PP2290 (Revised March 2026)

NDSU | EXTENSION

2025

EXTENSION SOYBEAN PATHOLOGY FIELD RESEARCH REPORTS

Authors:
Wade Webster, Assistant Professor and Extension Soybean Specialist

Gabe Dusek, Research Scientist

Hope Becton, Research Assistant Professor of Soybean Pathology

NDSU PLANT PATHOLOGY

PP2290 (revised March 2026)

Editors:

Samuel Markell
Andrew Friskop
Eric Branch

Collaborators:

Fargo – Main campus
Ana Carcedo
Carrie Dottey
Joe Ikley
Janet Knodel
Gustavo Kreutz
Lindsay Malone
Tonny Obua
Guiping Yan
Pat Beauzay
Joel Bell
Chad Deplazes
Bryan Hansen
Ben Harms
Mike McKenna
Addison Plaisance
Jess Scherer
Austin Weippert
Cole Williams
Daryl Ritchison and the NDAWN Team

Carrington Research Extension Center
Michael Wunsch

Dickinson Research Extension Center
Victor Gomes

North Central Research Extension Center
Chandler Gruener
Leandro Bortolon

Oakes Irrigation Research Site
Heidi Eslinger
Spencer Eslinger
Thomas Miorini

Williston Research Extension Center
Edson Ncube

The authors would like to thank the following for their support in 2025:

Albaugh
Arthur Company
BASF
Bayer Crop Science
Biogama
CHS
Gowan
National Sclerotinia Initiative
North Central Soybean Research Program
North Dakota Soybean Council
North Dakota State University
SummitAgro USA
Syngenta
United Soybean Board
Valent

DISCLAIMER
Reference to any specific commercial product, process, service, or the use of any trade, firm, or corporation name in this publication is for informational purposes only and does not constitute an endorsement, recommendation, or certification by North Dakota State University Extension. The research presented is not a comprehensive evaluation of all available products or technologies. Individuals choosing to use such products are responsible for doing so in accordance with current manufacturer directions and all applicable regulations.

TABLE OF CONTENTS

North Dakota Soybean Disease Summary - 2025

Brown Stem Rot

Brown stem rot, caused by the fungus *Cadophora gregata*, is a vascular disease of soybean that primarily infects and colonizes the stem pith. This disease can reduce plant vigor, cause premature leaf death and lead to notable yield losses, especially when infections align with environmental stress such as cool, wet conditions early in the season. The pathogen survives in soybean residue, infects roots early in the growing season and progresses systemically up the plant, with symptoms typically becoming evident during mid- to late-reproductive growth stages. During 2025, brown stem rot was observed across eastern North Dakota in early August, but did not develop to severe levels, resulting in minimal yield impacts.

Brown stem rot sample identified in Cass County in early August.

Frogeye Leaf Spot

Frogeye leaf spot, caused by the fungus *Cercospora sojina*, is a foliar disease of soybean that produces characteristic circular lesions with dark borders and light centers. This disease can significantly reduce the total photosynthetic area, weaken plants and lead to measurable yield losses, particularly in susceptible varieties under warm, humid conditions. The pathogen overwinters in infected residue, produces spores during periods of leaf wetness and spreads via wind and rain splash, leading to repeated cycles of infection throughout the growing season. Frogeye leaf spot has been increasing in prevalence and severity since its first identification in North Dakota in 2020. In 2025, frogeye leaf spot was identified in 28 counties in North Dakota through our field scouting. However, yield impacts were minimal.

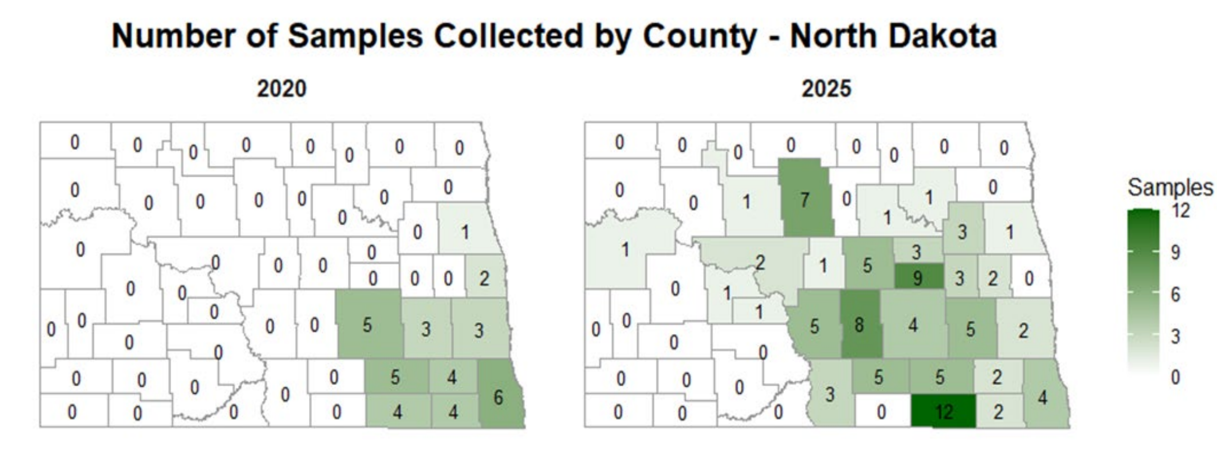


Figure 1. Symptomatic frogeye leaf spot samples collected by North Dakota county during the 2020 and 2025 growing seasons, respectively.

Soybean leaves symptomatic of frogeye leaf spot were observed in a farmer's field in Kidder County, North Dakota, on Sept. 10, 2025, with an approximate 50% field incidence and up to 10% severity.

Phytophthora Root and Stem Rot

Phytophthora root and stem rot, caused primarily by *Phytophthora sojae*, is a destructive soilborne disease of soybean that attacks roots and lower stems. Recently, there has been a second Phytophthora species identified, which is capable of infecting soybean, called *P. sansomeana*, but the impact of this pathogen is still unknown in North Dakota. This disease can cause damping-off, stand loss, reduced plant vigor and significant yield reductions, especially in poorly drained or saturated soils where infection pressure is high. The pathogen survives in the soil as long-lived oospores, infects roots shortly after planting under wet conditions and continues to reinfect throughout the season as new zoospores are produced. Despite consistent moisture across much of North Dakota in 2025, Phytophthora root and stem rot did not develop at high levels.

Red Crown Rot

Red crown rot, caused by the fungus *Calonectria ilicicola*, is a soilborne disease of soybean characterized by red discoloration at the stem base and root decay. This disease can reduce stand establishment, stunt plant growth and cause significant yield loss, particularly in warm, wet environments where the pathogen thrives. The pathogen survives in soil and residue, infects roots early in the season and progressively colonizes the lower stem, with symptoms intensifying as plants reach reproductive stages. Traditionally, a disease of southern production systems, red crown rot has been moving northward for the past few years. After extensive field scouting in 2025, no red crown rot has been identified in North Dakota. However, there has been a confirmed report in southwest Minnesota in late fall 2025.

Seedling Diseases

Seedling diseases of soybeans occur as a complex caused by multiple soilborne pathogens, including Pythium, Phytophthora, Rhizoctonia and Fusarium, that attack seeds and young seedlings during the earliest growth stages. Collectively, these diseases reduce stand establishment, slow early-season soybean growth and can permanently limit yield potential long before plants reach full canopy. The pathogens survive in the soil for many years, infect under stress-prone conditions such as cool, wet soils or compaction, and often co-occur, making it difficult to diagnose individual species without laboratory confirmation.

Pythium damping-off, caused by multiple Pythium species, is an oomycete (water mold) disease that attacks soybean seeds and seedlings, particularly under cool, wet soil conditions. This disease can lead to poor stand establishment, pre- and post-emergence damping-off and weakened seedlings that are slow to grow and vulnerable to additional stresses. The pathogen survives in soil as oospores and infects young roots shortly after planting, often spreading rapidly when soil remains saturated.

Rhizoctonia seedling blight and root rot, caused by *Rhizoctonia solani*, results in reddish-brown lesions on hypocotyls and roots that can girdle and kill young seedlings. This disease reduces plant vigor, delays canopy development and can lead to notable stand thinning in warm, moderately moist soils that favor pathogen activity. The fungus survives in soil and residue as overwintering structures (sclerotia) and infects seedlings soon after emergence, particularly when plants are stressed or growing slowly.

Fusarium root rot, caused by a complex of Fusarium species (*F. oxysporum*, *F. solani*, *F. graminearum*), affects soybean seedlings by attacking roots and lower stems early in the season. These pathogens can cause subtle reductions in vigor, discoloration of roots and chronic stand loss, ultimately reducing yield potential before plants reach the V2 stage. *Fusarium* spp. persist in soil and residue and infect seedlings under a wide range of conditions, often becoming more severe when plants are stressed by cold soils or compaction.

Collectively in 2025, seedling disease resulted in substantial yield impacts due to consistent moisture and plant stress early in the growing season. This led to reduced stands and poor root development which limited yield potential later in the season.

Soybean Cyst Nematode

Soybean cyst nematode (SCN), caused by *Heterodera glycines*, is the most economically damaging soybean disease in North America and parasitizes soybean roots by forming specialized feeding sites. This pest reduces yield by impairing root growth, limiting nutrient and water uptake and causing hidden yield loss even in the absence of obvious above-ground symptoms. The nematode survives in soil as long-lived cysts, hatches in response to soybean root exudates and completes multiple reproductive cycles per season, allowing populations to build rapidly under favorable conditions.

In the 2025 Soybean Cyst Nematode Sampling Program, a total of 466 soil samples were received and processed. From these samples, 40% were found to have no SCN present, 20% of samples had 1-200 SCN eggs + J2/100cc, 23% had 201-2,000 SCN eggs + J2/100cc, 15% had 2,001-10,000 SCN eggs + J2/100cc, 2% had 10,001-20,000 SCN eggs + J2/100cc and only one sample had greater than 20,000 SCN eggs + J2/100cc. The 2025 SCN figures are provided below.

Table 1.

Year	0 SCN eggs+J2/100cc	1-200 SCN eggs+J2/100cc	201-2,000 SCN eggs+J2/100cc	2,001-10,000 SCN eggs+J2/100cc	10,001-20,000 SCN eggs+J2/100cc	20,001+ SCN eggs+J2/100cc	Total Samples Received
2013	109 (58%)	44 (23%)	11 (6%)	14 (7%)	5 (3%)	5 (3%)	188
2014	392 (69%)	92 (16%)	29 (5%)	33 (6%)	13 (2%)	8 (1%)	567
2015	634 (73%)	129 (15%)	51 (6%)	25 (3%)	15 (2%)	10 (1%)	864
2016	347 (70%)	69 (14%)	33 (7%)	27 (5%)	16 (3%)	3 (1%)	495
2017	463 (67%)	89 (13%)	66 (10%)	56 (8%)	13 (2%)	6 (1%)	693
2018	411 (67%)	79 (13%)	51 (8%)	35 (6%)	25 (4%)	15 (2%)	616
2019	132 (58%)	27 (12%)	41 (18%)	24 (10%)	3 (1%)	2 (1%)	229
2020	384 (64%)	92 (15%)	75 (13%)	45 (8%)	3 (1%)	0 (0%)	599
2021	173 (48%)	49 (13%)	55 (15%)	50 (14%)	19 (5%)	18 (5%)	364
2022	196 (50%)	66 (17%)	43 (11%)	60 (15%)	16 (4%)	13 (3%)	394
2023	245 (42%)	105 (18%)	95 (16%)	90 (15%)	39 (7%)	9 (2%)	583
2024	356 (52%)	124 (18%)	109 (16%)	87 (13%)	8 (1%)	3 (0%)	687
2025	185 (40%)	93 (20%)	109 (23%)	69 (15%)	9 (2%)	1 (0%)	466

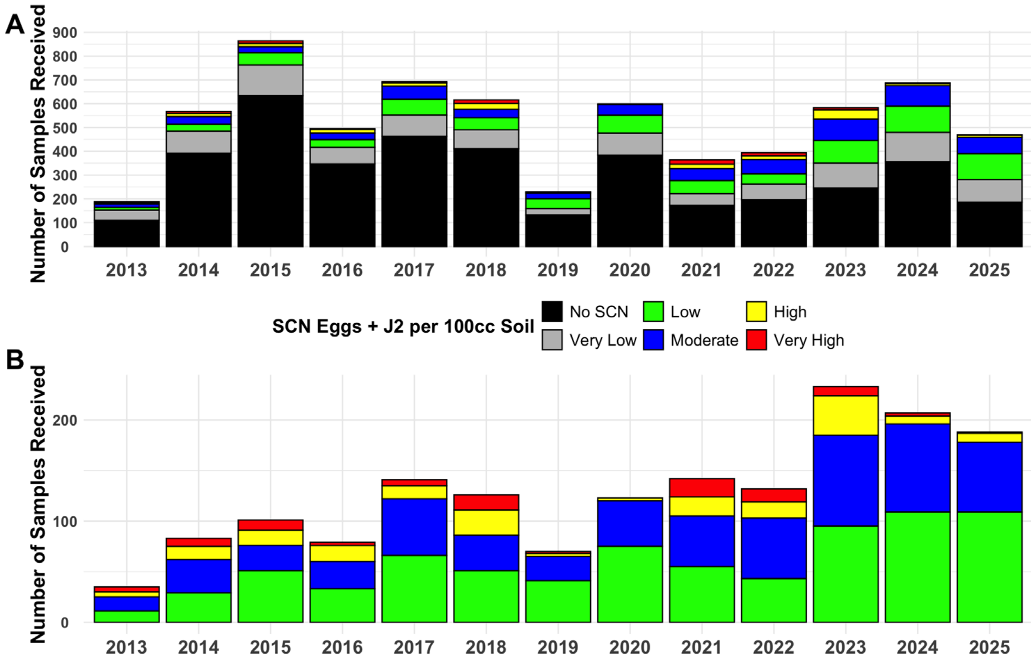


Figure 1. Evaluation of the number of submitted soil samples within each of the six classification levels. Figure 1A represents all samples, and Figure 1B represents all positive samples. Samples are classified based on their egg counts as either No SCN (0 eggs + J2/100 cc), Very Low (1-200 eggs + J2/100 cc), Low (201 – 2,000 eggs + J2/100 cc), Moderate (2,001 – 10,000 eggs + J2/100 cc), High (10,001 – 20,000 eggs + J2/100 cc) or Very High (greater than 20,000 eggs + J2/100 cc).

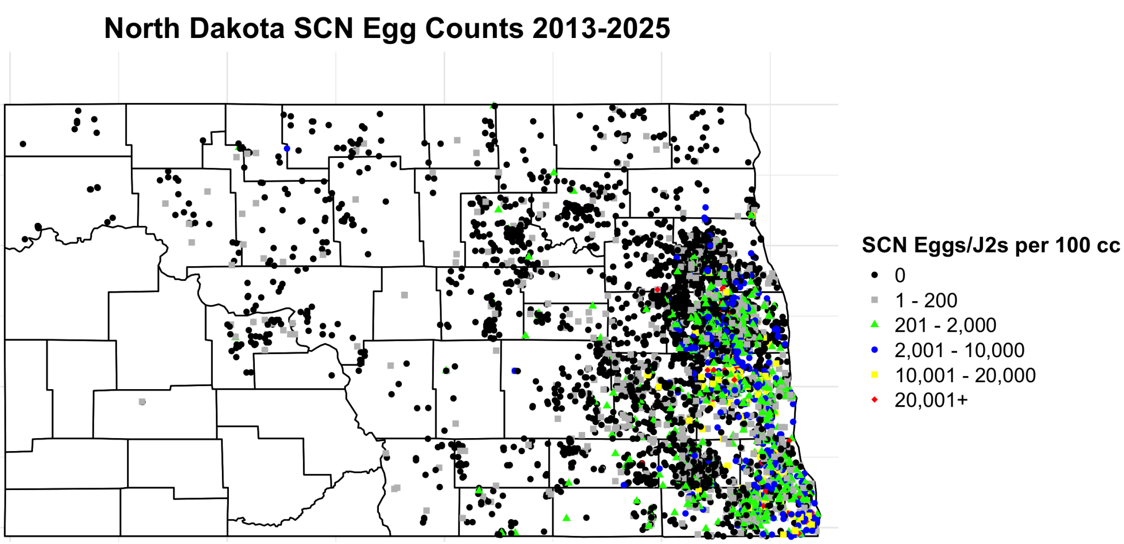


Figure 2. Map of North Dakota displaying SCN soil samples collected from 2013-2025. Samples are classified based on their egg counts as either No SCN (0 eggs + J2/100 cc of soil), Very Low (1-200 eggs + J2/100 cc), Low (201 – 2,000 eggs + J2/100 cc), Moderate (2,001 – 10,000 eggs + J2/100 cc), High (10,001 – 20,000 eggs + J2/100 cc) or Very High (greater than 20,000 eggs + J2/100 cc).

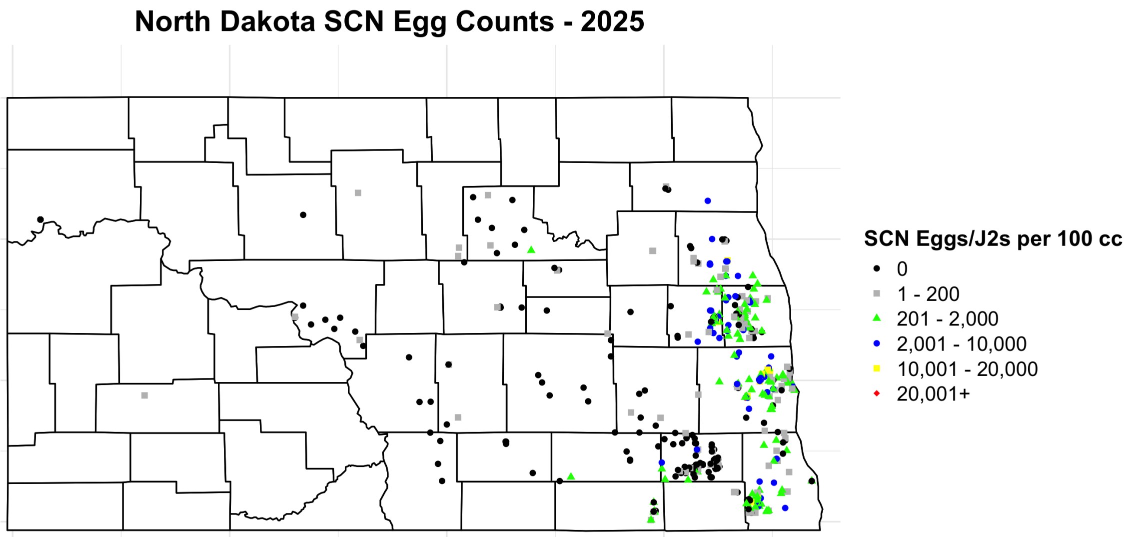


Figure 3. Map of North Dakota displaying SCN soil samples collected during 2025. Samples are classified based on their egg counts as either No SCN (0 eggs + J2/100 cc of soil), Very Low (1-200 eggs + J2/100 cc), Low (201 – 2,000 eggs + J2/100 cc), Moderate (2,001 – 10,000 eggs + J2/100 cc), High (10,001 – 20,000 eggs + J2/100 cc) or Very High (greater than 20,000 eggs + J2/100 cc).

Sudden Death Syndrome

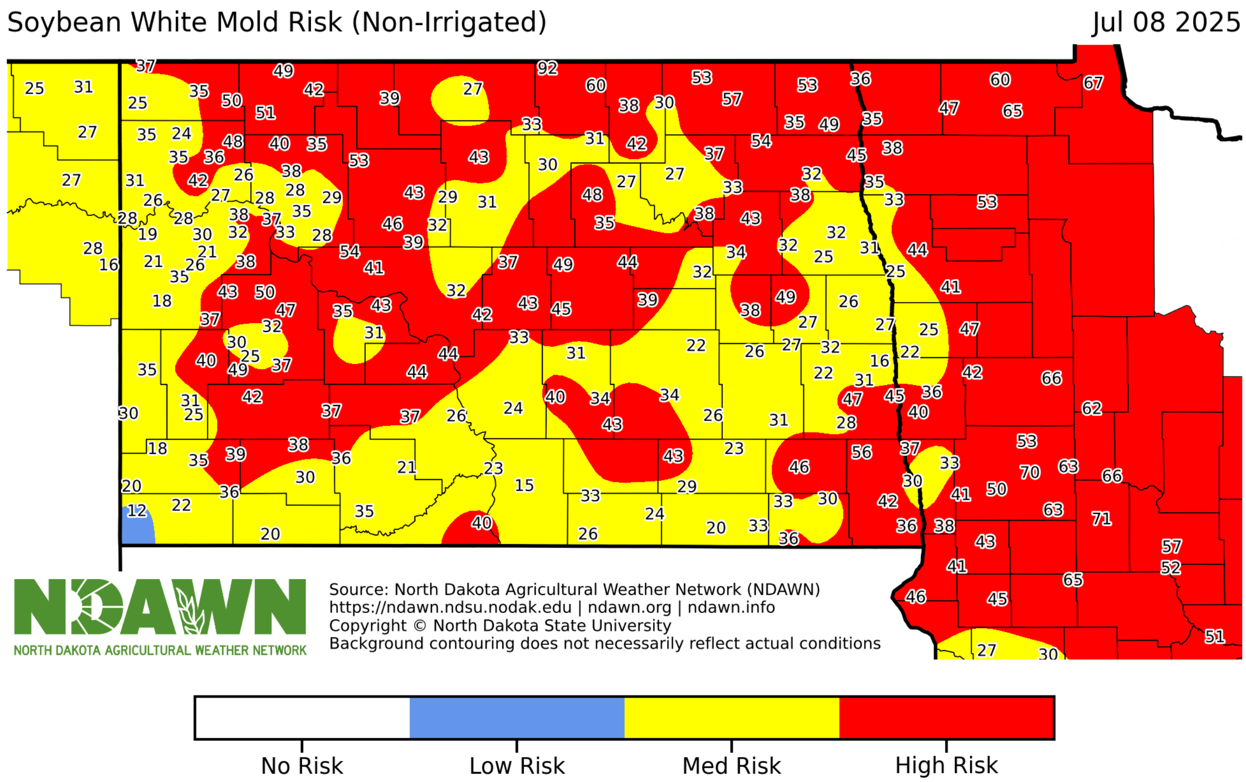
Sudden death syndrome (SDS), caused by the soilborne fungus *Fusarium virguliforme*, is a root disease of soybean that leads to toxin-induced foliar symptoms. This disease can substantially reduce yield by impairing root function, limiting nutrient and water uptake and causing premature defoliation, with the greatest losses occurring in high-yield environments and susceptible varieties. The pathogen survives in the soil and in crop residue, infects roots shortly after planting under cool, wet conditions and produces toxins that move upward into the leaves later in the season, causing the characteristic interveinal chlorosis and necrosis. In 2025, SDS was identified in Richland, Cass and Dickey counties; however, disease severity was lower than expected, and yield losses are estimated to have been minimal and isolated to the southeast corner of North Dakota.

White Mold

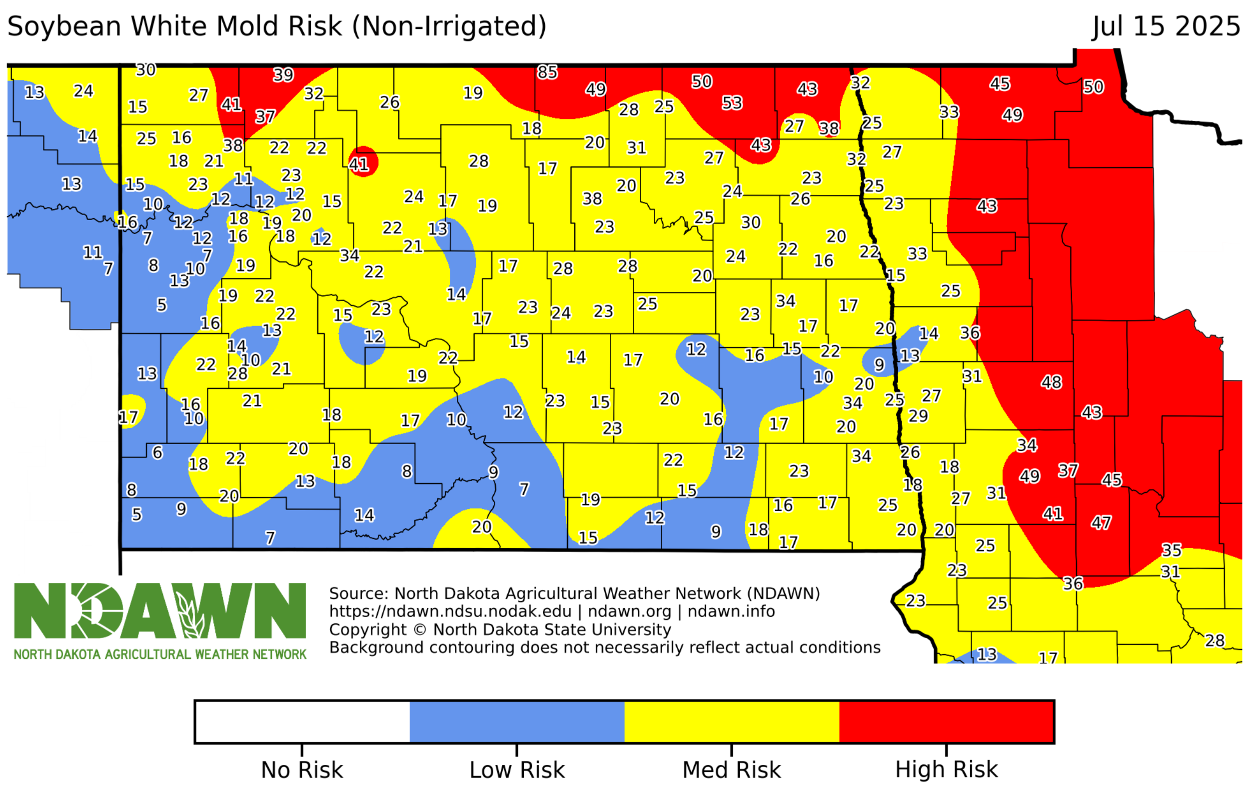
White mold, caused by the fungus *Sclerotinia sclerotiorum*, is a stem disease of soybean characterized by white, cottony mycelium and the formation of black sclerotia on or within infected tissues. This disease can lead to severe yield losses by killing branches or entire plants, reducing pod set and limiting canopy development, especially in cool, wet and dense canopies that favor infection. The pathogen overwinters as sclerotia in soil, which germinate to produce apothecia that release ascospores, and infections occur when these spores land on senescing flowers during periods of extended moisture.

Field with high white mold pressure near Granville, North Dakota (McHenry County). Photo was taken Sept. 11, 2025.

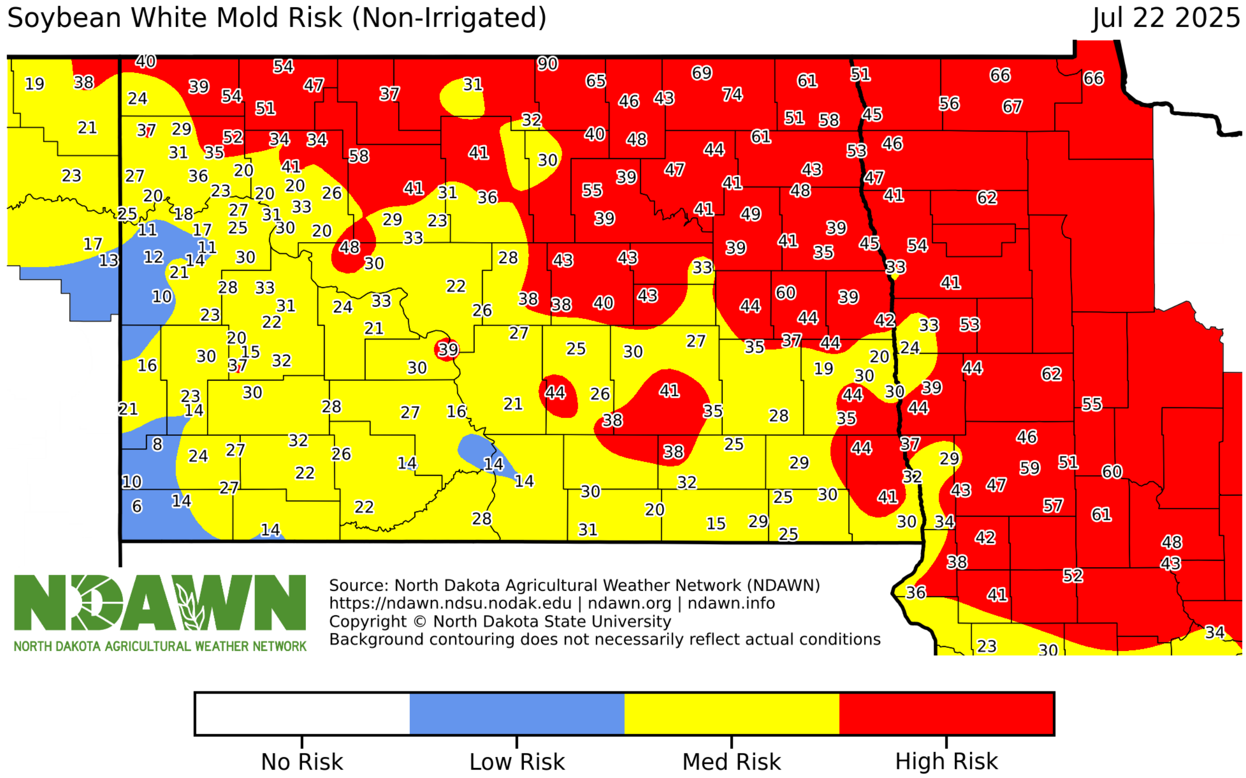
In 2025, environmental conditions were highly conducive to disease development, with high humidity, consistent precipitation and moderate temperatures less than 75 degrees Fahrenheit during the flowering growth stages (R1-R3). These conditions are outlined by the new NDAWN Soybean White Mold Risk Maps from three dates during flowering. As a result, white mold severity was high, and yield losses across North Dakota are estimated to be higher than in previous years. In addition to yield losses, severe white mold years are also known to increase the amount of new inoculum in the soil for future years, increasing the risk of disease development in future years.



White mold risk on July 8, 2025



White mold risk on July 15, 2025



White mold risk on July 22, 2025

Each number on the map represents a single weather station from which weather data is pulled. These numbers represent the risk probability (%) of the apothecia (white mold mushrooms) forming on the soil surface. High risk is defined as "Red" and is when a fungicide application is recommended if canopy closure has occurred and flowers are present. Medium risk is defined as "Yellow" and indicates when to be cautious of environmental conditions and potentially prepare to make a fungicide application. If you are growing highly susceptible soybeans in a field with a long history of white mold, fungicide applications may be warranted in the medium risk "Yellow." Low risk is defined as "Blue," and fungicide applications are not recommended. NDAWN Soybean White Mold Risk Maps are available here. Be sure to stop back next season to evaluate white mold risk.

Experimental Designs

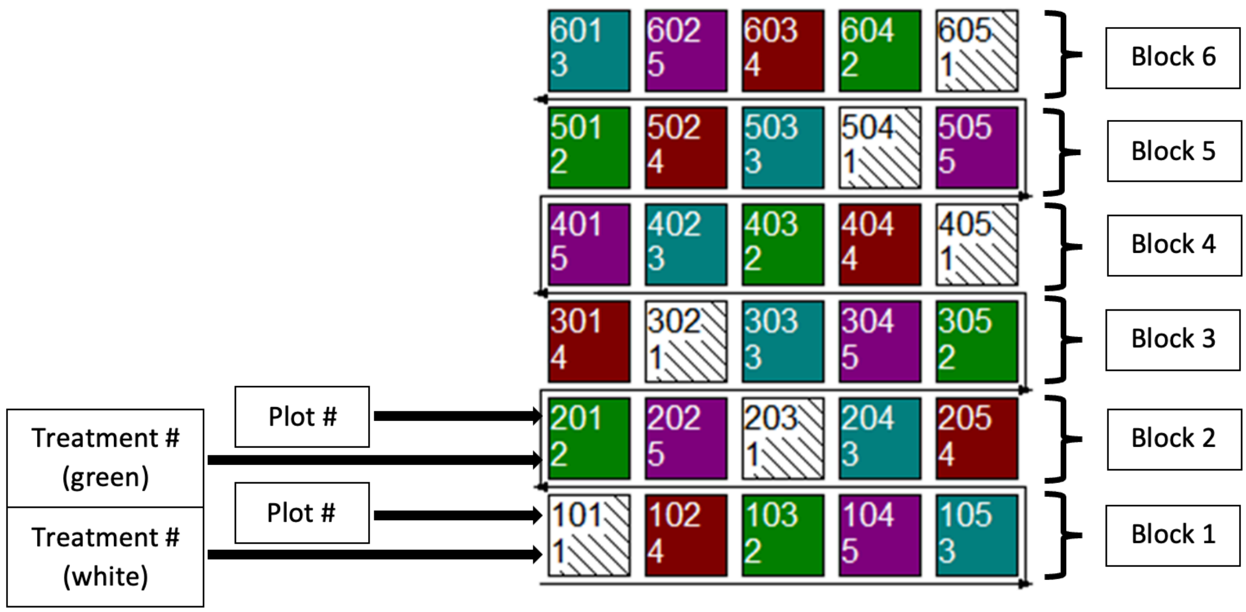
Designing Experiments

All experiment treatments are represented multiple times within reps for each experiment. A rep indicates how many times each treatment appears in an experiment (e.g., if an experiment has four reps, each treatment will appear four times in the experiment). Where the treatments are planted is often randomized within experiments to limit the amount of variation among treatments within the same rep. The type of variation that we attempt to reduce within each experiment includes, but is not limited to, environmental variation, soil variation, etc. To randomize where treatments are planted, we utilize a software called Agriculture Research Manager (ARM), which is one of the most commonly used programs when conducting crop protection research. Plots can vary in size from experiment to experiment, but a common size used in soybean disease research is 10 feet wide by 20 feet long. Treatments are given numbers within experiments to help with randomization and efficiency. An example is provided below.

This image represents a single plot from ARM, including the plot number and treatment number. Plot numbers often start with 101, but this can vary depending on the research program. Treatment numbers often start with 1.

Randomized Complete Block Design

A randomized complete block design (RCBD) is an experimental design that randomizes experiment treatments within reps and divides reps using blocks. Treatment location is randomized within each rep, and the experiment is planted with the intent to minimize variation (e.g., environmental, soil) within a rep and maximize variation across reps. It is important to minimize variation within reps to ensure a fair comparison of treatments within that rep. To put this in a different perspective, if you were to plant half of a rep in a wet portion of the field and the other half of a rep in a dry portion, the environment would have a large amount of variation within that rep. Due to the large variation that would be present in this example, the way individual treatments perform could be heavily influenced by the environment and, therefore, make it appear as if some treatments work better than others when in reality that may not be the case. In the example below, there is an experiment that has five treatments and six reps. Each treatment is represented six times, once within each rep.



This is a full image output from ARM, indicating the entire experiment randomization in a randomized complete block design. Treatments are randomized within blocks and indicated by numbers and colors. This experiment has six reps of each treatment and therefore six blocks. Plots are numbered starting with 101 and increase by 100 for each block.

Research Reports

Seedling Diseases

Trial 1. Evaluation of fungicide seed treatments for controlling seedling diseases in Fargo, ND - 2025

SOYBEAN (*Glycine max 'PFS 2003E'*)

G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS2003E was planted on May 6, 2025, in Fargo, North Dakota, at a rate of 140,000 seed/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The previous crop was wheat, and the soil type was silty clay. Standard practices were used to manage weeds and nutrition. Stand counts were taken on June 3, 2025. Root rot evaluations were conducted on June 23, 2025. Yield was collected from rows one and four on Oct. 24, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 16.24 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.1.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. Root rot evaluations were conducted by assessing the roots of 30 soybean plants per plot. Soybeans were pulled from the front and back of each plot. Assessments were conducted on a 0-5 scale, where 0 represented no disease, and 5 represented complete plant death due to seedling disease. These assessments were then used to calculate a root rot % ranging from 0-100. There was a low level of disease observed across the majority of this trial, with the highest root rot percentage that was observed in a single plot being 35.3% (data not presented). Statistical analysis indicated there were no significant differences among treatments for stand counts, root rot %, or yield. Although there were no significant differences, a treatment of Cruiser Maxx APX at 3.9 fl oz/cwt had the highest reported mean yield at 68.6 bu/a, which was 5.3 bu/a higher than when no seed treatment was used. The seed treatment Relenya at 0.8 fl oz/cwt had the second-highest reported mean yield at 67.7 bu/a, and a combination treatment of C-3023FI at 1.136 fl oz/cwt and Lumiderm at 1.14 fl oz/cwt had the third-highest reported mean yield at 67 bu/a. The results from this experiment support findings that suggest planting soybeans with a seed treatment will generally result in a higher yield than if no seed treatment were used.

Table 1. Effect of seed treatments on stand counts, root rot severity and yield.

Treatment[a]	Rate	Stand Counts (plants/a)[b]	Root Rot Severity (%)[c]	Yield (bu/a)[d]
Non-Treated	-	84,289	24.0	63.3
Allegiance	1.5 fl oz/cwt	85,596	21.5	64.2
Relenya	0.8 fl oz/cwt	84,725	23.2	67.7
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	82,329	19.8	65.6
Vibrance Trio	1.44 fl oz/cwt	87,338	16.0	64.3
Cruiser Maxx APX	3.9 fl oz/cwt	83,091	16.7	68.6
C-3023FI Lumiderm	1.136 fl oz/cwt 1.14 fl oz/cwt	87,992	22.5	67.0
Allegiance Acceleron D281	1.5 fl oz/cwt 0.32 fl oz/cwt	91,912	17.7	65.3
Vibrance Trio Cruiser 5FS	1.44 fl oz/cwt 1.28 fl oz/cwt	85,923	18.2	63.7
Allegiance Acceleron D281 Cruiser 5FS	1.5 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	89,843	15.0	59.0
P-Value		0.5583	0.1041	0.1989

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] Stand counts were taken on June 4, 2025. This trial was planted at 140,000 seeds per acre.
[c] Root rot severity (%) was calculated based on root rot severity evaluations taken on June 12, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 1, 2025.

Trial 2. Evaluation of fungicide seed treatments for controlling seedling diseases in Oakes, ND- 2025

SOYBEAN (*Glycine max 'PFS 2003E'*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS2003E was planted on May 7, 2025, in Oakes, North Dakota, at a rate of 140,000 seed/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times, designed in a randomized complete block, and blocks were separated by 5-foot alleys. The previous crop was soybean, and the soil type was Barnes-Svea loams. Standard practices were used to manage weeds and nutrition. Stand counts were taken on June 4, 2025. Root rot evaluations were conducted on June 12, 2025. Yield was collected from the first two rows on Oct. 1, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 17.2 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.1.

Stand counts were recorded by counting the number of emerged soybeans in the first two rows (100 sq feet) and converting to plants per acre. Root rot evaluations were conducted by assessing the roots of 30 soybean plants per plot. Soybeans were pulled from the front and back of each plot. Assessments were conducted on a 0-5 scale where 0 represented no disease, and 5 represented complete plant death due to seedling disease. These assessments were then used to calculate a root rot % ranging from 0-100. There was a low level of root rot diseases that developed in this trial, with the highest reported root rot % for a single plot was 33.3% in a nontreated control plot. There were no statistical differences detected among treatments for root rot %. There were statistically significant differences detected among treatments for stand counts. Only one seed treatment differed from the non-treated control significantly, which was a combination treatment of Vibrance Trio and Cruiser 5FS, which resulted in a significantly higher stand than the non-treated control. There were no significant differences in mean treatment yields. However, trends in the data suggest that the seed treatments evaluated in this experiment generally had higher mean yield than if no seed treatment were used. The mean yield for the non-treated control was 56.9 bu/a, whereas seed treatments ranged from 59.4 to 62.5 bu/a, which is 2.5 to 5.6 bu/a higher than if no seed treatment was used. The treatment with the highest mean yield was a combination of C-3023FI and Lumiderm, with treatments of Vibrance Trio and a combination of Allegiance at 1.5 fl oz/a and Relenya at 0.32 fl oz/a having similar mean yield results. The results from this experiment provide evidence that using seed treatments in environments with low pressure from seedling diseases may generally result in higher yields than if no seed treatment were to be used.

Table 2. Effect of seed treatments on stand counts, root rot severity and yield.

Treatment[a]	Rate	Stand Counts (plants/a)[b]	Root Rot Severity (%)[c]	Yield (bu/a)[d]
Non-Treated	-	98,555 bc[e]	17.7	56.9
Allegiance	1.5 fl oz/cwt	98,664 bc	17.0	59.4
Relenya	0.8 fl oz/cwt	100,733 ab	20.0	61.4
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	93,654 c	22.0	60.4
Vibrance Trio	1.44 fl oz/cwt	103,673 ab	17.7	62.1
Cruiser Maxx APX	3.9 fl oz/cwt	102,475 ab	18.2	60.4
C-3023FI Lumiderm	1.136 fl oz/cwt 1.14 fl oz/cwt	99,644 b	26.5	62.5
Allegiance Acceleron D281	1.5 fl oz/cwt 0.32 fl oz/cwt	102,366 ab	11.2	62.1
Vibrance Trio Cruiser 5FS	1.44 fl oz/cwt 1.28 fl oz/cwt	106,287 a	15.3	59.5
Allegiance Acceleron D281 Cruiser 5FS	1.5 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	101,604 ab	15.2	61.4
P-Value		0.0532	0.2984	0.3470

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] Stand counts were taken on June 4, 2025. This trial was planted at 140,000 seeds per acre.
[c] Root rot severity (%) was calculated based on root rot severity evaluations taken on June 12, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 1, 2025.
[e] Treatments with different letter groupings differ significantly ($\alpha = 0.1$).

Trial 3. Evaluation of fungicide seed treatments for controlling seedling diseases in Mohall, ND - 2025

SOYBEAN (*Glycine max ‘PFS 24XF01’*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS24XF01 was planted on May 30, 2025, in Mohall, North Dakota, at a rate of 140,000 seed/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 19 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block and blocks were separated by 6-foot alleys. The previous crop was wheat, and the soil type was Hamlet-Souris loams. Standard practices were used to manage weeds and nutrition. Stand counts were taken on July 1, 2025. Root rot evaluations were conducted on July 1, 2025. Yield was collected from the center two rows on Oct. 9, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 9.18 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher’s Protected LSD at α=0.1.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (95 sq feet) and converting to plants per acre. Root rot evaluations were conducted by assessing the roots of 30 soybean plants per plot. Soybeans were pulled from the front and backs of each plot. Assessments were conducted on a 0-5 scale where 0 represented no disease and 5 represented complete plant death due to seedling disease. These assessments were then used to calculate a root rot % ranging from 0-100. There was a moderate level of disease that was observed in this trial with the highest reported root rot % for a single plot being 52%. Statistical analysis indicated there were no significant differences among treatments for stand counts, root rot % or yield. Although there were no significant differences, the non-treated control resulted in the highest reported mean root rot % at 41.2%. Additionally, a combination treatment of C-3023FI at 1.136 fl oz/cwt and Lumiderm at 1.14 fl oz/cwt had the highest reported mean yield at 34 bu/a, which was 1.4 bu/a higher than if no seed treatment was used.

Table 3. Effect of seed treatments on stand counts, root rot severity and yield.

Treatment[a]	**Rate**	**Stand Counts (plants/a)**[b]	**Root Rot Severity (%)**[c]	**Yield (bu/a)**[d]
Non-Treated	-	113,027	41.2	32.6
Allegiance	1.5 fl oz/cwt	107,640	36.8	31.6
Relenya	0.8 fl oz/cwt	116,810	34.3	30.1
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	109,932	34.8	33.6
Vibrance Trio	1.44 fl oz/cwt	117,039	29.0	30.4
Cruiser Maxx APX	3.9 fl oz/cwt	108,327	30.0	31.8
C-3023FI Lumiderm	1.136 fl oz/cwt 1.14 fl oz/cwt	117,727	22.5	34.0
Allegiance Acceleron D281	1.5 fl oz/cwt 0.32 fl oz/cwt	109,130	29.3	24.7
Vibrance Trio Cruiser 5FS	1.44 fl oz/cwt 1.28 fl oz/cwt	106,952	26.5	33.3
Allegiance Acceleron D281 Cruiser 5FS	1.5 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	113,486	24.7	30.9
P-Value		0.8637	0.2764	0.7562

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] Stand counts were taken on July 1, 2025. This trial was planted at 140,000 seeds per acre.
[c] Root rot severity (%) was calculated based on root rot severity evaluations taken on July 1, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 9, 2025.

Trial 4. Evaluation of fungicide seed treatments for controlling seedling diseases in Dickinson, ND - 2025

SOYBEAN (*Glycine max 'PFS 2003E'*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS2003E was planted on May 12, 2025, in Dickinson, North Dakota, at a rate of 120,000 seed/a in bedded single rows spaced 7 inches apart and a planting depth of 1.5 inches. Experiment plots were 4 feet wide by 25 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. Standard practices were used to manage weeds and nutrition. Stand counts and root rot evaluations were taken on June 24, 2025. Yield was collected on Oct. 8, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 17.41 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.1.

Stand counts were recorded by counting the number of emerged soybeans in the center three rows (43.75 sq feet) and converting to plants per acre. Root rot evaluations were conducted by assessing the roots of 30 soybean plants per plot. Soybeans were pulled from the front and backs of each plot. Assessments were conducted on a 0-5 scale where 0 represented no disease and 5 represented complete plant death due to seedling disease. These assessments were then used to calculate a root rot % ranging from 0-100. There was a moderate level of disease that developed in this trial, with the highest reported root rot percentage in a single plot being 40.7%. Statistical analysis indicated significant differences among treatments for both stand counts (P=0.0512) and root rot % (P=0.0457); however, there were no significant differences among treatments for yield. A treatment of Allegiance at 1.5 fl oz/cwt resulted in significantly higher stand counts than if no seed treatment were used. Additionally, the same treatment of Allegiance had significantly lower root rot % than if no seed treatment were used. A combination treatment of C-3023FI at 1.136 fl oz/cwt and Lumiderm at 1.14 fl oz/cwt also had significantly lower root rot % than if no seed treatment were used. Interestingly, although there were significant differences for stand counts and root rot % there were no significant differences for yield. Only two seed treatments resulted in higher mean yields than if no seed treatment were used. Those treatments were a sole application of Cruiser Maxx APX at 3.9 fl oz/cwt which resulted in a mean yield of 43.3 bu/a (3.3 bu/a higher than the non-treated control) and a combination application of Vibrance Trio at 1.44 fl oz/cwt and Cruiser 5FS at 1.28 fl oz/cwt, which resulted in a mean yield of 41.9 bu/a (1.9 bu/a higher than the non-treated control).

Table 4. Effect of seed treatments on stand counts, root rot severity and yield.

Treatment[a]	Rate	Stand Counts (plants/a)[b]	Root Rot Severity (%)[c]	Yield (bu/a)[d]
Non-Treated	-	103,499 bc[e]	28.5 ac	40.0
Allegiance	1.5 fl oz/cwt	118,832 a	21.3 d	38.4
Relenya	0.8 fl oz/cwt	90,605 c	32.2 a	37.3
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	108,378 ab	31.7 ab	38.6
Vibrance Trio	1.44 fl oz/cwt	91,999 c	29.7 ac	37.8
Cruiser Maxx APX	3.9 fl oz/cwt	112,908 ab	24.8 bd	43.3
C-3023FI Lumiderm	1.136 fl oz/cwt 1.14 fl oz/cwt	106,287 ab	20.5 d	39.6
Allegiance Acceleron D281	1.5 fl oz/cwt 0.32 fl oz/cwt	101,060 bc	22.7 cd	39.2
Vibrance Trio Cruiser 5FS	1.44 fl oz/cwt 1.28 fl oz/cwt	102,454 bc	30.2 ab	41.9
Allegiance Acceleron D281 Cruiser 5FS	1.5 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	106,984 ab	30.3 ab	37.7
P-Value		0.0512	0.0457	0.3890

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] Stand counts were taken on June 24, 2025. This trial was planted at 120,000 seeds per acre.
[c] Root rot severity (%) was calculated based on root rot severity evaluations taken on June 24, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 8, 2025.
[e] Treatments with different letter groupings differ significantly ($\alpha = 0.1$).

Trial 5. Evaluation of fungicide seed treatments for controlling seedling diseases in Williston, ND - 2025

SOYBEAN (*Glycine max 'PFS 2003E'*)

G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS2003E was planted on May 12, 2025, in Williston, North Dakota, at a rate of 140,000 seed/a in bedded single rows spaced 7 inches apart and a planting depth of 1.5 inches. Experiment plots were 4 feet and 10 in wide by 20 feet long. Treatment evaluations were replicated five times and designed in a randomized complete block, and blocks were separated by 5-foot alleys. This trial was planted where the previous crop was flax and soybeans had not been planted for a minimum of five years, and the soil type was Williams-Bowbells loams. Standard practices were used to manage weeds and nutrition. Stand counts were taken on June 25, 2025. Root rot evaluations were collected on June 25, 2025. Yield was collected from seven rows on Sept. 29, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 11.3 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.1$.

Stand counts were recorded by counting the number of emerged soybeans in the center three rows (35 sq feet) and converting to plants per acre. Root rot evaluations were conducted by assessing the roots of 15 soybean plants per plot. Soybeans were pulled from the front and backs of each plot. Assessments were conducted on a 0-5 scale where 0 represented no disease and 5 represented complete plant death due to seedling disease. These assessments were then used to calculate a root rot % ranging from 0-100. This trial had moderate levels of disease development, with the highest recorded root rot % in a single plot being 44%. There were no significant differences among treatments for stand counts, root rot % or yield. This trial also had very low yields, with the highest recorded treatment mean yield being 8.4 bu/a, which can likely be attributed to low levels of rainfall over the course of the growing season. Additionally, these yields are generally within the range of what is expected for this region of North Dakota.

Table 5. Effect of seed treatments on stand counts, root rot severity and yield.

Treatment[a]	Rate	Stand Counts (plants/a)[b]	Root Rot Severity (%)[c]	Yield (bu/a)[d]
Non-Treated	-	66,709	32.3	7.2
Allegiance	1.5 fl oz/cwt	63,723	34.1	6.8
Relenya	0.8 fl oz/cwt	63,723	29.9	7.5
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	66,212	29.1	8.4
Vibrance Trio	1.44 fl oz/cwt	64,469	26.4	7.3
Cruiser Maxx APX	3.9 fl oz/cwt	71,190	29.3	6.9
C-3023FI Lumiderm	1.136 fl oz/cwt 1.14 fl oz/cwt	63,225	34.4	8.1
Allegiance Acceleron D281	1.5 fl oz/cwt 0.32 fl oz/cwt	70,194	26.7	7.8
Vibrance Trio Cruiser 5FS	1.44 fl oz/cwt 1.28 fl oz/cwt	67,207	30.1	7.9
Allegiance Acceleron D281 Cruiser 5FS	1.5 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	63,723	28.5	7.2
P-Value		0.5141	0.216	0.4393

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] Stand counts were taken on June 25, 2025. This trial was planted at 140,000 seeds per acre.
[c] Root rot % was calculated based on root rot severity evaluations taken on June 25, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Sept. 29, 2025.

Trial 6. Evaluation of fungicide seed treatments, seeding rates, and planting date for control of seedling diseases in Fargo, ND – 2025

SOYBEAN (*Glycine max 'PFS 2003E'*) H. R. Becton, G. Dusek and R. W. Webster

The soybean variety PFS 2003E was planted in Fargo, North Dakota. Two planting dates were evaluated in this study, which were an early planting date of May 6, 2025, and a late planting date of May 31, 2025. Two seeding rates were also examined, including 130,000 (low) and 170,000 (high) seed/a. All seeds were planted at a depth of 1.5 inches in bedded single rows spaced 30 inches apart. Plots were four rows by 20 feet long. Integrated with the two planting dates and two seeding rates included five seed treatment programs. In total, there were 20 treatment combinations evaluated (seed treatment x seeding rate x planting date) with each replicated four times and organized in a randomized complete block design with a split-plot arrangement. Blocks were separated by 7-foot alleys. The field was rainfed, and the previous crop was wheat. Soil type was silty clay. Standard practices were used to manage weeds and nutrition. Mixing compatibility issues and phytotoxicity were not observed during the trial. Root rot ratings were taken at the VC and V3 growth stages for each planting date. Yield was collected from the center two rows on Oct. 2, 2025. Rainfall during the period totaled 16.2 inches, and weather conditions were conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.05$.

Significant differences were observed between individual treatments ($P<0.001$) for root rot ratings at VC and V3 as well as yields. The Allegiance+Relenya+Acceleron+Cruiser 5FS treatment planted early at a rate of 170k had the lowest mean root rot rating and was significantly different than more than half the treatments. Further, all early-planted treatments (mean=16.9 %) had significantly lower ($P<0.001$) root rot ratings compared to the late-planted treatments (mean=42.5 %). No differences were observed among individual seed treatments ($P=0.88$) nor seeding rates ($P=0.89$) for root rot ratings. Treatments that were planted early had significantly greater ($P<0.001$) yields compared to those planted late, with means of 70.4 bu/ac and 59.7 bu/ac, respectively. Differences ($P=0.046$) were also observed between planting rates; plots planted at the higher rate (170k) had greater yields compared to the lower rate (130k) seeded plots. Generally, the treatments where lower root rot and greater yields were observed were the ones planted early at 170k seed/a.

Table 6. Effect of integration of seed treatments, seeding rate and planting date on stand counts, root rot severity and yield.

Treatment	Rate	Seeding Rate (seeds/a)	Planting Date[a]	Stand Counts (plants/a)[b]	Root Rot Severity (%) [c]	Yield (bu/a)[d]
Non-treated	-	130,000	Early	68,171 ef[e]	20.3 cd	66.1 be
Allegiance	1.5 fl oz/cwt	130,000	Early	67,191 ef	17 ce	72.4 ac
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz /cwt	130,000	Early	67,954 ef	18.3 ce	67.9 ae
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt	130,000	Early	66,211 ef	11.5 de	63.5 cf
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	130,000	Early	62,835 f	12..5 de	71.5 ad
Non-treated	-	170,000	Early	82,002 de	17.8 ce	72.9 ab
Allegiance	1.5 fl oz/cwt	170,000	Early	90,496 cd	26.8 bc	70.0 ad
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz /cwt	170,000	Early	88,427 cd	22.2 cd	70.1 ad
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt	170,000	Early	78,299 df	15.7 ce	75.7 a
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	170,000	Early	87,447 cd	6.5 e	73.7 ab
Non-treated	-	130,000	Late	93,872 bd	39.8 a	55.6 f
Allegiance	1.5 fl oz/cwt	130,000	Late	91,585 cd	42.7 a	56.0 f
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz /cwt	130,000	Late	92,347 cd	42.8 a	62.4 ef
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt	130,000	Late	88,862 cd	42.8 a	56.2 f
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	130,000	Late	96,703 bd	46.5 a	60.3 ef
Non-treated	-	170,000	Late	106,286 ac	38.7 ab	62.9 def

Allegiance	1.5 fl oz/cwt	170,000	Late	117,612 a	43 a	59.0 ef
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz /cwt	170,000	Late	121,424 a	42.3 a	62.8 df
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt	170,000	Late	112,167 ab	42.7 a	59.0 ef
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	170,000	Late	119,790 a	43.7 a	63.1 df
P-Value				<0.001	<0.001	<0.001

[a] Early planting date was May 6, 2025, and the late planting date was May 31, 2025.
[b] Stand counts were recorded at VC growth stage.
[c] Weighted calculation based using severity scale ratings based on root rot ratings collected at the V3 growth stage.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 2, 2025.
[e] Means followed with different letters are significantly different following Fisher's Protected LSD at α=0.05.

Trial 7. Evaluation of fungicide seed treatments, seeding rates, and planting date for control of seedling diseases in Carrington, ND – 2025

SOYBEAN (*Glycine max 'PFS 2003E')*

H. R. Becton, G. Dusek, and R. W.

The soybean variety PFS 2003E was planted in Carrington, North Dakota, at two planting dates, which were considered part of the treatments evaluated in this study. The early planting date was May 14, 2025, and the late planting date was May 29, 2025. Seeding rates were planted at two rates, 130,000 (low) and 170,000 (high) seeds/a at a depth of 1.5 inches in bedded single rows spaced 28 inches apart. There was an error made at planting, where only the low seeding rate was planted at the first planting date, and only the high seeding rate was planted at the second planting date. Plots were four rows by 90 feet. There were 10 individual treatments evaluated (seed treatment x seeding rate), with each replicated 12 times and organized as two randomized complete block designs. The field was rainfed, and the previous crop was spring wheat. Soil type was silty clay. Standard practices were used to manage weeds and fertility. Mixing compatibility issues and phytotoxicity were not observed during the trial. Root rot ratings were taken at the VC and V3 growth stages for each planting date. Yield was collected from the center two rows on Nov. 2, 2025. Rainfall during the period totaled 18.5 inches, and weather conditions were conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of seed treatments at varying seeding rates and planting dates on disease ratings and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.05$.

Because of the planting error, these data were analyzed as two separate studies. Root rot severity ratings were not significant among treatments for either experiment. There were significant differences with respect to yield, though. For both studies, the seed treatment containing Allegiance+Relenya+Acceleron D-281+Cruiser 5FS was the best at preserving yields compared to other treatments and the non-treated.

Table 7. Effect of integration of seed treatments, seeding rate and planting date on stand counts, root rot severity and yield.

Treatment	Rate	Seeding Rate (seeds/a)	Planting Date[a]	Stand Counts (plants/a)[b]	Root Rot Severity (%)[c]	Yield (bu/a)[d]
Non-treated	-	130,000	Early	65,807 ab[e]	58.6	48.6 bc
Allegiance	1.5 fl oz/cwt	130,000	Early	63,732 b	63.1	47.8 c
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	130,000	Early	70,215 ab	61.0	49.8 ab
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt	130,000	Early	64,044 ab	51.9	49.4 ac
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	130,000	Early	75,815 a	59.4	50.9 a
P-Value				0.04	0.24	0.01
Non-treated	-	170,000	Late	92,358 b	58.9	48.5 b
Allegiance	1.5 fl oz/cwt	170,000	Late	90,750 b	57.7	48.6 b
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	170,000	Late	92,150 b	54.6	49.3 b
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt	170,000	Late	92,271 b	52.9	48.4 b
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.32 fl oz/cwt 1.28 fl oz/cwt	170,000	Late	112,219 a	49.5	50.3 a
P-Value				0.002	0.25	<0.001

[a] Early planting date was May 14, 2025, and the late planting date was May 29, 2025.
[b] Stand counts were recorded at VC growth stage.
[c] Weighted calculation based using severity scale ratings based on root rot ratings collected at the V3 growth stage.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Nov. 2, 2025.
[e] Means followed by different letters are significantly different following Fisher's Protected LSD at α=0.05.

Trial 8. Evaluation of fungicide seed treatments with cereal rye cover crops for controlling seedling diseases in Gardner, ND - 2025

SOYBEAN (*Glycine max 'PFS 2003E'*) H. R. Becton, G. Dusek and R. W. Webster

Cereal rye was planted over half of the space, in Gardner, North Dakota, used for this trial on Sept. 19, 2024. Burndown application was made on May 14, 2025, using glyphosate. 'PFS 2003E' soybean was planted May 27, 2025, at a rate of 140,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 14 inches apart in Gardner, North Dakota. Plots were four rows by 25 feet. Treatments included seed treatments and the incorporation of a cover crop; each was replicated four times and designed in a split-plot design. Blocks were separated by 7-foot alleys. The field was rainfed, and standard practices were used to manage weeds and fertility. Root rot ratings were taken on July. Yield was collected from the center rows on Oct. 14, 2025. Rainfall during the period totaled approximately 12.8 inches, and weather conditions were only moderately conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

No significant differences were observed among seed treatments or plots with a cover crop with respect to root rot severity or yield.

Table 8. Effect of integrating seed treatments in a cereal rye cover crop system on stand counts, root rot severity and yield.

Treatment	Rate	Cover crop	Stand Counts (plant/a)[a]	Root Rot Severity (%)[b]	Yield (bu/a)[c]
Non-Treated	-	Cereal Rye	62,182	18.5	30.1
Allegiance	1.5 fl oz/cwt	Cereal Rye	56,846	18.9	32.1
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	Cereal Rye	60,984	17.3	34.4
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt	Cereal Rye	55,648	15.5	29.0
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt 9.0 fl oz/cwt	Cereal Rye	58,697	18.3	31.9
Non-Treated	-	No Cover	68,063	22.5	34.0
Allegiance	1.5 fl oz/cwt	No Cover	59,786	14.0	34.9
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	No Cover	60,766	19.3	35.1
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt	No Cover	64,578	17.5	30.0
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt 9.0 fl oz/cwt	No Cover	50,312	19.0	36.3
P-Value		Cover*Treatment	0.66	0.64	0.34
		Treatment	0.83	0.50	0.73
		Cover	0.63	0.50	0.99

[a] Stand counts were recorded at VC growth stage.
[b] Weighted calculation based using severity scale ratings based on root rot ratings collected at the V3 growth stage.
[c] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 14, 2025.

Trial 9. Evaluation of fungicide seed treatments with cereal rye cover crops for controlling seedling diseases in Dickinson, ND - 2025

SOYBEAN (*Glycine max 'PFS 2003E'*)

H. R. Becton, G. Dusek, and R. W. Webster

Cereal rye was planted over half of the space, in Dickinson, North Dakota, used for this trial on Sept. 18, 2024. A burndown application was made on May 9, 2025, using glyphosate. 'PFS 2003E' soybean was planted May 12, 2025, at a rate of 120,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 7.5 inches apart at the Dickinson Research and Education Center. Plots were seven rows by 25 feet long. Treatments included seed treatments and the incorporation of a cover crop. Each treatment combination was replicated four times and organized in a randomized complete block design with a split-plot arrangement. Blocks were separated by 7-foot alleys. The field was rainfed, and standard practices were used to manage weeds and fertility. Root rot ratings were taken on July 1, 2025. Yield was collected from the center rows on Oct. 8, 2025. Rainfall during the period totaled approximately 17.4 inches, and weather conditions were moderately conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.1.

There were no significant differences among root rot severity ratings collected among cover crop, seed treatment or their interaction between cover and seed treatment. There were significant differences (P=0.09) among seed treatments and their effects on yield. The seed treatment with Allegiance + Relenya + Acceleron D-281 preserved significantly more yield compared to the non-treated. This trend was significant across plots where cereal rye was planted as a cover crop and those with no cover crop. Though plots where seeds were treated with Allegiance alone and Allegiance + Relenya + Acceleron D-281 + Cruiser 5FS resulted in similar yields.

Table 9. Effect of integrating seed treatments in a cereal rye cover crop system on stand counts, root rot severity and yield.

Treatment	Rate	Cover Crop	Stand Counts (plants/a)[a]	Root Rot Severity (%)[b]	Yield (bu/a)[c]
Non-Treated	-	Cereal Rye	63,224 b[d]	34.7	29.5 a
Allegiance	1.5 fl oz/cwt	Cereal Rye	71,936 ab	29.8	30.9 a
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	Cereal Rye	65,464 ab	28.7	29.5 a
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt	Cereal Rye	76,666 a	32.2	32.9 a
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt 9.0 fl oz/cwt	Cereal Rye	77,412 a	33.8	32.3 a
Non-Treated	-	No Cover	74,674 ab	27.8	29.2 c
Allegiance	1.5 fl oz/cwt	No Cover	66,709 b	29.2	32.9 ab
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	No Cover	79,901 a	30.7	31.4 bc
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt	No Cover	70,194 ab	32.5	32.8 a
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt 9.0 fl oz/cwt	No Cover	66,709 b	30.0	31.6 ab
P-Value		Cover*Treatment	0.06	0.63	0.74
		Treatment	0.86	0.84	0.09
		Cover	0.83	0.36	0.50

[a] Stand counts were recorded at VC growth stage.
[b] Weighted calculation based using severity scale ratings based on root rot ratings collected at the V3 growth stage.
[c] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 8, 2025.
[d] Means followed by different letters are significantly different following Fisher's Protected LSD at α=0.05.

Trial 10. Evaluation of fungicide seed treatments with cereal rye cover crops for controlling seedling diseases in Minot, ND - 2025

SOYBEAN (*Glycine max 'PFS 2003E'*) H. R. Becton, G. Dusek and R. W. Webster

Cereal rye was planted over half of the space used for this trial on Oct. 15, 2024. Burndown application was made on May 28, 2025, using glyphosate. 'PFS 2003E' soybean was planted June 3, 2025, at a rate of 120,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 7.5 inches apart at the North Central Research Extension Center in Minot, North Dakota. Plots were seven rows by 25 feet. Treatments included seed treatments and the incorporation of a cover crop; each were replicated four times and organized in a randomized complete block design with a split-plot arrangement. Blocks were separated by 7-foot alleys. The field was rainfed and standard practices were used to manage weeds and fertility. Root rot ratings were taken on July 1, 2025. Yield was collected from the center rows on Oct. 10, 2025. Rainfall during the period totaled approximately 9.3 inches, and weather conditions were only slightly conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.05$.

There were significant differences among treatments ($P=0.002$) with respect to root rot severity. The non-treated (35%) had significantly greater ratings for root rot severity compared to the treated plots, with the exception of the Allegiance + Relenya (31%) treatment. The plots where seed were treated with Allegiance + Relenya + Acceleron D-281 (24%) had the lowest mean severity score; however, the combination Allegiance + Relenya + Acceleron D-281 led to significantly lower ($P<0.001$) yields compared to all of the other seed treatments. With respect to yields, there were significant differences ($P<0.001$) between cover crop, seed treatments and the interaction between cover and seed treatment.

Table 10. Effect of integrating seed treatments in a cereal rye cover crop system on stand counts, root rot severity and yield.

Treatment	Rate	Cover Crop	Stand Counts (plants/a)[a]	Root Rot Severity (%)[b]	Yield (bu/a)[c]
Non-Treated	-	Cereal Rye	56,887 ab[d]	34.3	33.9
Allegiance	1.5 fl oz/cwt	Cereal Rye	49,079 b	31.6	34.5
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	Cereal Rye	52,881 b	30.4	33.9
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt	Cereal Rye	47,210 b	25.0	27.1
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt 9.0 fl oz/cwt	Cereal Rye	49,399 b	23.8	34.0
Non-Treated	-	No Cover	51,911 b	35.4	37.7
Allegiance	1.5 fl oz/cwt	No Cover	49,071 b	27.4	46.4
Allegiance Relenya	1.5 fl oz/cwt 0.8 fl oz/cwt	No Cover	47,978 b	30.8	44.3
Allegiance Relenya Acceleron D-281	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt	No Cover	62,567 a	23.0	45.2
Allegiance Relenya Acceleron D-281 Cruiser 5FS	1.5 fl oz/cwt 0.8 fl oz/cwt 0.3 fl oz/cwt 9.0 fl oz/cwt	No Cover	50,276 b	30.0	46.9
P-Value		Cover*Treatment	0.001	0.33	<0.001
		Treatment	0.34	0.002	<0.001
		Cover	0.58	0.85	<0.001

[a] Stand counts were recorded at VC growth stage.
[b] Weighted calculation based using severity scale ratings based on root rot ratings collected at the V3 growth stage.
[c] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 10, 2025.
[d] Means followed by different letters are significantly different following Fisher's Protected LSD at α=0.05.

Trial 11. Evaluation of biological seed treatments for control of seedling diseases in Fargo, ND - 2025

SOYBEAN (*Glycine max 'PFS 2003E'*)

H. R. Becton, G. Dusek and R. W. Webster

The soybean variety PFS 2003E was planted in Fargo, North Dakota, on May 6, 2025, at a rate of 140,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 30 inches apart. Plots were four rows (10 feet) wide by 20 feet long. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 5-foot alleys. The field was rainfed and grown to wheat the previous year. Soil type was silty clay. Standard practices were used to manage weeds and nutrition. Mixing compatibility issues and phytotoxicity were not observed during the trial. Root rot ratings were taken on June 23, 2025. Yield was collected from the center two rows on Oct. 3, 2025. Rainfall during the period totaled 16.2 inches, and overall, weather conditions were moderately conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

No significant differences were observed between treatments regarding root rot severity scores or yield.

Table 11. Effect of biological seed treatments on stand counts, root rot severity and yield.

Treatment	Rate	Stand Counts (plants/a)[a]	Root Rot Severity (%)[b]	Yield (bu/a)[c]
Non-Treated	-	65,885	19.0	57.9
Avodigen	1.2 fl oz/cwt	68,498	25.8	53.5
F4034-5	0.64 fl oz/cwt	70,241	18.7	55.6
Rhizotrop	300 ml/cwt	76,448	19.3	61.2
RootShield	5 oz/cwt	75,577	20.3	60.8
Howler	5 lb/cwt	76,883	25.8	58.0
Heads Up	8 fl oz/cwt	75,389	18.8	59.1
Cruiser Maxx APX	3.9 fl oz/cwt	72,092	20.5	54.8
P-Value		0.60	0.60	0.69

[a] Stand counts were recorded at the VC growth stage. This trial was planted at 140,000 seeds per acre.
[b] Root rot % was calculated based on root rot severity evaluations taken on June 23, 2025.
[c] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 3, 2025.

Trial 12. Evaluation of biological seed treatments for control of seedling diseases in Oakes, ND - 2025

SOYBEAN (*Glycine max 'PFS 2003E'*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS2003E was planted on May 7, 2025, in Oakes, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 5-foot alleys. The previous crop was soybean, and the soil type was Barnes-Svea loams. Standard practices were used to manage weeds and nutrition. Stand counts were taken on June 4, 2025. Root rot evaluations were conducted on June 12, 2025. Yield was collected from the first two rows on Oct. 1, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 17.2 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.1.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. Root rot evaluations were conducted by assessing the roots of 30 soybean plants per plot. Soybeans were pulled from the front and back of each plot. Assessments were conducted on a 0-5 scale where 0 represented no disease and 5 represented complete plant death due to seedling disease. These assessments were then used to calculate a root rot % ranging from 0-100. There was a moderate-high level of root rot % in this trial; the highest reported root rot % in a single plot was 58.7%. There were no significant differences detected among treatments for stand counts, root rot % or yield. The treatment with the highest yield was a treatment of RootShield at 5 oz/cwt, which resulted in 62.4 bu/a, which is 4.4 bu/a higher than if no seed treatment was used. The treatment with the second-highest mean yield was Rhizotrop at 300 ml/100,000 seeds, which resulted in a mean yield of 62.1 bu/a, which is 4.1 bu/a higher than if no seed treatment was used.

Table 12. Effect of biological seed treatments on stand counts, root rot severity and yield.

Treatment[a]	Rate	Stand Counts (plants/a)[b]	Root Rot Severity (%)[c]	Yield (bu/a)[d]
Non-Treated	-	99,862	32.5	58.0
Avodigen	1.2 fl oz/cwt	97,139	33.0	58.1
F4034-5	0.64 fl oz/cwt	92,674	35.5	60.3
Rhizotrop	300 ml/100,000 seeds	104,980	34.0	62.1
RootShield	5 oz/cwt	99,208	27.7	62.4
Howler	5 lb/cwt	97,030	36.3	60.9
Heads Up	8 fl oz/cwt	98,991	28.3	58.0
Cruiser Maxx APX	3.9 fl oz/cwt	98,991	24.7	57.6
P-Value		0.4276	0.5045	0.2631

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] Stand counts were taken on June 4, 2025. This trial was planted at 140,000 seeds per acre.
[c] Root rot % was calculated based on root rot severity evaluations taken on June 12, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 1, 2025.

Trial 13. Evaluation of biological seed treatments for control of seedling diseases in Mohall, ND - 2025

SOYBEAN (*Glycine max ‘PFS 24XF01*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS24XF01 was planted on May 30, 2025, in Mohall, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 19 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 6-foot alleys. The previous crop was wheat, and the soil type was Hamlet-Souris loams. Standard practices were used to manage weeds and nutrition. Stand counts were taken on July 1, 2025. Root rot evaluations were conducted on July 1, 2025. Yield was collected from the center two rows on Oct. 9, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 9.18 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher’s Protected LSD at α=0.1.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. Root rot evaluations were conducted by assessing the roots of 30 soybean plants per plot. Soybeans were pulled from the front and back of each plot. Assessments were conducted on a 0-5 scale where 0 represented no disease and 5 represented complete plant death due to seedling disease. These assessments were then used to calculate a root rot % ranging from 0-100. This trial had moderate-very high levels of root rot %, with moderate being the most common, and only a few cases of very high disease pressure. The highest reported root rot % in a single plot was 70%. There were no statistically significant differences detected among treatments for stand counts, root rot % or yield. A treatment of Cruiser Maxx APX at 3.9 fl oz/cwt resulted in the lowest mean root rot % at 14.7%. A treatment of RootShield at 5 oz/cwt resulted in the highest mean yield at 39.7 bu/a, which is 1.4 bu/a higher than if no seed treatment was used. The treatment with the second-highest mean yield was Rhizotrop at 300 ml/100,000 seeds, which resulted in a mean yield of 39.4 bu/a, which was 1.1 bu/a higher than if no seed treatment was used.

Table 13. Effect of biological seed treatments on stand counts, root rot severity and yield.

Treatment[a]	**Rate**	**Stand Counts (plants/a)**[b]	**Root Rot Severity (%)**[c]	**Yield (bu/a)**[d]
Non-Treated	-	117,956	41.0	38.3
Avodigen	1.2 fl oz/cwt	109,703	38.5	37.1
F4034-5	0.64 fl oz/cwt	117,269	27.3	38.4
Rhizotrop	300 ml/100,000 seeds	107,869	31.7	39.4
RootShield	5 oz/cwt	109,244	24.2	39.7
Howler	5 lb/cwt	116,810	41.2	36.5
Heads Up	8 fl oz/cwt	117,956	32.8	38.3
Cruiser Maxx APX	3.9 fl oz/cwt	115,893	14.7	36.5
P-Value		0.423	0.2337	0.8221

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] Stand counts were taken on July 1, 2025. This trial was planted at 140,000 seeds per acre.
[c] Root rot % was calculated based on root rot severity evaluations taken on July 1, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 9, 2025.

Trial 14. Evaluation of fungicide seed treatments and variety selection for controlling Phytophthora root rot in Fargo, ND - 2025

SOYBEAN (*Glycine max*) H. R. Becton, G. Dusek and R. W. Webster

Three varieties of soybean were planted in Fargo, North Dakota, on May 6, 2025, at a rate of 140,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 30 inches apart. These three varieties were selected to have varying resistance to *Phyopthora sojae*. 'PFS 2003E' was selected as having no Rps gene and low field tolerance, 'PFS 2207E' was selected as having no Rps gene and moderate field tolerance and 'PFS 2405E' was selected as having a stack of Rps1k and Rps3a and having high field tolerance. At planting, 200 grams of millet infested with *Phytophthora sojae* Race 3 was applied in-furrow. Plots were four rows by 20 feet. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 7-foot alleys. The field was rainfed and grown to oat the previous year. Soil type was a silty clay. Standard practices were used to manage weeds and nutrition. Mixing compatibility issues and phytotoxicity were not observed during the trial. Stand counts were recorded on June 28, 2025 by counting the number of plants in the center two rows. Yield was collected from the center two rows on Oct. 4, 2025. Rainfall during the period totaled 16.2 inches, and overall, weather conditions were moderately conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

There were significant differences among treatments with respect to stand counts (P<0.0001) and yields (P=0.001). The Relenya + Cruiser + Vayantis treatment on PFS 2207E seed provided the greatest protection against seedling disease by P*hytophthora sojae*. Overall, all treatments on PFS 2207E performed better than the same treatments on PFS 2003E and PFS 2207E.

Table 14. Effect of seed treatments and soybean variety on stand counts and yield when inoculated with *Phytophthora sojae* Race 3.

Treatment	Rate	Variety	Stand Count (plants/a)[a]	Yield (bu/a)[b]
Relenya Cruiser 5FS	0.8 fl oz/cwt 8.96 fl oz/cwt	PFS 2003E	87,991 d[c]	49.1 d
Relenya Cruiser 5FS Allegiance	0.8 fl oz/cwt 8.96 fl oz/cwt 1.5 fl oz/cwt	PFS 2003E	101,059 c	45.9 d
Relenya Cruiser 5FS Vayantis	0.8 fl oz/cwt 8.96 fl oz/cwt 0.195 fl oz/cwt	PFS 2003E	109,336 bc	49.2 d
Relenya Cruiser 5FS	0.8 fl oz/cwt 8.96 fl oz/cwt	PFS 2207E	115,870 b	57.6 ab
Relenya Cruiser 5FS Allegiance	0.8 fl oz/cwt 8.96 fl oz/cwt 1.5 fl oz/cwt	PFS 2207E	118,483 ab	57.1 ac
Relenya Cruiser 5FS Vayantis	0.8 fl oz/cwt 8.96 fl oz/cwt 0.195 fl oz/cwt	PFS 2207E	128,502 a	60.4 a
Relenya Cruiser 5FS	0.8 fl oz/cwt 8.96 fl oz/cwt	PFS 2405E	53,143 e	50.4 bd
Relenya Cruiser 5FS Allegiance	0.8 fl oz/cwt 8.96 fl oz/cwt 1.5 fl oz/cwt	PFS 2405E	40,511 f	45.0 d
Relenya Cruiser 5FS Vayantis	0.8 fl oz/cwt 8.96 fl oz/cwt 0.195 fl oz/cwt	PFS 2405E	55,757 e	50.2 cd
P-Value			<0.001	0.001

[a] Stand counts were recorded at VC growth stage.
[b] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 4, 2025.
[c] Means followed by different letters are significantly different following Fisher's Protected LSD at α=0.05.

Trial 15. Evaluation of fungicide seed treatments for controlling Phytophthora root rot in Fargo, ND - 2025

SOYBEAN (*Glycine max 'DSR-0920E'*) H. R. Becton, G. Dusek and R. W. Webster

The soybean variety DSR-0920E was planted on May 6, 2025, in Fargo, North Dakota at a rate of 140,000 seed/a and depth of 1.5 inches in bedded single rows spaced 30 inches apart. At planting, 200 grams of millet infested with *Phytophthora sojae* was applied in-furrow. Plots were four rows by 20 feet. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 7-foot alleys. The field was rainfed, and it was fallow the previous season with a fall cover crop. Soil type was a silty clay. Standard practices were used to manage weeds and fertility. Mixing compatibility issues and phytotoxicity were not observed during the trial. On June 18, 2025, five plants were arbitrarily selected from each plot, from which plant height, fresh weight and dry weight were recorded. Yield was collected from the center two rows on Oct. 6, 2025. Rainfall during the period totaled 16.24 inches, and overall, weather conditions were conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

No significant differences were observed among treatments for stand counts, plant heights, fresh and dry weights, or yield. However, the plots treated with CruiserMaxx + Terrasym yielded an average of 7 bu/a greater than the non-treated plots.

Table 15. Effect of seed treatments on stand counts, seedling height, seedling mass and yield when inoculated with *Phytophthora sojae*.

Treatment	Rate	Stand Count (plants/a)[a]	Plant Height (cm)	Dry Weight (g)	Yield (bu/a)[b]
Non-treated	-	79,279	14.6	6.0	39.3
Cruiser Maxx	1.38 fl oz/cwt	91,912	14.8	6.3	40.0
Cruiser Maxx Trianum-P	1.38 fl oz/cwt 0.5 fl oz/cwt	84,506	14.2	5.0	40.2
Cruiser Maxx Terrasym 401	1.38 fl oz/cwt 0.5 fl oz/cwt	90,169	14.8	6.1	46.2
Trianum-P	0.5 fl oz/cwt	88,862	15.0	6.7	42.8
Terrasym 401	0.5 fl oz/cwt	88,427	14.3	6.6	43.7
P-Value		0.39	0.93	0.42	0.60

[a] Stand counts were recorded at VC growth stage.
[b] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 6, 2025.

Trial 16. Evaluation of fungicide seed treatments for controlling Pythium seed and root rot in Fargo, ND - 2025

SOYBEAN (*Glycine max*) G. Dusek, H. R. Becton, and R. W. Webster

Soybeans were planted on May 6, 2025, in Fargo, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The previous crop was wheat, and the soil type was silty clay. Standard practices were used to manage weeds and nutrition. Each plot in this trial was inoculated with 200g of *Pythium ultimum*-infested and sterilized grain millet. Stand counts were taken on June 3, 2025, and June 18, 2025. Yield was collected from the center two rows on Oct. 3, 2025. The weather over the course of the growing season was conducive to disease development, particularly in the early part of the season. This trial received a total of 16.24 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.1$.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. Stands were generally low in this trial, with emergence percentage at the second date of stand count evaluation ranging from 77% to about 89%. The low emergence percentage can likely be attributed to a combination of environmental effects and disease pressure. This trial experienced cool temperatures and significant rainfall within the first two weeks after planting. Additionally, the field in which this trial was conducted has poor drainage, which, in combination with disease inoculations, likely led to high levels of disease pressure. Low levels of phytotoxicity were observed during the trial across treatments, with no differences among treatments. There were statistically significant differences among treatments in stand counts at the first date of evaluation (June 3, 2025) ($P=0.0998$). The non-treated control had significantly lower stand than all the seed treatment programs evaluated except for Intego Suite Soybeans. The seed treatment program that included Obvius Plus, Poncho Votivo Precise and Stamina resulted in the highest stand count, which was significantly higher than the non-treated and Intego Suite Soybeans. There were no statistically significant differences in stand counts collected at the second date (June 18, 2025); trends suggest a similar ranking in seed treatment programs for these stand counts. The non-treated control had the lowest stand count on June 18, 2025, and the program that included Obvius Plus, Poncho Votivo Precise and Stamina remained the highest stand count across treatments. There were no significant differences among treatments for mean yields; however, similar to stand count trends, the non-treated had the lowest mean yield at 67.5 bu/a, and the seed treatment program that included Obvius Plus, Poncho Votivo Precise and Stamina resulted in the highest mean yield at 72.4 bu/a, which was nearly 5 bu/a higher than the non-treated control. Trends of the other treatments differed slightly from stand count data trends, with the seed treatment of Intego Suite Soybeans managing nearly identical yields to other seed treatments, regardless of its generally lower stand count. The results of this study suggest that some seed treatment programs are capable of protecting emergence for over 16,000 more plants per acre, and yields can reach approximately 5 bu/a higher than programs that do not use a seed treatment. In general, results from this trial indicate that seed treatments evaluated will produce generally higher stand counts and yields than programs that do not use seed treatment.

Table 16. Effect of seed treatments on stand counts and yield when inoculated with *Pythium ultimum*.

Seed Treatment[a]	Rate	Stand count VC (plants/a)[b]	Stand Count V2 (plants/a)[c]	Yield (bu/a)[d]
Non-Treated	-	85,596 c[e]	107,811	67.5
Obvius Plus Poncho Votivo Precise	35 g AI/100 kg seed 0.13 mg AI/seed	99,971 ab	120,335	69.1
Obvius Plus Poncho Votivo Precise Stamina	35 g AI/100 kg seed 0.13 mg AI/seed 5 g AI/100 kg seed	102,040 a	124,255	72.4
Obvius Plus Poncho Votivo Precise Velondis Plus	35 g AI/100 kg seed 0.13 mg AI/seed 6.5 ml/100 kg seed	95,397 ab	113,256	69.5
Cruiser Maxx APX	65.3 g AI/100 kg seed	99,644 ab	116,632	69.8
Intego Suite Soybeans	62.2 g AI/100 kg seed	92,021 bc	112,930	69.5
Mefenoxam Fludioxonil Thiabendazole Thiamethoxam	3.75 g AI/100 kg seed 2.5 g AI/100 kg seed 5 g AI/100 kg seed 0.08 mg AI/seed	98,555 ab	117,395	71.5
P-Value		0.0998	0.2559	0.4142

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] VC stand counts were taken on June 3, 2025.
[c] V2 stand counts were taken on June 18, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 3, 2025.
[e] Treatments with different letter groupings differ significantly (α = 0.1).

Trial 17. Evaluation of fungicide seed treatments for control of Pythium and Rhizoctonia seedling disease in Fargo, ND - 2025

SOYBEAN (*Glycine max*) G. Dusek, H. R. Becton, and R. W. Webster

Soybeans were planted on May 6, 2025, in Fargo, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The previous crop was wheat, and the soil type was silty clay. Standard practices were used to manage weeds and nutrition. There were five treatments in this study, including an inoculated non-treated control and a non-inoculated non-treated control. For treatments that were inoculated, each plot received 70g of *Pythium ultimum*-infested, sterilized grain millet and 30g of *Rhizoctonia solani*-infested, sterilized grain millet, applied in-furrow at planting in conjunction with soybean seeds. Stand counts were taken on June 3, 2025 (SC1), and June 18, 2025 (SC2). Yield was collected from the center two rows on Oct. 3, 2025. The weather over the course of the growing season was conducive to disease development, particularly at the beginning of the season. This trial received a total of 16.24 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.1 for the first date of stand counts and α=0.05 for the second date of stand counts and yield data.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet), then converting to plants per acre. From this analysis, there were significant differences among treatments detected for SC1 (P=0.055) and SC2 (P=0.0035). For SC1, CruiserMaxx APX had the highest stand count at 100,624 plants/a, which was significantly higher than all other treatments except for Zeltera Suite Soybeans. For SC2, all treatments that included a chemical seed treatment had higher stand counts than the non-treated controls, regardless of inoculation. However, not all chemical seed treatments' stand counts were significantly higher statistically than the non-treated controls. The treatment CruiserMaxx APX had significantly higher stand counts statistically than both non-treated controls. Interestingly, the non-treated control that received inoculation had significantly higher stand counts statistically than the non-treated control that did not receive inoculation. This was an unexpected result that is difficult to explain but is possibly due to field and environmental variation within the trial. There were no statistical differences among treatments for yield. Interestingly, the non-treated control that received inoculation had the highest reported mean yield. Similar to the V2 stand counts, this was unexpected and difficult to explain, but again, it is possibly due to field and environmental variation. The results from this trial provide evidence that planting soybeans with a chemical seed treatment that was included in this experiment will result in higher stand counts when compared to soybeans that do not have a chemical seed treatment.

Table 17. Effect of seed treatments on stand counts and yield when inoculated with *Pythium ultimum* and *Rhizoctonia solani.*

Treatment[a]	Rate	Inoculated[b]	Stand Count VC (plants/a)[c]	Stand Count V2 (plants/a)[d]	Yield (bu/a)[e]
Non-Treated	-	No	87,665 b[f]	95,832 c[g]	64.5
Non-Treated	-	Yes	90,932 b	104,980 b	67.0
Zeltera Suite Soybeans	3.5 FL OZ/Cwt	Yes	94,090 ab	109,336 ab	62.9
CruiserMaxx APX	4.18 FL OZ/Cwt	Yes	100,624 a	112,385 a	65.2
Evergol Energy Allegiance FL Gaucho 600FS	1 FL OZ/Cwt .533 FL OZ/Cwt 2 FL OZ/Cwt	Yes	93,437 b	106,940 ab	65.4
P-Value			0.0553	0.0035	0.7649

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] Treatments followed by an N in inoculated column were not inoculated while treatments followed by a Y were inoculated with 70g of *Pythium ultimum* and 30g of *Rhizoctonia solani*.
[c] VC stand counts were taken on June 3, 2025. This trial was planted at 140,000 seeds per acre.
[d] V2 stand counts were taken on June 18, 2025.
[e] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 3, 2025.
[f] Treatments with different letter groupings within SC1 analysis differ significantly ($\alpha = 0.1$).
[g] Treatments with different letter groupings within SC2 analysis differ significantly ($\alpha = 0.05$).

Soybean Cyst Nematode

Trial 18. Evaluation of seed treatments for controlling soybean cyst nematode in Colfax, ND - 2025

SOYBEAN (*Glycine max*) G. Dusek, H. R. Becton, and R. W. Webster

Soybeans were planted on May 30, 2025, in Colfax, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 18 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The soil type was Wyndmere fine sandy loam. Standard practices were used to manage weeds and nutrition. This trial was conducted in a field with a history of soybean cyst nematode (SCN). Samples of SCN were taken from the center two rows of each plot at the beginning (June 3, 2025) and the end of the season (Oct. 2, 2025). Yield was collected from the center two rows on Oct. 11, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 13.3 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

To assess levels of SCN, the number of eggs was counted per 100cc of soil. The number of SCN eggs in this experiment was very low (1-200) to low (201-2,000). There were no significant differences among treatments in SCN egg counts at the beginning of the season. However, there were statistically significant differences among treatments for the number of SCN egg counts at the end of the season. A combination treatment of Evergol Energy at 1 fl oz/cwt, Allegiance FL at 0.533 fl oz/cwt, Gaucho at 2 fl oz/cwt and Ilevo 1.08 fl oz/cwt resulted in the highest egg count at the end of the season at 1075. However, SCN egg counts of under 2,000 are generally not associated with any yield loss, and when comparing the mean yield of this treatment to that of no seed treatment was used, there was less than a bu/a difference, which was not statistically significant. Across the whole experiment, there were no significant differences among treatments for yield. The treatment with the highest yield was a combination treatment of Cruiser Maxx APX at 3.22 fl oz/cwt and BioST Nematicide 3 fl oz/cwt, which resulted in a mean yield of 63.1 bu/a (2.9 bu/a higher than if no seed treatment was used). The results from this experiment provide support for findings indicating yield loss associated with SCN will likely not reach significant levels when egg counts are under 2,000 eggs + J2/100 cc.

Table 18. Effect of seed treatments on soybean cyst nematode counts and yield in a field with history of SCN.

Treatment[a]	Rate	SCN1[b]	SCN2[c]	Yield (bu/a)[d]
Non-Treated	-	825	425 b[e]	60.2
Zeltera Suite Soybeans	3.5 fl oz/cwt	300	113 b	62.6
Cruiser Maxx APX Saltro	3.22 fl oz/cwt 1.53 fl oz/cwt	225	225 b	60.7
Evergol Energy Allegiance FL Gaucho Ilevo	1 fl oz/cwt 0.533 fl oz/cwt 2 fl oz/cwt 1.08 fl oz/cwt	225	1075 a	59.6
Zeltera Suite Soybeans Aveo EZ	3.5 fl oz/cwt 0.2 fl oz/cwt	363	275 b	62.5
Cruiser Maxx APX BioST Nematicide	3.22 fl oz/cwt 3 fl oz/cwt	75	400 b	63.1
P-Value		0.4643	0.0057	0.8474

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] SCN1 = soybean cyst nematode egg count per 100cc of soil at the beginning of the season (June 3, 2025).
[c] SCN2 = soybean cyst nematode egg count per 100cc of soil sample at the end of the season (Oct. 2, 2025).
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 11, 2025.
[e] Treatments with different letter groupings differ significantly ($\alpha = 0.05$).

Trial 19. Evaluation of seed treatments for controlling soybean cyst nematode in Colfax, ND - 2025

SOYBEAN (*Glycine max*)

G. Dusek, H. R. Becton, and R. W. Webster

Soybeans were planted on May 30, 2025, in Colfax, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 18 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The soil type was Wyndmere fine sandy loam. Standard practices were used to manage weeds and nutrition. Soybean cyst nematode (SCN) egg counts were collected on July 14, 2025 (~45 days after planting), and on Oct. 2, 2025 (end of the season), from only plots that received a sole application of Cruiser Maxx APX. Stand counts were taken on June 17, 2025, and June 30, 2025. Yield was collected from the center two rows on Oct. 11, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 13.3 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.1$.

To assess levels of SCN, the number of eggs were counted per 100cc of soil. The number of SCN eggs in this experiment were very low (1-200) to low (201-2,000). Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. There were no significant differences among treatments detected for stand counts collected at either date. There were significant differences among treatments for phytotoxicity percentage where a combination of treatment of Cruiser Maxx APX and Ilevo at 0.15 mg ai/seed had significantly higher phytotoxicity than all other treatments. However, the phytotoxicity levels observed in this treatment were still very low at less than 5%. There were no significant differences among treatments for mean yield. A sole application of Cruiser Maxx APX had the highest reported mean yield at 66.4 bu/a.

Table 19. Effect of seed treatments on stand counts, phytotoxicity, and yield in a field with a history of SCN.

Treatment[a]	Rate	Stand Count VC (plants /a)[b]	Stand Count V2 (plants/a)[c]	Phytotoxicity (%)[d]	Yield (bu/a)[e]
Cruiser Maxx APX	0.098 mg ai/seed	81,675	99,946	0.0 b[f]	66.4
Cruiser Maxx APX Saltro	0.098 mg ai/seed 0.075 mg ai/seed	77,440	94,743	0.0 b	62.0
Cruiser Maxx APX Tymirium	0.098 mg ai/seed 0.075 mg ai/seed	71,269	96,195	1.5 b	60.1
Cruiser Maxx APX Ilevo	0.098 mg ai/seed 0.15 mg ai/seed	75,746	94,501	4.5 a	65.5
P-Value		0.5595	0.3191	0.0589	0.3458

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] VC stand counts were taken on June 17, 2025. This trial was planted at 140,000 seeds per acre.
[c] V2 stand counts were taken on June 30, 2025.
[d] Phytotoxicity was measured on a percentage scale ranging from 0-100.
[e] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 11, 2025.
[f] Treatments with different letter groupings differ significantly ($\alpha = 0.1$).

Trial 20. SCN resistance sources variety screenings, Arthur, ND -2025

SOYBEAN (*Glycine max*) H. R. Becton, G. Dusek, and R. W. Webster

Sixty-four varieties among three relative maturity groups, early (0.009 – 0.3), mid- (0.4 – 0.7), and late (0.8 – 1.4). Treatments were replicated 5 times and were randomized by maturity group. Most varieties have known sources of resistance, either PI 88788 or Peking; however, some are reported to contain resistance but their source has not been made public knowledge, these varieties will be grouped as 'Unknown'.

Data collected included SCN counts pre-planting (bulk samples), bulk soil samples for HG-type determination, end-of-season SCN egg counts by plot, and yield. Reproduction factor (RF) was calculated by dividing the end-of-season SCN egg counts by the averaged bulk samples collected pre-planting. HG-type for this location was determined to be 2.5.7 meaning that there is a breakdown of resistance to PI 88788, with a female index of 16.7%, as well as two other resistance sources that are not evaluated here. Generalized linear mixed models were used to evaluate relationships between the dependent and independent variables with replicate included as the random variable in each model.

Significant differences among maturity groups were observed for SCN RF (P=0.005). Varieties within the early maturity group has significantly greater mean RF (3.0) compared to the moderate group (1.3); the late maturity group was similar to the early with a mean RF of 2.1. No significant differences were observed among varieties with respect to end-of-season egg counts or RF for the early, moderate, or late maturity groups (Tables 1, 2 & 3). Though no statistical significances were observed (P>0.05), there were clear biological differences observed. SCN egg counts ranged from 826 to 9836 for the early maturity group, 222 to 3046 for the moderate group, and 285 to 6755 for the late maturing varieties. Several varieties had RF values < 1 which indicates that SCN were not reproducing on those soybeans, with the majority of these varieties were within the moderate maturity group. These varieties were NK02-W8E3 (PI 88788), XO0315 (PI 88788), P04A98E (Unknown), XO0436 (PI 88788), B053EE (Peking), A06E36 (PI 88788), NK06-A1E3 (PI 88788), XO0602 (PI 88788), AG07XF4 (PI 88788), B074EE (PI 88788), B095EE (PI 88788), A10E35 (PI 88788), and A12E33 (PI 88788).

Significant differences were observed by maturity grouping (P<0.0001) where late maturing varieties had significantly greater yields than those in early and moderate groups. Significant differences among yields were also observed with respect to varieties (P<0.0001) with means ranging from 18 bu/ac to 50 bu/ac. Varieties, LGS1043E (PI 88788), NK11-U2X (P I88788), XO1095 (PI 88788), A12E33 (PI 88788), NK08-R3XF (PI 88788), XO0602 (PI 88788), LGS0988X (PI 88788), and NK10-P7X (PI 88788) had mean yields greater than 45 bu/ac. While NK13-Y4X (PI 88788), LGS1385X (PI 88788), and AG05XF4 (Unknown) resulted in mean yields less than 25 bu/ac.

Table 20-1. Brand, variety name, relative maturity, SCN egg counts, SCN reproductive factor, and yield for each of the early maturity group varieties.

Brand	**Variety**	**Relative Maturity**	**SCN Resistance Source**	**EOS[a] SCN egg count**	**SCN RF[b]**	**Yield (bu/ac)[c]**
Alloy	A03E34	0.3	PI88788	2405	2.1	42.2
Asgrow	AG02XF5	0.2	R3	2681	2.3	41.0
NK	NK02-W8E3	0.2	PI88788	826	0.7	39.5
Xitavo	XO0234	0.2	PI88788	2530	2.2	39.0
LG Seeds	LGS0320E3	0.3	PI88788	6622	5.7	38.7
Brevant	B025EE	0.2	Peking	2750	2.4	37.6
NK	NK03-J1XF	0.3	Susceptible	1658	1.4	37.1
Alloy	A01E36	0.1	PI88788	3750	3.2	36.5
LG Seeds	LGS0360XF	0.3	PI88788	1332	1.1	34.62
NK	NK02-Y2XF	0.2	PI88788	4510	3.9	33.6
Xitavo	XO0094	0.09	PI88788	1440	1.2	32.3
Brevant	B0095EE	0.09	Peking	4686	4.0	32.2
Asgrow	AG01XF3	0.1	R3	1756	1.5	31.9
Brevant	B014EE	0.1	Peking	2650	2.3	27.9
Brevant	B032EE	0.3	PI88788	9836	8.4	27.1
NK	NK008-P8XF	0.08	Susceptible	5556	4.7	26.1
Asgrow	AG009XF6	0.09	Susceptible	7188	6.1	–
NK	NK01-S7E	0.1	PI88788	3664	3.1	–
Xitavo	XO0315	0.3	PI88788	916	0.8	–
P-value	-	-	-	0.53	0.53	0.03

[a] EOS = End of season. These values are the mean egg counts among the 4 plots sampled.

[b] Mean reproductive factor based on the egg count per plot was divided by the number of SCN eggs present in the soil sample collected at planting.

[c] Means were significant but there were no means separation following Tukey's HSD test at α=0.05. Missing yield data was due to poor plant survival from early season hail.

Table 20-2. Brand, variety name, relative maturity, SCN egg counts, SCN reproductive factor, and yield for each of the moderate maturity group varieties.

Brand	Variety	Relative Maturity	SCN Resistance Source	EOS[a] SCN egg count	SCN RF[b]	Yield (bu/ac)[c]
Xitavo	XO0602	0.6	PI88788	640	0.5	46.8 a
Brevant	B074EE	0.7	PI88788	828	0.7	44.4 ab
NK	NK06-C4XF	0.6	PI88788	3046	2.6	44.3 ab
NK	NK06-A1E3	0.6	PI88788	927	0.8	43.4 ab
NK	NK07-G5E3	0.7	Peking	1699	1.5	43.2 ab
NK	NK04-Q9XF	0.4	PI88788	1612	1.4	42.2 ab
Alloy	A06E36	0.6	PI88788	947	0.8	41.9 ac
Pioneer	P06A38E	0.6	Unknown	2595	2.2	41.3 ac
Xitavo	XO0731	0.7	PI88788	2535	2.2	39.7 ac
Xitavo	XO0436	0.4	PI88788	222	0.2	38.9 ac
NK	NK04-A9E3	0.4	PI88788	3035	2.6	37.5 ac
Xitavo	XO0554	0.5	PI88788	1457	1.2	37.1 ac
Brevant	B053EE	0.5	Peking	415	0.4	35.6 ac
Asgrow	AG04XF4	0.4	R3	1549	1.3	32.6 ac
Brevant	B054EE	0.5	PI88788	2704	2.3	32.0 ac
Asgrow	AG06XF3	0.6	R3	1414	1.2	31.4 ac
Asgrow	AG07XF4	0.7	R3	313	0.3	31.2 ac
LG Seeds	LGS0444XF	0.4	PI88788	1165	1.0	31.0 ac
LG Seeds	LGS0405E3	0.4	Peking	2229	1.9	26.4 bc
Asgrow	AG05XF4	0.5	R3	2178	1.9	18.4 c
Pioneer	P04A98E	0.4	R3	782	0.7	–
P-value	-	-	-	0.77	0.77	<0.001

[a] EOS = End of season. These values are the mean egg counts among the 4 plots sampled.

[b] Mean reproductive factor based on the egg count per plot was divided by the number of SCN eggs present in the soil sample collected at planting.

[c] Mean followed by different letters are significantly different following Tukey's HSD test at α=0.05. Missing yield data was due to poor plant survival from early season hail.

Table 20-3. Brand, variety name, relative maturity, SCN egg counts, SCN reproductive factor, and yield for each of the late maturity group varieties.

Brand	Variety	Relative Maturity	SCN Resistance Source	EOS[a] SCN egg count	SCN RF[b]	Yield (bu/ac)[c]
LG Seeds	LGS1043E3	1.0	PI88788	2943	2.5	50.3 a
NK	NK11-U2XF	1.1	PI88788	1255	1.1	48.3 a
Xitavo	XO1095	1.0	PI88788	2501	2.1	48.1 a
Alloy	A12E33	1.2	PI88788	285	0.2	47.7 a
NK	NK08-R3XF	0.8	PI88788	2630	2.2	47.3 a
Asgrow	AG09XF3	0.9	R3	1358	1.2	47.2 a
LG Seeds	LGS0988XF	0.9	PI88788	3330	2.8	46.2 a
NK	NK10-P7XF	1.0	PI88788	2118	1.8	45.6 ab
Alloy	A10E35	1.0	PI88788	411	0.4	44.8 ab
NK	NK11-A4E3	1.1	PI88788	6755	5.8	44.6 ab
NK	NK09-V2E3	0.9	PI88788	2866	2.4	43.7 ab
Xitavo	XO1116E	1.1	PI88788	1561	1.3	43.1 ab
Xitavo	XO0806	0.8	PI88788	4755	4.1	42.3 ab
NK	NK14-U5E3	1.4	Peking	694	0.6	39.4 ac
LG Seeds	LGS0830E3	0.8	PI88788	4661	4.0	39.1 ac
Brevant	B095EE	0.9	PI88788	803	0.7	36.9 ac
Asgrow	AG10XF4	1.0	R3	2123	1.8	36.4 ac
NK	NK08-Z4E3	0.8	PI88788	4220	3.6	36.3 ac
Pioneer	P08A44E	0.8	PI88788	3305	2.8	32.0 ac
NK	NK13-Y4XF	1.3	PI88788	2913	2.5	23.1 bc
LG Seeds	LGS1385XF	1.3	PI88788	1396	1.2	21.0 c
Alloy	A08E36	0.8	PI88788	5693	4.9	–
Xitavo	XO993	0.9	PI88788	1678	1.4	–
Brevant	B114EE	1.1	Peking	1795	1.5	–
P-value	-	-	-	0.28	0.28	<0.001

[a] EOS = End of season. These values are the mean egg counts among the 4 plots sampled.

[b] Mean reproductive factor based on the egg count per plot was divided by the number of SCN eggs present in the soil sample collected at planting.

[c] Mean followed by different letters are significantly different following Tukey's HSD test at α=0.05. Missing yield data was due to poor plant survival from early season hail.

Trial 21. SCN resistance sources variety screenings in Ayr, ND – 2025

SOYBEAN (*Glycine max*)

H. R. Becton, G. Dusek, and R. W. Webster

A total of 64 varieties divided across three relative maturity groups, early (0.009 – 0.3), mid- (0.4 – 0.7), and late (0.8 – 1.4) were sown in a field with a history of SCN pressure in Ayr, ND. Each variety was replicated five times and randomized by maturity group. Most varieties have known sources of resistance, either PI 88788 or Peking; however, some are reported to contain resistance to SCN Race 3 but their source of resistance is not known and is marked as R3.

Data collected included SCN counts pre-planting (bulk samples), bulk soil samples for HG-type determination, end-of-season SCN egg counts by plot, and yield. Reproduction factor (RF) was calculated by dividing the end-of-season SCN egg counts by the averaged bulk samples collected pre-planting. HG-type for this location was determined to be 2.5.7 meaning that there is a breakdown of resistance to PI 88788, with a female index of 21.7%, as well as two other resistance sources that are not evaluated here. Generalized linear mixed models were used to evaluate relationships between the dependent and independent variables with replicate included as the random variable in each model.

Significant differences among maturity groups were observed for SCN RF ($P<0.0001$). Varieties within the moderate maturity group has significantly greater mean RF (3.2) compared to the early group (2.1) and the late maturity group (1.2). Analysis conducted within each maturity group (early, moderate, and late) indicated no significant differences among varieties with respect to end-of-season egg counts or RF (Tables 1, 2 & 3). Though no statistical differences were observed ($P>0.05$), there were clear biological differences observed. SCN egg counts ranged from 294 to 4898 for the early maturity group, 958 to 10835 for the moderate group, and 503 to 3180 for the late maturing varieties. Several varieties had RF values < 1 which indicates that SCN were not reproducing on those soybeans, with the majority of these varieties falling in the moderate maturity group. These varieties were B025EE (Peking), NK07-G5E3 (Peking), NK08-R3XF (PI 88788), P08A44E (PI 88788), B095EE (PI 88788), XO993 (PI 88788), AG10XF4 (Unknown), LGS1043E3 (PI 88788), XO1116E (PI 88788), NK13-Y4XF (PI 88788), NK14-U5E3 (Peking).

Significant differences in yield were observed among maturity grouping ($P<0.0001$) where late and moderate maturity groups had significantly greater yields compared to early maturing varieties. Significant differences in yields were also observed with respect to varieties within maturity groups ($P<0.05$) with means ranging from 37.2 bu/ac to 62.6 bu/ac. NK14-U5E3 (Peking), NK08-R3XF (PI88788), NK07-G5E3 (Peking), AG07XF4 (Unknown), B074EE (PI88788), AG09XF3 (Unknown), NK04-A9E (PI88788), XO0602 (PI88788), XO1116E (PI88788), LGS0988X (PI88788), and A01E36 (PI88788) had mean yields ≥ 55 bu/ac. Only AG01XF3 (Unknown), NK03-J1XF (Susceptible), and LGS0360XF (PI88788) had mean yields less than 45 bu/ac.

Table 21-1. Soybean seed brand, variety name, relative maturity, SCN resistance source, end of season SCN egg counts, SCN reproductive factor, and yield for each of the early maturity group varieties.

Brand	Variety	Relative Maturity	SCN Resistance Source	EOS[a] SCN egg count	SCN RF[b]	Yield (bu/ac)[c]
Alloy	A01E36	0.1	PI88788	2215	1.9	55.5 a
Asgrow	AG02XF5	0.2	R3	3643	3.1	53.2 ab
Alloy	A03E34	0.3	PI88788	1800	1.6	52.9 ab
Brevant	B025EE	0.2	Peking	294	0.3	51.9 ab
Xitavo	XO0234	0.2	PI88788	2663	2.3	51.4 ab
Xitavo	XO0094	0.09	PI88788	1708	1.5	50.5 ab
NK	NK02-W8E3	0.2	PI88788	1899	1.6	50.3 ab
LG Seeds	LGS0320E3	0.3	PI88788	1191	1.0	50.2 ab
NK	NK02-Y2XF	0.2	PI88788	2340	2.0	49.0 ab
Brevant	B032EE	0.3	PI88788	2608	2.3	49.2 ab
Brevant	B0095EE	0.09	Peking	1410	1.2	44.9 ab
Brevant	B014EE	0.1	Peking	2078	1.8	44.8 ab
NK	NK008-P8XF	0.08	Susceptible	2221	1.9	44.7 ab
Asgrow	AG01XF3	0.1	R3	1839	1.6	44.4 ab
NK	NK03-J1XF	0.3	Susceptible	4855	4.2	43.3 ab
LG Seeds	LGS0360XF	0.3	PI88788	1806	1.6	37.2 b
Asgrow	AG009XF6	0.09	Susceptible	3776	3.3	–
NK	NK01-S7E	0.1	PI88788	4898	4.2	–
Xitavo	XO0315	0.3	PI88788	2203	1.9	–
P-value	-	-	-	0.08	0.08	<0.05

[a] EOS = End of season. These values are the mean egg counts among the 4 plots sampled.
[b] Mean reproductive factor was calculated as follows, the end of season egg count per plot divided by the number of SCN eggs present in the soil sample collected at planting.
[c] Mean followed by different letters are significantly different following Tukey's HSD at α=0.05. Missing yield data was due to poor plant survival from early season hail.

Table 21-2. Soybean seed brand, variety name, relative maturity, SCN resistance source =, end of season SCN egg counts, SCN reproductive factor, and yield for each of the moderate maturity group varieties.

Brand	Variety	Relative Maturity	SCN Resistance Source	EOS[a] SCN egg count	SCN RF[b]	Yield (bu/ac)[c]
NK	NK07-G5E3	0.7	Peking	958	0.8	61.7
Asgrow	AG07XF4	0.7	R3	2748	2.4	59.2
Brevant	B074EE	0.7	PI88788	2738	2.4	58.6
Xitavo	XO0602	0.6	PI88788	3375	2.9	56.3
NK	NK04-A9E3	0.4	PI88788	2113	1.8	55.2
Xitavo	XO0554	0.5	PI88788	1820	1.6	53.4
Xitavo	XO0731	0.7	PI88788	1273	1.1	53.2
Asgrow	AG05XF4	0.5	R3	4060	3.5	53.1
NK	NK06-C4XF	0.6	PI88788	8120	7.0	52.9
Asgrow	AG04XF4	0.4	R3	3190	2.8	51.6
Brevant	B053EE	0.5	Peking	2055	1.8	50.9
NK	NK04-Q9XF	0.4	PI88788	1530	1.3	50.8
Brevant	B054EE	0.5	PI88788	2765	2.4	49.8
NK	NK06-A1E3	0.6	PI88788	6893	6.0	47.2
Xitavo	XO0436	0.4	PI88788	10835	9.4	46.9
LG Seeds	LGS0405E3	0.4	Peking	3098	2.7	46.3
Asgrow	AG06XF3	0.6	R3	4065	3.5	45.4
LG Seeds	LGS0444XF	0.4	PI88788	4500	3.9	44.3
Pioneer	P04A98E	0.4	R3	3698	3.2	–
Alloy	A06E36	0.6	PI88788	4068	3.5	–
Pioneer	P06A38E	0.6	Unknown	2653	2.3	–
P-value	-	-	-	0.25	0.25	0.03

[a] EOS = End of season. These values are the mean egg counts among the 4 plots sampled.
[b] Mean reproductive factor was calculated as follows, the end of season egg count per plot divided by the number of SCN eggs present in the soil sample collected at planting.
[c] Mean were significantly different but no means separation were observed following Tukey's HSD at α=0.05.
Missing yield data was due to poor plant survival from early season hail.

Table 21-3. Soybean seed brand, variety name, relative maturity, SCN resistance source, end of season SCN egg counts, SCN reproductive factor, and yield for each of the late maturity group varieties.

Brand	Variety	Relative Maturity	SCN Resistance Source	EOS[a] SCN egg count	SCN RF[b]	Yield (bu/ac)[c]
NK	NK08-R3XF	0.8	PI88788	1085	0.9	62.6 a
NK	NK14-U5E3	1.4	Peking	503	0.4	62.5 a
Asgrow	AG09XF3	0.9	R3	1166	1.0	57.6 ab
Xitavo	XO1116E	1.1	PI88788	1028	0.9	56.0 ab
LG Seeds	LGS0988XF	0.9	PI88788	1440	1.2	55.8 ab
NK	NK11-A4E3	1.1	PI88788	1275	1.1	55.5 ab
Alloy	A12E33	1.2	PI88788	1095	0.9	55.5 ab
NK	NK11-U2XF	1.1	PI88788	3180	2.7	55.1 ab
Xitavo	XO1095	1.0	PI88788	1408	1.2	54 ab
NK	NK10-P7XF	1.0	PI88788	1445	1.2	53.8 ab
NK	NK13-Y4XF	1.3	PI88788	996	0.9	53.2 ab
LG Seeds	LGS1385XF	1.3	PI88788	1496	1.3	52.8 ab
Alloy	A10E35	1.0	PI88788	1705	1.5	52.7 ab
LG Seeds	LGS1043E3	1.0	PI88788	770	0.7	52.4 ab
LG Seeds	LGS0830E3	0.8	PI88788	2659	2.3	52.3 ab
NK	NK09-V2E3	0.9	PI88788	2895	2.5	51.3 ab
Brevant	B095EE	0.9	PI88788	670	0.6	50.6 ab
Pioneer	P08A44E	0.8	PI88788	579	0.5	50.5 ab
NK	NK08-Z4E3	0.8	PI88788	1728	1.5	48.9 ab
Asgrow	AG10XF4	1.0	R3	653	0.6	48.0 b
Xitavo	XO0806	0.8	PI88788	1806	1.6	47.5 b
Alloy	A08E36	0.8	PI88788	1988	1.7	–
Xitavo	XO993	0.9	PI88788	781	0.7	–
Brevant	B114EE	1.1	Peking	1178	1.0	–
P-value	-	-	-	0.28	0.28	0.01

[a] EOS = End of season. These values are the mean egg counts among the 4 plots sampled.

[b] Mean reproductive factor was calculated as follows the end of season egg count per plot divided by the number of SCN eggs present in the soil sample collected at planting.

[c] Mean followed by different letters are significantly different following Tukey's HSD at α=0.05.

Missing yield data was due to poor plant survival from early season hail.

Sudden Death Syndrome

Trial 22. Evaluation of fungicide seed treatments for controlling sudden death syndrome in Fargo, ND - 2025

SOYBEAN (*Glycine max 'DSR-0920E'*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety DSR-0920E was planted on May 6, 2025, in Fargo, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The soil type was silty clay. Standard practices were used to manage weeds and nutrition. All seed treatments evaluated in this study were paired with a "Base" seed treatment that included Allegiance FL at 0.194 fl oz/cwt, Stamina at 0.575 fl oz/cwt, Systiva XS 0.237 fl oz/cwt, Poncho 600 at 1.736 fl oz/cwt and Flo Rite 1706 at 1 fl oz/cwt. This trial was planted in a field where sudden death syndrome (SDS) has never been detected. Stand counts were taken on June 6, 2025, and June 24, 2025. Observations for SDS were conducted on Aug. 14, 2025, and Aug. 26, 2025. Yield was collected from the center two rows on Oct. 6, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 16.24 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.1.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. No symptoms or signs of SDS were observed in this trial throughout the course of the year. This was expected as there is no history of this field having SDS. There were no statistically significant differences detected for stand counts or yield. A treatment including only the Base resulted in the highest mean yield of 47.4 bu/a, which was 0.6 bu/a and 11.9 bu/a higher than the two treatments that did not have a seed treatment.

Table 22. Effect of seed treatments on stand counts and yield.

Treatment[a]	Rate	Stand Count VC (plants/a)[b]	Stand Count V2 (plants/a)[c]	Yield (bu/a)[d]
Non-Treated	-	67,518	78,517	46.8
Base[e]		77,319	90,279	47.4
Base Ilevo	1.18 fl oz	76,013	86,249	35.4
Base Saltro	1.45 fl oz/cwt	75,141	84,507	39.3
Base Zeltera	1.0 fl oz/cwt	74,161	84,398	40.9
Non-Treated	NA	71,221	85,814	35.5
Base Saltro Ilevo	1.45 fl oz/cwt 1.18 fl oz	75,359	89,734	41.1
Base Ilevo	1.98 fl oz	72,310	79,606	33.4
P-Value		0.7056	0.4013	0.4466

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] VC stand counts were taken on June 6, 2025. This trial was planted at 140,000 seeds per acre.
[c] V2 stand counts were taken on June 24, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 6, 2025.
[e] Treatments that included a “Base” treatment included Allegiance FL at 0.194 fl oz/cwt, Stamina at 0.575 fl oz/cwt, Systiva XS 0.237 fl oz/cwt, Poncho 600 at 1.736 fl oz/cwt and Flo Rite 1706 at 1 fl oz/cwt.

Trial 23. Evaluation of fungicide seed treatments for controlling sudden death syndrome in La Mars, ND - 2025

SOYBEAN (*Glycine max 'DSR-0920E'*) G. Dusek, H. R. Becton, and R. W. Webster

Soybeans were planted on May 11, 2025, in La Mars, North Dakota, at a rate of 140,000 seed/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 18 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The soil type was silt/sandy loam. Standard practices were used to manage weeds and nutrition. All seed treatments evaluated in this study were paired with a "Base" seed treatment that included Allegiance FL at 0.194 fl oz/cwt, Stamina at 0.575 fl oz/cwt, Systiva XS 0.237 fl oz/cwt, Poncho 600 at 1.736 fl oz/cwt and Flo Rite 1706 at 1 fl oz/cwt. This trial was planted in a field with a history of sudden death syndrome (SDS). Stand counts were taken on June 3, 2025, and June 30, 2025. Yield was collected from the center two rows on Oct. 13, 2025. The weather over the course of the growing season was conducive to disease development. However, there was a hail/wind storm early in the season, which impacted plant growth during the vegetative stages. This trial received a total of 17.12 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. A foliar evaluation for SDS was conducted in two ways: first, by estimating the percentage of a plot that was symptomatic (disease incidence); and second, by estimating the severity of symptomatic soybeans (disease severity). The disease incidence and disease severity values were used to calculate an SDS disease index percentage (SDS DIX%) value. There was a low level of SDS DIX% observed in this trial with the highest percentage in a single plot that was observed being 1.83%. There were no statistical differences detected among treatments for stand counts, SDS DIX% or yield. Interestingly, mean stand counts decreased in every treatment from the first date of recording to the second date of recording. This is atypical but can likely be attributed to the severe hailstorm that this trial endured. A combination treatment of the Base treatment and Ilevo at 1.98 fl oz resulted in the highest mean yield at 23.4 bu/a, which was 3 bu/a higher than if no seed treatment was used in one scenario and 11.7 bu/a higher than if no seed treatment was used in a second scenario. A combination treatment of the Base treatment, Saltro at 1.45 fl oz/cwt and Ilevo at 1.18 fl oz resulted in the second-highest mean yield at 23.2 bu/a.

Table 23. Effect of seed treatments on stand counts, sudden death syndrome disease index, and yield.

Treatment[a]	Rate	Stand Count VC (plants/a)[b]	Stand Count V2 (plants/a)[c]	SDS DIX (%)[d]	Yield (bu/a)[e]
Non-Treated	-	87,120	64,493	0.08	20.4
Base[f]		91,597	63,888	0.13	22.2
Base Ilevo	 1.18 fl oz	90,629	60,984	0.50	19.1
Base Saltro	 1.45 fl oz/cwt	87,483	65,582	0.03	21.4
Base Zeltera	 1.0 fl oz/cwt	80,223	55,656	0.42	15.1
Non-Treated		93,170	60,500	0.62	11.1
Base Saltro Ilevo	 1.45 fl oz/cwt 1.18 fl oz	91,718	65,219	0.06	23.2
Base Ilevo	 1.98 fl oz	89,177	64,009	0.21	23.4
P-Value		0.1407	0.8169	0.3990	0.5572

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] VC stand counts were taken on June 3, 2025. This trial was planted at 140,000 seeds per acre.
[c] V2 stand counts were taken on June 30, 2025.
[d] SDS DIX (%) = sudden death syndrome disease index in percent.
[e] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 13, 2025.
[f] Treatments that included a “Base” treatment included Allegiance FL at 0.194 fl oz/cwt, Stamina at 0.575 fl oz/cwt, Systiva XS 0.237 fl oz/cwt, Poncho 600 at 1.736 fl oz/cwt and Flo Rite 1706 at 1 fl oz/cwt.

Trial 24. Evaluation of biological seed treatments for controlling sudden death syndrome in Fargo, ND - 2025

SOYBEAN (*Glycine max 'DSR-0920E'*)

G. Dusek, H. R. Becton, and R. W. Webster

Soybeans were planted on May 6, 2025, in Fargo, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The soil type was silty clay. Standard practices were used to manage weeds and nutrition. All biological seed treatments evaluated in this study were paired with a "Base" seed treatment that included Allegiance FL at 0.194 fl oz/cwt, Stamina at 0.575 fl oz/cwt, Systiva XS 0.237 fl oz/cwt, Poncho 600 at 1.736 fl oz/cwt and Flo Rite 1706 at 1 fl oz/cwt. This trial was planted in a field that had no history of sudden death syndrome (SDS). Stand counts were taken on June 6, 2025, and June 24, 2025. Evaluations for SDS were conducted on Aug. 14, 2025, and Aug. 26, 2025. Yield was collected from the center two rows on Oct. 6, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 16.24 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. No symptoms or signs of SDS were observed in this trial throughout the course of the year. This was expected as there is no history of this field having SDS. There were significant differences among treatments detected for stand counts taken on June 6, 2025 (P=0.0425). A combination treatment of the Base, CeraMax and Germate Plus had a stand count of 87,229 plants/a, which was significantly higher than if no seed treatment was used. Additionally, a combination treatment of the Base, Thiabendazole, Heads Up, Biost 2nd Gen and Ascribe SAR had a stand count of 90,932, which was significantly higher than if no seed treatment was used. There were no significant differences detected for stand counts collected on the second date (June 24, 2025) or for yield. A combination treatment of the Base and Ilevo had the highest mean yield at 58.7 bu/a which was 4.2 bu/a higher than if no seed treatment was used.

Table 24. Effect of biological seed treatments on stand counts and yield.

Treatment[a]	Rate	Stand Count VC (plants/a)[b]	Stand Count V2 (plants/a)[c]	Yield (bu/a)[d]
Non-Treated	-	75,795 c[e]	81,675	54.5
Base[f]		81,926 ac	93,219	52.6
Base CeraMax Germate Plus	 2.5 fl oz/cwt 0.1 fl oz/cwt	87,229 ab	96,813	54.0
Base Avodigen Adaplan Ethos Elite	 1.26 fl oz/cwt 0.54 fl oz/cwt 0.69 fl oz/cwt	82,547 ac	87,774	56.9
Base Thiabendazole HeadsUp Biost 2nd Gen	 0.65 fl oz/cwt 0.16 fl oz/cwt 3.04 fl oz/cwt	90,932 a	92,130	57.7
Base		80,586 bc	92,130	55.0
Base Ilevo	 2.37 fl oz/cwt	77,755 c	86,576	58.7
P-Value		0.0425	0.5361	0.9313

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] VC stand counts were taken on June 6, 2025. This trial was planted at 140,000 seeds per acre.
[c] V2 stand counts were taken on June 24, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 6, 2025.
[e] Treatments with different letter groupings differ significantly ($\alpha = 0.05$).
[f] Treatments that included a "Base" treatment included Allegiance FL at 0.194 fl oz/cwt, Stamina at 0.575 fl oz/cwt, Systiva XS 0.237 fl oz/cwt, Poncho 600 at 1.736 fl oz/cwt and Flo Rite 1706 at 1 fl oz/cwt.

Trial 25. Evaluation of biological seed treatments for controlling sudden death syndrome in La Mars, ND - 2025

SOYBEAN (*Glycine max 'DSR-0920E'*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety DSR-0920E was planted on May 11, 2025, in La Mars, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 18 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The soil type was silt/sandy loam. Standard practices were used to manage weeds and nutrition. All biological seed treatments evaluated in this study were paired with a "Base" seed treatment that included Allegiance FL at 0.194 fl oz/cwt, Stamina at 0.575 fl oz/cwt, Systiva XS 0.237 fl oz/cwt, Poncho 600 at 1.736 fl oz/cwt and Flo Rite 1706 at 1 fl oz/cwt. This trial was planted in a field with a history of sudden death syndrome (SDS). Stand counts were taken on June 3, 2025, and June 30, 2025. Evaluations for SDS were conducted on Aug. 26, 2025. Yield was collected from the center two rows on Oct. 13, 2025. The weather over the course of the growing season was conducive to disease development. However, there was a hail/wind storm early in the season, which impacted plant growth during the vegetative stages. This trial received a total of 17.12 inches of rainfall over the course of the growing season. This trial also received a significant amount of hail early in the season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

Stand counts were recorded by counting the number of emerged soybeans in the center two rows (100 sq feet) and converting to plants per acre. A foliar evaluation for SDS was conducted in two ways: first, by estimating the percentage of a plot that was symptomatic (disease incidence); and second, by estimating the severity of symptomatic soybeans (disease severity). The disease incidence and disease severity values were used to calculate an SDS disease index percentage (SDSDIX%) value. This trial had a very low level of foliar SDS symptoms that developed, with the highest disease index value for a single plot being 0.14%. There were no statistically significant differences among treatments for stand counts at either date of recording. Interestingly, mean stand counts decreased in every treatment from the first date of recording to the second date of recording. This is atypical but can likely be attributed to the severe hailstorm that this trial endured. There were no significant differences in SDSDIX% among treatments. There were significant differences detected among treatments for yield (P=0.0112). Four out of the six chemical seed treatments evaluated in this study resulted in a significantly higher mean than if no seed treatment was used. The treatment with the highest yield was a combination treatment of the Base treatment and Ilevo at 2.37 fl oz/cwt, which resulted in a mean yield of 48.2 bu/a, which is 9.1 bu/a higher than if no seed treatment was used. Results from this experiment provide support for findings that suggest that seed treatments can protect significant levels of yield when used where there has been a history of SDS.

Table 25. Effect of biological seed treatments on stand counts, sudden death syndrome disease index, and yield.

Treatment[a]	Rate	Stand Count VC (plants/a)[b]	Stand Count V2 (plants/a)[c]	SDS DIX (%)[d]	Yield (bu/a)[e]
Non-Treated	-	84,700	66,671	0.00	39.1 bc[f]
Base[g]		85,910	84,216	0.01	46.6 a
Base CeraMax Germate Plus	 2.5 fl oz/cwt 0.1 fl oz/cwt	86,878	83,369	0.01	45.4 a
Base Avodigen Adaplan Ethos Elite	 1.26 fl oz/cwt 0.54 fl oz/cwt 0.69 fl oz/cwt	85,184	69,575	0.03	38.2 c
Base Thiabendazole HeadsUp Biost 2nd Gen	 0.65 fl oz/cwt 0.16 fl oz/cwt 3.04 fl oz/cwt	87,241	71,995	0.01	44.4 ab
Base		90,750	76,835	0.05	45.9 a
Base Ilevo	 2.37 fl oz/cwt	85,547	67,397	0.01	48.2 a
P-Value		0.586	0.1121	0.2572	0.0112

[a] Treatments were applied as standard seed treatments in conjunction with colorant.
[b] VC stand counts were taken on June 3, 2025. This trial was planted at 140,000 seeds per acre.
[c] V2 stand counts were taken on June 30, 2025.
[d] SDS DIX (%) = sudden death syndrome disease index in percent.
[e] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 13, 2025.
[f] Treatments with different letter groupings differ significantly ($\alpha = 0.05$).
[g] Treatments that included a "Base" treatment included Allegiance FL at 0.194 fl oz/cwt, Stamina at 0.575 fl oz/cwt, Systiva XS 0.237 fl oz/cwt, Poncho 600 at 1.736 fl oz/cwt and Flo Rite 1706 at 1 fl oz/cwt.

White Mold

Trial 26. Evaluation of foliar fungicides for controlling white mold of soybean in Oakes, ND - 2025

SOYBEAN (*Glycine max 'PFS 2414E'*) G. Dusek, H. R. Becton, and R. W. Webster

This trial was planted on May 9, 2025, in Oakes, North Dakota, at a rate of 160,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 5-foot alleys. The previous crop was soybean, and the soil type was Embden fine sandy loam. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. White mold incidence and severity ratings were taken on Aug. 22, 2025, and Sept. 3, 2025. Yield was collected from the first two rows on Oct. 3, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 17.2 inches of rainfall and 6.75 inches of irrigation for a total water input of 23.95 inches over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

White mold disease index percentages (WM DIX%) are calculated using disease incidence, which is recorded as a percentage of diseased soybeans in a plot, and disease severity, which is rated on a scale that considers the number of diseased soybeans and severity of disease on each soybean. There were moderate levels of white mold that developed in this trial. The highest WM DIX% in a single plot that was observed was 32.8% (data not presented), while the highest mean WM DIX% on a treatment was 15.6%. Regardless, there were no statistical differences in WM DIX% among treatments for both dates of data collection. Even though there were no statistical differences among treatments, most fungicide programs included in this experiment resulted in less disease development than if no fungicide was applied. Additionally, trends in the data suggest that fungicide programs that include an application of SAUS70, an experimental product that has not been commercially released, at 4 fl oz/a had better success for suppressing disease development when applied at the V4/V5 growth stage compared to the R2 growth stage. There were no statistical differences observed among treatments for mean yield. Mean yield values ranged from 71.4 bu/a to 76.5 bu/a and single plot yield values ranging from 57.3 bu/a to 91 bu/a (data not presented). The treatment with the highest mean yield value was an application of SAUS70 at 4 fl oz/a at the V4/V5 growth stage followed by an application of Reveg HBX at 8.5 fl oz/a at the R2 growth stage, resulting in a mean yield of 76.5 bu/a. This was 4.4 bu/a higher than if no fungicide was applied. The treatment with the second-highest yield value was an application of Endura at 8 oz/a at the R2 growth stage, resulting in a mean yield of 74.5 bu/a. This was 2.4 bu/a higher than if no fungicide was applied. The results of this experiment provide support for suggestions that applying a fungicide for control of white mold under a moderate level of disease pressure can result in lower disease development and higher yields than if no fungicide were to be applied.

Table 26. Effect of foliar fungicides on white mold disease values and yield.

Treatment[a]	Rate	Growth Stage	WM DIX1 (%)[b]	WM DIX2 (%)[c]	Yield (bu/a)[d]
Non-Treated	-	-	3.5	9.7	72.1
SAUS70[e]	4 fl oz/a	V4/V5	3.2	7.2	71.7
Regev HBX	8.5 fl oz/a	R2	5.2	8.7	73.4
SAUS70 Reveg HBX	4 fl oz/a 8.5 fl oz/a	V4/V5 R2	3.4	5.8	76.5
SAUS70 Reveg HBX	4 fl oz/a 8.5 fl oz/a	R2 R2	7.4	15.6	71.4
Endura	8 oz/a	R2	2.5	5.0	74.5
P-Value			0.1736	0.1708	0.8596

[a] Treatments were applied on July 14 (V4/V5 growth stage) and July 24 (R2 growth stage), all treatments were applied with all treatments were applied in conjunction with a non-ionic surfactant at a rate of 0.25% V/V.
[b] WM DIX1 (%) = white mold disease index percentage collected on Aug. 22, 2025.
[c] WM DIX2 (%) = white mold disease index percentage collected on Sept. 3, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 3, 2025.
[e] SAUS70 is an experimental product that has not been commercially released.

Trial 27. Evaluation of foliar fungicides for controlling white mold of soybean in Oakes, ND - 2025

SOYBEAN (*Glycine max 'PFS 2414E'*)

G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS 2414E was planted on May 9, 2025, in Oakes, North Dakota, at a rate of 160,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 5-foot alleys. The previous crop was dry edible beans, and the soil type was Embden fine sandy loam. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. White mold incidence and severity ratings were taken on Aug. 22, 2025. Yield was collected from the first two rows on Oct. 4, 2025. The weather over the course of the growing season was conducive to disease development. This trial was irrigated receiving 7.5 inches of irrigation and it received a total of 17.2 inches of rainfall for a total of 24.2 inches of water input over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

White mold disease index percentages (WM DIX%) are calculated using disease incidence, which is recorded as a percentage of diseased soybeans in a plot, and disease severity, which is rated on a scale that considers the number of diseased soybeans and severity of disease on each soybean. Low levels of white mold developed across this trial with most fungicide treatments resulting in near zero disease. Statistical analysis indicated there were significant differences in WM DIX% among treatments (P=0.0049). The non-treated control had the highest level of disease at 4.4%, which was significantly higher than two fungicide treatments: a duo application of Delaro Complete at 8 fl oz/a at both R1 and R3 growth stages, and an application of Endura at 5.5 oz/a at the R1 growth stage. Similarly, an application of Endura at 5.5 oz/a at the R1 growth stage resulted in significantly lower disease than every treatment except for a duo application of Delaro Complete at 8 fl oz/a at both R1 and R3. Additionally, there were statistical differences in mean yields detected among treatments (P=0.0058). The non-treated control had the lowest mean yield at 62.4 bu/a. Several fungicide application programs had significantly higher yield than the non-treated control, including the following: Propulse at 6 fl oz/a at R1 followed by Delaro Complete at 8 fl oz/a at R3, Propulse at 8 fl oz/a at R1 followed by Delaro Complete at 8 fl oz/a at R3, Delaro Complete at 8 fl oz/a at R1 followed by Delaro Complete at 8 fl oz/a at R3, and Endura at 5.5 oz/a at R1. An application of Propulse at 6 fl oz/a at R1 followed by Delaro Complete at 8 fl oz/a at R3 resulted in the highest mean yield of 75.7, which was 13.3 bu/a higher than the non-treated. Results from this study suggest that the treatments evaluated will result in a higher mean yield than if no fungicide were to be applied in a low disease environment. Additionally, programs that included fungicide applications at more than one growth stage resulted in higher mean yield than programs that only applied a fungicide at one growth stage.

Table 27. Effect of foliar fungicides on white mold disease values and yield.

Treatment[a]	Rate	Growth Stage	WM DIX (%)[b]	Yield (bu/a)[c]
Non-Treated	-	-	4.4 a[d]	62.4 c
Delaro Complete	8 fl oz/a	R1	3.5 a	64.5 bc
Propulse Delaro Complete	6 fl oz/a 8 fl oz/a	R1 R3	0.5 ab	75.7 a
Propulse Delaro Complete	8 fl oz/a 8 fl oz/a	R1 R3	0.9 ab	70.2 ab
Propulse	6 fl oz/a	R1	0.5 ab	67.7 bc
Propulse	8 fl oz/a	R1	1.6 ab	66.2 bc
Delaro Complete Delaro Complete	8 fl oz/a 8 fl oz/a	R1 R3	0.3 bc	69.9 ab
Endura	5.5 oz/a	R1	0.0 c	69.1 b
P-Value			0.0049	0.0058

[a] Treatments were applied on July 14 (R1) and July 24 (R3); all treatments were applied in conjunction with a non-ionic surfactant at a rate of 0.125% V/V except for Endura.
[b] WM DIX (%) = white mold disease index percentage collected on Aug. 22, 2025.
[c] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 4, 2025.
[d] Treatments with different letter groupings differ significantly ($\alpha = 0.05$).

Trial 28. Evaluation of foliar biological fungicides for controlling white mold of soybean in Fargo, ND - 2025

SOYBEAN (*Glycine max 'PFS 2414E'*)

G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS 2414E was planted on May 6, 2025, in Fargo, North Dakota, at a rate of 140,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 7-foot alleys. The previous crop was oat, and the soil type was silty clay. Standard practices were used to manage weeds and fertility. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. White mold incidence and severity ratings were taken on Sept. 2, 2025. Yield was collected from the center two rows on Oct. 4, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 16.24 inches of rainfall over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments, and the yield data were modeled according to a negative binomial distribution. Means separations followed Fisher's Protected LSD at α=0.1.

White mold disease index percentages (WM DIX%) are calculated using disease incidence, which is recorded as a percentage of diseased soybeans in a plot, and disease severity, which is rated on a scale that considers the number of diseased soybeans and severity of disease on each soybean. Although conducive conditions were present, this trial had low levels of disease development, with the highest level observed on a single treatment being 0.5%. No significant differences were observed among treatments for WM DIX% (*P*=0.4294) or yield (*P*=0.7432). Yield values ranged from 59.7 bu/a at the highest to 55.9 bu/a at the lowest, or a 3.8 bu/a difference. The yield range observed is likely due to environmental conditions, as the disease levels observed are unlikely to cause any yield loss.

Table 28. Effect of foliar biological fungicides on white mold disease values and yield.

Treatment[a]	Rate	Growth Stage	WM DIX (%)[b]	Yield (bu/a)[c]
Non-Treated	-	-	0.0	57.2
Double Nickel 55	1 lb/a	R2	0.0	59.7
LifeGard WG	4.5 oz wt/100 gal	R2	0.5	56.6
Serenade OPTI	14 oz/a	R2	0.5	56.4
Howler EVO	2.5 lb/a	R2	0.3	56.1
RootShield	16 oz/a	R2	0.0	55.9
Botrystop	2 lb/a	R2	0.1	56.4
Endura	8 oz/a	R2	0.0	57.2
P-Value			0.4294	0.7432

[a] Treatments were applied on July 28, 2025.
[d] WM DIX (%) = disease index percentage collected on Sept. 2, 2025.
[c] Yield was adjusted to 13% moisture and represented in bushels an acre (bu/a) and collected on Oct. 4, 2025.

Trial 29. Evaluation of foliar biological fungicides for controlling white mold of soybean in Fargo, ND - 2025

SOYBEAN (*Glycine max 'PFS 2414E'*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS 2414E was planted on May 9, 2025, in Oakes, North Dakota, at a rate of 160,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 5-foot alleys. The previous crop was edible beans, and the soil type was Embden fine sandy loam. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. White mold incidence and severity ratings were taken on Aug. 22, 2025, and Sept. 3, 2025. Yield was collected from the first two rows on Oct. 4, 2025. The weather over the course of the growing season was conducive to disease development. This trial was irrigated receiving 7.5 inches of irrigation, and it received a total of 17.2 inches of rainfall for a total of 24.2 inches of water input over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield data. Means separations followed Fisher's Protected LSD at α=0.05.

White mold disease index percentage (WM DIX%) is calculated using disease incidence, which is recorded as a percentage of diseased soybeans in a plot, and disease severity, which is rated on a scale that considers the number of diseased soybeans and severity of disease on each soybean. There was a moderate level of disease that developed, with the highest level of disease in a single treatment being 13.5 WM DIX% on Sept. 3. There were significant differences among treatments for WM DIX% on both Aug. 22, and Sept. 3, with P=0.0153 and P=0.0049, respectively. The Endura treatment resulted in significantly lower WM DIX% than all treatments except for the non-treated control on Aug. 22. Similarly, the Endura treatment resulted in significantly lower WM DIX% than all treatments, excluding the non-treated and double nickel 55 on Sept. 3. There were no statistical differences in yield among treatments. Interestingly, a treatment of Botrystop resulted in a WM DIX% of 10.6, which is on the higher end of disease development of the treatments evaluated; however, it also resulted in the highest mean yield of all treatments evaluated at 67.4 bu/a, which was 4.3 bu/a higher than the non-treated control.

Table 29. Effect of foliar biological fungicides on white mold disease values and yield.

Treatment[a]	**Rate**	**Growth Stage**	**WM DIX1 (%)**[b]	**WM DIX2 (%)**[c]	**Yield (bu/a)**[d]
Non-Treated	-	-	3.5 bc[e]	6.4 bc	63.1
Botrystop	2 lb/a	R2	5.5 ab	10.6 ab	67.4
Double Nickel 55	1 lb/a	R2	4.2 ab	6.7 bc	65.0
Endura	8 oz/a	R2	0.6 c	2.1 c	65.6
Howler EVO	2.5 lb/a	R2	7.1 ab	13.5 a	62.5
RootShield	16 oz/a	R2	5.1 ab	10.9 ab	62.4
P-Value			0.0153	0.0049	0.8696

[a] Treatments were applied on July 14, 2025.
[b] WM DIX1 (%) = white mold disease index percentage at the first date of disease evaluation (Aug. 22, 2025).
[c] WM DIX2 (%) = white mold disease index percentage at the second date of disease evaluation (Sept. 3, 2025).
[d] Yield was adjusted to 13% moisture and represented in bushels an acre (bu/a) and collected on Oct. 4, 2025.
[e] Treatments with different letter groupings differ significantly (α = 0.05).

Trial 30. Evaluation of foliar biological fungicides for controlling white mold of soybean in Fargo, ND - 2025

SOYBEAN (*Glycine max 'PFS 2414E'*)

G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety PFS 2414E was planted on May 9, 2025, in Oakes, North Dakota, at a rate of 160,000 seeds/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated four times and designed in a randomized complete block, and blocks were separated by 5-foot alleys. The previous crop was corn, and the soil type was Embden fine sandy loam. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. White mold incidence and severity ratings were taken on Aug. 22, 2025, and Sept. 3, 2025. Yield was collected from the center two rows on Oct. 4, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 17.2 inches of rainfall and 6.75 inches of irrigation for a total water input of 23.95 inches over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

White mold disease index percentages (WM DIX%) are calculated using disease incidence, which is recorded as a percentage of diseased soybeans in a plot, and disease severity, which is rated on a scale that considers the number of diseased soybeans and severity of disease on each soybean. There was a very low level of white mold that developed in this trial throughout the year. There were no significant differences among treatments for either dates WM DIX% was collected. Similarly, there were no significant differences in mean yields among treatments. Considering the level of white mold that developed in this trial, these results are not surprising. Previous studies have suggested that yield loss above two bu/a occurs starting at 5% WM DIX%; in this trial, WM DIX% numbers were most commonly under 5%. While some treatments did have WM DIX% rise above 5%, there was still no observed yield loss. The level of disease pressure in this trial likely did not impact yield to cause any noticeable losses. Results from this research support suggestions that fungicide applications in very low disease environments will not suppress significant levels of white mold development or protect significant levels of yield.

Table 30. Effect of foliar biological fungicide and conventional fungicide on white mold disease values and yield.

Treatment[a]	**Rate**	**Growth Stage**	**WM DIX1 (%)**[b]	**WM DIX2 (%)**[c]	**Yield (bu/a)**[d]
Non-Treated	-	-	2.5	3.6	72.2
Polyversum	2 oz/a	R2	3.7	10.6	72.7
Polyversum Polyversum	1.5 oz/a 1.5 oz/a	R2 10 days after[e]	3.9	7.0	73.5
Endura	6 oz/a	R2	0.6	2.2	72.3
P-Value			0.4827	0.1242	0.9342

[a] Treatments were applied on July 14, 2025 (R2 growth stage), and July 24, 2025 (10 days after first application).
[b] WM DIX1 (%) = white mold disease index percentage collected on Aug. 22, 2025.
[c] WM DIX2 (%) = white mold disease index percentage collected on Sept. 3, 2025.
[d] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 4, 2025.
[e] 10 days after = 10 days after first application that was made at the R2 growth stage

Foliar Diseases

Trial 31. Evaluation of foliar fungicides for controlling foliar soybean diseases in Fargo, ND - 2025

SOYBEAN (*Glycine max 'PFS 2207E'*) H. R. Becton, G. Dusek and R. W. Webster

The soybean variety PFS 2207E was planted in Fargo, North Dakota, on May 6, 2025, at a rate of 140,000 seeds/a and depth of 1.5 in. in bedded single rows spaced 30 inches apart. Plots were four rows by 20 feet. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 7-foot alleys. The field was rainfed and grown to oat the previous year. Soil type was a silty clay. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. Foliar incidence and severity ratings were taken on Aug. 28, 2025. Yield was collected from the center two rows on Oct. 4, 2025. Rainfall during the period totaled 16.24 inches, and overall, weather conditions were moderately conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

While frogeye leaf spot, Cercospora leaf blight and Septoria brown spot were present, incidence remained low throughout the season. There is historically low disease pressure from these pathogens at this location. As such, there were no significant differences observed among treatments for foliar disease incidence or yield.

Table 31. Effect of seed treatments and foliar fungicides on soybean foliar disease incidence and yield.

Treatment	Rate	Timing[a]	Mean disease incidence (%)[b]			Yield (bu/a)
			Frogeye leaf spot	Cercospora leaf blight	Septoria brown spot	
Non-Treated	-	-	0.8	0.0	2.3	57.5
Cruiser Maxx APX	4.18 fl oz/cwt	SDTR[c]				
Saltro	2.3 fl oz/cwt	SDTR				
Delaro Complete	8 fl oz/a	R1				
NIS	0.25% v/v	R1				
Delaro Complete	8 fl oz/a	R3				
NIS	0.25% v/v	R3	0.3	0.3	0.5	60.4
Cruiser Maxx APX	4.18 fl oz/cwt	SDTR				
Saltro	2.3 fl oz/cwt	SDTR				
Delaro Complete	8 fl oz/a	R3				
NIS	0.25% v/v	R3	0.3	0.3	0.8	59.0
Cruiser Maxx APX	4.18 fl oz/cwt	SDTR				
Saltro	2.3 fl oz/cwt	SDTR	1.0	0.3	2.7	60.2
Delaro Complete	8 fl oz/a	R1				
NIS	0.25% v/v	R1				
Delaro Complete	8 fl oz/a	R3				
NIS	0.25% v/v	R3	0.0	0.0	1.0	53.9
Delaro Complete	8 fl oz/a	R3				
NIS	0.25% v/v	R3	0.3	0.0	4.0	60.6
Cruiser Maxx APX	4.18 fl oz/cwt	SDTR				
Saltro	2.3 fl oz/cwt	SDTR				
Delaro Complete	8 fl oz/a	50% risk[d]				
NIS	0.25% v/v	50% risk	0.5	0.0	1.5	58.8
Delaro Complete	8 fl oz/a	50% risk				
NIS	0.25% v/v	50% risk	0.5	0.0	3.8	57.4
P-Value			0.24	0.53	0.45	0.43

[a] Growth stage or timing at which the fungicide application was applied.
[b] These incidence ratings were recorded on Aug. 28, 2025.
[c] SDTR = seed treatment.
[d] Fungicide applications were guided by predictive models for frogeye leaf spot disease risk.

Trial 32. Evaluation of foliar fungicides for controlling frogeye leaf spot in Oakes, ND - 2025

SOYBEAN (*Glycine max 'XO 1095E'*)

H. R. Becton, G. Dusek, and R. W. Webster

The soybean variety XO 1095E was planted May 9, 2025, in Oakes, North Dakota, at a rate of 140,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 30 inches apart. Plots were four rows by 20 feet. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 7-foot alleys. The field was irrigated and grown to soybean the previous year. Soil type was an Embden fine sandy loam with a 0%-2% slope. Standard practices were used to manage weeds and fertility. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. Frogeye incidence and severity ratings were taken on Aug. 13, 2025, and Aug. 28, 2025. Yield was collected from the center two rows on Oct. 3, 2025. Rainfall during the period totaled 17.2 inches, and overall, weather conditions were conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

Significant differences were observed for the FLS disease index among treatments ($P<0.01$). The non-treated check has significantly greater disease compared to the treated plots. Treatments containing azoxyprop had significantly greater control of FLS than the check and treatments containing an application of Experimental 1 or Experimental 2 alone. There were also significant differences observed among yields ($P=0.01$), with azoxyprop + Experimental 1 having the greatest yield. Again, the programs with a standalone application of Experimental 1 or Experimental 2 had similar yields to the NTC.

Table 32. Effect of foliar fungicides on frogeye leaf spot disease index and yield.

Treatment	Rate	Timing[a]	FLS disease index (%)[b]	Yield (bu/a)[c]
Non-Treated	-	-	41.8 a[d]	60.1 bc
Azoxyprop	18 fl oz/a	R3	0.1 c	60.8 bc
Azoxyprop Experimental #1	18 fl oz/a 2 fl oz/a	R3 R3	0.1 c	64.1 a
Experimental #1	4 fl oz/a	R3	29.1 ab	59.5 bc
ExperTimental #2	1 fl oz/a	R3	10.2 bc	58.2 c
Azoxyprop Experimental #2	18 fl oz/a 0.5 fl oz/a	R3 R3	0.5 c	62.0 ab
P-Value			0.002	0.01

[a] Growth stage or timing at which the fungicide application was applied.
[b] Calculated by dividing FLS incidence by FLS severity and multiplying by 10.
[c] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 3, 2025.
[d] Means with differing letters are significantly different at an α=0.05.

Trial 33. Evaluation of foliar fungicides for controlling foliar soybean diseases in Fargo, ND - 2025

SOYBEAN (*Glycine max 'XO 1095E'*) H. R. Becton, G. Dusek and R. W. Webster

The soybean variety XO 1095E was planted in Fargo, North Dakota, on May 6, 2025, at a rate of 140,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 30 inches apart. Plots were four rows by 20 feet. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 7-foot alleys. The field was rainfed and grown to oat the previous year. Soil type was silty clay. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. Four foliar incidence and severity ratings were taken on a biweekly basis beginning on July 29, 2025. Yield was collected from the center two rows on Oct. 6, 2025. Rainfall during the period totaled 16.24 inches, and overall, weather conditions were moderately conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

While frogeye leaf spot, Cercospora leaf blight and Septoria brown spot were present, incidence remained low throughout the season. There is historically low disease pressure from these pathogens at this location. As such, there were no significant differences observed among treatments for foliar disease incidence or yield.

Table 33. Effect of foliar fungicides on frogeye leaf spot, Cercospora leaf blight and Septoria brown spot incidence and yield.

			Mean disease incidence (%)[b]			
Treatment	**Rate**	**Timing[a]**	**Frogeye leaf spot**	**Cercospora leaf blight**	**Septoria brown spot**	**Yield (bu/a)**
Non-Treated	-	-	1.0	6.0	7.0	54.9
Delaro Complete	8 fl oz/a	R3				
NIS	0.25% v/v	R3	0.5	6.0	2.8	53.1
Adastrio	8 fl oz/a	R3				
NIS	0.25% v/v	R3	0.5	6.5	4.0	54.2
Badge SC	1.5 pt/a	R3				
NIS	0.25% v/v	R3	0.8	6.8	4.8	55.2
Affiance	14 fl oz/a	R3				
NIS	0.25% v/v	R3	0.8	6.8	4.0	52.6
Quilt	12 fl oz/a	R3				
NIS	0.25% v/v	R3	0.5	6.0	5.8	57.2
Delaro Complete	8 fl oz/a	R5				
NIS	0.25% v/v	R5	1.0	7.5	4.3	54.9
Delaro Complete	8 fl oz/a	R3				
NIS	0.25% v/v	R3				
Delaro Complete	8 fl oz/a	R5				
NIS	0.25% v/v	R5	1.0	4.7	1.7	53.8
Quilt	12 fl oz/a	R5				
NIS	0.25% v/v	R5	0.3	6.0	6.0	59.1
Viatude	16 fl oz/a	R3				
NIS	0.25% v/v	R3	0.8	7.0	3.0	55.7
P-Value			0.91	0.89	0.47	0.70

[a] Growth stage or timing at which the fungicide application was applied.
[b] These incidence ratings for FLS and CLB were recorded on Sept. 9, 2025, and the mean disease incidence for SBS was recorded on Aug. 28, 2025.

Trial 34. Evaluation of foliar fungicides for controlling foliar soybean diseases in Oakes, ND (Irrigated) - 2025

SOYBEAN (*Glycine max 'XO 1095E'*)

H. R. Becton, G. Dusek and R. W. Webster

The soybean variety XO 1095E was planted in Oakes, North Dakota, on May 6, 2025, at a rate of 140,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 30 inches apart. Plots were four rows by 20 feet. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 5-foot alleys. The field was irrigated and grown to flax the previous year. Soil type was an Embden fine sandy loam with a 0%-2% slope. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. Foliar incidence and severity ratings were taken on July 24, 2025, and Aug. 13, 2025. White mold incidence and severity was rated on Sept. 3, 2025. Yield was collected from the center two rows on Oct. 4, 2025. Rainfall during the period totaled 17.2 inches, and overall, weather conditions were conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.05$.

No significant differences were observed between treatments with respect to incidence of frogeye leaf spot, Cercospora leaf blight or white mold. Overall, disease pressure was low throughout the trial. Additionally, there were no differences in yield.

Table 34. Effect of foliar fungicides on frogeye leaf spot, Cercospora leaf blight and Septoria brown spot incidence and yield.

Treatment and amount/A	Rate	Timing[a]	Mean disease incidence (%)[b] Frogeye leaf spot	Cercospora leaf blight	White mold	Yield (bu/a)
Non-Treated	-	-	0.5	0.0	2.0	74.5
Delaro Complete	8 fl oz/a	R3				
NIS	0.25% v/v	R3	0.0	0.1	0.6	78.7
Adastrio	8 fl oz/a	R3				
NIS	0.25% v/v	R3	0.1	0.0	1.4	78.9
Badge SC	1.5 pt/a	R3				
NIS	0.25% v/v	R3	0.0	0.0	0.6	79.1
Affiance	14 fl oz/a	R3				
NIS	0.25% v/v	R3	0.0	0.1	0.9	77.6
Quilt	12 fl oz/a	R3				
NIS	0.25% v/v	R3	0.1	0.1	0.7	77.2
Delaro Complete	8 fl oz/a	R5				
NIS	0.25% v/v	R5	0.0	0.1	0.9	82.5
Delaro Complete	8 fl oz/a	R3				
NIS	0.25% v/v	R3				
Delaro Complete	8 fl oz/a	R5				
NIS	0.25% v/v	R5	0.0	0.0	0.8	76.7
Quilt	12 fl oz/a	R5				
NIS	0.25% v/v	R5	0.0	0.1	1.5	78.3
Viatude	16 fl oz/a	R3				
NIS	0.25% v/v	R3	0.3	0.1	0.4	79.6
P-Value	-	-	0.10	0.68	0.32	0.93

[a] Growth stage or timing at which the fungicide application was applied.
[b] These incidence ratings for FLS and CLB were recorded on Aug. 13, 2025, and the mean disease incidence for WM was recorded on Sept. 3, 2025.

Trial 35. Evaluation of foliar fungicides for controlling foliar soybean diseases in Oakes, ND (Dryland) - 2025

SOYBEAN (Glycine max 'XO 1095E')

H. R. Becton, G. Dusek and R.W. Webster

The soybean variety XO1095E was planted May 7, 2025, in Oakes, North Dakota, at a rate of 140,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 30 inches apart. Plots were four rows by 20 feet. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 5-foot alleys. The field was rainfed and grown to corn the previous year. Soil type was a Barnes-Svea loam with a 0%-3% slope. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. Foliar incidence and severity ratings were taken on July 24, 2025, Aug. 13, 2025, and Aug. 22, 2025. Yield was collected from the center two rows on Oct. 1, 2025. Rainfall during the period totaled 17.2 inches, and overall, weather conditions were conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.05$.

No differences were observed between treatments for their effect on frogeye leaf spot and Cercospora leaf blight incidence. Disease pressure was very low across the whole trial.

Table 35. Effect of foliar fungicides on frogeye leaf spot, Cercospora leaf blight and Septoria brown spot incidence and yield.

Treatment	Rate	Timing[a]	Mean disease incidence (%)[b]		Yield (bu/a)
			Frogeye leaf spot	Cercospora leaf blight	
Non-Treated	-	-	0.08	0.05	62.3
Delaro Complete NIS	8 fl oz/a 0.25% v/v	R3 R3	0.03	0.08	63.1
Adastrio NIS	8 fl oz/a 0.25% v/v	R3 R3	0.00	0.03	60.3
Badge SC NIS	1.5 PT/a 0.25% v/v	R3 R3	0.50	0.25	65.0
Affiance NIS	14 fl oz/a 0.25% v/v	R3 R3	0.05	0.50	62.8
Quilt NIS	12 fl oz/a 0.25% v/v	R3 R3	0.05	1.25	59.7
Delaro Complete NIS	8 fl oz/a 0.25% v/v	R5 R5	0.00	0.03	66.8
Delaro Complete NIS Delaro Complete NIS	8 fl oz/a 0.25% v/v 8 fl oz/a 0.25% v/v	R3 R3 R5 R5	0.00	0.03	63.4
Quilt NIS	12 fl oz/a 0.25% v/v	R5 R5	0.30	0.00	65.4
Viatude NIS	16 fl oz/a 0.25% v/v	R3 R3	0.05	0.30	61.2
P-Value			0.09	0.61	0.33

[a] Growth stage or timing at which the fungicide application was applied.
[b] These incidence ratings for FLS and CLB were recorded on Aug. 22, 2025.

Trial 36. Evaluation of foliar fungicides for controlling foliar soybean diseases in Prosper, ND - 2025

SOYBEAN (*Glycine max 'AG 07XF4'*) H. R. Becton, G. Dusek and R. W. Webster

The soybean variety AG07XF4 was planted in Prosper, North Dakota, on May 2025, at a rate of 140,000 seeds/a and depth of 1.5 inches in bedded single rows spaced 30 inches apart. Plots were four rows by 20 feet. Treatments were replicated four times and designed in a randomized complete block. Blocks were separated by 5-foot alleys. The field was rainfed and grown to wheat the previous year. Soil type was a silty clay loam. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 20 gal/A at 40 psi using four XR TeeJet 8002VS flat-fan nozzles spaced at 20 inches apart. Mixing compatibility issues and phytotoxicity were not observed during the trial. Foliar incidence and severity ratings were taken on Aug. 13, 2025, and Sept. 9, 2025. White mold incidence and severity were recorded on Sept. 9, 2025. Yield was collected from the center two rows on Oct. 3, 2025. Rainfall during the period totaled 17.2 inches, and overall, weather conditions were conducive to disease development. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at α=0.05.

Disease was low across the trial, though frogeye leaf spot, Cercospora leaf blight and Septoria brown spot were present. There were no significant differences across the fungicide programs tested with respect to disease ratings or yield.

Table 36. Effect of foliar fungicides on frogeye leaf spot, Cercospora leaf blight and Septoria brown spot incidence and yield.

Treatment	Rate	Timing[a]	Mean disease incidence (%)[b] Frogeye leaf spot	Cercospora leaf blight	Septoria brown spot	Yield (bu/a)
Non-Treated	-	-	1.0	1.7	0.6	51.5
Delaro Complete	8 fl oz/a	R2				
NIS	0.25% v/v	R2	1.3	2.3	0.0	56.2
Adastrio	8 fl oz/a	R2				
NIS	0.25% v/v	R2	1.3	4.0	0.3	59.0
Badge SC	1.5 PT/a	R2				
NIS	0.25% v/v	R2	1.5	2.3	0.2	57.3
Affiance	14 fl oz/a	R2				
NIS	0.25% v/v	R2	1.0	1.0	0.1	58.7
Quilt	12 fl oz/a	R2				
NIS	0.25% v/v	R2	0.7	3.3	0.5	51.5
Delaro Complete	8 fl oz/a	R5				
NIS	0.25% v/v	R5	1.3	2.7	0.4	55.6
Delaro Complete	8 fl oz/a	R2				
NIS	0.25% v/v	R2				
Delaro Complete	8 fl oz/a	R5				
NIS	0.25% v/v	R5	0.8	3.8	0.2	59.8
Quilt	12 fl oz/a	R5				
NIS	0.25% v/v	R5	1.0	4.7	0.1	47.2
Viatude	16 fl oz/a	R2				
NIS	0.25% v/v	R2	1.0	1.8	0.3	59.3
P-Value			0.86	0.36	0.84	0.17

[a] Growth stage or timing at which the fungicide application was applied.
[b] These incidence ratings for FLS, CLB and SBS were recorded on Sept. 9, 2025.

Trial 37. Evaluation of foliar fungicides for controlling foliar soybean diseases and white mold in Oakes, ND - 2025

SOYBEAN (*Glycine max 'XO 1095E'*) G. Dusek, H. R. Becton, and R. W. Webster

The soybean variety XO1095E was planted on May 9, 2025, in Oakes, North Dakota, at a rate of 160,000 seed/a in bedded single rows spaced 30 inches apart and a planting depth of 1.5 inches. Experiment plots were four rows (10 feet) wide by 20 feet long. Treatment evaluations were replicated six times and designed in a randomized complete block, and blocks were separated by 5-foot alleys. The previous crop was soybean, and the soil type was Embden fine sandy loam. Standard practices were used to manage weeds and nutrition. Fungicides were applied at 15 gal/A at 40 psi using four XR TeeJet 110015VS flat-fan nozzles spaced at 20 inches apart. There were no mixing compatibility or phytotoxicity issues observed during the trial. Frogeye leaf spot (FLS) evaluations were conducted on Aug. 22, 2025. White mold (WM) incidence and severity ratings were taken on Aug. 22, 2025, and Sept. 3, 2025. Yield was collected from the first two rows on Oct. 3, 2025. The weather over the course of the growing season was conducive to disease development. This trial received a total of 17.2 inches of rainfall and 6.75 inches of irrigation for a total water input of 23.95 inches over the course of the growing season. Analysis was conducted using SAS 9.4 PROC GLIMMIX to determine the effects of treatments on disease and yield. Means separations followed Fisher's Protected LSD at $\alpha=0.05$.

Frogeye leaf spot disease index percentages (FLS DIX%) are calculated using disease incidence, which is recorded as a percentage of soybeans in a plot with FLS symptoms, and disease severity, which is recorded as the percentage of leaf area infected on symptomatic soybeans. White mold disease index percentages (WM DIX%) are calculated using disease incidence, which is recorded as a percentage of WM diseased soybeans in a plot, and disease severity, which is rated on a scale that considers the number of WM diseased soybeans and severity of disease on each soybean. This trial had low-moderate levels of both FLS and WM that developed, and there were statistically significant differences among treatments for FLS DIX% (P=<.0001) and WM DIX% that were recorded on Sept. 3, 2025 (P=0.0111). Statistical tests showed that a treatment with Viatude fungicide resulted in significantly higher FLS DIX% than other fungicide treatments; however, the percentage of FLS that developed was essentially 0% for both a Viatude fungicide treatment and all other fungicide treatments. There were minimal levels of WM that had developed during the first date for data collection (Aug. 22, 2025); there were no differences among treatments for WM DIX% detected at this date. However, WM disease evaluations that were conducted later in the season (Sept. 3, 2025) detected significant differences among treatments. Veltyma resulted in the highest level of WM DIX% at 10.3%, which was statistically higher than all other treatments except for Miravis Top. There were no significant differences detected among treatments for yield. However, although a treatment of Veltyma resulted in the highest level of WM DIX% that developed, the yield after a Veltyma treatment trended towards the higher end of treatments evaluated in this study. A treatment of Revytek and Zorina resulted in the highest mean yields across treatments at 73.1 bu/a and 72.4 bu/a, respectively; this was 4.3 bu/a and 3.6 bu/a higher than the non-treated.

Table 37. Effect of foliar fungicides on frogeye leaf spot development, white mold development and yield.

Treatment[a]	Rate	Growth Stage	FLS DIX (%)[b]	WM DIX1 (%)[c]	WM DIX2 (%)[d]	Yield (bu/a)[e]
Non-Treated	-	R3	9.80 a[f]	0.8	2.2 c	68.8
Revytek	8.0 fl oz/a	R3	0.00 c	2.0	3.4 c	73.1
Revylok	5.5 fl oz/a	R3	0.00 c	2.3	4.7 bc	69.3
Veltyma	7.0 fl oz/a	R3	0.00 c	3.6	10.3 a	70.4
Delaro Complete	8.0 fl oz/a	R3	0.00 c	1.1	3.4 c	68.0
Miravis Neo	13.7 fl oz/a	R3	0.01 bc	3.2	5.3 bc	68.5
Miravis Top	13.7 fl oz/a	R3	0.00 c	4.5	9.0 ab	66.1
Viatude	10.0 fl oz/a	R3	0.04 b	1.7	2.3 c	69.2
Zorina	18.5 fl oz/a	R3	0.00 c	1.1	3.0 c	72.4
P-Value			<.0001	0.1863	0.0111	0.1138

[a] Treatments were applied on July 24, 2025, all treatments were applied with all treatments were applied in conjunction with a non-ionic surfactant at a rate of 0.25% V/V.
[b] FLS DIX (%) = frogeye leaf spot disease index percentage collected on Aug. 22, 2025.
[c] WM DIX1 (%) = white mold disease index percentage collected on Aug. 22, 2025.
[d] WM DIX2 (%) = white mold disease index percentage collected on Sept. 3, 2025.
[e] Yield was adjusted to 13% moisture and calculated in bushels per acre (bu/a) and collected on Oct. 3, 2025.
[f] Treatments with different letter groupings differ significantly (α = 0.05).

For more information on this and other topics, see www.ndsu.edu/extension