rust is favored by high temperatures (over 77 ºF, 25 ºC) and high relative humidity.

Figure 1. Southern rust (*Puccinia polysora)* pustules on a corn leaf.

Pathogen Facts

- Southern rust is a foliar disease of corn caused by the fungal pathogen *Puccinia polysora*.
- Southern rust does not occur as frequently in the Corn Belt as common rust (*P. sorghi*), but can be more destructive when infection does take place.
- Unlike other major foliar diseases of corn in North America, the rusts do not overwinter in the Corn Belt.
  - Rusts develop first in southern corn fields, and then may spread into primary corn-growing states.
  - Movement is by windblown spores that travel northward with prevailing weather systems.
- Southern rust is favored by high temperatures (over 77 ºF, 25 ºC) and high relative humidity, which tends to confine it to tropical and subtropical regions.
- Southern rust is generally more damaging to corn than common rust due to its ability to rapidly develop and spread.
- When conditions favorable for disease development persist for an extended period, severity can quickly reach epidemic levels.
- Yield impact depends on timing of infection, amount of leaf area damaged, and location of damaged leaves on the plant.

Crop Damage

- Photosynthesis is reduced as functional leaf area decreases, which can reduce kernel fill and yield.
- Corn stalk quality can also be negatively affected as plants remobilize carbohydrates from the stalk to compensate for reduced photosynthesis.
- Later-planted corn is generally at higher risk for yield loss due to leaf diseases.
- If damage is confined to lower leaves or occurs after corn is well-dented, yield impact will be low.

Life Cycle

- Urediniospores are the primary infective propagule and are spread northward via the wind from living hosts in tropical areas.
- Spores will infect corn and cause symptoms within 3-4 days. Within 7 to 10 days, more urediniospores are produced and new infections continue to occur as long as conditions remain favorable, which can rapidly lead to an epidemic.
- In the U.S., southern rust usually appears later in the growing season and is more prevalent in the southeastern states.
- In seasons with higher than average temperatures, southern rust can spread further up into the Corn Belt where it can impact corn yield.
- *P. polysora* is not known to have an alternate host.

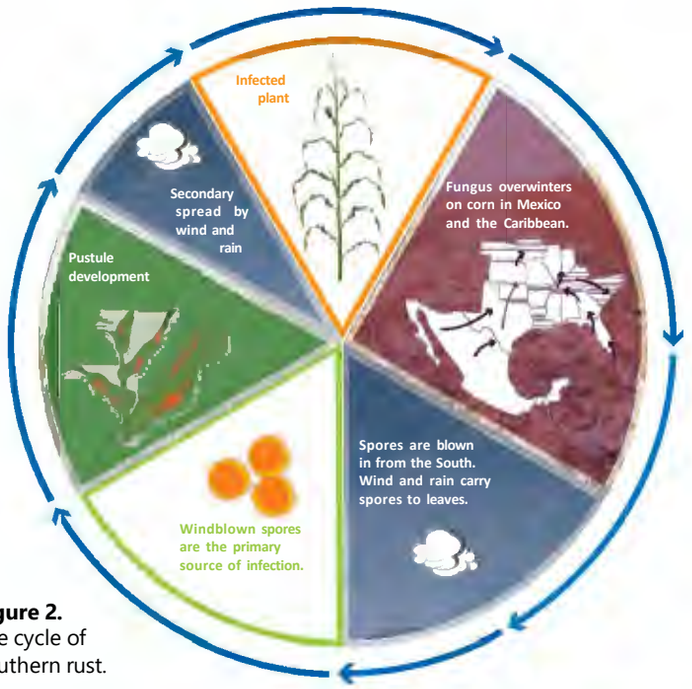


Figure 2. Life cycle of southern rust.

Identification

- Both rust diseases of corn can cause substantial yield losses under severe disease pressure; however, southern rust generally poses a greater risk to corn yield than common rust, making proper identification important.
- Southern rust looks very similar to common rust, but several characteristics distinguish the two, including the shape and color of pustules and their location on the plant.

Southern Rust

- Has small circular, pinhead-shaped pustules.
- Coloration of pustules/spores is reddish orange.
- Infects the upper leaf surface, as well as stalks and husks.
- Favored by higher temperatures (over 77 ºF, 25 ºC).

Common Rust

- Has larger pustules that are more elongate and blocky.
- Coloration of pustules/spores is brown to cinnamon-brown.
- Infects the upper and lower leaf surfaces.
- Favored by cooler temperatures (60-77 ºF, 15-25 ºC).

Distribution

- In recent growing seasons, southern rust has occurred further north in the Midwestern U.S. earlier in the season than has been historically typical for this disease.
- Southern rust is now routinely observed in Indiana, Illinois, Iowa, Nebraska, and Kansas and has been detected as far north as South Dakota, Minnesota, and Wisconsin.
- The increased prevalence of southern rust in the Corn Belt makes awareness and proper identification of this disease especially important.

Figure 3. Southern rust on corn; Johnston, IA; August 2024. Southern rust outbreaks often begin with isolated patches of disease in the middle or upper canopy along field edges

Figure 4. Later in the season, *P. polysora* forms darker pustules called telia that contain teliospores.

Author: Mark Jeschke

Vol. 16 No. 12 August 2024

Tar Spot of Corn

Pathogen Facts

- Tar spot, caused by the fungal pathogen *Phyllachora maydis*, is a relatively new foliar disease of corn in the United States, first appearing in Illinois and Indiana in 2015 and subsequently spreading through much of the Corn Belt.
- Look for tar spot to develop during cool temperatures (60-70 ºF, 16-20 ºC), high relative humidity (>75%), frequent cloudy days, and 7+ hours of dew at night.
- Tar spot reduces yield by reducing the photosynthetic capacity of leaves and causing rapid premature leaf senescence.

Identification and Symptoms of Tar Spot

- Tar spot is the physical manifestation of circular-sharped, tar colored fungal fruiting bodies, called ascomata, developing on corn leaves.
- Initial symptoms are small brown lesions that darken with age.
- The texture of the leaf becomes bumpy and uneven when the fruiting bodies are present.
- Tar spot lesions cannot be rubbed away completely or dissolved in water.

Corn leaves infected with tar spot in a field in Illinois in 2018.

- Under favorable conditions, tar spot spreads from the lowest leaves to the upper leaves, leaf sheathes, and eventually the husks of the developing ears.
- Severe infection can cause leaf necrosis.
- Affected ears can have reduced weight and loose kernels, and kernels at the ear tip may germinate prematurely.

Corn leaf under magnification showing dense coverage with tar spot ascomata.

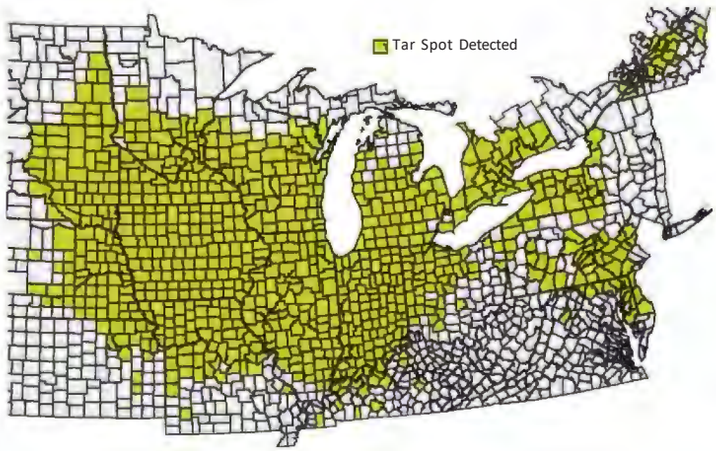


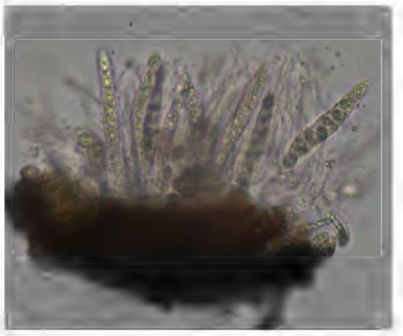
Figure 1. Counties in the Corn Belt with confirmed incidence of tar spot, as of October 2024. (Corn ipmPIPE, 2024; Corteva Plant Diagnostic Lab).

Tar Spot Occurrence in the U.S.

- Tar spot in corn was first observed over a century ago in high valleys in Mexico.
- The first confirmations of tar spot in the U.S. were in Illinois and Indiana in 2015 (Bissonnette, 2015; Ruhl et al., 2016).
- It has subsequently spread across much of the U.S. Corn Belt and into southern Ontario (Figure 1).
- Tar spot has also been found in several counties in southern Florida and southwestern Georgia.
- In 2018, tar spot established itself as an economic concern for corn production in the Midwest, with severe outbreaks reported in several states.
- A severe outbreak of tar spot impacted a large portion of the Corn Belt again in 2021.

Tar Spot Epidemiology

- *P. maydis* is an obligate pathogen, which means it needs a living host to grow and reproduce. It is capable of overwintering in the Midwestern U.S. in infected crop residue on the soil surface.
- Tar spot is more likely to develop during cool temperatures (60-70 ºF, 16-20 ºC), high relative humidity (>75%), frequent cloudy days, and 7+ hours of dew at night.
- Tar spot is polycyclic and can continue to produce spores and spread to new plants as long as environmental conditions are favorable.
- *P. maydis* produces windborne spores that have been shown to disperse up to 800 ft. Spores are released during periods of high humidity.



Microscopic view of fungal spores of P. maydis.

Management Considerations

Yield Impact of Tar Spot

- 2018 was the first time that corn yield reductions associated with tar spot were documented in the U.S.
- University corn hybrid trials conducted in 2018 suggested potential yield losses of up to 39 bu/acre under heavy infestations (Telenko et al., 2019).
- Severe tar spot infestations have been associated with reduced stalk quality. If foliar symptoms are present, monitor stalk quality carefully to determine harvest timing.
- There is no evidence that tar spot causes ear rot or produces harmful mycotoxins (Kleczewski, 2018).

Differences in Hybrid Response

- Observations in hybrid trials have shown that hybrids differ in susceptibility to tar spot (Kleczewski and Smith, 2018).
- Longer maturity hybrids for a given location have been shown to have a greater risk of yield loss from tar spot than shorter maturity hybrids (Telenko et al., 2019).
- Genetic resistance to tar spot should be the number one consideration when seeking to manage this disease, as it appears to have a greater impact on symptoms and yield loss than either cultural or chemical management practices.

Foliar Fungicides

- Several foliar fungicides are labeled for control of tar spot in corn (Wise, 2024).
- A multistate university study conducted in 2020 and 2021 showed that fungicide treatments with multiple modes of action were better at reducing tar spot severity and protecting corn yield than those with only a single mode of action (Telenko et al., 2022).
- Research suggests that tar spot may be challenging to control with a single fungicide application due to its rapid reinfection cycle, particularly in irrigated corn.
- A 2019 Purdue University study compared single-pass and two-pass treatments for tar spot control using Aproach® and Aproach® Prima fungicides under moderate to high tar spot severity (Da Silva et al., 2019).
- Aproach Prima fungicide applied at VT and the two-pass treatments all significantly increased yield relative to the nontreated check. Aproach Prima fungicide applied at VT followed by Aproach fungicide at R2 had the greatest yield, although it was not significantly greater than Aproach followed by Aproach Prima (Figure 2).

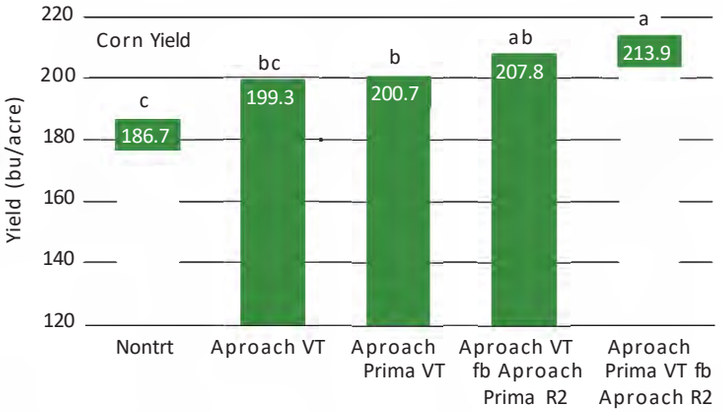


Figure 2. Fungicide treatment effects on corn yield under moderate to high tar spot severity in a 2019 Purdue Univ. study.

Means followed by the same letter are not significantly different based on Fisher's Least Significant Difference test (LSD; α=0.05)

Agronomic Practices to Manage Tar Spot

- The pathogen that causes tar spot overwinters in corn residue. How the amount of residue on a field's soil surface affects disease severity the following year is unknown.
- Observations so far suggest that rotation and tillage probably have little effect on tar spot severity.
- Duration of leaf surface wetness appears to be a key factor in the development and spread of tar spot. Farmers with irrigated corn in areas affected by tar spot have experimented with irrigating at night to reduce the duration of leaf wetness.

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Author: Mark Jeschke

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Fungicide Application Timing in Corn

Key Points

- The onset and progression of foliar disease in corn is heavily dependent on environmental conditions, which can make timing a fungicide application challenging.
- Research has shown that VT/R1 is generally the most consistently effective fungicide application timing for disease control and yield protection.
- Applications as late as R3 may be optimal in some cases with later flushes of disease. Applications after R3 are less likely to be economically beneficial as the crop gets closer to physiological maturity

Optimizing Fungicide Application Timing

- Application timing of a foliar fungicide treatment in corn is important for maximizing disease control and yield.
- There are three main factors that influence optimal fungicide application timing in corn:
  - Duration of fungicide activity
  - Timing of disease onset and progression
  - Critical period for protecting corn yield

Duration of Fungicide Activity

- If one fungicide application could provide season-long disease protection, application timing would be far less important, but fungicides have a limited window of efficacy.
- Foliar fungicides generally have around 21 days of activity, with some newer products as long as 35 days.
- The total duration of the reproductive growth period in corn, from silking to black layer, is typically around 65 days, so a fungicide application will only provide disease protection for around half of that period at most.

Timing of Disease Onset and Progression

- A fungicide needs to be present on the plant prior to pathogen infection or in the very early stages of infection to be effective (Mueller and Robertson, 2008).
- Ideally, the best time to apply a fungicide would be right when foliar disease is beginning to proliferate within the crop canopy – aligning the window of maximum fungicide activity with the phase of disease progression when it would have the greatest impact.
- In practice, this is challenging to do because the onset and progression of foliar disease is heavily dependent on environmental conditions.
- Foliar diseases are generally most active during the latter part of the season when corn is in the reproductive growth stages.
- Environmental conditions tend to be more favorable for foliar disease development during this time – temperatures are more conducive for disease development and the shading of the crop canopy helps preserve moisture on the lower leaves.
- Additionally, as the plants begin shifting resources toward the developing ear, the leaves have less capacity to defend against fungal infection.

Critical Period For Corn Yield

- The reproductive stages are the period that is the most critical for protecting corn yield.
- Foliar diseases impact yield by reducing the amount of functional photosynthetic leaf area during grain fill. The yield impact associated with lost leaf area peaks at the VT/R1 stage and then gradually declines as the plant gets closer to physiological maturity (Figure 1).
- The leaves in the upper part of the canopy – from the ear leaf up – account for the majority of photosynthate flowing into the ear during grain fill, so these leaves are the most important to protect from foliar disease.
- Fungicides have limited mobility in plant tissue, so only leaves that receive a fungicide treatment are protected.
- If a fungicide is applied before the uppermost leaves have emerged, those leaves will not be directly protected by the fungicide.

Fungicide Application Timing Research

- Research has generally shown that VT/R1 is the most effective application timing for disease control and yield protection (Paul et al. 2011; Wise and Mueller 2011; Wise et al. 2019).
- Optimal timing can vary depending on the timing and rate of disease progression.

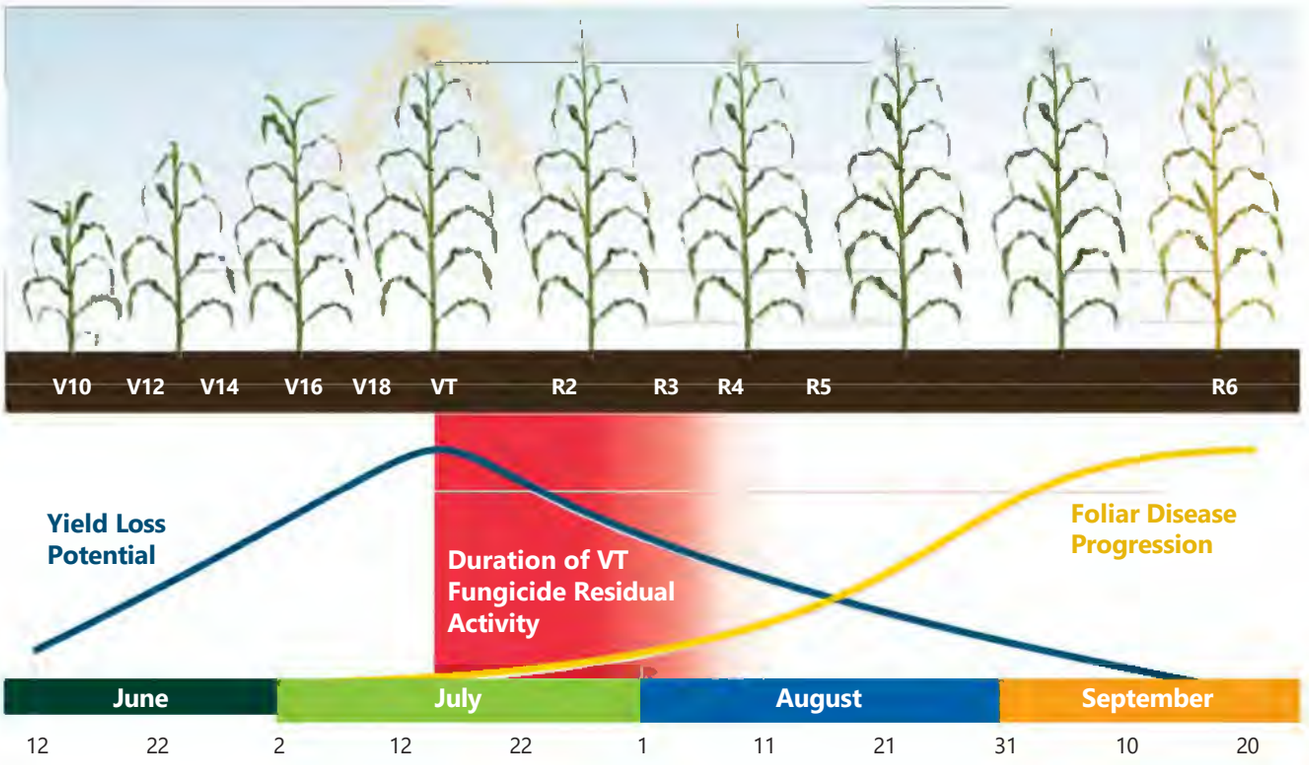

Figure 1. Generalized model of corn foliar disease progression and yield loss potential by growth stage.

- A University of Nebraska study that compared multiple fungicide timings found that VT to R3 applications provided the best results (Jackson-Ziems et al., 2016), with yield response declining with later application timings.
- Applications as late as R5 (dent) still significantly improved yield in some cases, but not as much as the earlier applications.
- A University of Arkansas study comparing VT, R3, and R5 fungicide applications for southern rust control found that the R3 application provided better disease control in one year when southern rust came on later but did not improve yield over the VT timing, and that the VT timing was generally best for yield protection (Faske and Emerson, 2021).
- Diseases such as southern rust or tar spot, which can come on late and spread quickly, may justify a later R stage application but, in general, the closer the crop is to physiological maturity, the less impact a fungicide treatment is likely to have on yield.

Vegetative Stage Applications

- Earlier applications during vegetative growth stages have been explored as a way to simplify field logistics.
- Application around the V5-V6 stage would allow a fungicide to be tank mixed with a post-emergence herbicide application.
- Applications around the V10-V14 timing have also been evaluated, as they could more easily be performed using a ground sprayer rather than aerial application.
- Applying fungicide at the V5-V6 stage puts it on the crop well-ahead of the onset of most foliar diseases, and residual activity would be gone by the time the crop reached grain fill.
- A V10-V14 application would put the window of fungicide efficacy closer to peak foliar disease activity but may leave the door open for a late flush of disease.
- A meta-analysis of research studies conducted over two years in the U.S. and Canada found an average yield increase of 2.0 bu/acre with V6 applications.
- The limited studies that have been done on later vegetative stages applications have shown that a V12 application can provide similar disease suppression to a VT/R1 application in some cases, particularly when disease pressure is low.
- An Iowa State study found better suppression of gray leaf spot with a V12 application in one year when conditions were conducive to earlier disease (Robertson and Shriver, 2018).
- A 3-year Purdue University study found that V12 and VT applications provided similar levels of gray leaf spot protection when pressure was low, but VT applications had a significant advantage under higher disease pressure (Telenko et al., 2020).

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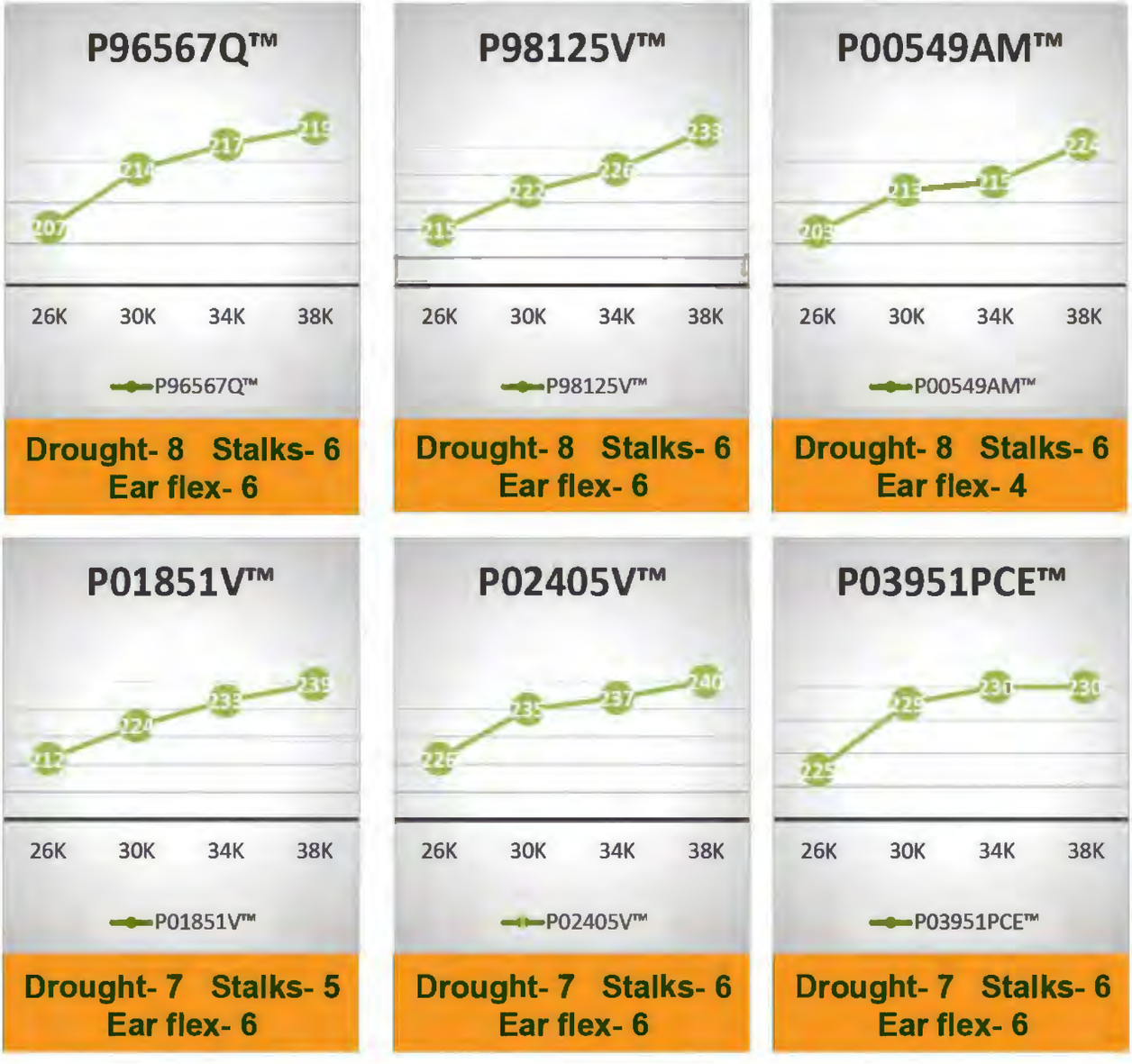
Author: Mark Jeschke

CORN RESEARCH REPORT:
Population Trials – Northeast SD

Corn Population Trials – Territory CVC

A uniform set of hybrids were selected and planted in strip trials at four locations in Beadle and Clark Counties in South Dakota. Four seeding rates were selected (26K, 30K, 34K, & 38K). Hybrids were available for observation during the season and harvested as detailed below. Details on each hybrid's trait scores are given below as well. Yields tended to be strong overall, and increased with seeding rate.

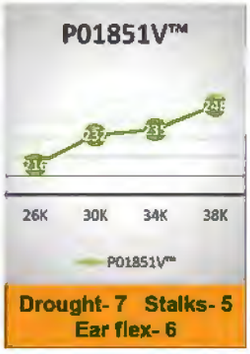
Territory CVC – Averages from 4 Locations

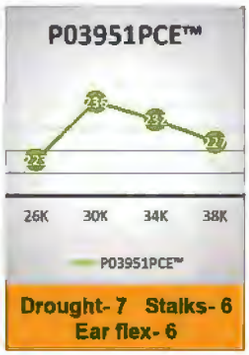


trials and data coordinated by Wes Helken, Field Agronomist

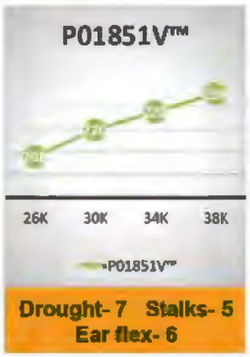
CORN RESEARCH REPORT:
2025 Population Trials – Northeast SD

CK Seeds, Clark Co., SD – Planted: 5/7, Harvest: 10/22

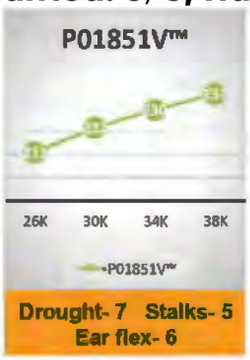




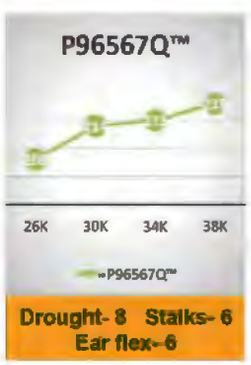
Proven Ag, Beadle Co., SD – Planted: 5/6, Harvest: 10/25

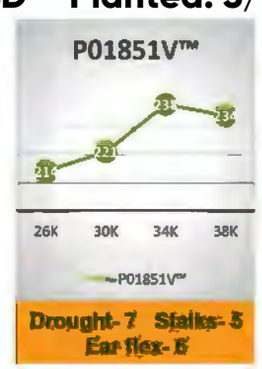


Bauman, Beadle Co., SD – Planted: 5/5, Harvest: 10/25



Dakota Valley Ag, Clark Co., SD – Planted: 5/10, Harvest: 10/25





CORN RESEARCH REPORT:
Emergence in High Salt Situation

Corn Tolerance of High Salts

Many areas in drought prone regions with slow soil drainage will often develop high salt concentrations in the upper soil layers. While corn generally tolerates some level of salinity, it can be especially stressful on germinating seedlings and young roots. Also, hybrids tend to vary in their ability to perform in high-salt fields.

This trial in intended to evaluate emergence and stand establishment in a high-salt situation.

P98125V had highest emerged stand and also showed decent ear uniformity.

	Stand Counts by Date	
Hybrid:	5/27/25	6/3/25
P96567AM	19,000	21,000
P97073V	15,000	19,000
P98125V	21,000	23,000
P02405V	20,000	22,000
P00549AM	15,000	19,000
P03357PCUE	18,000	18,000

2025 Corn Rootworm Trapping: Season Summary

Key Findings:

Regional Comparison
Average Pressure: The seasonal pressure in West Central Minnesota was found to be **~60 beetles/trap location** while in South Dakota locations were a bit lower pressure (**~18 beetles/trap location**).
Minnesota's high average was driven by a few "hotspots," whereas South Dakota's pressure was widespread.

South Dakota Summary:
Locations Monitored: 27 unique trap locations.
Seasonal Average Pressure: 17.9 beetles per trap location.

This region showed a **lower or more moderate pressure** compared to Minnesota. The pressure was more broadly distributed across the monitoring network.

Key Observations
High-Pressure Site: The highest-pressure site in this region recorded **a high of 30 beetles avg per trap** (Bon Homme County), indicating significant local pressure.

Zero Pressure: 6 of the 27 sites monitored (**22%**) recorded no beetle activity, a rate identical to the Minnesota network.

West Central Minnesota Summary:

Locations Monitored: 9 unique trap locations.
Total Beetles Collected: 539 beetles for the season.
Seasonal Average Pressure: 59.9 beetles per trap location.

This region was characterized by **moderate-high CRW pressure** concentrated in a few significant hotspots. The overall average was heavily skewed by these high-count locations.

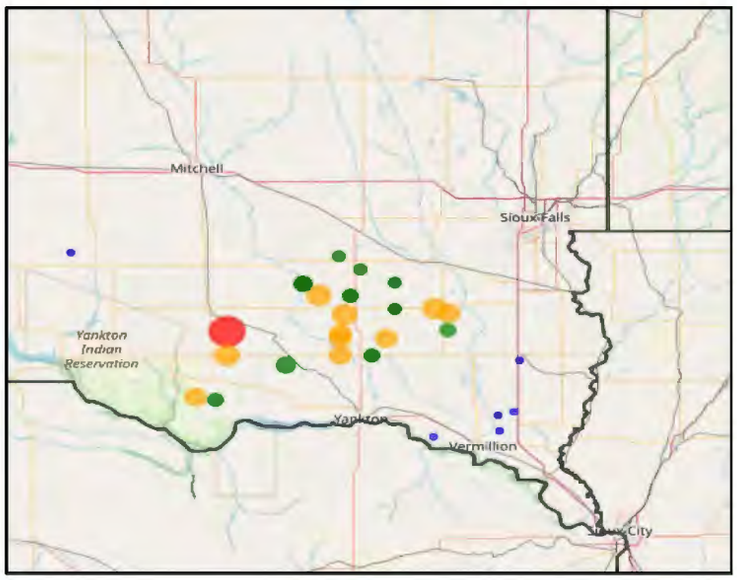
Key Observations
Hotspots: This region contained the highest-pressure sites. The top three locations (**163 beetles -** Grant County, **147 beetles -** Otter Tail**, and 105 beetles -** Wilkin County) accounted for **78%** of all beetles collected in Minnesota trap sites.

Zero Pressure: Despite the high average, 2 of the 9 sites (**22%**) recorded no beetle activity.

Western vs Northern Corn Root Worm counts:
The majority of beetle trapping was conducted in rotated acres which are more likely to host Northern CRW with extended diapause characteristics. In SD, about 70% of beetles trapped were Northern CRW and 30% Western CRW.

Beetle Trap Counts – 2025

Southeast South Dakota



West-Central Minnesota

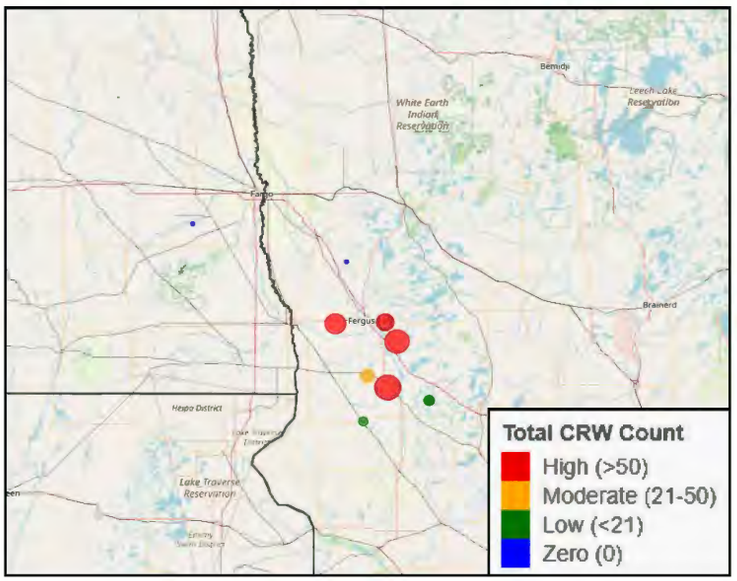


Figure 1. 2025 Beetle trap count for Southeast South Dakota and West-Central Minnesota. Maps illustrate total CRW beetle counts recorded across monitoring sites in each region. Marker colors represent pressure categories based on total beetles trapped: The Southeast South Dakota network showed a broader distribution of moderate pressure with localized high activity in Bon Homme County, while Minnesota exhibited concentrated high-pressure sites.

Extended Diapause in Northern Corn Rootworm

Key Points:

- Northern corn rootworm has adapted to crop rotation in some areas by altering its overwintering dormancy period via a mechanism called extended diapause.
- Populations exhibiting extended diapause have eggs that remain viable in the soil for two or more years before hatching, allowing the insect population to survive until corn returns to the rotation.
- Rotation-resistant northern corn rootworm can now be found throughout much of the northern Corn Belt and continues to expand its range to the south and east.
- Even with the extended diapause adaptation, crop rotation remains a highly effective management tactic.

Corn Rootworm

- Corn rootworm has long been one of the most damaging insect pests of corn in North America.
- The western corn rootworm (*Diabrotica virgifera virgifera*) and northern corn rootworm (*D. barberi*) can both be found throughout much of the Corn Belt, often coexisting in the same fields.
- Both species have a history of adapting to and overcoming control practices, which has increased the complexity and difficulty of successfully managing these pests.

Western Corn Rootworm

- Has three stripes, or one broad stripe, on the wing covers.
- The legs are partially black but not banded.

Northern Corn Rootworm

- Solid green color. Newly emerged adults may be tan or light yellow in coloration.
- No stripes or spots on the wing covers.

Crop Rotation as a Management Strategy

- Crop rotation is the most effective and widely used management strategy for corn rootworm today.
- Crop rotation works by depriving newly-hatched larvae of a food source.
  - Corn rootworm larvae need corn roots within close proximity to feed on in order to survive.
  - A field that has been rotated to a different crop lacks this food source, causing the larvae to starve and die.
- However, both western and northern corn rootworm have developed adaptations that have reduced the effectiveness of crop rotation in many areas.
  - Western corn rootworm began laying eggs in soybean fields, allowing larvae to survive in the subsequent season when the field was rotated back into corn.
  - Northern corn rootworm adapted its lifecycle, altering its overwintering dormancy period via a mechanism called **extended diapause**.

Newly-hatched corn rootworm larvae cannot move very far in the soil, only around 18 inches, so corn roots must be in close proximity for them to feed and survive.

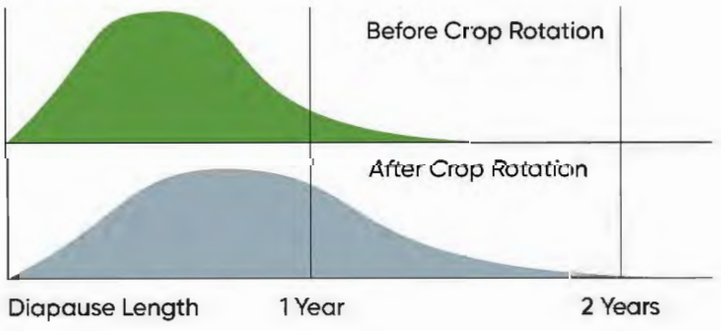
What is Diapause?

- Diapause is a delay in development in response to regular and recurring periods of adverse environmental conditions
- Diapause is a common adaptation of insect species in temperate regions to allow populations to survive over the winter.
- Winter dormancy for corn rootworm eggs overwintering in the soil consists of two phases: **obligate diapause** and **facultative quiescence** (Krysan, 1978).
- **Obligate diapause** begins in the fall when embryonic development ceases in eggs that have been deposited in the soil.
- The duration of diapause is genetically determined, hence the term *obligate* diapause.
- Duration of diapause can vary widely across populations and among individuals within a population (Branson, 1976; Krysan, 1982).

- The end of diapause often occurs sometime during the winter. At this point, dormancy enters the **facultative quiescence** phase, in which environmental conditions become the controlling factor in maintaining dormancy.
- Embryonic development remains suspended until soil temperature increases above a threshold at which development can resume.
- This two-phase dormancy allows insects to survive harsh winter conditions while being ready to resume development as soon as conditions turn favorable.

Extended Diapause in Northern Corn Rootworm

- Northern corn rootworm populations exhibiting extended diapause have eggs that remain viable in the soil for two or more years before hatching, allowing the insect population to survive until corn returns to the rotation.
- Selection pressure imposed on corn rootworm populations selects for individuals with a diapause duration that gives them the best chance for survival by timing hatch to correspond with food availability.
- Diapause length in northern corn rootworm is naturally variable, and populations have been able to use this variability to adapt to different crop rotation schemes.
- Repeated use of crop rotation as a means of control selected for individuals with a longer diapause period that allowed eggs to hatch when the field was rotated back to corn.



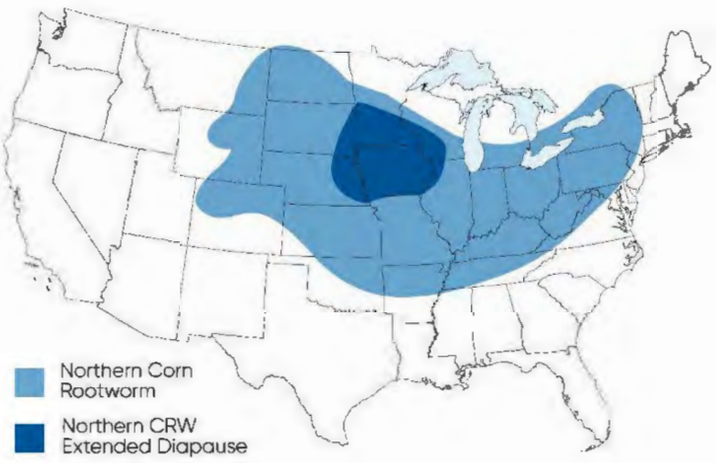
- Extended diapause can last up to four years and has shown adaptability to rotation patterns over time; i.e., fields with corn every other year have a relatively high percentage of eggs that hatch in the second year, and fields with corn every third year tend to have more eggs that hatch the third year, etc. (Levine et al. 1992).

Effect of Environmental Conditions

- Diapause in northern corn rootworm is genetically controlled, but the duration of dormancy is also influenced by environmental conditions.
- Exposure to low temperatures has been shown to accelerate dormancy termination in some insect species, including northern corn rootworm.
- Research has shown that northern corn rootworm eggs may need to be exposed to a minimum number of low temperature units before dormancy ends (Fisher et al., 1994).
- The range for these low temperature units appears to be between 37 and 59°F (3-15°C). Temperatures above or below this range do not affect the duration of dormancy.
- Consequently, an overwintering period with a below average number of days falling within this temperature range may extend dormancy and result in a greater proportion of the rootworm population hatching the following year.

Occurrence and Spread of Extended Diapause

- Instances of northern corn rootworm damage to corn grown in rotation with other crops was noted as far back as the 1930s.
- Rotation-resistant northern corn rootworm can now be found throughout much of the northern Corn Belt and continues to expand its range to the south and east.



Management Considerations

- Corn growers within or near the geographic area where extended diapause has been observed should be on the lookout for rootworm damage in 1st-year corn fields.
- Employ best management practices for corn rootworm that focus on controlling population levels using an integrated management strategy.
- Crop rotation can still have value in extended diapause areas for reducing rootworm population levels, particularly if western corn rootworm is present as well.

References

Branson, T.F. 1976. The selection of a non-diapause strain of *Diabrotica virgifera* (Coleoptera: Chrysomelidae). Entomologia Experimentalis et Applicata. 19:148-154.

Fisher, J.R., J.J. Jackson, and A.C. Lew. 1994. Temperature and diapause development in the egg of *Diabrotica barberi* (Coleoptera: Chrysomelidae). Environ. Entomol. 23:464-471.

Krysan, J.L. 1978. Diapause, quiescence, and moisture in the egg of the western corn rootworm, *Diabrotica virgifera*. J Insect Physiol. 24:535-540.

Krysan, J.L. 1982. Diapause in the nearctic species of the *virgifera* group of *Diabrotica*: evidence for tropical origin and temperate adaptations. Annals of the Entomol. Soc. of Am. 75:136-142.

Levine, E., H. Oloumi-Sadeghi, and J.R. Fisher. 1992. Discovery of multiyear diapauses in Illinois and South Dakota northern corn rootworm (Coleoptera: Chrysomelidae) eggs and incidence of the prolonged diapauses trait in Illinois. J. Econ. Entomol. 85:262-267.

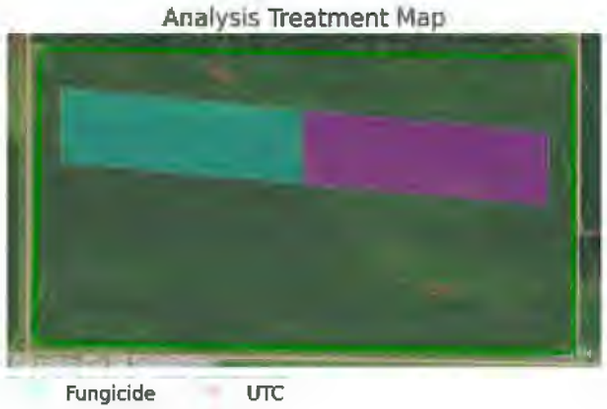
Author: Mark Jeschke

Soybean PKP + Fungicide, near Huron, SD 2025

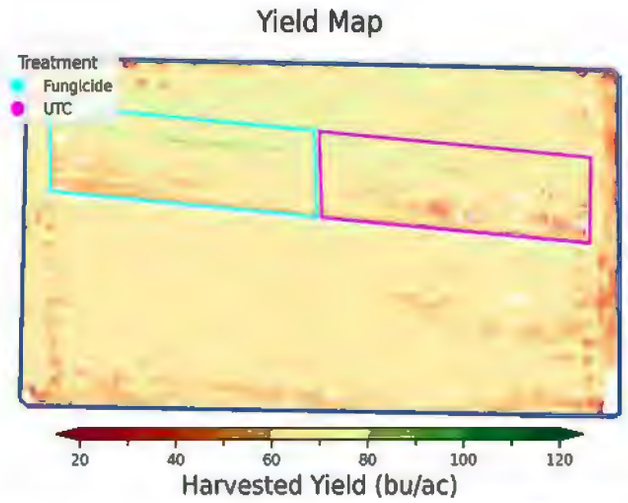
Variety by Fungicide Response

This soybean variety trial near Huron, SD conducted by Pioneer Sales Rep Curtis Bauman is a great example of how, in adding one additional factor, we can set up additional observation and learning opportunities in our Product Knowledge Plots (PKP).

In this 8-acre trial in Beadle County SD, the grower planted 17 mostly Z-Series Pioneer soybean varieties in field-length strips and followed up at flowering time with a foliar fungicide application on half of the field. At harvest, combine data was analysed in Granular Insights. The team was able to: learn about the relative performance of each product; get good looks at how each variety grows and responds to in-season stress at the location; if disease pressure had been severe, they also would have been able to note each variety's performance against the disease, with or without foliar fungicide. In this case, disease pressure was generally low yet fungicide response was positive for all but 2 varieties. Average response was over 2 bu/ac.



Fungicide Treatment: Forcivo™ (Corteva)
Application Details: 8oz/ac applied Aug 5, 2025 (R3 stage)
Planting: April 30, 2025
Harvest: October 9, 2025

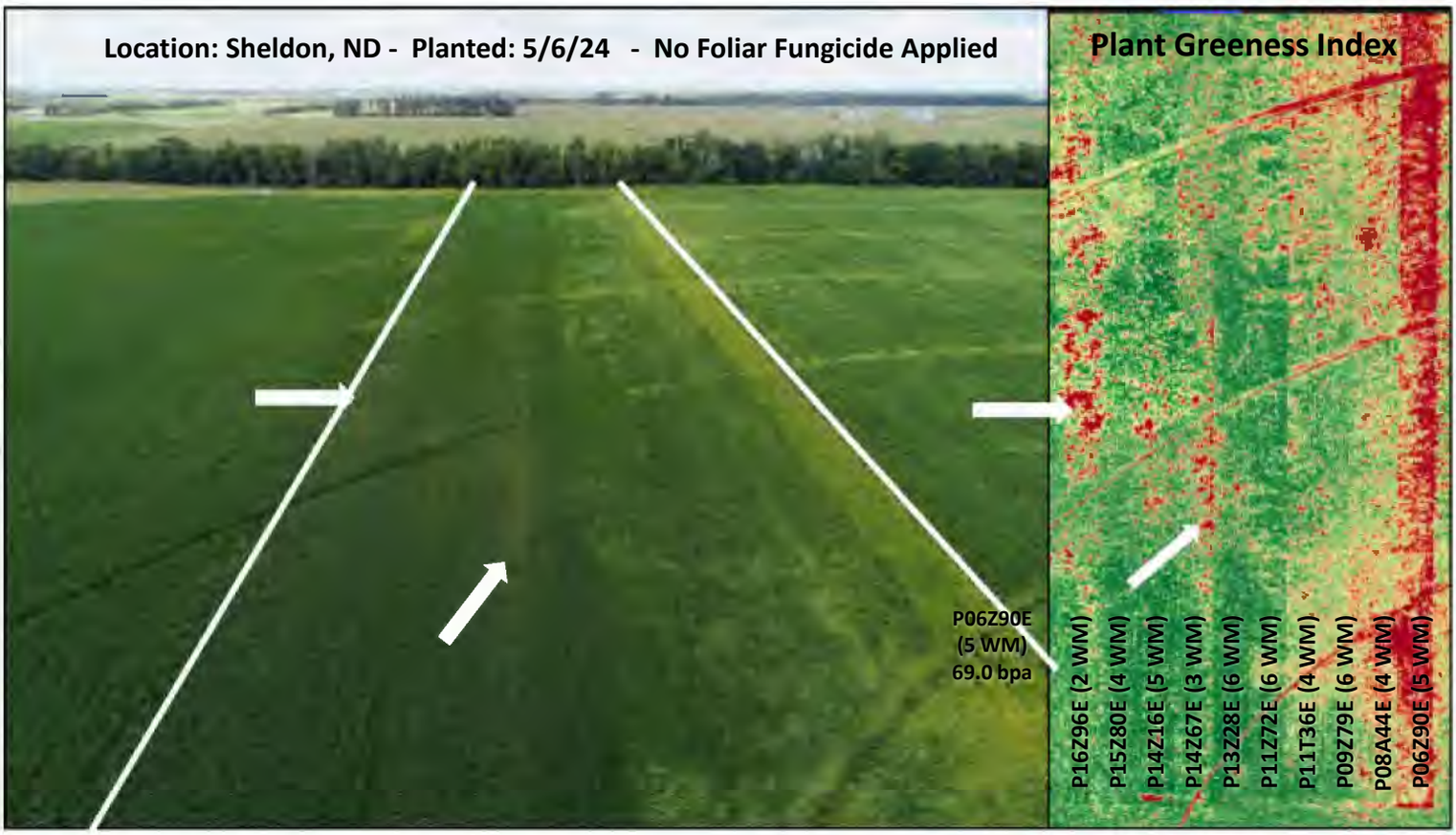


Variety	Untreated Yield (bu/ac)	Fungicide Treated Yield (bu/ac)	Advantage to Fungicide
P11Z72E	55.5	56.8	1.3
P13Z28E	61.5	60.9	-0.6
P14Z08E	60	60.9	0.9
P14Z67E	59.2	64.4	5.2
P15Z80E	59.9	61.1	1.2
P16Z25E	61.5	61.9	0.4
P16Z42E	62.8	65.4	2.6
P16Z96E	63.2	63.7	0.5
P17Z39E	65.8	67.4	1.6
P19A37E	70.4	69.2	-1.2
P19Z25E	63.6	67.2	3.6
P20Z14E	63	67.1	4.1
P21Z71E	68.9	77.1	8.2
P21Z88E	70.8	74.5	3.7
P22Z02E	69.3	70.1	0.8
P23Z58E	67.7	69.5	1.8
P25Z11E	70.7	74.4	3.7
Mean:	**64.4**	**66.6**	**2.2**

data coordinated by Wes Helkenn, Field Agronomist

PIONEER agronomy

Soybean White Mold – Sheldon, ND (2024)



P16Z96E (2 WM) 55.0 bpa	P15Z80E (4 WM) 63.0 bpa	P14Z16E (5 WM) 61.5 bpa	P14Z67E (3 WM) 61.3 bpa	P13Z28E (6 WM) 68.6 bpa	P11Z72E (6 WM) 66.9 bpa	P11T36E (4 WM) 67.1 bpa	P09Z79E (6 WM) 65.3 bpa	P08A44E (4 WM) 64.6 bpa

Greenness Index
Imagery captured by drone

White Mold by Variety under low to moderate pressure

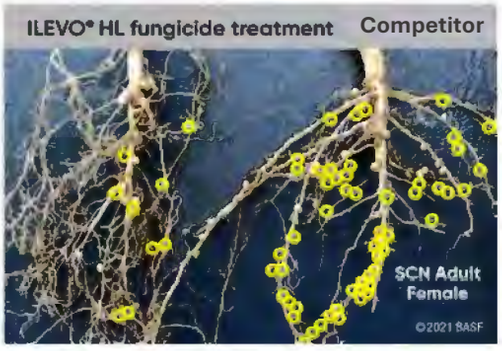
Soybean white mold typically causes plant damage and yield loss sporadically throughout affected fields. Irrigated acres, tend to have more problem areas. In the imagery above, hot spots for WM are indicated by arrows both in the full color image as well as in the false color (green index) image. Disease pressure was unexpectedly low in 2024 as conditions overall must have been less than ideal for severe disease. Nevertheless, yields in varieties with low white mold ratings tended to yield lower here even under lower pressure, and varieties like P13Z28E & P11Z72E with strong white mold tolerance are near the top yield in the plot. Of note here is the strip on the far right, P06Z90, a 0.6RM soybean with strong white mold tolerance and strong yield (leading the plot with 69 bu) is showing less greenness only due to its relative maturity at the time the photo was captured.

VARIETY	White Mold Score	YIELD (Bu/ac)
P16Z96E	2	55.0
P15Z80E	4	63.0
P14Z16E	5	61.5
P14Z67E	3	61.3
P13Z28E	6	68.6
P11Z72E	6	66.9
P11T36E	4	67.1
P09Z79E	6	65.3
P08A44E	4	64.6
P06Z90E	5	69.0

conducted / photographed by JJ Jaehning, Field Agronomist

PIONEER agronomy

Sudden Death Syndrome & ILeVO® HL Seed Treatment



ILeVO® HL Seed Treatment for SCN & SDS in Soybean

Soybeans in the Northern Plains deal with a number of damaging soil-borne pathogens/diseases including soybean cyst nematode (SCN) and sudden death syndrome (SDS, caused by *Fusarium virguliforme*). Pioneer uses a strong combination of fungicide modes of action in their Lumigen™ seed treatments, but as an additional layer of protection in areas with pressure from SDS and SCN, ILeVO® HL Seed Treatment offers protection from both, with demonstrated yield response, especially under situations where one or both are known to cause more problems. In this example above, the grower treated P13Z28E soybeans with ILeVO® HL which were planted into a field that showed significant pressure from SDS in 2025. A second variety, P11Z91E was planted also, but without the ILeVO HL, only standard fungicide seed treatment. The image above clearly shows the plant health differences.

conducted / photographed by JJ Jaehning, Field Agronomist

Sudden Death Syndrome of Soybeans

Key Points

- Sudden death syndrome (SDS) is a fungal disease of soybeans that infects the roots early in the season.
- The fungus produces a toxin that is translocated up the plant and causes foliar symptoms, which typically appear later in the season.
- SDS-tolerant varieties, fungicide seed treatments, management of SCN, and improved soil drainage can help minimize damage from SDS.
- Foliar fungicides have no effect since the infection is in the roots.

A Major Disease of Soybean

- Sudden death syndrome (SDS) is one of the most economically important yield-limiting diseases of soybean in North America.
- Since its initial discovery in Arkansas in the early 1970s, it has spread to infect soybean fields in almost all U.S. soybean-growing states and Ontario, Canada.
- SDS is capable of causing significant yield loss in soybeans, with reductions exceeding 50% in the most severe cases.

Causal Pathogen

- In North America, SDS is caused by the fungal pathogen *Fusarium virguliforme*, formerly known as *F. solani* f. sp. *glycines*.
- *F. virguliforme* is believed to be an invasive pathogen that originally evolved in South America.
- *F. virguliforme* survives in root debris and soil as chlamydospores, which are thick-walled, asexual fungal spores.
- As the soil warms up in the spring, chlamydospores germinate and can infect nearby soybean roots.
- Infection of soybean plants occurs early in the growing season, often as early as germination to just after crop emergence.
- The fungus colonizes cortical tissue of the roots. It has been isolated from both the taproots and lateral roots, but infection does not extend above the crown of the plant.
- Later in the season, the fungus will penetrate the xylem tissue in the roots and produce a toxin that is translocated up the plant and causes the characteristic foliar symptoms (Figure 1).
- *F. virguliforme* produces spores (macroconidia) on the surface of infected roots during the summer, which then convert to chlamydospores and are sloughed off of the plant.
- Within a growing season, these spores will only spread a short distance from infected plants, but flowing water and movement of soil can spread the pathogen over greater distances.

Figure 1. Soybean leaf showing classic symptoms of sudden death syndrome infection, with yellow and brown areas contrasted against a green midvein and green lateral veins.

Root and Stem Symptoms

- SDS begins as a root disease that limits root development and deteriorates roots and nodules, resulting in reduced water and nutrient uptake by the plant.
- On severely infected plants, a blue coloration may be found on the outer surface of tap roots due to the large number of spores produced (Figure 2).
- Splitting the root will reveal that the cortical cells have turned a milky gray-brown color while the inner core, or pith, remains white (Figure 3).

Figure 2. Microscopic view of blue colored spore masses on the root of a soybean plant infected with SDS (left) and *F. virguliforme* growth on artificial media (right).

Leaf Symptoms

- Leaf symptoms usually do not appear until the reproductive stages of crop development.
- Leaf symptoms of SDS first appear as yellow spots, usually on the upper leaves, in a mosaic pattern. The yellow spots coalesce to form chlorotic blotches between the leaf veins (Figure 4).

- As these chlorotic areas begin to die, the leaf symptoms become very distinct, with yellow and brown areas contrasted against a green midvein and green lateral veins.
- Rapid drying of necrotic areas can cause curling of affected leaves. Leaves drop from the plant prematurely, but leaf petioles remain firmly attached to the stem.

Figure 3. Split soybean plant stems showing the discolored cortical tissue of a SDS-infected plant compared to a healthy plant.

Conditions Favoring Disease Development

- SDS often appears first in localized spots in the field, such as low, poorly drained, or compacted areas (Figure 5).
- Higher incidence of SDS often occurs when soybeans have been exposed to cool, moist soil conditions early in the growing season.
- SDS symptoms are usually more severe if SCN is also problematic in the field. SCN increases the stress on the soybean plant and also provides wounds through which the SDS pathogen can enter the roots.

Figure 4. Field view of sudden death syndrome symptoms. Note yellow and brown areas contrasted against a green midvein and green lateral veins. Rapid drying of necrotic areas can cause curling of affected leaves.

- The appearance of symptoms is often associated with weather patterns that bring cooler temperatures and significant rainfall to an area during flowering or pod-fill.
- Wet soils can increase the production and translocation of the toxin responsible for foliar symptoms.

Figure 5. Aerial view of a soybean field with SDS. Symptoms are more prevalent near waterways and areas with poor drainage.

Management

- There are no management options available to protect yield once foliar symptoms of SDS begin to appear. Foliar fungicides have no effect since the infection is in the roots.
- Scouting and management strategies are focused on mitigating disease impact in subsequent seasons.
- The first line of defense against SDS is genetic tolerance of soybean varieties.
- Soybean varieties can differ significantly in susceptibility to SDS infection, with tolerance exhibited primarily as a reduction in symptom severity.
- SCN resistance is also an important consideration for variety selection, since SCN injury can exacerbate SDS problems.
- ILEVO® HL fungicide (active ingredient: fluopyram) is a seed treatment that provides protection of soybean seedlings from *F. virguliforme* infection.
- Improving field drainage and reducing compaction can help reduce severity of SDS.

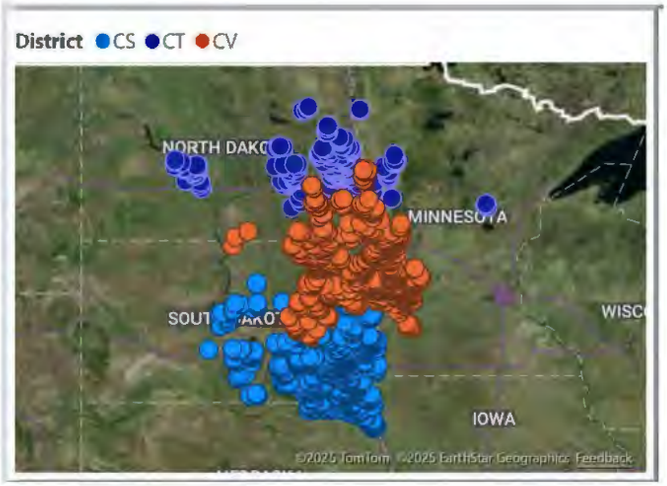
Author: Mark Jeschke

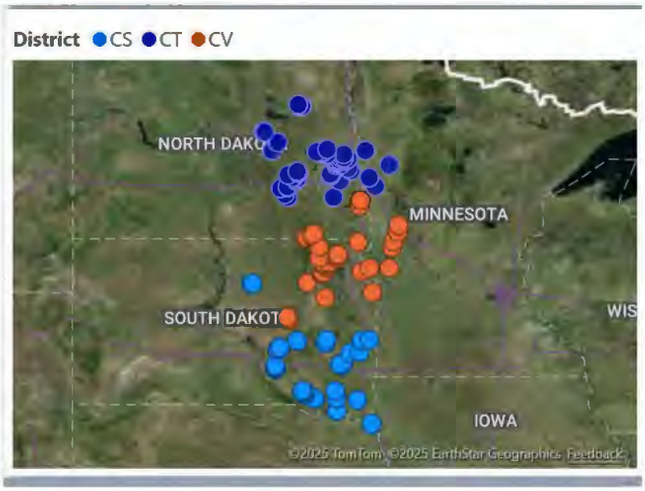
Vol. 17 No. 14 August 2025

PIONEER®

EVERY. BUSHEL. COUNTS.

Northern Plains Harvest Results 2025
Granular Insights Connected Operations





Yields From Your Fields – Connected Harvest Results

Crop & Geography:	Yield Avg (bu/ac)	Acres (approx.)	Fields (approx.)
CORN (Grain) HARVEST:			
Northern Plains (Area CE)	**199**	**300,000**	**3050**
Dist. CS (Southern SD)	203	126,500	1300
Dist. CV (No. SD/So. ND/WC MN)	201	125,000	1300
Dist. CT (North Dakota/NW MN)	182	48,500	450
SOYBEAN HARVEST:			
Northern Plains (Area CE)	**43**	**118,000**	**1200**
Dist. CS (Southern SD)	55	24,000	230
Dist. CV (No. SD/So. ND/WC MN)	48	25,000	270
Dist. CT (North Dakota/NW MN)	38	69,000	700

Data is taken as an anonymous summary of all 2025 harvest data entered in 'Granular Insights' from connected operations. Data represents the area indicated in the maps above, and is a summary of all brands, products, and fields.

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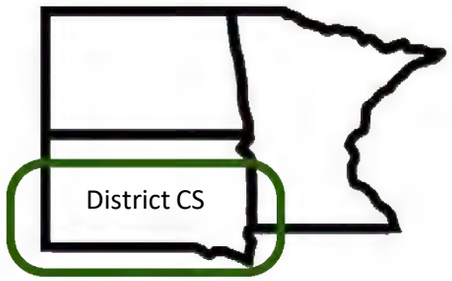
Corn Platform Yield Performance vs. All Competitors within +/-5 CRM, District CS (Southern and SE SD)

Platform data include all tested versions against all competitive products within 5 CRM. Data from 2025 performance trials and side-by-sides as of 11/7/2025 in District CS, which includes the southernmost 2/3 of South Dakota.



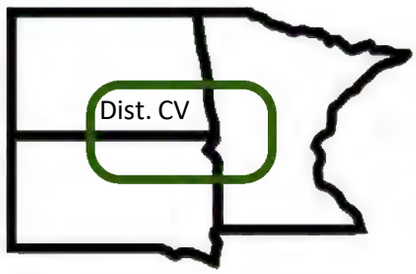
Evaluating performance across yield ranges gives indirect information on how a hybrid compares to competitors across differences in geographical areas, stress conditions, soil types and other factors with strong relationship to yield level.

	Yield Levels (bu/ac range)											
	<150		150-180		180-210		210-240		240-270		>270	
Platform:	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins
P9624	3.9	57%	5.0	64%	-1.3	48%	-4.0	40%	-7.7	36%		
P96760	-5.4	60%	-2.6	48%	7.3	70%	-0.6	50%	-0.8	42%		
P97299	3.2	61%	3.6	65%	1.5	59%	0.9	53%	-2.6	40%		
P9955	1.1	44%	4.4	60%	6.9	66%	2.2	59%	2.0	55%		
P0046	9.9	88%	13.3	93%	-7.5	39%	-2.4	23%	-2.8	33%		
P0075	6.0	61%	-0.5	56%	1.6	52%	-3.1	37%	-2.6	35%		
P0339	14.3	87%	10.4	79%	-5.4	42%	0.3	48%	4.1	60%		
P03951	5.5	50%			1.9	40%	10.5	79%	8.4	72%	18.6	82%
P0404	7.4	88%	4.3	62%	4.4	57%	-0.8	47%	-1.4	48%	1.1	38%
P05466	-1.5	27%	-2.4	50%	4.8	52%	2.7	56%	3.1	59%	9.3	67%
P05737	6.5	65%	16.7	86%	11.0	70%	6.0	64%	5.9	64%	8.5	55%
P0622	25.1	80%	-2.3	38%	5.3	64%	1.4	53%	3.1	63%	-4.3	31%
P08527	2.9	67%	0.5	40%	13.3	77%	12.7	83%	14.0	81%	6.6	58%
P0859	10.2	69%	3.4	69%	8.9	67%	12.9	78%	7.9	70%	6.2	63%
P09312			16.3	100%	17.1	100%	11.0	79%	7.0	70%	5.2	64%
P10625	-0.5	50%	5.7	73%	20.9	80%	3.3	58%	2.8	57%	1.7	47%
P1185	10.6	70%	5.0	64%	0.4	55%	6.7	71%	8.7	74%	6.7	69%
P13050	23.4	97%	4.9	57%	3.9	58%	5.1	67%	3.8	56%	5.4	70%
P13777	2.7	37%	41.0	92%	12.7	74%	13.0	83%	17.8	92%	18.8	93%

PIONEER agronomy

Corn Platform Yield Performance vs. All Competitors within +/-5 CRM, District CV

Platform data include all tested versions against all competitive products within 5 CRM. Data from 2025 performance trials and side-by-sides as of 11/7/2025 in District CV, which includes southeast ND, northeast SD, and west-central MN.



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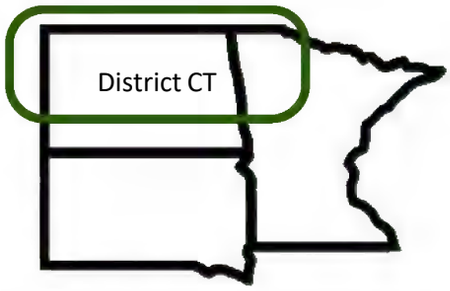
	Yield Levels (bu/ac range)											
	<150		150-180		180-210		210-240		240-270		>270	
Platform:	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins	Yield Adv. (bu.a)	% Wins
P90630	1.7	61%	5.1	66%	5.8	65%	5.6	67%	-3.3	37%		
P9193	-6.7	31%	-0.3	42%	0.3	48%	-3.6	44%	-4.0	48%		
P92399	0.1	59%	9.4	75%	2.5	56%	2.4	56%	1.7	69%		
P9492	2.4	50%	0.8	56%	1.9	54%	0.3	49%	-1.9	49%		
P9540	3.2	71%	3.6	68%	1.8	55%	0.4	46%	-3.0	31%		
P95819	-1.0	57%	3.9	58%	6.8	63%	4.1	58%	3.9	54%		
P9624	3.9	57%	5.0	64%	-1.3	48%	-4.0	40%	-7.7	36%		
P96760	-3.1	51%	1.5	57%	12.6	74%	9.5	70%	11.2	68%		
P97299	3.0	49%	4.4	61%	5.9	62%	5.5	62%	2.5	55%		
P9823	-5.3	52%	-1.8	52%	1.9	55%	7.4	67%	7.7	66%		
P9830	-3.1	42%	1.4	55%	4.2	54%	3.8	57%	10.1	73%		
P98533	-3.5	55%	2.8	53%	6.4	58%	8.7	70%	9.0	66%		
P9955	-8.5	39%	6.2	61%	5.9	62%	3.7	58%	7.7	66%		
P0075	-2.9	47%	-4.7	48%	0.4	48%	-0.2	48%	4.8	60%		
P0339	-7.5	45%	-7.7	36%	3.1	57%	3.0	56%	4.3	60%		
P0404	7.8	65%	-4.8	41%	8.7	70%	3.7	59%	2.2	55%	1.1	38%
P05466	2.4	52%	-0.5	44%	10.4	62%	7.1	63%	10.0	69%	9.3	67%
P05737	3.6	57%	15.7	81%	10.7	69%	2.3	56%	3.0	57%	8.5	55%
P0622	2.2	61%	6.4	58%	11.0	76%	6.6	61%	8.0	66%	-4.6	29%

PIONEER agronomy

Corn Platform Yield Performance vs. All Competitors within +/-5 CRM, District CT

Platform data include all tested versions against all competitive products within 5 CRM. Data from 2025 performance trials & side-by-sides as of 11/7/2025 in District CT (Northern MN, Northern ND, MT & WY).

Evaluating performance across yield ranges gives indirect information on how a hybrid compares to competitors across differences in geographical areas, stress conditions, soil types and other factors with strong relationship to yield level.



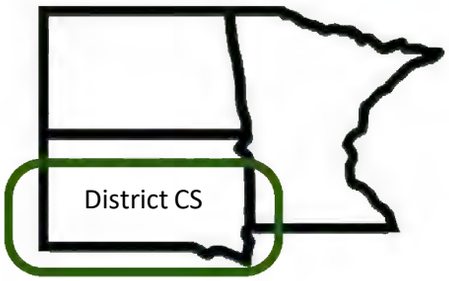
	Yield Levels (bu/ac range)									
	<150		150-180		180-210		210-240		240-270	
Platform:	Yield Adv. (bu/ac)	% Wins	Yield Adv. (bu/ac)	% Wins	Yield Adv. (bu/ac)	% Wins	Yield Adv. (bu/ac)	% Wins	Yield Adv. (bu/ac)	% Wins
P7389	-1.9	42%	-5.0	31%	-6.5	32%	-8.5	22%		
P74691	-4.7	50%	-6.8	31%	-13.3	18%	2.1	57%		
P7527	0.6	56%	-2.9	42%	-4.0	33%	-2.3	50%		
P7844	-1.9	39%	-2.3	42%	-3.8	36%	3.2	54%		
P7861	0.8	48%	-5.5	34%	-6.8	26%	-6.0	23%		
P8048	0.8	53%	-0.5	46%	-0.4	44%	-2.2	40%		
P82288	1.0	48%	1.3	55%	1.4	54%	4.0	64%		
P8588	-1.0	47%	-7.1	31%	-7.6	29%	-5.7	26%		
P8592	1.5	50%	0.4	53%	2.9	59%	1.3	55%		
P8602	-2.5	46%	0.6	55%	3.6	59%	6.4	64%		
P87040	-4.2	36%	0.3	50%	4.8	65%	7.5	70%		
P88044	-3.2	40%	-20.2	69%	3.2	58%	1.4	54%		
P8859	-4.5	33%	-0.5	43%	0.0	49%	-0.9	45%		
P90630	1.7	61%	5.1	66%	5.8	65%	5.6	67%	-3.3	37%
P91083	-4.8	35%	-1.0	40%	4.9	63%	0.3	52%	8.5	83%
P9188	-6.5	36%	1.0	53%	-3.3	43%	-6.4	39%	6.1	75%
P92399	0.1	59%	9.4	75%	2.5	56%	2.4	56%	1.7	69%
P9492	2.4	50%	0.8	56%	1.9	54%	0.3	49%	-1.9	49%
P9540	3.2	71%	3.6	68%	1.8	55%	0.4	46%	-3.0	31%
P96760	-3.1	51%	1.5	57%	12.6	74%	9.5	70%	11.2	68%

Soybean Yield by Yield Level
District CS

Soybean Yield Performance vs. All Competitors within +/- 3 RM, District CS (Southern and SE SD)

Soybean variety performance against all competitive products within 3 RM. Data from 2025 performance trials and side-by-sides as of 11/7/2025 in District CS, which includes the southernmost 2/3 of South Dakota.

Evaluating performance across yield ranges gives indirect information on how a variety may compare to competitors across differences in geographical areas, stress conditions, soil types and other factors with strong relationship to yield level.

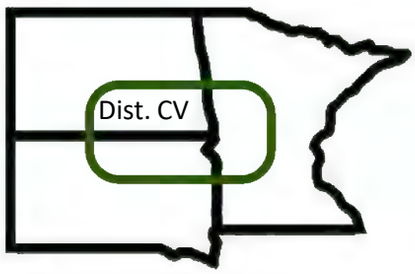


	Yield Levels (bu/ac range)									
	30-50		50-60		60-70		70-80		>80	
Variety:	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins
P11Z72E	-1.3	45%	0.6	56%	1.5	63%	0.9	52%		
P13Z28E	-2.0	41%	-0.2	48%	1.3	63%	4.7	82%		
P14Z16E	-1.4	42%	0.0	49%	1.1	60%	2.1	72%		
P14Z67E	-0.1	48%	0.9	59%	1.7	62%	2.5	76%		
P16Z42E	-0.3	49%	0.6	57%	-1.0	47%	-0.8	47%	-0.6	44%
P17Z39E	1.1	62%	1.7	64%	1.2	60%	1.7	63%	2.1	63%
P18A73E	-1.6	37%	-2.4	25%	-2.3	26%	-1.6	31%	-4.2	19%
P19A37E	1.3	69%	-0.3	49%	0.5	52%	0.9	56%	0.4	55%
P19A66E	2.5	75%	-0.1	55%	0.1	52%	2.5	71%	0.2	47%
P19Z52E	-0.1	52%	2.5	77%	2.8	71%	2.8	72%	5.0	81%
P21Z71E	-1.0	43%	1.4	66%	3.2	71%	4.7	85%	5.5	85%
P21Z88E	2.9	71%	0.1	49%	0.9	54%	2.9	74%	4.0	74%
P23Z58E	-0.5	46%	0.6	54%	2.3	68%	3.2	74%	4.2	85%
P25A16E	-1.0	36%	-0.1	53%	2.0	68%	0.4	50%	2.0	59%
P26Z78E	2.4	73%	1.8	71%	3.7	76%	2.5	69%	3.0	73%
P27Z41E	3.5	86%	2.5	71%	5.8	87%	4.1	73%	4.2	72%
P28Z30E	1.5	53%	3.4	80%	6.1	90%	5.4	80%	4.6	75%
P30A75E	5.7	85%	4.7	85%	6.1	85%	3.1	63%	1.6	63%
P31Z03E	7.9	83%	4.8	94%	9.8	82%	7.4	87%	4.4	81%

Soybean Yield by Yield Level District CV

Soybean Yield Performance vs. All Competitors within +/- 3 RM, District CV

Soybean variety performance against all competitive products within 3 RM. Data from 2025 performance trials and side-by-sides as of 11/7/2025 in District CV, which includes southeast ND, northeast SD, and west-central MN.



Evaluating performance across yield ranges gives indirect information on how a variety may compare to competitors across differences in geographical areas, stress conditions, soil types and other factors with strong relationship to yield level.

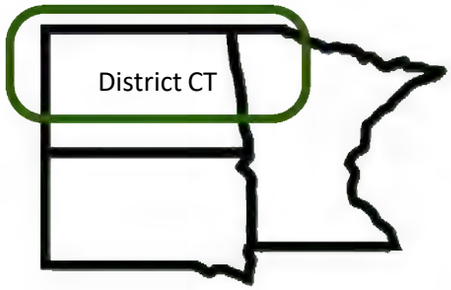
	Yield Levels (bu/ac range)									
	30-50		50-60		60-70		70-80		>80	
Variety:	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins
P06Z90E	-1.0	49%	-0.3	46%	-0.6	42%				
P08A44E	2.3	74%	1.2	62%	0.6	54%	-0.5	50%		
P09Z79E	2.4	74%	0.6	59%	0.0	48%	2.3	80%		
P11T36E	-3.1	36%	0.4	53%	2.9	69%	4.6	82%		
P11Z72E	-1.3	44%	0.6	56%	1.8	66%	0.9	50%		
P11Z91E	-1.3	33%	0.8	58%	-0.5	49%				
P13Z28E	-2.0	41%	-0.2	48%	1.2	62%	4.6	81%		
P14Z16E	-1.4	42%	0.0	49%	1.1	59%	1.9	69%		
P14Z67E	-0.1	48%	0.8	58%	1.6	61%	2.6	77%		
P15Z80E	-0.4	38%	1.0	53%	1.0	58%	1.7	65%	-1.1	33%
P16Z42E	-0.3	49%	0.6	57%	-0.9	47%	-1.0	46%	-0.6	44%
P16Z96E	0.0	46%	1.2	59%	0.0	51%	1.0	54%	0.0	50%
P17Z39E	1.1	62%	1.6	63%	1.2	60%	1.4	60%	2.1	63%
P18A73E	-1.6	37%	-2.4	25%	-2.4	26%	-1.7	29%	-4.2	19%
P19A37E	1.3	69%	-0.5	48%	0.5	52%	0.7	54%	0.4	55%
P19Z52E	-0.2	51%	2.5	77%	2.8	71%	2.6	71%	5.0	81%
P20Z14E	1.3	57%	0.7	58%	2.9	71%	4.2	85%	4.6	76%
P21Z88E	2.9	70%	0.1	48%	0.8	54%	3.0	76%	4.0	74%
P22A67E	-0.9	40%	0.3	50%	1.2	63%	2.7	71%	2.8	69%
P23Z58E	-0.4	45%	0.6	53%	2.1	67%	3.4	77%	3.9	84%

Soybean Yield by Yield Level
District CT

Soybean Yield Performance vs. All Competitors within +/- 3 RM, District CT

Soybean variety performance against all competitive products within 3 RM. Data from 2025 performance trials and side-by-sides as of 11/7/2025 in District CT, which includes Northwest MN, most of ND, MT, & WY

Evaluating performance across yield ranges gives indirect information on how a variety may compare to competitors across differences in geographical areas, stress conditions, soil types and other factors with strong relationship to yield level.



	Yield Level (bu/ac range)											
	<30		30-40		40-50		50-60		60-70		70-80	
Variety:	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins	Yield Adv. (Bu/A)	% Wins
P004Z87E					-0.2	58%	4.9	78%				
P007A68E					-1.5	41%	1.6	52%	-2.5	%		
P007Z45E			-3.7	50%	1.0	60%	0.8	59%	1.5	100%		
P009Z94E			1.7	75%	3.8	74%	0.2	51%	1.2	40%		
P00Z65E	-3.3	20%	1.4	63%	4.1	63%	0.5	60%	1.8	75%		
P02A78E	0.0	50%	0.2	31%	3.1	62%	0.5	55%	-0.4	31%		
P02Z34E	0.1	50%	4.2	83%	5.0	74%	1.7	67%	0.6	38%		
P04A98E	2.2	67%	3.5	75%	5.1	86%	2.6	76%	4.4	76%		
P04Z49E	-0.3	67%	0.5	50%	4.1	72%	1.3	61%	1.4	60%		
P05Z60E	12.0	100%	-0.2	69%	0.1	58%	-0.3	45%	1.4	62%		
P06A38E	0.9	67%	-1.1	18%	0.2	51%	-0.8	43%	0.4	48%		
P06Z90E	-7.0	%	-1.5	54%	-0.2	53%	-0.2	46%	-0.2	48%	-1.4	38%
P08A44E	10.4	100%	4.0	93%	1.2	67%	1.3	62%	0.6	56%	-0.5	50%
P09Z79E	-0.6	67%	4.4	94%	2.0	68%	0.6	58%	0.0	48%	2.3	80%
P11T36E			-1.2	33%	-3.3	38%	0.4	54%	2.9	69%	4.6	82%
P11Z72E			-1.7	33%	-1.2	47%	0.6	56%	1.8	66%	0.9	50%
P13Z28E			0.0	44%	-2.3	41%	-0.2	48%	1.2	62%	4.6	81%
P14Z16E			-9.2	%	-0.6	46%	0.0	49%	1.1	59%	1.9	69%
P14Z67E			-2.7	29%	0.1	50%	0.8	58%	1.6	61%	2.6	77%


INNOVATION

Fungicide Timing Pilot

PIONEER®

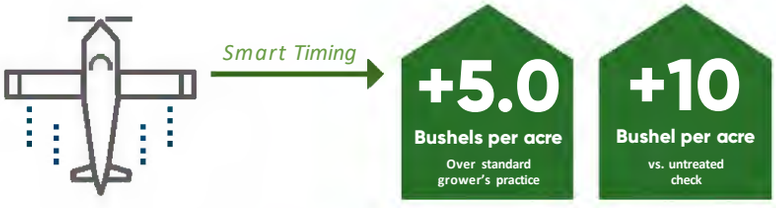
MAXIMIZING RETURN ON INVESTMENT & SIMPLIFYING APPLICATION DECISIONS

Tired of guessing when to spray a corn fungicide? Leverage Corteva's smart application technology to customize the timing of your fungicide application to your operation.

Maximize Corn Performance

Backed by Corteva's most robust agronomic science, research and pathology expert rules, Fungicide Timing monitoring of Northern Corn Leaf Blight and Gray Leaf Spot provides growers a straightforward fungicide decision and optimized yield protection.

APPLICATION **RETURN ON INVESTMENT**



*2 years of strip trial results

Efficiently Scout for Disease

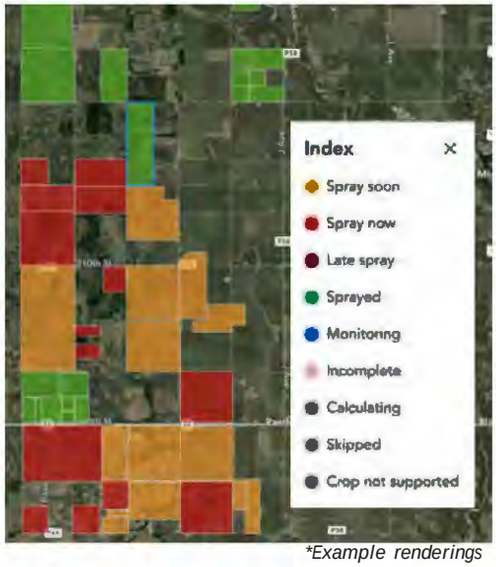
Leverage the latest technology to gain customized field specific guidance of where and when to spray to hit the optimum window. Fungicide Timing monitors disease progression daily, saving time scouting and providing peace of mind as to what is happening in each field.

Protect your Investment

Use a 10-day forecast with a 4-day treatment window to apply precisely. Protect fungicide and seed investments by using:

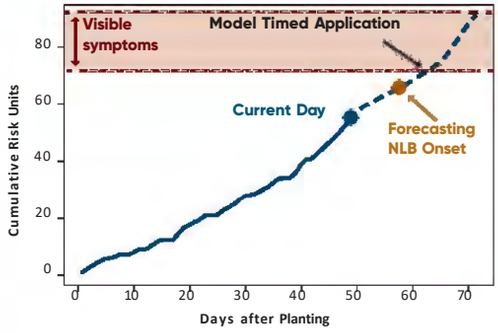
- Actual + Forecasted Weather
- Grower Management practices
- Leading Agronomic models
- Pioneer Genetics

FUNIGICIDE TIMING DASHBOARD MAP VIEW

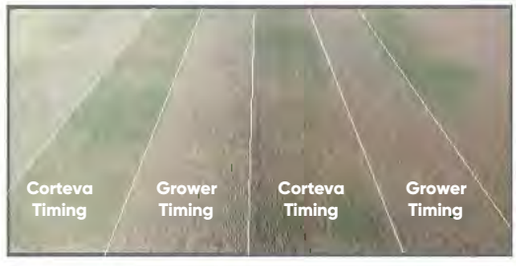


*Example renderings

MODEL PREDICTION SIMULATION



ON-FARM STRIP TRIAL TESTING OF GROWER STANDARD PRACTICE VS CORTEVA MODEL



*2023 & 2024 strip trials across multiple locations in Midwest. Grower standard timing, Corteva model timing and untreated checks.

CORTEVA™ agriscience

PIONEER.

Pre-Harvest Yield Guide Job Aid

A field-by-field preview of corn performance with hybrid summary data

Visualize pre-harvest performance use case trends across your geography

- Draw attention to fields off target
- Discover early product performance trends
- Help key customers plan for harvest
- Track competitor performance

Note: To predict yield, as-planted and matched canonical hybrid is needed.

How to Access Use Case Data

Visualize use-case data by clicking the blue links (Figure 1). Once you have clicked into a use case you can filter the data to begin solving that use case and explore deeper into the solution.

Figure 1

Pre-Harvest Yield View

Examine each district's fields from three viewpoints at scale (Figure 2).

- Field +- to Target
- Pre-Harvest Yield
- County +- to Target

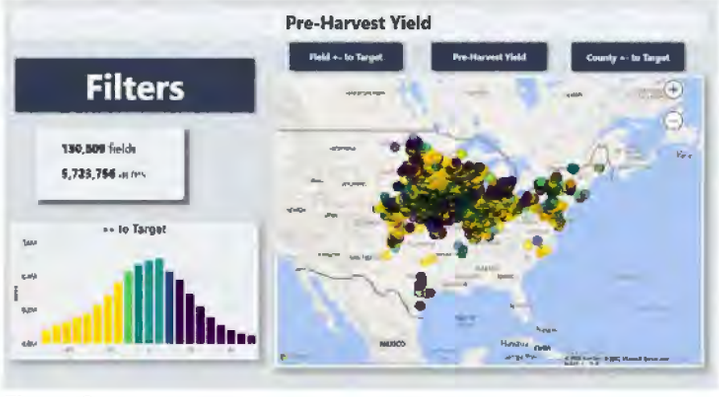


Figure 2

The 'Filters' button in the top left allows you to sort by various criteria such as:

- Hybrid
- Irrigation
- Tech Segment
- Drought Tolerance
- CRM
- Ear Flex
- Silk CRM
- Commercialized Year

Once a filter is set it will stay active when navigating between pages.

Tabular View

Sift through data like a spreadsheet to focus on particular operations, hybrids, and yield differences (Figure 3).

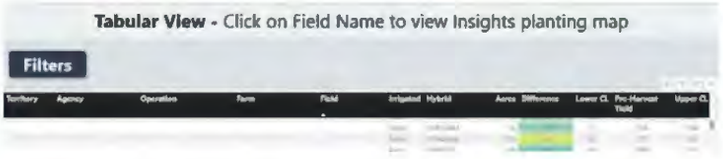


Figure 3

Product View

Discover products that fall below the set yield target effortlessly.

Select a product segment by clicking on the right hand side. The left side map view will focus on the specific product and will provide a detailed view of performance (Figure 4).

Note: Hybrid must have 600 acres of data within the selected geography.

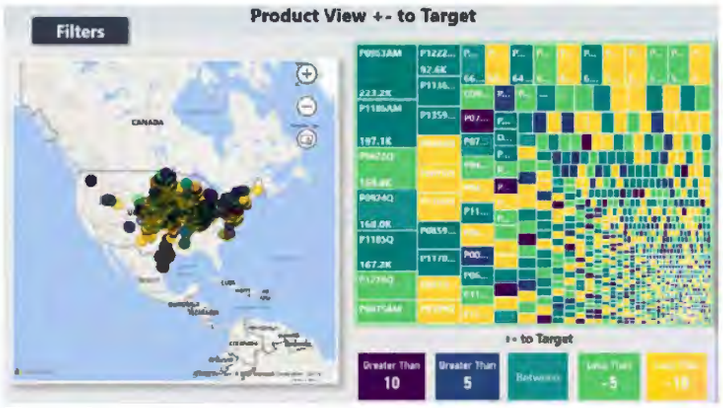


Figure 4

Brand Comparison

Gain insights into competitor yields and acres planted.

To visualize, select a competitor by clicking on the corresponding blue bar (Figure 5). Add or use existing filters to narrow in on a specific comparison.

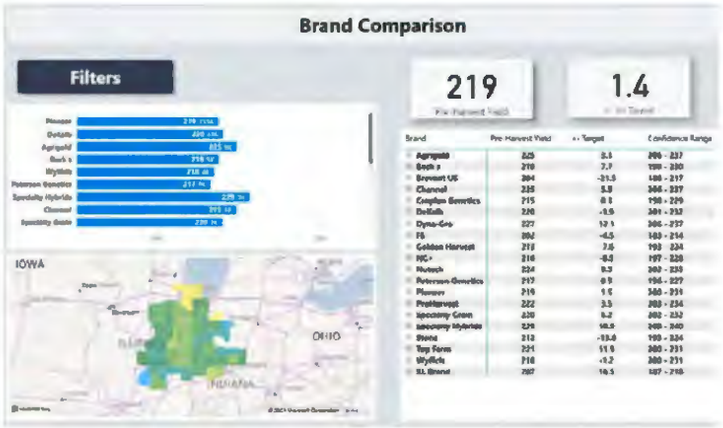


Figure 5

Analyze product and field performance prior to harvest.
Visit Power BI - Pre-Harvest Yield Guide

SILAGE STAGING

PIONEER.

Granular

Every season as silage harvest approaches, the same questions are asked. When will corn silage be ready to chop this year? Which hybrids or fields will be ready first? To answer these questions, a chipper shredder is used, or choppers are taken to test a small area of the field, in order to develop a plan. The question is, can we find an easier and more efficient way to develop a plan earlier in the season?

In 2018, Pioneer Sales Representatives developed a system to help with harvest staging. Using the Granular platform, Pioneer's extensive product knowledge, weather data and hybrid maturity information they were able to stage silage maturity and harvest. With the accuracy and success they experienced in 2018, Pioneer worked to streamline this effort and make the information available to more growers.

How's it Done?

The optimal corn silage kernel maturity has been identified as ¾ milkline to maximize forage quality and dry matter. By capturing real time weather data through the Granular tools, the crop model leverages hybrid specific GDU to black layer (BL) data to provide an estimated BL date for each hybrid planted. Through a series of calculations, the black layer date is taken and ¾ milkline conversion is subtracted, providing the GDU's to silage maturity (¾ milkline).

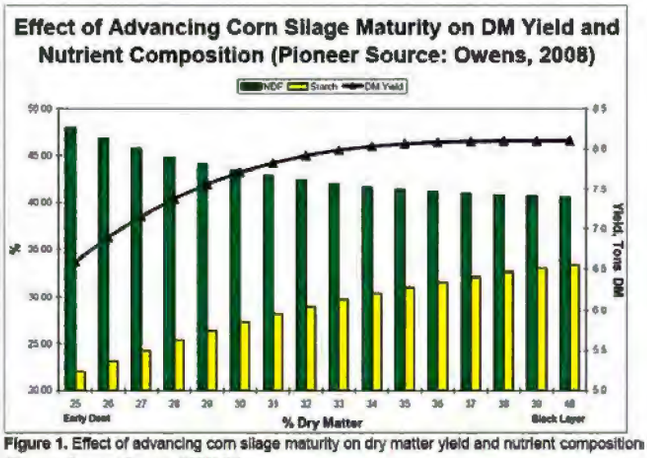


Figure 1. Effect of advancing corn silage maturity on dry matter yield and nutrient composition (Pioneer Source: Owens, 2008) CII

Why Silage Staging is Valuable

Healthy Corn Plants Mean More Yield, More Quality, More Flexibility

As a thumb rule each +1%DM a healthy plant increases as it physiologically matures, it will add[1]:

+0.6 %Starch in feed analysis
+5 bu/A equivalent grain yield
+0.3 Tons/A@35%DM
-0.2 %NDFD30[2]

Therefore, a healthy plant maturing +5%DM (e.g. from 35% to 40%DM) will gain an estimated:

+3.0 %Starch in feed analysis
+25 bu/A equivalent grain yield
+1.5 Tons/A@35%DM
-1.0 %NDFD30

[1] Derived from university and Corteva Pioneer research and field trial data.
[2] The economic benefits of the additional starch far outweigh the modest, potentially indiscernible decline in fiber digestibility.

Right place, Right time

- While the late season plant health advantage of Pioneer presents the opportunity, silage staging provides a plan to capture that higher yield, higher quality potential. When you can't efficiently monitor every corn field leading up to silage harvest, silage staging can.

Preemptively Identify...

...when harvest will likely begin. Prioritize field-by-field with an order of harvest across your entire corn crop enterprise. Consideration given to various hybrids, relative maturities, planting dates, and growing environments.

...when too many acres will be ready at once (bottlenecks). Enable anticipation of harvest equipment and labor requirements for optimal harvest speed management.

...when there is an anticipated gap in the harvest window. Provide opportunity for proactive harvest and/or storage plan adjustments.

Consult with your Pioneer Sales Professional for regional adjustments in timing dates based on local conditions.

SILAGE STAGING REPORT EXAMPLE

GRANULAR INSIGHTS | Silage-Staging Weekly Summary

Hello.

Below is the report for the week of **Apr 25 - May 02**. There will be **0 (ac)** predicted to reach maturity this coming week.

Estimated Harvest Date is driven by hybrid GDU data (PHY CRM - **150 GDU**) to simulate 3/4 Milk. Model is driven by the 15 day forecast so dates will continually adjust as actual weather is captured.

Past Date | Current Week | Future Date

Farm Name	Field Name	Field Acres	Product Acres	Variety	GDU Since Planting	Average Daily GDU	Planting Date	VT/R1 Date	Black Layer Date	Estimated Harvest Date (YTD + Normal GDU Daily)
[redacted]	[redacted]	146.26 (ac)	40.71 (ac)	P1413AM (AM, LL, RR2)	285	15	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	146.26 (ac)	103.51 (ac)	P1413AM (AM, LL, RR2)	285	15	[redacted]	[redacted]	[redacted]	[redacted]

Insights Operation

Contact us for more info:
digitalservices@corteva.com

THANK YOU FOR SUPPORTING AMERICAN INNOVATION.

Pioneer® brand products boast 95+ years of history and trailblazing innovation.

Innovating for the American farmer to deliver on increasing yield per acre, proprietary and differentiated traits and new breeding techniques. We plan to launch more traits in the next decade than ever before in our company's history.

VORCEED® Enlist™

POWERCORE® Enlist™

Z SERIES SOYBEANS

PIONEER®

GRAIN CORN AGRONOMIC FOOTNOTES

INTRO Introductory product. Quantities may be limited.

NEW New Product.

All scores of integrated refuge products are based upon the major component

** All Pioneer corn products are hybrids. All Pioneer products denoted with ™ are brand names. If corn product designated with AM, AML, AMT, AMX, AMXT, Q, V, PCU, PCUE, PWE & PWUE, it is a blend/mixture.

Product performance in water-limited environments is variable and depends on many factors such as the severity and timing of moisture deficiency, heat stress, soil type, management practices and environmental stress as well as disease and pest pressures. All products may exhibit reduced yield under water and heat stress. Individual results may vary.

IMPORTANT: Trait rating scores provide key information useful in selection and management of Pioneer® brand products in your area. Information and ratings are based on comparisons with other Pioneer brand products, not competitive products. Information and scores are assigned by Pioneer Research Managers. Scores are based on period-of-years testing through 2024 harvest and were the latest available at time of printing. Some scores may change after 2025 harvest. Scores represent an average of performance data across areas of adaptation, multiple growing conditions, and a wide range of both climate and soil types and may not predict future results. All products within a hybrid family receive the same score unless observations indicate a significant difference. Individual product responses are variable and subject to a variety of environmental, disease and pest pressures. Please use this information as only one component of your product positioning decision. Refer to www.pioneer.com or contact a Pioneer sales professional for the latest and most complete listing of traits and scores for each Pioneer brand product and for product placement and management suggestions specific to your operation and local conditions.

RATINGS: 9 = Outstanding; **1** = Poor, Blank = Insufficient Data.

WHITE AND WAXY CORN RATINGS: Based on comparisons with other Pioneer brand products, not competitive products. Trait ratings for white and waxy products reflect comparison with non-modified yellow products of a similar maturity.

HYBRID FAMILY: Hybrid family identifies products that have the same base genetics. Manage products within the same family similarly.

TECHNOLOGY SEGMENT: AM - Optimum® AcreMax® insect protection system with YGCB, HX1, LL, RR2. Contains a single-bag integrated refuge solution for above-ground insects. In EPA-designated cotton-growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax products. **AMT** - Optimum® AcreMax® TRIsect® insect protection system with RW YGCB, HX1, LL, RR2. Contains a single-bag refuge solution for above- and below-ground insects. The major component contains the Agrisure® RW trait, the Bt trait, and the Herculex® I gene. In EPA-designated cotton-growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax TRIsect products. **AMX** - Optimum® AcreMax® Xtra insect protection system with YGCB, HXX, LL, RR2. Contains a single-bag integrated refuge solution for above- and below-ground insects. In EPA-designated cotton-growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax Xtra products. **AMXT** (Optimum® AcreMax® XTreme) - Contains a single-bag integrated refuge solution for above- and below-ground insects. The major component contains the Agrisure® RW trait, the Bt trait and the Herculex® XTRA gene. In EPA-designated cotton-growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax XTreme products. **Q** (Qrome®) - Contains a single-bag integrated refuge solution for above- and below-ground insects. The major component contains the Agrisure® RW trait, the Bt trait, and the Herculex® XTRA gene. In EPA-designated cotton-growing counties, a 20% separate corn borer refuge must be planted with Qrome products. **YGCB, HX1, LL, RR2** (Optimum® Intrasect™) - Contains the Bt trait and Herculex® I gene for resistance to corn borer. **AML** - Optimum® AcreMax® Leptra® products with AVBL, YGCB, HX1, LL, RR2. Contains a single-bag integrated refuge solution for above-ground insects. In EPA-designated cotton-growing counties, a 20% separate corn borer refuge must be planted with Optimum AcreMax Leptra products. **AVBL, YGCB, HX1, LL, RR2** (Optimum® Leptra™) - Contains the Agrisure Viptera® trait, the Bt trait, the Herculex® I gene, the LibertyLink® gene and the Roundup Ready® Corn 2 trait. **V** – Vorceed® Enlist® products with V, LL, RR2, ENL. Contains a single-bag integrated refuge solution with multiple modes of action for above- and below-ground insects. The major component contains the Herculex® XTRA genes, the RW3 trait and the VTP trait. In EPA-designated cotton growing counties, a 20% separate corn borer refuge must be planted for Vorceed Enlist products. **PCE** - Powercore® Enlist® Refuge Advanced® corn products with HX1, VTP, ENL, LL, RR2. Contains a single-bag integrated refuge solution for above-ground insects. In EPA-designated cotton-growing counties, a 20% separate corn borer refuge must be planted with PowerCore Enlist Refuge Advanced products. **PCUE** - Powercore® Ultra Enlist® Refuge Advanced® corn products with AVBL, RX1, VTP, ENL, LL, RR2. Contains a single-bag integrated refuge solution for above-ground insects. In EPA-designated cotton-growing counties, a 20% separate corn borer refuge must be planted with PowerCore Ultra Enlist Refuge Advanced products. **PWE** - PowerCore® Enlist® corn products with HX1, VTP, ENL, LL, RR2. A separate 5% corn borer refuge in the corn belt, and a separate 20% corn borer refuge in EPA-designated cotton-growing counties must be planted PowerCore Enlist products. **PWUE** - PowerCore® Ultra Enlist® corn products with AVBL, RX1, VTP, ENL, LL, RR2. A separate 5% corn borer refuge in the corn belt, and a separate 20% corn borer refuge in EPA-designated cotton-growing counties must be planted PowerCore Ultra Enlist products. **HX1** - Contains the Herculex® I insect protection gene which provides protection against European corn borer, southwestern corn borer, black cutworm, fall armyworm, lesser corn stalk borer, southern corn stalk borer, and sugarcane borer; and suppresses corn earworm. **HXX** - Herculex® XTRA contains the Herculex® I and Herculex® RW gene. **YGCB** - The Bt trait offers a high level of resistance to European corn borer, southwestern corn borer and southern cornstalk borer, moderate resistance to corn earworm and common stalk borer, and above average resistance to fall armyworm. **LL** - Contains the LibertyLink® gene for resistance to glufosinate herbicide. **LR** - Contains the LibertyLink® gene and the Roundup Ready® Corn 2 trait. **RR2** - Contains the Roundup Ready® Corn 2 trait that provides crop safety for over-the-top applications of labeled glyphosate herbicides when applied according to label directions.

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LibertyLink® and the Water Droplet Design are registered trademarks of BASF.

Agrisure® and Agrisure Viptera® are registered trademarks of, and used under license from, a Syngenta Group Company. MIR162 is part of Agrisure Viptera® and is a registered trademark of Syngenta Agro SA. Agrisure® technology incorporated into these seeds is commercialized under a license from Syngenta Crop Protection AG.

POWERCORE® is a registered trademark of Bayer Group. POWERCORE® multi-event technology developed by Corteva Agriscience and Bayer Group. Always follow IRM, grain marketing and all other stewardship practices and pesticide label directions. B.t. products may not yet be registered in all states. Check with your seed representative for the registration status in your state.

Following burndown, Enlist Duo® and Enlist One® herbicides with Colex-D® technology are the only herbicides containing 2,4-D that are authorized for preemergence and postemergence use with Enlist® crops. Consult Enlist® herbicide labels for weed species controlled. Enlist Duo and Enlist One herbicides are not registered for use or sale in all states and counties, are not registered in AK, CA, CT, HI, ID, MA, ME, MT, NH, NY, OR, RI, UT, VT, WA and WY, and have additional subcounty restrictions in AL, GA, TN and TX, while enabling county restrictions still remain in FL. All users must check "Bulletins Live! Two" no earlier than six months before using Enlist One or Enlist Duo. To obtain "Bulletins," consult epa.gov/espp/, call 1-844-447-3813 or email ESPP@epa.gov. You must use the "Bulletin" valid for the month and state and county in which Enlist One or Enlist Duo are being applied. Contact your state pesticide regulatory agency if you have questions about the registration status of Enlist® herbicides in your area. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. IT IS A VIOLATION OF FEDERAL AND STATE LAW TO USE ANY PESTICIDE PRODUCT OTHER THAN IN ACCORDANCE WITH ITS LABELING. ONLY USE FORMULATIONS THAT ARE SPECIFICALLY LABELED FOR SUCH USE IN THE STATE OF APPLICATION. USE OF PESTICIDE PRODUCTS, INCLUDING, WITHOUT LIMITATION, 2,4-D-CONTAINING PRODUCTS NOT AUTHORIZED FOR USE WITH ENLIST CROPS, MAY RESULT IN OFF-TARGET DAMAGE TO SENSITIVE CROPS/AREAS AND/OR SUSCEPTIBLE PLANTS, IN ADDITION TO CIVIL AND/OR CRIMINAL PENALTIES. Additional product-specific stewardship requirements for Enlist crops, including the Enlist Product Use Guide, can be found at www.traitsteward ship.com.

MARKET SEGMENT: Designations indicate product is also suitable for the following market: **WX** – Waxy, **WH** – White food corn, **YFC** – Yellow food corn, **AQ** – Optimum® AQUAmax® product, **BMR** – Brown MidRib Corn, **BOV** – Bovalta® BMR Corn, **TE** – Pioneer® brand exclusive corn silage TonnEdge hybrids, powered by the Silage Zone®, offer livestock producers products that deliver high tonnage potential and superior plant health while providing an edge over the competition with a focus on local selection, agronomics and quality. All this comes with the service, support, and tools you need to produce the highest quality feed for your operation.

CRM (Comparative Relative Maturity): There is not an industry standard for maturity ratings so comparing product maturity and harvest moisture ratings between companies is usually difficult. Use the CRM rating to compare Pioneer® brand products with competitive products of a similar maturity and harvest moisture. CRM ratings, and harvest moistures, for products within a family may vary slightly, depending upon the level of insect (ECB and CRW) infestation. Conventional and straight products with the RR2 gene within a family will usually be 1-2 CRMs earlier than indicated, when insect infestations are moderate to heavy. One CRM difference is about ½ point of moisture difference at harvest.

PHYSIOLOGICAL CRM: Measures differences in maturity to zero milkline stage. To help decide if a new product fits your area's growing season, compare its physiological CRM to a product that you plant or one that is successfully used in your area.

GDUs TO PHYSIOLOGICAL MATURITY: Measures differences in growing degree units (GDUs) required to zero milkline stage. To help decide if a new product fits your area's growing season, compare its GDUs to physiological maturity to a product that you plant or one that is successfully used in your area.

MID-SEASON BRITTLE STALK: Ratings determined by frequency and severity of stalk snappage at layout to mid-late stalk internodes from conditions usually favored by rapid or optimum growth. Relative response of products can be affected by planting date, stage of growth, rate of growth, wind severity and other variables. Scores derived from both natural observations and artificial evaluation immediately prior to tasseling. NOTE: Scores do not reflect snappage enhanced by or due to herbicide interaction. The use of growth regulator herbicides such as 2,4-D and dicamba can increase the brittle snap potential of corn products. Products with lower brittle stalk ratings will require more caution and have a higher risk associated with the use of growth regulator herbicides. Early application, proper rates and application methods, along with both product and herbicide selection can help reduce this risk. BRITTLE STALK PRECAUTION: In areas with higher potential for brittle stalk breakage, growers must balance the risk of planting products with brittle stalk ratings of less than 4 against the overall performance of more resistant products with higher ratings. All products have a period of susceptibility to brittle stalk. Products with below average ratings may have a longer period of susceptibility, or may experience more severe breakage relative to products with higher scores during period of susceptibility.

STRESS EMERGENCE: All products are expected to establish normal stands under average soil conditions. Stress emergence is a measure of the genetic ability or potential to emerge in the stressful environmental conditions of cold, wet soils or short periods of severe low temperatures, relative to other Pioneer brand products. Ratings of 7-9 indicate very good potential to establish normal stands under such conditions; a rating of 5-6 indicates average potential to establish normal stands under moderate stress conditions; and ratings of 1-4 indicate the product has below average potential to establish normal stands under stress and should not be used if severe cold conditions are expected immediately after planting. Stress emergence is not a rating for seedling disease susceptibility, early growth or speed of emergence.

DROUGHT TOLERANCE: Drought tolerance is a complex trait, determined by a plant's ability to maintain yield in limited-moisture environments. A higher score indicates the potential for higher yields vs. other platforms of similar maturity in limited-moisture environments.

HIGH RESIDUE SUITABILITY: NS - Highly Suitable; **S** – Suitable; **MA** – Manage Appropriately; **X** - Poorly Suited, **NS** – Not Scored. Suitability rating based on field observations and a weighted calculation of gray leaf spot, stress emergence, anthracnose stalk rot or stalk strength, northern corn leaf blight, and Diplodia ear rot scores. High Residue Suitability ratings may vary by environment and geography.

GRAIN DRYDOWN: Compares products of similar maturity for rate of moisture loss during grain drydown. A higher score indicates faster drydown. A lower score indicates slower drydown, or a wider opportunity for silage and high-moisture corn harvest.

EAR FLEX: Score reflects the ability of a product to flex ear size as plant density is reduced, or as growing conditions improve.

TEST WEIGHT: Higher score indicates heavier test weight.

PLANT HEIGHT: 9 = Very Tall; **1** = Short.

EAR HEIGHT: 9 = High; **1** = Low.

GRAIN CORN DISEASE FOOTNOTES

** Ratings denoted with a double asterisk (**) reflect preliminary data subject to change when additional data becomes available.

DISEASE PRECAUTION: Grower should balance product yield potential, product maturity and cultural practice selection against their anticipated risk of a specific disease and need for resistance. In high disease-risk conditions, consider planting products with at least moderate resistance ratings of 4 or higher to help reduce risk. When susceptible products with disease ratings of 1 to 3 are planted in conditions of high disease pressure, the grower assumes a higher level of risk. If conditions are severe, even products rated as resistant can be adversely affected. Independent of yield reduction, diseases can predispose plants to secondary diseases such as stalk rots. This requires individual field and product monitoring for stalk stability and timely harvest when warranted.

DISEASE & PEST RATINGS: 8–9 = Highly Resistant; **6-7** = Resistant, **4–5** = Moderately Resistant; **1–3** = Susceptible; **Blank** = Insufficient Data.

GRAY LEAF SPOT PRECAUTION: Avoid planting products with a lower gray leaf spot (GLS) rating in continuous corn fields that have a history of GLS infection, unless tillage operations that bury significant amounts of corn residue and inoculum are practiced.

FOLIAR FUNGICIDE RESPONSE – GLS: Probability of positive yield response to foliar fungicide applications when significant levels of Gray Leaf Spot (GLS) leaf disease is present. **HP** - High Probability; **MP** – Moderate Probability; **LP** – Low Probability. Probabilities based upon product disease scores. Because of the unlimited number of growing environments, cropping practices, and foliar fungicide active ingredients combinations possible, Pioneer makes no warranty regarding the foliar fungicide crop response information.

NORTHERN LEAF BLIGHT CAUTION: In conditions where northern leaf blight (NLB) risk is high, growers should consider planting only products with at least moderate NLB resistance ratings of 4 or higher.

FOLIAR FUNGICIDE RESPONSE – NLB: Probability of positive yield response to foliar fungicide applications when significant levels of Northern Leaf Blight (NLB) leaf disease is present. **HP** - High Probability; **MP** – Moderate Probability; **LP** – Low Probability. Probabilities based upon product disease scores. Because of the unlimited number of growing environments, cropping practices, and foliar fungicide active ingredients combinations possible, Pioneer makes no warranty regarding this foliar fungicide crop response information.

FUSARIUM EAR ROT CAUTION: Ratings based upon visual symptoms at harvest. If Fusarium ear rot has caused significant damage in the past, growers should consider planting only products with at least moderate Fusarium ear rot ratings of 5 or higher.

GIBBERELLA EAR ROT CAUTION: Ratings based upon visual symptoms at harvest. If Gibberella ear rot has caused significant damage in the past, growers should consider planting only products with at least moderate Gibberella ear rot ratings of 5 or higher.

DIPLODIA EAR ROT CAUTION: Ratings based upon visual symptoms at harvest. If Diplodia ear rot has caused significant damage in the past, growers should consider planting only products with a Diplodia ear rot rating of 4 or higher.

TAR SPOT CAUTION: Scores reflect the relative sensitivity of the hybrids evaluated. Products with higher scores pose lower risk of severe disease development. In areas with tar spot pressure, consider using products with higher tar spot ratings. In addition, consider the use of fungicides labeled for use on tar spot when the disease is present. As more evidence is collected, suggested score minimums for high-risk conditions will be developed.

CORN SILAGE FOOTNOTES

** This minor component of this blend product is not a Brown MidRib Corn hybrid.

SILAGE CRM (Silage Comparative Relative Maturity): With no industry standard for silage maturity, comparing maturity and harvest moisture across various companies' corn-for-silage hybrids can be difficult. Pioneer silage CRM ratings provide a relative comparison among Pioneer® brand products of rates at which products reach harvestable whole plant moistures. It is on the same scale as the CRM rating provided for grain corn products, and does not represent actual days from planting or emergence to harvest moisture or half milkline.

SILAGE YIELD: Based on whole-plant yield per acre adjusted to 35% dry matter from multi-year comparison with other products within a maturity range not exceeding 5 silage CRM units.

STARCH AND SUGAR, %: Percent starch and soluble sugars (DM basis) in the whole-plant sample predicted by NIRS.

FIBER DIGESTIBILITY: Based on 30-hour rumen-fluid based estimate of the percent of ruminally degradable neutral detergent fiber (NDF) as a percent of total NDF in whole-plant samples predicted by NIRS. Brown MidRib Corn hybrids are designated with "B" since NDFD30 averages 6-8 percentage points higher than non-BMR silage hybrids. To optimize fiber digestibility, growers should consider use of BMR Corn hybrids.

SILAGE CRUDE PROTEIN: Based on the amount of crude protein in the whole plant, predicted by NIRS.

MILK PER ACRE: 9 = Outstanding; **1** = Poor, based on University of Wisconsin MILK2006 utilizing silage yield, nutrient content and digestibility.

MILK PER TON: 9 = Outstanding; **1** = Poor, based on University of Wisconsin MILK2006 utilizing silage nutrient content and digestibility.

BEEF PER ACRE: 9 = Outstanding; **1** = Poor, based on University of Wisconsin MILK2006 utilizing silage yield, nutrient content and digestibility.

BEEF PER TON: 9 = Outstanding; **1** = Poor, based on University of Wisconsin MILK2006 utilizing silage nutrient content and digestibility.

PLANT STAYGREEN: Indicator of late season plant health. A higher score indicates ability to survive farther into the growing season. Scores are taken near grain physiological maturity (zero kernel milkline) stage.

SOYBEAN FOOTNOTES

NEW New Product.

All Pioneer products denoted with ™ are brand names.

**Ratings denoted with a double asterisk (**) reflect preliminary data subject to change when additional data becomes available.

IMPORTANT: Product responses are variable and subject to any number of environmental, disease and pest pressures. Please use this information as only part of your product positioning decision. Individual results may vary.

Trait ratings provide key information useful in selection and management of Pioneer® brand products in your area. Scores are based on testing through 2024 harvest and were the latest available at time of printing. Some scores may change after 2025 harvest. Information and ratings are based on average performance across area of adaptation under normal conditions, over a wide range of both climate and soil types and may not predict future results. Refer to www.pioneer.com or contact a Pioneer sales professional for the latest and most complete listing of traits and scores for each Pioneer brand product and for product placement and management suggestions specific to your operation and local conditions.

NUMERIC RATINGS: 9 = Excellent; **1** = Poor; Blank = Insufficient Data or variety not tested for that particular trait.

RELATIVE MATURITY: Shows the relative maturity group rating, with the digits preceding the decimal representing the general maturity group, and the digit following the decimal showing relative maturity within the group on a scale of 0 to 9, with 0 early and 9 late. For example, a soybean product with a relative maturity rating of 1.8 would be a late product in Group 1 maturity.

TECHNOLOGY SEGMENT:

Always follow stewardship practices in accordance with the Product Use Guide (PUG) or other product-specific stewardship requirements including grain marketing and pesticide label directions. **Varieties with BOLT™ technology** provide excellent plant-back flexibility for soybeans following application of sulfonylurea (SU) herbicides such as LeadOff® or Basis® Blend as a component of a burndown program or for double-crop soybeans following SU herbicides such as Finesse® applied to wheat the previous fall.

Always follow grain marketing, stewardship practices and pesticide label directions. **Varieties with the Glyphosate Tolerant trait** (including those designated by the letter "R" in the product number) contain genes that confer tolerance to glyphosate herbicides. Glyphosate herbicides will kill crops that are not tolerant to glyphosate.

Varieties with the STS® trait are tolerant to certain sulfonylurea (SU) herbicides. This technology allows post-emergent applications of Synchrony® XP and Classic® herbicides without crop injury or stress (see herbicide product labels). NOTE: A soybean variety with a herbicide tolerant trait does not confer tolerance to all herbicides. Spraying herbicides not labeled for a specific soybean variety will result in severe plant injury or plant death. Always read and follow herbicide label directions and precautions for use.

Varieties with the LibertyLink® (LL) gene are resistant to glufosinate herbicide. LibertyLink® and the Water Droplet Design are registered trademarks of BASF.

DO NOT APPLY DICAMBA HERBICIDE IN-CROP TO SOYBEANS WITH Roundup Ready 2 Xtend® (RR2X) technology unless you use a dicamba herbicide product that is specifically labeled for that use in the location where you intend to make the application. IT IS A VIOLATION OF FEDERAL AND STATE LAW TO MAKE AN IN-CROP APPLICATION OF ANY DICAMBA HERBICIDE PRODUCT ON SOYBEANS WITH Roundup Ready 2 Xtend® technology, OR ANY OTHER PESTICIDE APPLICATION, UNLESS THE PRODUCT LABELING SPECIFICALLY AUTHORIZES THE USE. Contact the U.S. EPA and your state pesticide regulatory agency with any questions about the approval status of dicamba herbicide products for in-crop use with soybeans with Roundup Ready 2 Xtend® technology. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Soybeans with Roundup Ready 2 Xtend® technology contain genes that confer tolerance to glyphosate and dicamba. Glyphosate herbicides will kill crops that are not tolerant to glyphosate. Dicamba will kill crops that are not tolerant to dicamba. IMPORTANT NOTICE: No dicamba herbicide has been approved for use in-crop with seed containing Roundup Ready® Xtend Technology for the 2025 spray season at this time. No dicamba herbicide may be used in-crop with this seed unless and until such use is approved or specifically permitted. Roundup Ready 2 Xtend® is a registered trademark of Bayer Group.

Varieties with Enlist E3® technology (E3): The transgenic soybean event in Enlist E3® soybeans is jointly developed and owned by Corteva Agriscience and M.S. Technologies L.L.C.

Following burndown, Enlist Duo® and Enlist One® herbicides with Colex-D® technology are the only herbicides containing 2,4-D that are authorized for preemergence and postemergence use with Enlist® crops. Consult Enlist® herbicide labels for weed species controlled. Enlist Duo and Enlist One herbicides are not registered for use or sale in all states and counties; are not registered in AK, CA, CT, HI, ID, MA, ME, MT, NH, NY, OR, RI, UT, VT, WA and WY; and have additional subcounty restrictions in AL, GA, TN and TX, while existing county restrictions still remain in FL. All users must check "Bulletins Live! Two" no earlier than six months before using Enlist One or Enlist Duo. To obtain "Bulletins," consult epa.gov/espp/, call 1-844-447-3813, or email ESPP@epa.gov. You must use the "Bulletin" valid for the month and state and county in which Enlist One or Enlist Duo are being applied. Contact your state pesticide regulatory agency if you have questions about the registration status of Enlist® herbicides in your area. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. IT IS A VIOLATION OF FEDERAL AND STATE LAW TO USE ANY PESTICIDE PRODUCT OTHER THAN IN ACCORDANCE WITH ITS LABELING. ONLY USE FORMULATIONS THAT ARE SPECIFICALLY LABELED FOR SUCH USE IN THE STATE OF APPLICATION. USE OF PESTICIDE PRODUCTS, INCLUDING, WITHOUT LIMITATION, 2,4-D-CONTAINING PRODUCTS NOT AUTHORIZED FOR USE WITH ENLIST CROPS, MAY RESULT IN OFF-TARGET DAMAGE TO SENSITIVE CROPS/AREAS AND/OR SUSCEPTIBLE PLANTS, IN ADDITION TO CIVIL AND/OR CRIMINAL PENALTIES. Additional product-specific stewardship requirements for Enlist crops, including the Enlist Product Use Guide, can be found at www.traitstewardship.com.

Plenish® (P) high oleic soybeans have an enhanced oil profile and are produced and channeled under contract to specific grain markets. Growers should refer to the Pioneer Product Use Guide on www.pioneer.com/us/stewardship for more information.

(-) = Variety does not contain a herbicide resistant gene.

FIELD EMERGENCE: Rating based on speed and strength of emergence in sub-optimal temperatures. **1-3** = Below Average; **4-6** = Average; **7-9** = Excellent.

PHYTOPHTHORA RESISTANCE GENE:

(-) = No specific gene for resistance.

Rps1^^ = Contains Rps1c or Rps1k Phytophthora resistance.

Rps 1a = Provides resistance to races 1, 2, 10, 11, 13-18, 24, 26, 27, 31, 32, 36, 38, 48, 51-52, 54-55.

Rps 1c = Provides resistance to races 1-3, 6-11, 13, 15, 17, 21, 23, 24, 26, 28-30, 32, 34, 36, 38, 41, 42, 44, 48, 50, 52, 54, 55.

Rps 1k = Provides resistance to races 1-11, 13-15, 17, 18, 21-24, 26, 36-38, 42-44, 46-55.

Rps 6 = Provides resistance to races 1-4, 10, 12, 14-16, 18-21, 26, 28, 33-35, 39-48, 52-54.

Rps 3a = Resistant to races 1-5, 8-9, 11, 13-14, 16, 18, 23, 25, 28-29, 31-35, 39-41, 43-45, 47-52, 54.

Rps 3c = Resistant to races 1-4, 10-16, 18-36, 38-54.

PHYTOPHTHORA FIELD TOLERANCE: Products with high tolerance scores have demonstrated an ability to thrive in the presence of Phytophthora races to which they lack specific resistance. In some products, tolerance is expressed only after the early seedling growth stage, making such products susceptible to damping off during emergence and early seed growth.

BROWN STEM ROT: HT = Highly Tolerant; **MT** = Moderately Tolerant; **MS** = Moderately Susceptible.

WHITE MOLD: Scores based on Pioneer research observations of comparative white mold tolerance among various soybean products across multiple locations and years. All products are capable of developing white mold symptoms under severe infestations. To our knowledge, there are no totally resistant products in the industry. However, differences exist in the ability of products to tolerate white mold (i.e., the rate at which the infection develops and the extent of damage it causes). These scores reflect those differences.

SCN RESISTANCE SOURCE: There are three sources of genetic resistance to SCN currently deployed in the marketplace: PI88788; PI548402 (also known as Peking); PI437654 (also known as Hartwig); **R** = Resistant to SCN but the source of that resistance is not yet identified. PI88788 provides good to excellent resistance to race 3 and average to excellent resistance to race 14. Peking provides very good to excellent resistance to races 1, 3, and 5. Peking^ provides excellent resistance to race 3 and below average to average resistance to race 5.

SOYBEAN CYST NEMATODE [SCN]: Resistance to each of the major SCN races is scored on a 1-9 scale. **9** = Excellent resistance; **8-7** = Very good resistance; **6** = Good resistance; **5** = Average resistance; **4** = Below average resistance; **3-2** = Susceptible; **1** = Highly susceptible; to the specific race indicated.

CHARCOAL ROT: A fungal disease that is enhanced by hot and dry conditions, especially during reproductive growth stages. Scores based on Pioneer research observations of the comparative ability to tolerate infection from the charcoal rot pathogen among various soybean products.

STEM CANKER GENE: RES = provides resistance. **SUS** = no specific gene for resistance.

CERCOSPORA: A fungal disease that is enhanced by wet periods followed by hot and dry conditions, especially during reproductive growth stages. Scores based on Pioneer research observations of the comparative ability to tolerate infection from the Cercospora kikuchii pathogen among various soybean products.

CHLORIDE SENSITIVITY: All soybeans take in chloride (Cl^-), a water-soluble salt, via the plants' roots. Chloride moves freely within damp or wet soils. This can be an issue in soils with higher levels of Cl^- by allowing harmful concentrations of Cl^- to accumulate in the tops of plants, or the "growing point," which can lead to a condition known as "chlorosis" and result in injury to soybean plants by stunting the plant's growth.

- **EXC** - Excluder varieties have the ability to identify and exclude Cl^-, inhibiting the movement of Cl^- into the growing point and reducing the likelihood of stunting due to chlorosis.
- **INT** - Intermediate varieties translocate Cl^-, slowing the rate at which Cl^- reaches the growing point of the plant. Intermediate varieties are less susceptible to chlorosis and its effects than includer varieties and are more susceptible to the effects of chlorosis than Excluder varieties.
- **INC** - Includer varieties readily translocate Cl^- to the growing point of the plant, increasing the risk of stunting due to chlorosis.

CANOPY WIDTH: 9 = Extremely bushy; **1** = Very narrow.

PLANT HEIGHT FOR MATURITY: 9 = Tall, **1** = Short.

PLANT HABIT: IND = INDETERMINATE-type soybeans grown in Group 00-4 regions. These plants typically continue to grow as they flower, resulting in a longer pod fill time. You may find nearly mature seeds at the bottom of a plant that is still flowering at the top. **DET** = DETERMINATE soybeans grown in Group 5 and later maturities. These plants typically stop growing once they begin to flower, and all flowering occurs within a more defined timeframe.

FLOOD TOLERANCE: Tolerance to standing water or saturated soils which are typically found at the low end of surface irrigated fields or in the low-lying areas of fields after a heavy rain event. The score is a measure of the variety's potential to continue normal growth and photosynthesis when placed under those environmental conditions for up to one week.

% PROTEIN AT 13% MOISTURE: Compare data within table only. Values can vary widely by growing season and region.

% OIL AT 13% MOISTURE: Compare data within table only. Values can vary widely by growing season and region.

FLOWER COLOR: P = Purple; **W** = White.

PUBESCENCE COLOR: T = Tawny; **G** = Gray; **L** = Light tawny; **M** = Mixed.

HILA COLOR: BL = Black, **BR** = Brown; **TN** = Tan; **G** = Gray; **IB** = Imperfect black; **BF** = Buff; **Y** = Yellow (Clear); **M** = Mixed.

POD COLOR: BR = Brown; **TN** = Tan.

Note: U.S. patents, Plant Variety Protection Act (PVPA) applications and certificates, or other limitations on use may be used to protect Pioneer brand soybean products from unauthorized growing, selling or use of the seed. These protections help assure that growers will continue to have access to new and improved products through the research efforts of plant scientists in the years ahead.

GRAIN SORGHUM FOOTNOTES

INTRO Introductory product. Quantities may be limited.

NEW New Product.

Trait ratings provide key information useful in selection and management of Pioneer® brand products in your area. Scores are based on period-of-years testing through 2024 harvest and were the latest available at time of printing. Some scores may change after 2025 harvest. Contact your Pioneer sales professional before planting for the latest trait rating information.

IMPORTANT: Information and ratings are based on comparisons with other Pioneer® brand products, not competitive products. Information and ratings are assigned by Pioneer Agronomists and Research Managers, based on average performance across area of adaptation under normal conditions, over a wide range of both climate and soil types, and may not predict future results. Product responses are variable and subject to any number of environmental, disease and pest pressures. Please use this information as only part of your product positioning decision. Refer to www.pioneer.com or contact a Pioneer sales professional for the latest and most complete listing of traits and scores for each Pioneer brand product and for product placement and management suggestions specific to your operation and local conditions.

RATINGS: 9 = Excellent; **1** = Poor; Blank = Insufficient Data.

DISEASE PRECAUTION: Growers should balance hybrid yield potential, hybrid maturity and cultural practice selection against their anticipated risk of a specific disease and need for resistance. In high disease risk conditions, consider planting hybrids with at least moderate resistance ratings of 4 or higher to help reduce risk. When susceptible hybrids with disease ratings of 1 to 3 are planted in conditions of high disease pressure, the grower assumes a higher level of risk. If conditions are severe, even hybrids rated as resistant can be adversely affected. Independent of yield reduction, disease can predispose plants to secondary diseases such as stalk rots. This requires individual field and hybrid monitoring for stalk stability and timely harvest when warranted.

DISEASE RATINGS: 9 = Excellent; **1** = Poor; Blank = Insufficient Data; **NA** = Not applicable; **(-)** = No specific gene resistance.

TECHNOLOGY SEGMENT: Hybrids with the Inzen™ trait are resistant to Zest™ WDG herbicide. Zest WDG herbicide is not registered for sale or use in all states. Always read and follow label directions.

CRM (COMPARATIVE RELATIVE MATURITY): Approximate length of time from emergence to physiological maturity, which will vary depending on planting date, environment and growing conditions.

RM (RELATIVE MATURITY): Approximate length of time in days until flowering.

HEAD TYPE: 9 = Open; **1** = Compact.

PLANT HEIGHT: 9 = Very Tall; **1** = Short.

HEAD SMUT RESISTANCE: Rated for resistance to Races 1, 2, 3, 4.

SORGHUM APHID TOLERANCE: Pioneer® brand sorghum hybrids with the Pioneer Protector® technology designation have a sorghum aphid tolerance rating of 5 or greater.

GRAIN COLOR AND ENDOSPERM COLOR: BRZ = Bronze; **RED** = Red; **W/WHT** = White; **Y/YEL** = Yellow. Grain color has no influence on feed quality.

Selected Pioneer® brand grain sorghum hybrids are available with Concep®.selened seed. Concep® is a registered trademark of a Syngenta Group Company.

Cruiser® seed treatment is available on select Pioneer® brand grain sorghum hybrids. Cruiser® is a registered trademark of a Syngenta Group Company.

FORAGE SORGHUM FOOTNOTES

Trait ratings provide key information useful in selection and management of Pioneer® brand products in your area. Scores are based on period-of-years testing through 2024 harvest and were the latest available at time of printing. Some scores may change after 2025 harvest. Contact your Pioneer sales professional before planting for the latest trait rating information.

IMPORTANT: Information and ratings are based on comparisons with other Pioneer® brand products, not competitive products. Information and ratings are assigned by Pioneer Agronomists and Research Managers, based on average performance across area of adaptation under normal conditions, over a wide range of both climate and soil types, and may not predict future results. Product responses are variable and subject to any number of environmental, disease and pest pressures. Please use this information as only part of your product positioning decision. Refer to www.pioneer.com or contact a Pioneer sales professional for the latest and most complete listing of traits and scores for each Pioneer brand product and for product placement and management suggestions specific to your operation and local conditions.

RATINGS: 9 = Excellent; **1** = Poor.

RM (RELATIVE MATURITY): Approximate length of time in days until flowering.

STEM SWEETNESS: 1 = Bitter, **9** = Sweet.

STEM JUICINESS: 1 = Dry; **9** = Wet.

SORGHUM APHID TOLERANCE: Pioneer® brand sorghum hybrids with the Pioneer Protector® technology designation have a sorghum aphid tolerance rating of 5 or greater.

Pioneer® hybrids 845F, 849F and 859F are available with Concep® selened seed. Concep® is a registered trademark of a Syngenta Group Company.

SORGHUM-SUDANGRASS FOOTNOTES

Trait ratings provide key information useful in selection and management of Pioneer® brand products in your area. Scores are based on period-of-years testing through 2024 harvest and were the latest available at time of printing. Some scores may change after 2025 harvest. Contact your Pioneer sales professional before planting for the latest trait rating information.

IMPORTANT: Information and ratings are based on comparisons with other Pioneer® brand products, not competitive products. Information and ratings are assigned by Pioneer Agronomists and Research Managers, based on average performance across area of adaptation under normal conditions, over a wide range of both climate and soil types, and may not predict future results. Product responses are variable and subject to any number of environmental, disease and pest pressures. Please use this information as only part of your product positioning decision. Refer to www.pioneer.com or contact a Pioneer sales professional for the latest and most complete listing of traits and scores for each Pioneer brand product and for product placement and management suggestions specific to your operation and local conditions.

RATINGS: 9 = Excellent; **1** = Poor.

RM (RELATIVE MATURITY): Approximate length of time in days until flowering.

STEM SWEETNESS: 1 = Bitter, **9** = Sweet.

STEM JUICINESS: 1 = Dry; **9** = Wet.

INOCULANT FOOTNOTES

^Rapid React® aerobic stability® technology.

^^Patented, proprietary and unique *L. buchneri* strain found only in Nutrivall® feed technology products proven to improve rate of fiber digestibility.

†Improved aerobic stability and reduced heating is relative to untreated silage. Actual results may vary. The effect of any silage inoculant is dependent upon management at harvest, storage and feedout. Factors such as moisture, maturity, chop length and compaction will determine inoculant efficacy.

IMPORTANT: Information and ratings are based on relative comparisons with other Pioneer® brand forage additives within each specific crop, not competitive products. Information and ratings are assigned by Pioneer Forage Additive Research, based on average performance across area of use under normal conditions, over a wide range of both environmental and management conditions, and may not predict future results. Product responses are variable and subject to any number of environmental and management conditions. Please use this information as only part of your product positioning decision. Refer to www.pioneer.com or contact a Pioneer sales professional for the latest and most complete listing of traits and scores for each Pioneer brand product and for product placement and management suggestions specific to your operation and local conditions.

FERMENTATION: Rate and extent of pH decline and the composition of fermentation acids occurring in silage.

NUTRIENT CONSERVATION: Retaining more sugar/starch and reducing protein degradation by rapidly reducing silage pH.

FIBER DIGESTIBILITY: The digestibility of neutral detergent fiber (NDF) by the ruminant animal expressed as a percentage of the total NDF.

WHEAT FOOTNOTES

INTRO **Introductory product. Quantities may be limited.**

NEW **New Product.**

Trait ratings provide key information useful in selection and management of Pioneer® brand products in your area. Scores are based on period-of-years testing through 2024 harvest and were the latest available at time of printing. Some scores may change during the 2025 season. Contact your Pioneer sales professional before planting for the latest trait rating information.

IMPORTANT: Information and ratings are based on comparisons with other Pioneer® brand products, not competitive products. Information and ratings are assigned by Pioneer Agronomists and Research Managers, based on average performance across area of adaptation under normal conditions, over a wide range of both climate and soil types, and may not predict future results. Product responses are variable and subject to any number of environmental, disease and pest pressures. Please use this information as only part of your product positioning decision. Refer to www.pioneer.com or contact a Pioneer sales professional for the latest and most complete listing of traits and scores for each Pioneer brand product and for product placement and management suggestions specific to your operation and local conditions.

NUMERIC RATINGS: **9** = Excellent, **1** = Poor; Blank = Insufficient Data.

WHEAT TYPE: **SRWW** = Soft Red Winter Wheat; **SWWW** = Soft White Winter Wheat.

HEADING DATE IN AREAS OF ADAPTATION: Heading date in days earlier (-) or later (+) than Pioneer brand variety.
25R40 in northern states of DE, NJ, NY, PA, OH, IN, MI, IL, MO, **WI**, and Ontario, Canada
25R40 in northern white wheat states of MI, **NY** and Ontario Canada
26R10 in mid-south states of KY, TN, AR and MO bootheel and northern AL, MS and LA.
26R10 in southeast states of VA, NC, SC and GA.
NR = Not recommended for region

HARVEST MATURITY: **VE** = Very Early, **E** = Early, **ME** = Medium Early, **M** = Medium, **ML** = Medium Late, **L** = Late, **VL** = Very Late.

SEED SIZE: Low scores = smaller

HEIGHT: Low scores = shorter

VERNALIZATION REQUIREMENT: High scores = lower vernalization requirement. Low scores = higher vernalization requirement.

HESSIAN FLY: **R**= Resistant/Tolerant, **MR** = Moderately Resistant/Tolerant, **MS**= Moderately Susceptible/Some Tolerance, **S** = Susceptible, in the primary area of adaptation. Genetic resistance/tolerance does not guarantee complete protection against all biotypes of Hessian fly. Growers should always follow sound insect management strategies, such as crop rotation, optimal planting date, scout fields for fly and apply insecticides as necessary for most effective control. Varietal reaction to Hessian fly was based on specific biotype screening tests as well as field screening for tolerance to predominant biotypes. Predominant biotypes may vary by region and change by season.

NOTE: U.S. patents, Plant Variety Protection Act (PVPA) applications and certificates or other limitations on use may be used to protect Pioneer brand wheat varieties from unauthorized growing, selling or use of the seed. Purchaser of a Pioneer brand wheat variety is granted a limited license solely to produce a single crop of grain for feeding or processing.

CANOLA FOOTNOTES

Roundup Ready CANOLA | Clearfield Production System for Canola | LIBERTY LINK | Optimum GLY HERBICIDE TOLERANCE

INTRO **Introductory product. Quantities may be limited.**

NEW **New Product.**

****** **Pending Registration**

Trait ratings provide key information useful in selection and management of Pioneer® brand products in your area. Scores are based on period-of-years testing through 2024 harvest and were the latest available at time of printing. Some scores may change after 2025 harvest. Contact your Pioneer sales professional before planting for the latest trait rating information.

IMPORTANT: Information and ratings are based on comparisons with other Pioneer® brand products, not competitive products. Information and ratings are assigned by Pioneer Agronomists and Research Managers, based on average performance across area of adaptation under normal conditions, over a wide range of both climate and soil types, and may not predict future results. Product responses are variable and subject to any number of environmental, disease and pest pressures. Please use this information as only part of your product positioning decision. Refer to www.pioneer.com or contact a Pioneer sales professional for the latest and most complete listing of traits and scores for each Pioneer brand product and for product placement and management suggestions specific to your operation and local conditions.

RATINGS: **9** = Excellent; **1** = Poor. Blank = Insufficient Data.

MATURITY: **9** = Late; **6** = Medium; **5** = Medium-Early; **3** = Early; **1** = Very Early.

HERBICIDE TOLERANT TRAIT:

Hybrids and varieties with the Roundup Ready® gene (RR) are tolerant to labeled rates of Roundup® branded herbicides. This technology allows for post-emergent applications of Roundup without crop injury or stress (see herbicide label). Labeled Roundup herbicide should only be used over the top of those hybrids and varieties that carry the Roundup Ready designation. Roundup Ready® and Roundup® are registered trademarks of Bayer Group.

Hybrids and varieties with the CLEARFIELD® trait (CL) are tolerant to labeled rates of Beyond® Odyssey® or Absolute® herbicides. This technology allows for post-emergent applications of these herbicides without crop injury or stress (see herbicide label). Labeled herbicides should only be used over the top of those hybrids and varieties that contain the CLEARFIELD trait. The unique Clearfield symbol and Clearfield® are registered trademarks of BASF.

Hybrids and varieties with the LibertyLink® gene (LL) are resistant to glufosinate herbicide. LibertyLink® and the Water Droplet Design are registered trademarks of BASF.

Hybrids and varieties with the Optimum® GLY trait are tolerant to labeled rates of glyphosate herbicides. This technology allows for post-emergent applications of these herbicides without crop injury or stress (see herbicide label). Labeled herbicides should only be used over the top of those hybrids and varieties that contain the Optimum® GLY trait.

CLUBROOT RESISTANCE: Shows different source of Clubroot resistance. CR1 is different from CR2, CR2 is different from CR3, etc.

CLUBROOT: **R** = Resistant, **S** = Susceptible

BLACKLEG: **R** = Resistant; **MR** = Moderately Resistant; **MS** = Moderately Susceptible; **S** = Susceptible.

BLACKLEG: **9** = Resistant; **1** = Susceptible.

SCLEROTINIA: **9** = Highly Tolerant; **5** = Moderately Tolerant; **1** = Susceptible.

FUSARIUM WILT: **R** = Resistant; **S** = Susceptible. Current Fusarium rating is provisional and based on limited data.

VERTICILLIUM STRIPE: **9** = Resistant, **1** = Susceptible.

EARLY GROWTH: **9** = Excellent, **1** = Poor. Early growth is recorded when plants are at 4-6 leaf stage. It is a subjective evaluation of healthiness of plants and the soil area covered by their leaves.

GREEN SEED CONTENT: **9** = Very low count (desired); **1** = Very high count.

STANDABILITY: **9** = upright (desired) while **1** = Severely lodged

PLANT HEIGHT: **9** = Tall; **1** = Short (desired).

Pioneer® brand canola products are treated with Helix® Vibrance® seed treatment. Helix® and Vibrance® are registered trademarks of a Syngenta Group Company.

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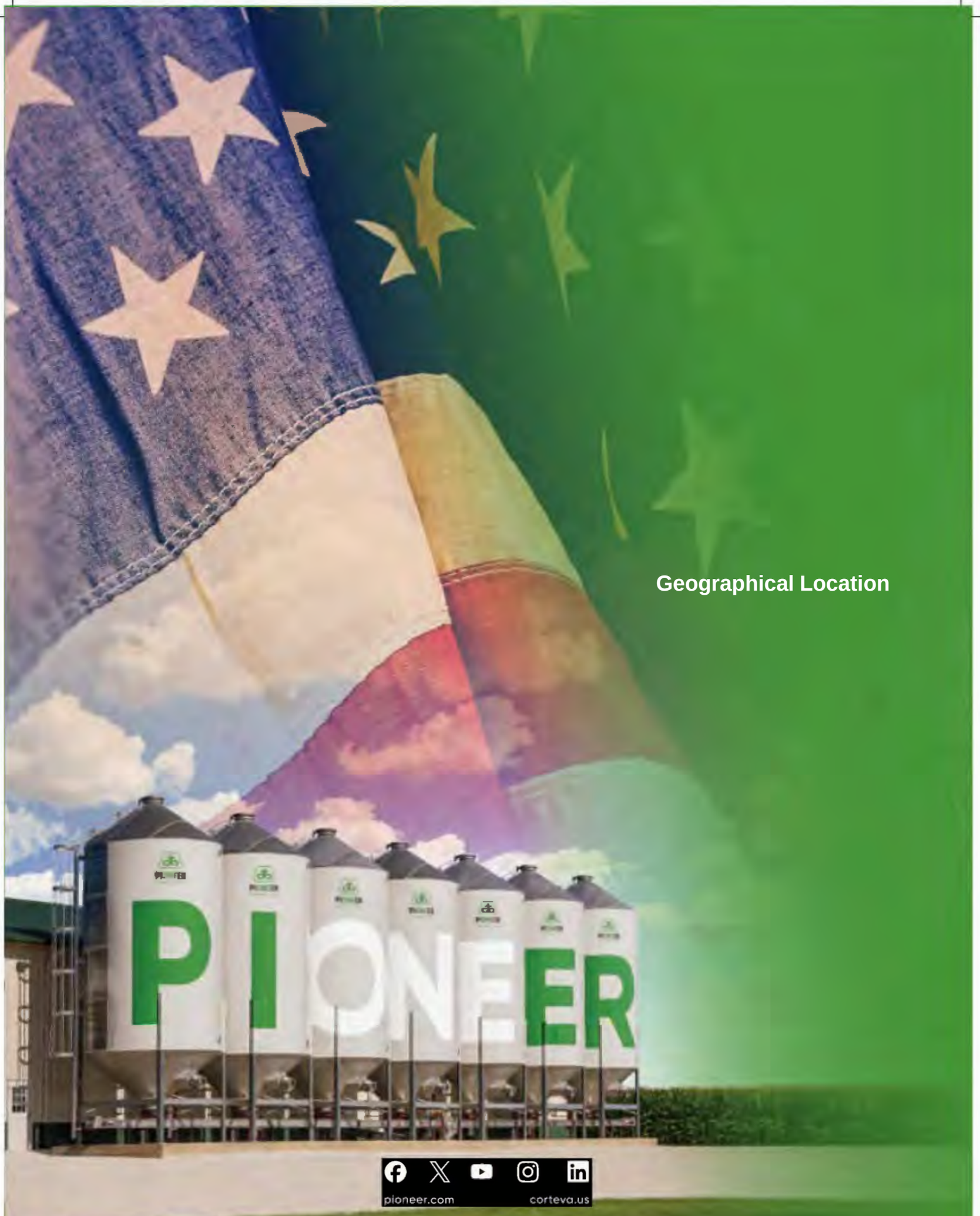

Geographical Location

pioneer.com corteva.us