

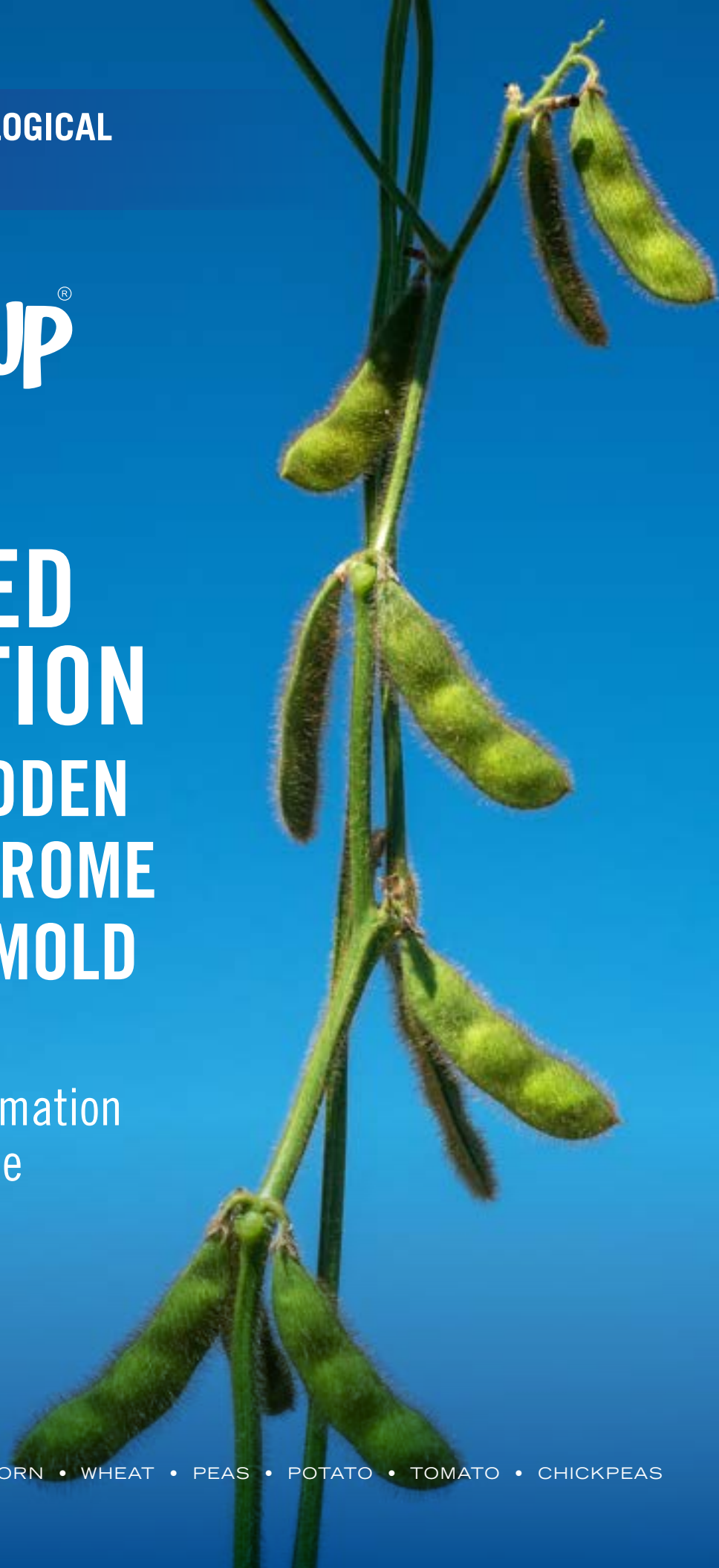
**EPA REGISTERED BIOLOGICAL
SEED TREATMENT**



ENHANCED PROTECTION AGAINST SUDDEN DEATH SYNDROME AND WHITE MOLD

2023 Product Information
and Research Guide

SOYBEANS • DRY BEANS • CORN • WHEAT • PEAS • POTATO • TOMATO • CHICKPEAS





ABOUT HEADS UP®

From our humble beginnings in Kamsack, Saskatchewan, Canada, to our North American expansion, our roots are deeply seeded in providing natural, reliable and sustainable products to improve the future of farming.

While founded in 1999, Heads Up® Plant Protectants, Inc. has been in motion since the 1970s. A venture that started on a 600-acre hobby farm in east-central Saskatchewan by Joe Dutcheshen has evolved into one of the leading biological crop protection companies in the U.S. and Canada.

A pharmacist and farmer, Joe honed in on his passion for pharmaceutical research and agriculture to develop a biological formulation from naturally occurring plant-extracted biochemicals found in specialty crops. Through persistence and determination and more than 20 years of research, Joe found that certain chemistries activate systemic acquired resistance in crops, which essentially sends signals to the plant to activate its defense system to ward off diseases. The formulation gives the plant a “heads up” to get its defense in place and aids to suppress yield-robbing diseases, such as white mold and sudden death syndrome.

Now, Heads Up is one of the most effective, economical biological seed treatments on the market for use on soybeans, corn, potatoes, dry beans, peas and wheat, as well as a pre-transplant foliar and root dip for tomato seedlings. And our footprint continues to grow; more than 10 million soybean acres in North America use Heads Up seed treatment, and in Alberta, Canada, Heads Up is on 100% of dry bean acres planted.

Heads Up is an independent, family-owned company based in Saskatoon, Saskatchewan, Canada. Heads Up Plant Protectant is both an EPA and PRMA (Canada) registered seed treatment in addition to OMRI™ (Organic Materials Review Institute) registered and approved for organic use. Heads Up continues product testing to refine future formulations, including Heads Up RTA: a pre-mix liquid product for growers who prefer an alternative to water-soluble powder.

TO LEARN MORE ABOUT HEADS UP®, VISIT US ONLINE AT WWW.HEADSUPST.COM

CONCERNED ABOUT WHITE MOLD AND SDS IN YOUR SOYBEANS?

HERE'S WHY YOU SHOULD ASK YOUR SEED DEALER FOR HEADS UP®

GROWERS WITH FIELDS THAT HAVE A HISTORY OF WHITE MOLD IN THEIR SOYBEANS HAVE NOTED WITH HEADS UP®:

- Lower overall incidence of disease (disease symptoms).
- Reduction of the severity of disease.
- Fewer infected plants (reduction in the spread of disease).
- Fewer sclerotia in harvested beans (less time spent cleaning).
- Less sclerotia returning to the soil, positively impacting future planting.
- Consistent yield benefit.
- Positive ROI.

GROWERS WITH A HISTORY OF SUDDEN DEATH SYNDROME IN THEIR SOYBEANS HAVE NOTED:

- Lower overall incidence of disease (disease symptoms).
- Reduction of the severity of disease.
- Fewer infected plants (reduction in the spread of disease).
- Consistent yield benefit.
- Positive ROI.

For more information, visit us online at www.headsupST.com or call toll free 1-866-368-9306.



TOP REASONS TO ASK YOUR DEALER FOR HEADS UP® SEED TREATMENT

1. PROVEN RESULTS.

Heads Up® has a long history of proven results across the United States and Canada, helping soybean producers control several fungal and bacterial diseases. In over 11 years and 68 trials conducted by the North Central Soybean Research Program, Heads Up® has shown to bring an average yield increase of 2.08 bu/ ac when used stand alone or paired with other commercial seed treatments.

2. COMPATIBILITY.

Heads Up® is non-microbial and is compatible with many other seed treatments and inoculants.

3. STACKED MODES OF ACTION.

Heads Up® utilizes a revolutionary mode of action (M.O.A) called systemic acquired resistance (S.A.R). When combined with traditional fungicide/insecticide seed treatment products, Heads Up® gives your seed treatment package additional protection against several key disease robbing pathogens fungicides alone cannot provide.

4. SYSTEMIC, SEASON LONG ACTIVITY.

Heads Up® is active from the time of germination to natural senescence. Because the product works to signal a physiological change, turning on and engaging the plants defenses early, this heightened resistance stays on and active all-season long.

5. BROAD SPECTRUM.

Heads Up® is registered for use on several crops and a variety of fungal diseases. See our website for a complete list of registrations and research data.

6. NO TIME-TO-USE RESTRICTIONS.

Heads Up® does not contain any living organisms, and can be applied to your seed days, weeks or months prior to planting.

7. EASILY APPLIED.

Because Heads Up® is applied as a seed treatment, it can be applied on request by your seed dealer meaning no extra work to the grower. The product will arrive to your farm pre-treated on your seed.

8. OMRI LISTED.

The product is OMRI listed and approved for organic use.



9. LOW USE RATE.

Heads Up® is sold as a highly concentrated dry powder and must be mixed into a solution before applying through seed treating equipment. The product is applied at a very low use rate and changes overall water volume at the time of treatment only marginally.

10. EXCELLENT VALUE.

Heads Up® Seed Treatment costs less than half the price of a single bushel of soybeans. Priced similar to an inoculant, it is an affordable, valuable tool in a total seed care package.



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NOW AVAILABLE

HEADS UP® RTA SEED TREATMENT



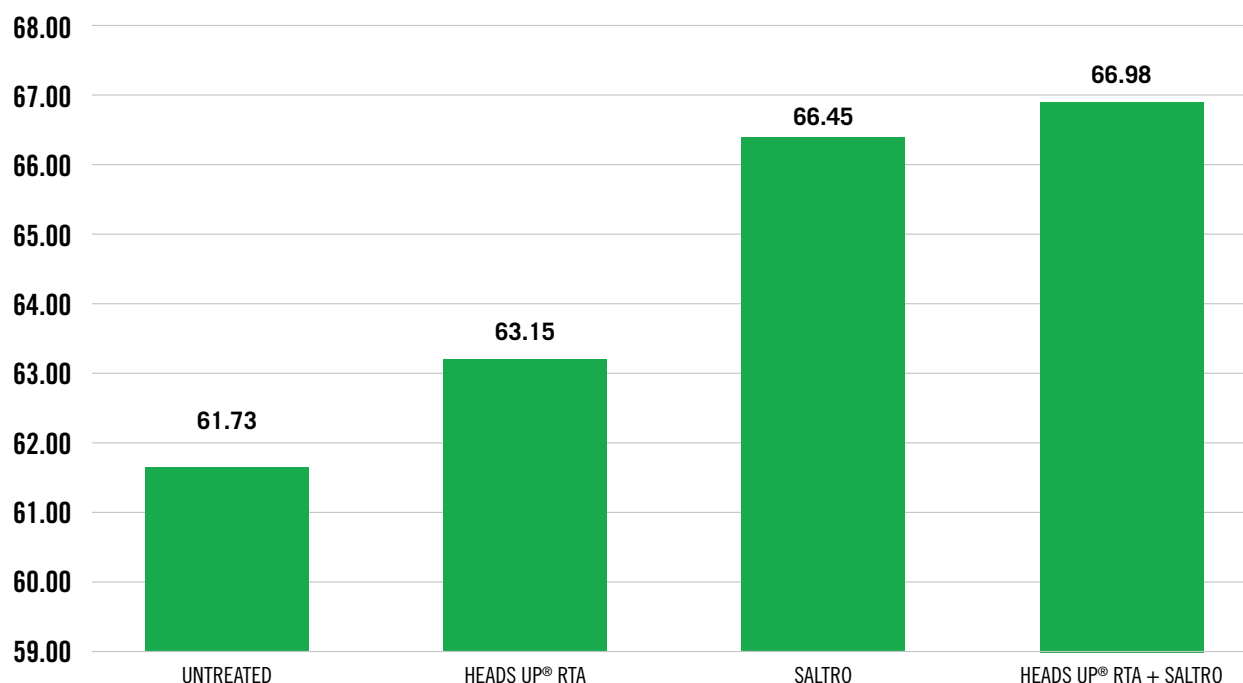
We're delivering a new, ready-to-apply formulation with a low use rate of 0.5 oz/cwt. Each jug treats 400 units of soybean seed, is compatible with other seed treatments and has a two-year shelf life. Contact us for more information, or to set up a product demo!

**Available in 100 fl. ounce, 15-gallon, and 30-gallon container sizes.
100 fl. ounces treats 400 units of soybean seed.**

2022 HEADS UP® RTA SEED TREATMENT TRIALS

Trial coordinator: SGS Wyoming, Illinois

HEADS UP® SDS INNOCULATED TRIAL WYOMING, ILL. 2022



Heads Up® RTA is a trademark of Heads Up Plant Protectants Inc

Saltro is a registered trademark of a Syngenta Group Company

Findings:

- Soybeans with Heads Up RTA had a +1.42 bushel/acre yield advantage compared to untreated beans.
- Soybeans with Heads Up RTA + Saltro® had a +0.53 bushel/acre yield advantage over beans only treated with Saltro.

Trial conducted by SGS Wyoming, ILL. in 2022.

Heads Up® RTA is a trademark of Heads Up Plant Protectants Inc.

Saltro® is a registered trademark of a Syngenta Group Company. EPA Reg. #81853-3.

All product and company names are trademarks of their respective holders. Use of them does not imply an affiliation with or endorsement by them.

TESTIMONIALS



"We have used Heads Up on our farm and include it as part of our seed treatment packages that we offer in our ag retail business. It is very simple and easy to apply. It mixes up really well. In our side-by-side trials we have done, we saw a 2 bushel increase over the check., with very little white mold present."

-Matthew Adrian, Adrian Seed Co, MINN.



"I had two different farms where I ran Heads Up trials. Both farms had white mold and one also had areas of SDS. From my observations, there was a visual difference in white mold pressure between the Heads Up and non. The soys treated with Heads Up still showed some white mold pressure but I would say it was 1/3 to 1/2 less pressure. In heavy white mold areas, the yield difference was 3+ bu/ac, advantage Heads Up. When I look at whole field differences from both farms where disease pressure varies it was 1.8 bu/ac, advantage Heads Up. SDS was observed on the untreated, I struggled to find SDS where Heads Up was applied."

-Justin S, MICH.



"We had a lot of white mold pressure in our area this year and the soybeans treated with Heads Up definitely stood out. We saw a 7-10bu/ac yield advantage in our trials with using the Heads Up product and our security guard treatment together."

-Ty, NEB.



"We have been using Heads Up for two years and continue to use it as we have seen it benefit our yields and better overall plant health."

-Cheney V, MINN.

TOP WAYS TO MANAGE WHITE MOLD

While there is no silver bullet approach for eliminating white mold, it can be effectively managed through a multiple step process to help limit yield loss. Below is a summary of the top practices for managing white mold both prior to and post planting:

PRIOR TO PLANTING

- Crop Rotation: rotate non-host crops; longer crop rotations with non-susceptible crops like corn will help reduce the level of inoculum (sclerotia) in the field.
- Land Selection: select fields with good drainage/plant in fields which do not have a history of white mold.
- Variety Selection: ask your seed dealer for a white mold tolerant seed variety.
- Consider lowering plant population: some studies have shown lower plant populations can help reduce white mold incidence by encouraging airflow.

HAVE YOUR SEED DEALER

APPLY HEADS UP® – The first EPA registered seed treatment for white mold and SDS, Heads Up® offers a systemic, full season approach to help suppress white mold throughout the growing season. For more information on Heads Up®, visit headsupST.com

POST PLANTING

- Consider using a fungicide at the R1–R3 growth stages.
- Consider a biofungicide in areas with a history of white mold (such as low/wet spots in the field).

POST INFECTION

- Make notes of highly infected areas for future planting consideration.
- Try to eliminate spreading the white mold sclerotia (survival structure) by harvesting heavily infected fields/areas last.

Make sure you're thinking about your white mold strategy ahead of time!

ADAPTED FROM AG PHD RADIO SHOW

DATA AND TRIALS



SOYBEANS 11-24



DRY BEANS 25-30



CORN 31-33



DATA AND TRIALS RESEARCH SOYBEANS



HEADS UP® PLANT PROTECTANTS 2022 SOYBEAN TRIALS



Maximize ROI with Heads Up® and Heads Up® RTA Seed Treatment — formulations that:

1. Suppress sudden death syndrome, white mold, pythium and rhizoctonia root rot/damping off.
2. Provide consistent yield advantages.
3. Mitigate the risk of yield loss.

TWO FORMULATIONS AVAILABLE

Heads Up can be applied in two ways:

- A water-soluble formulation (Heads Up)
- A dump-and-go, liquid formulation (Heads Up RTA)

Both are EPA-registered preplant seed treatments that are proven to activate natural plant defenses to combat diseases all season and deliver better yield, saving time and money in input cost. On average, soybeans treated with Heads Up returned an 8:1 investment — a valuable solution for your bottom line.

PERFORMANCE ADVANTAGE

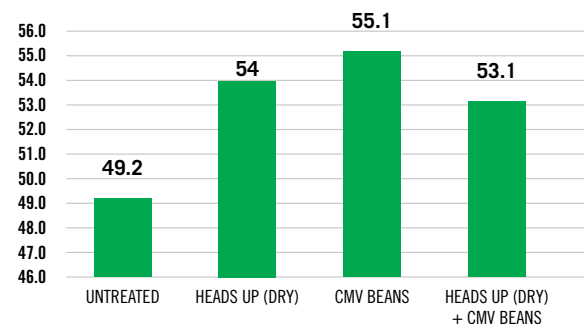
REDUCE WHITE MOLD (ONTARIO)

UP TO 20% LESS WHITE MOLD INCIDENCE

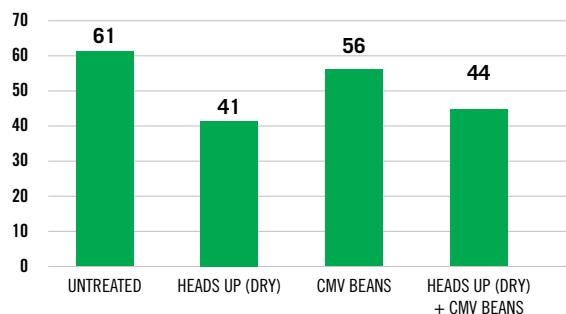
4.8 BU/ACRE YIELD INCREASE

LOWER WHITE MOLD SEVERITY

FINAL YIELD (BU/A)



WHITE MOLD INCIDENCE (% OF PLOT INFECTED)

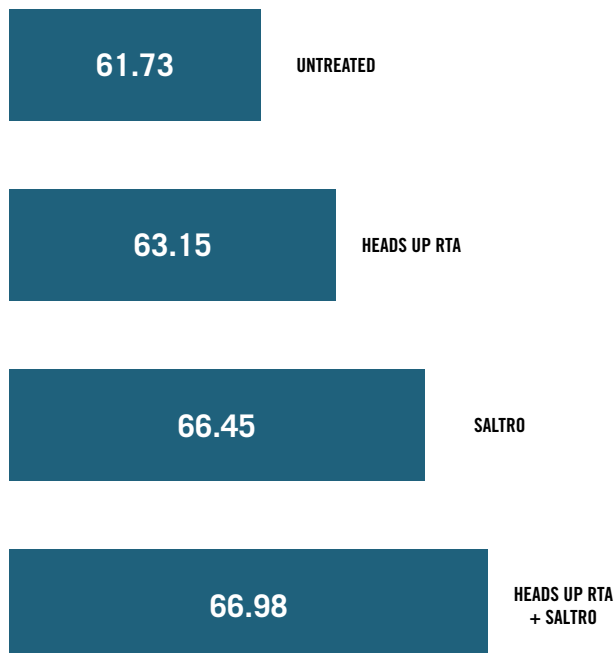


Heads Up (dry) was able to lower white mold severity, resulting in up to 20% less white mold incidence when compared to untreated seed while boosting yield by 4.8 bushels/acre. Heads Up led to 12% less white mold incidence when used with CMV compared to CMV only, delivering strong ROI.

BUILD A BETTER SDS PACKAGE

1.42 BU/ACRE ADVANTAGE

HEADS UP SDS INNOCULATED TRIAL (WYOMING, IL 2022)



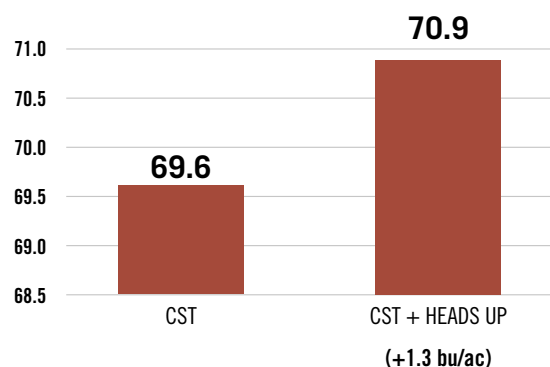
Fields that were inoculated with fusarium virguliforme (the casual pathogen behind SDS) and planted with Heads Up RTA-treated soybeans resulted in a 1.42 bu/ac yield increase compared to untreated seed. When Heads Up RTA is used with Salstro from Syngenta, yield also rose, resulting in an increase of 0.53 bushels/acre (a 2:1 ROI).

INCREASE OVERALL YIELD (IN, OH, MI, IA)

4.5 BU/ACRE AVG YIELD

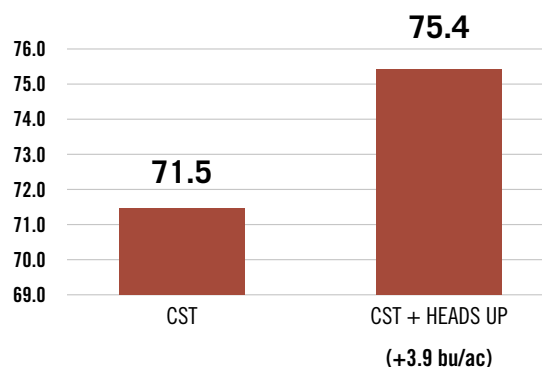
SOYBEAN SEED TREATMENT TRIALS

(GREENSBURG, IN 2022) YIELD BU/AC



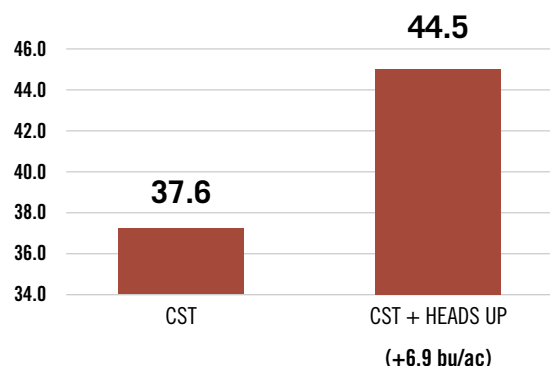
SOYBEAN SEED TREATMENT TRIALS

(DEERFIELD, MI 2022) YIELD BU/AC



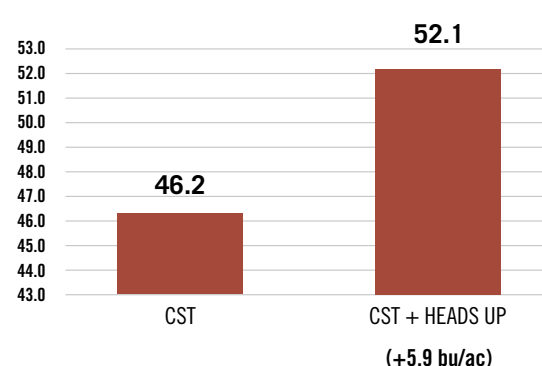
SOYBEAN SEED TREATMENT TRIALS

(GREENVILLE, OH 2022) YIELD BU/AC



SOYBEAN SEED TREATMENT TRIALS

(DYERSVILLE, IA 2022) YIELD BU/AC



When applied with CST, Heads Up seed treatment led to an average increased yield of 4.5 bushels/acre across trials in four states. On average, profitability soared with an increase of \$63.90/acre (using the average price of \$14.20/bushel).

The Heads Up yield advantage is in the data!

Talk to your local seed dealer about Heads Up and Heads Up RTA Seed Treatment — commercially available throughout the U.S. and Canada. Learn about application and more at WWW.HEADSUPST.COM or call us toll-free at **866-368-9306**. Or simply **scan the QR code** to the right.

LEGAL: Heads Up® RTA Seed Treatment is applicable as a disease preventive only. The directions for use of this product are based on test plots, greenhouse trials and the opinions of experts. They are believed to be reliable and correct; however, it is not possible to eliminate all possible detrimental effects associated with use, whether they are crop injury, ineffectiveness or other unintended consequences which may occur as a result of weather or other materials, or the manner of use or application, beyond the control of the manufacturer or the seller. To the fullest extent permitted by law, the buyer shall assume all risks.

Heads Up® is a trademark of Heads Up Plant Protectants, Inc.



SCAN FOR MORE
INFORMATION.



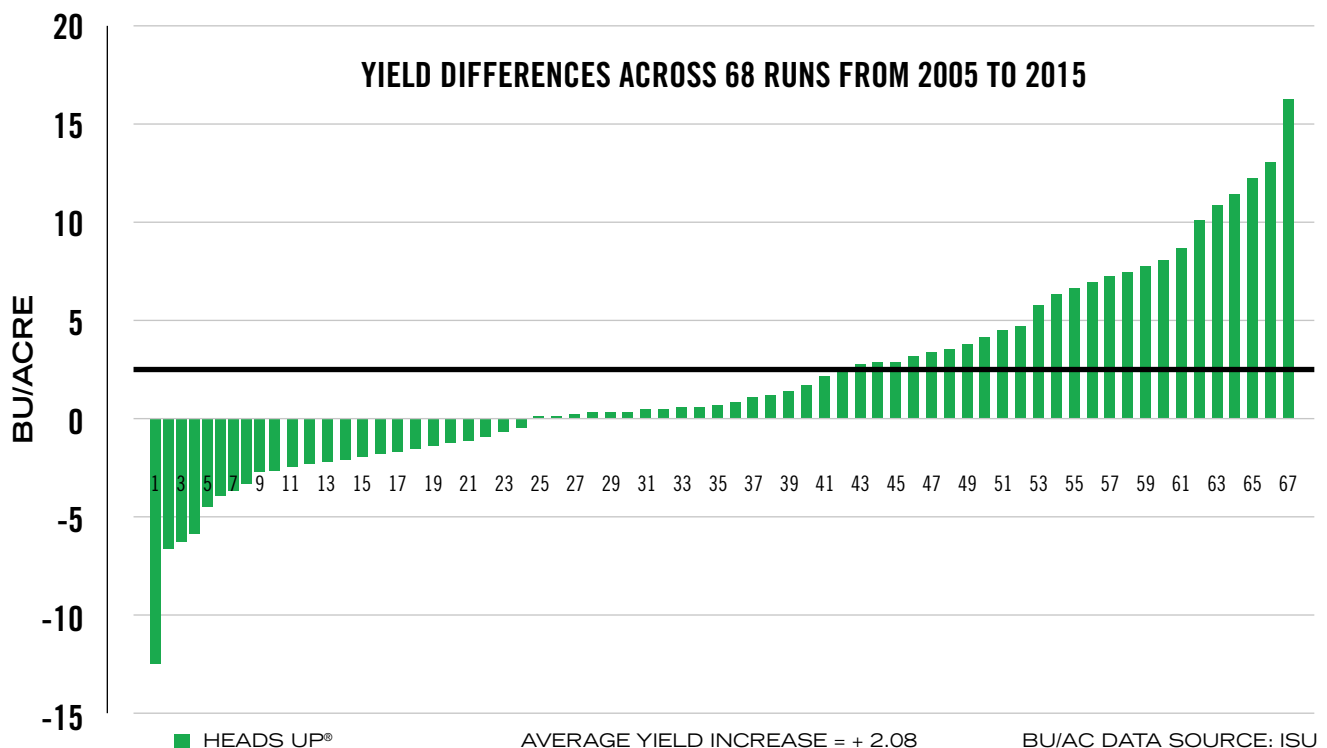
SOYBEANS

HEADS UP® SUMMARY, 2005-2015

- LOCATIONS: IA, IL, MN, MI, WI, KY, and Ontario
- RR VARIETIES: P92M76, P92M40, P92Y75, AG1835, DL2340, P92Y51, P22T69R, P92Y60, P25T51R, P93Y83, P33T72R, NCSRP1, NCSRP2
- DATA SOURCE: ISU and Heads Up
- Avg. yield benefit of Heads Up either alone or with Commercial Seed Treatment was 2.08 Bu/Ac.
- Heads Up also suppresses white mold due to SAR Mode of Action (Systemic Acquired Resistance).

AVERAGE BU/AC INCREASE FROM ADDING HEADS UP WITH COMMERCIAL SEED TREATMENT ACROSS 68 SITES; 2005-2015

YIELD ADVANTAGES OF HEADS UP® SEED TREATMENT



"By pooling the data from universities of several states and from historical tests, we found that Heads Up has the potential to increase soybean yield by suppressing soybean sudden death syndrome and white mold" - Dr XB Yang, ISU

SOYBEAN WHITE MOLD SEED TREATMENT TRIAL

Denmark, Wis. 9/5/19
STUDY CONDUCTOR T H AGRI-CHEMICALS

SEED TREATMENT STRIP TRIAL



Base Fungicide/Insecticide
Seed Treatment

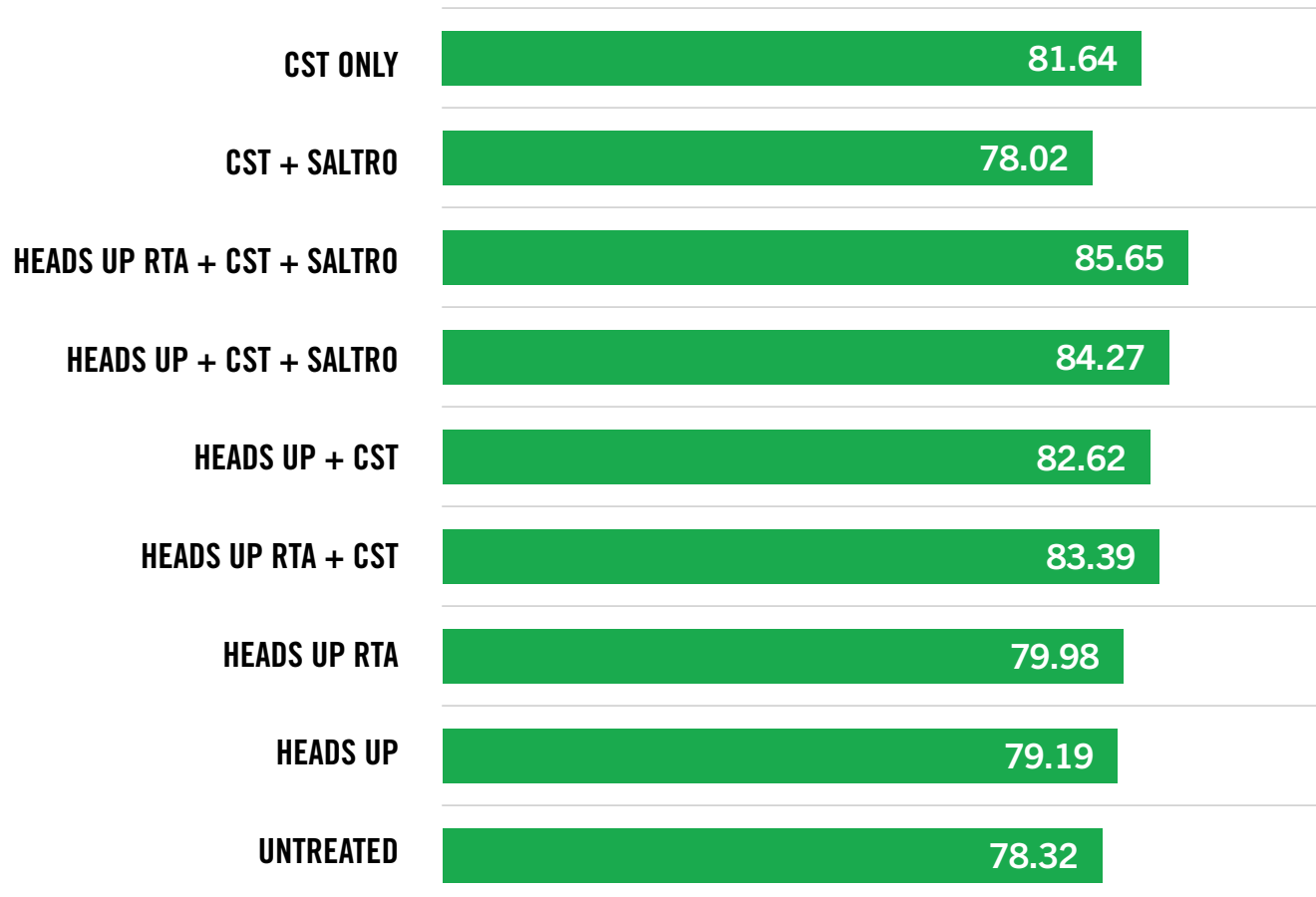
Base Fungicide/ Insecticide
SeedTreatment + **HEADS UP®**

Brown patches in strips to the left and right of the dark green Heads Up®, base fungicide, insecticide seed treated strip can be attributed to early senescence of soybeans, a symptom of sclerotinia white mold. **The Heads Up, base fungicide, insecticide seed treatment outyielded the base fungicide/insecticide seed treatment by 7.68 bushels per acre.**

SOYBEAN WHITE MOLD SEED TREATMENT TRIAL

STUDY CONDUCTOR: AGRI-TECH CONSULTING

WHITEWATER, WIS. (YIELD BU/AC)



Trial conducted by Agri-Tech Consulting, Whitewater, WIS. 2021.

CST used was CruiserMaxx®

Saltro® and CruiserMaxx® are registered trademarks of Syngenta Group Company.

Heads Up® and Heads Up® RTA are registered trademarks of Heads Up Plant Protectants, Inc.

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Use of them does not imply an affiliation with or endorsement by them.

NON-GMO SOYBEAN VARIETY TRIALS 2021

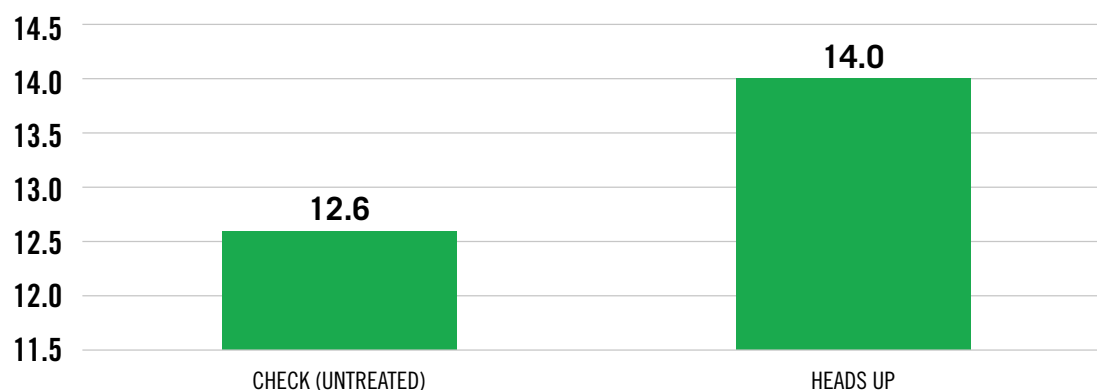
Varieties: HC-02 and HC-901

Goal: To evaluate Heads Up® Seed Treatment in two varieties of Non-GMO soybeans.

Notes:

- Much of North Dakota experienced extreme drought in 2021 hence low yields.
- Variety HC-901 is a small natto type. Variety HC-02 is more of a general use soybean for multiple food applications.
- Trial coordinated by Agassiz Seeds and conducted by HC International Inc.

SPIRITWOOD, N.D. VARIETY: HC-02 YIELD BU/AC



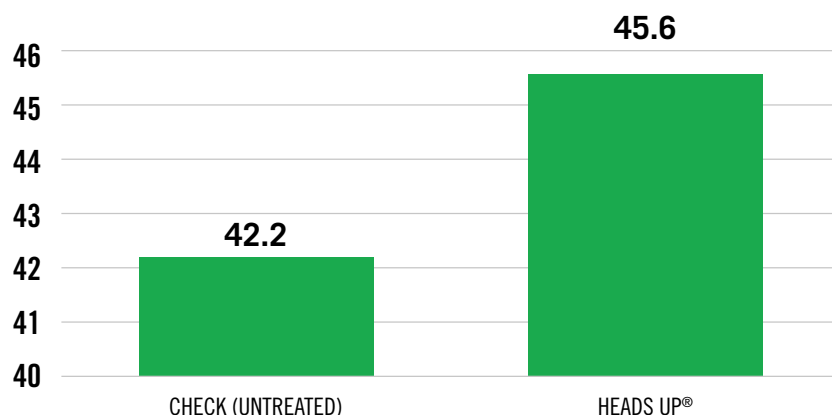
Yield advantage of Heads Up® + 1.4 bu/ac over check

SPIRITWOOD, N.D. VARIETY: B HUC/A-C901 YIELD BU/AC



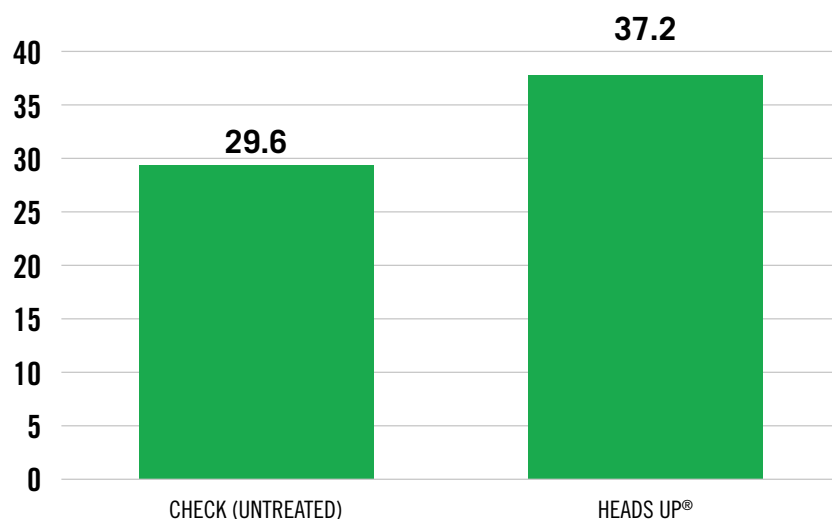
Yield advantage of Heads Up® + 1.3 bu/ac over check

NON-GMO SOYBEAN VARIETY TRIALS 2021



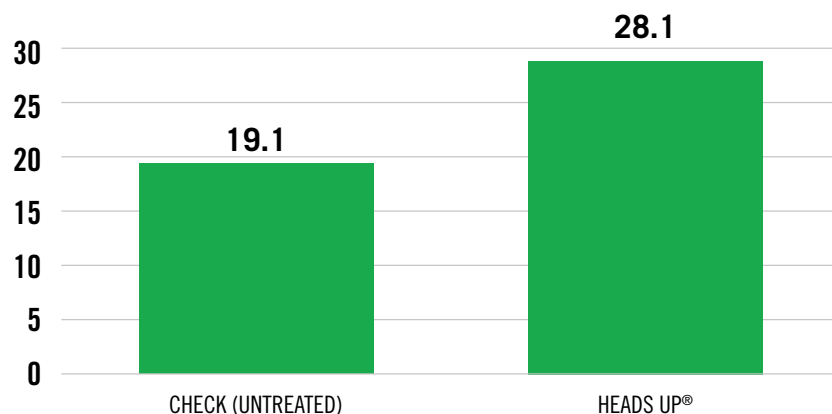
HOOPLE, N.D.
VARIETY: HC-02
YIELD BU/AC

Yield advantage of Heads Up® + 3.4
bu/ac over check



HOOPLE, N.D.
VARIETY: HC-901
YIELD BU/AC

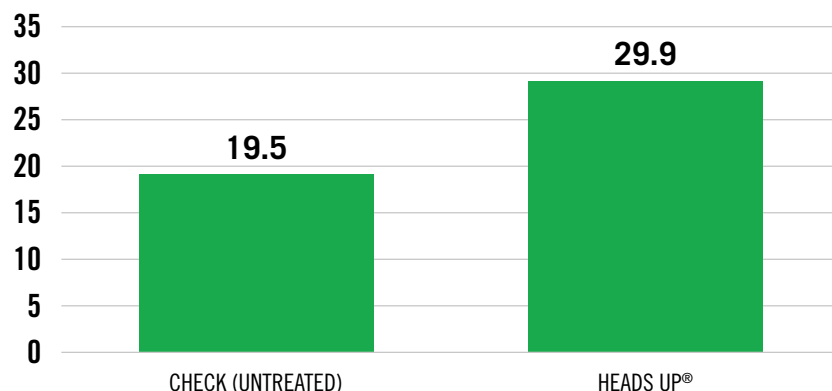
Yield advantage of Heads Up® + 7.6
bu/ac over check



MAYVILLE, N.D.
VARIETY: HC-02
YIELD BU/AC

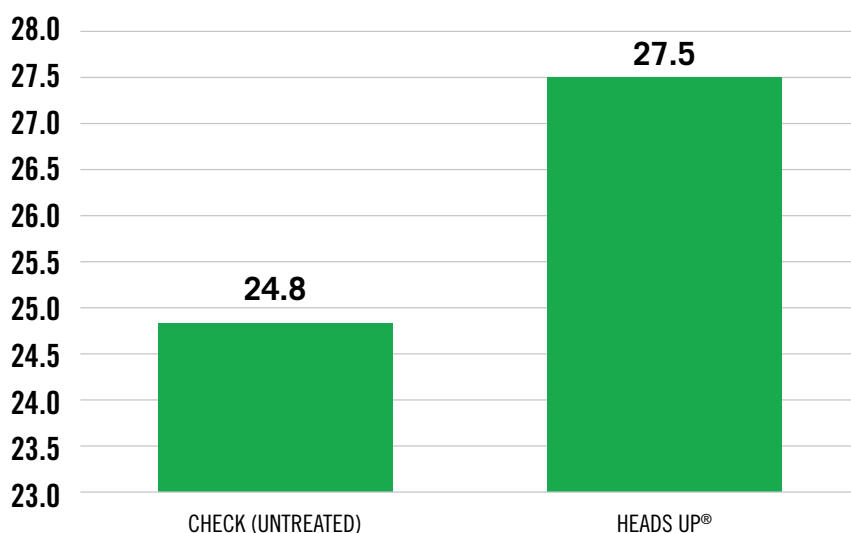
Yield advantage of Heads Up® + 9
bu/ac over check

NON-GMO SOYBEAN VARIETY TRIALS 2021



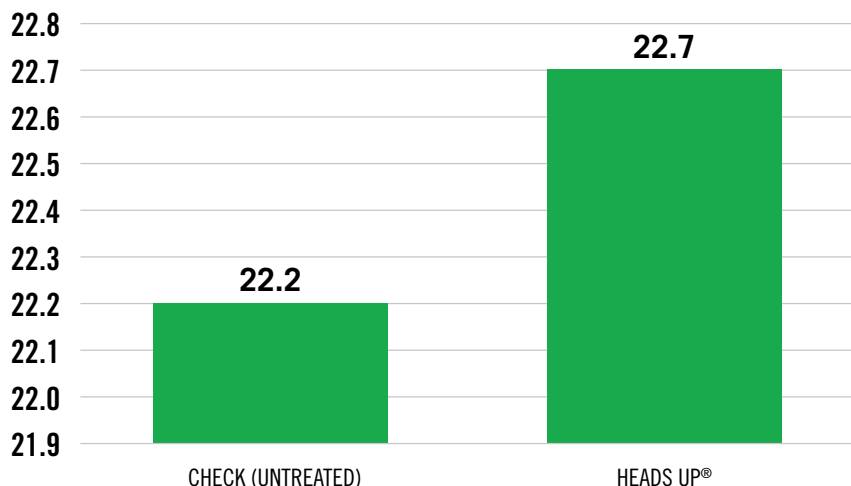
MAYVILLE, N.D.
VARIETY: HC-901
YIELD BU/AC

Yield advantage of Heads Up® + 10.4
bu/ac over check



PROSPER, N.D.
VARIETY HC-02
YIELD BU/AC

Yield advantage of Heads Up® +2.7
bu/ac over check



PROSPER, N.D.
VARIETY HC-901
YIELD BU/AC

Yield advantage of Heads Up® +0.5
bu/ac over check

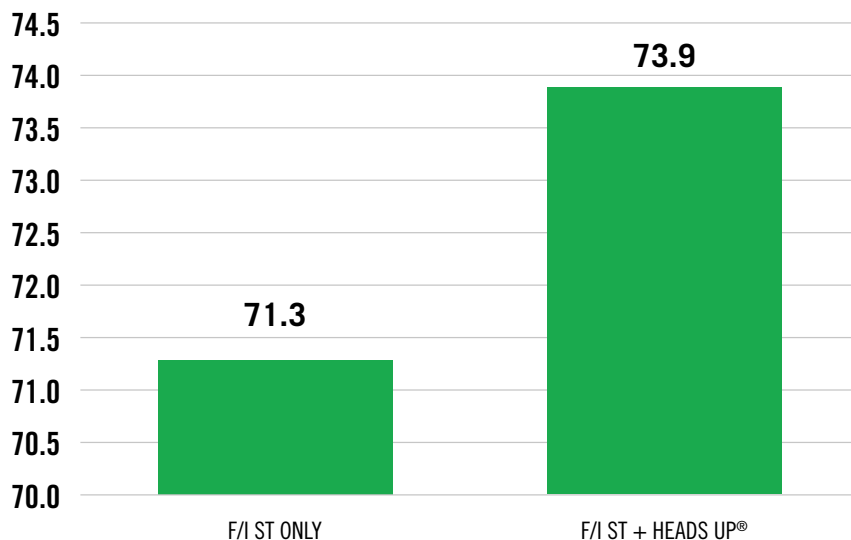
SUMMARY

Variety HC-02: Heads Up averaged +4.1
bu/a better than untreated

Variety HC-901: Heads Up averaged +4.9
bu/ac better than untreated

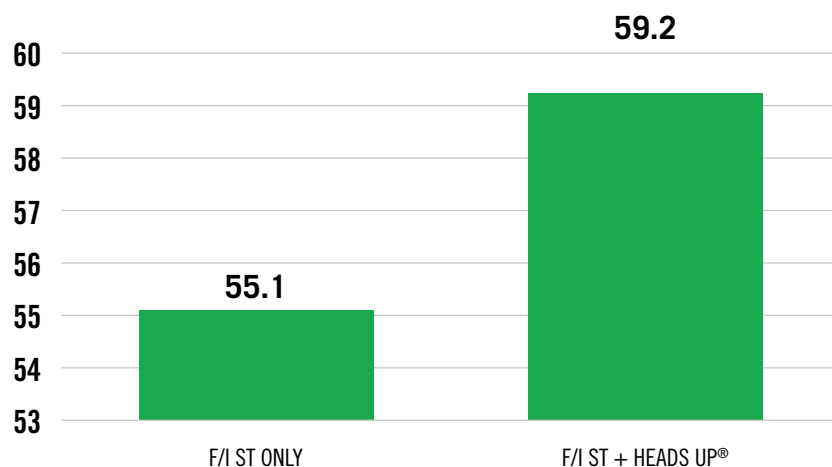
2021 HEADS UP SEED TREATMENT TRIALS

LANSGING, MICH.



Trial Coordinator:
Justin Schneider, LG Seeds
Field notes: Variety LG 2025
Field had slightly above avg.
white mold pressure

**Yield advantage of Heads Up®
+2.6 bu/ac**



Trial Conductor:
Justin Schneider, LG Seeds
Notes: Variety LG 2025
Field had heavy white mold pressure

**Yield advantage of Heads Up®
+ 4.1 bu/a**

NUTRIEN – NORTHVILLE, S.D.

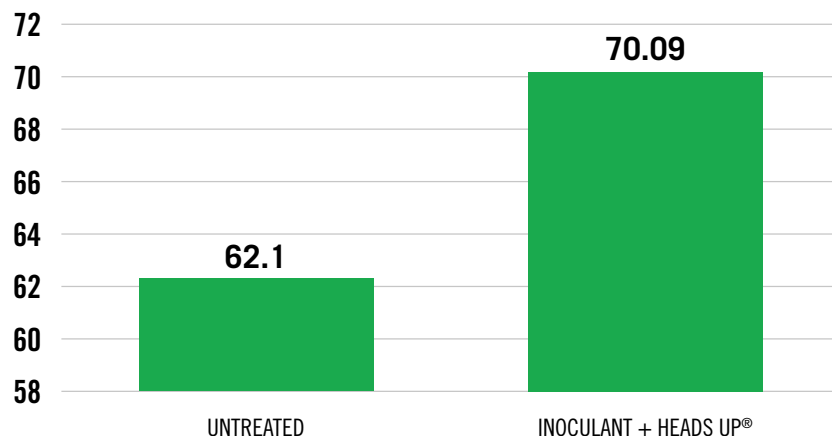
“Results of trial in SW Minnesota. This was a dry year so there was not much white mold present. The hills burnt off pretty bad so strip was narrowed down to small area.” – Luke Jelen, Nutrien

YIELD ADVANTAGE OF HEADS UP® +1.9 BU/AC



2021 HEADS UP SEED TREATMENT TRIALS

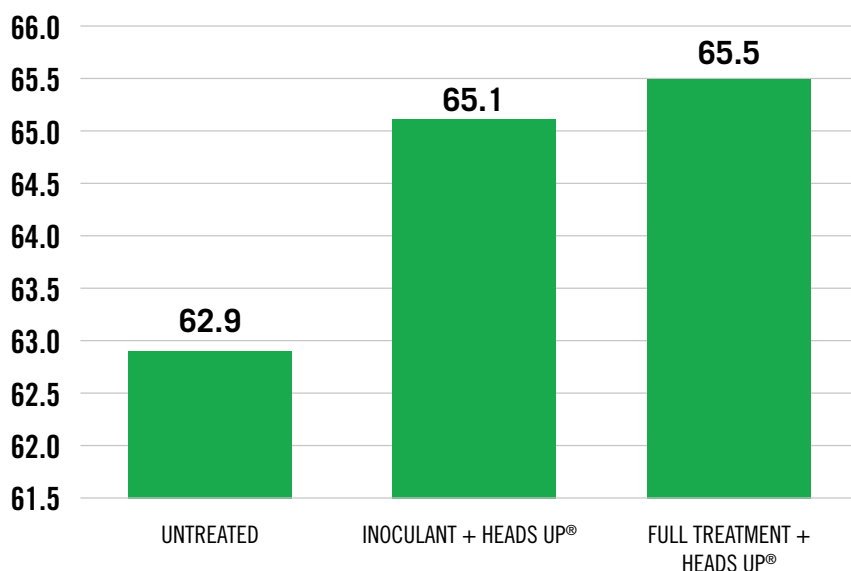
VOLIN, S.D.



Trial Coordinator: Tyler Carda,
Southeast Ag Supply, Volin, S.D.

Variety: Pioneer 31T64E

**Yield advantage of Heads Up® +
Inoculant 7.9 bu/ac**

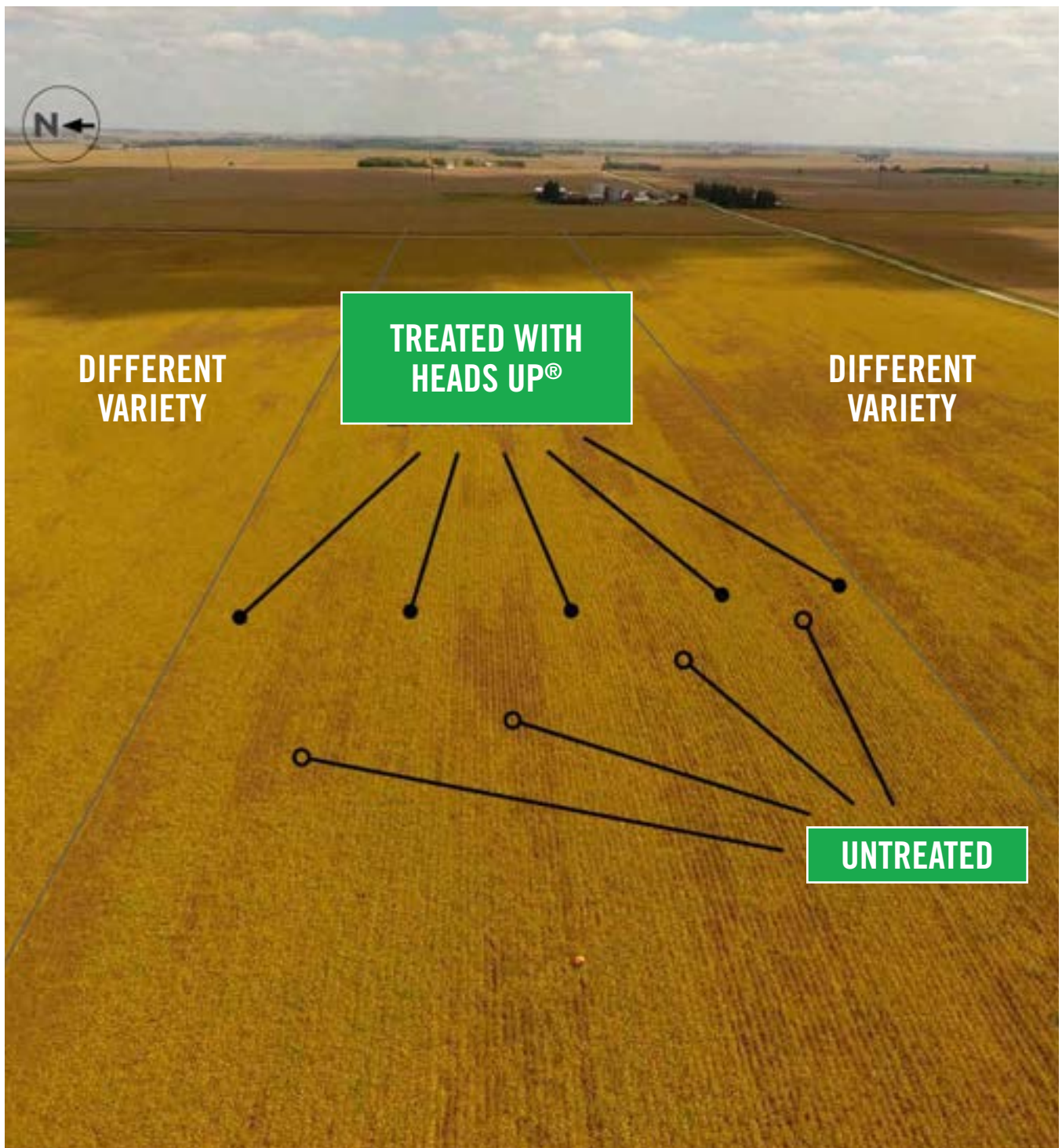


Trial Coordinator: Tyler Carda,
Southeast Ag Supply, Volin, S.D.

Variety: Pioneer 26T23E

*Full treatment (Gaucho,
Lumisena, PPST2030, Evergol)

**Yield advantage of Heads Up® +
Inoculant 2.2 bu/ac**



Above: Heads Up® Seed Treatment vs Untreated Soybean Trial - Clear Lake, Iowa.

Dark patches attributed to early die down caused by Soybean SDS.

Heads Up® treated beans had a 3.9 bu/ac yield advantage over untreated in trial.

Trial data on following page.

CROP PROTECTION - SEED TREATMENT TRIAL

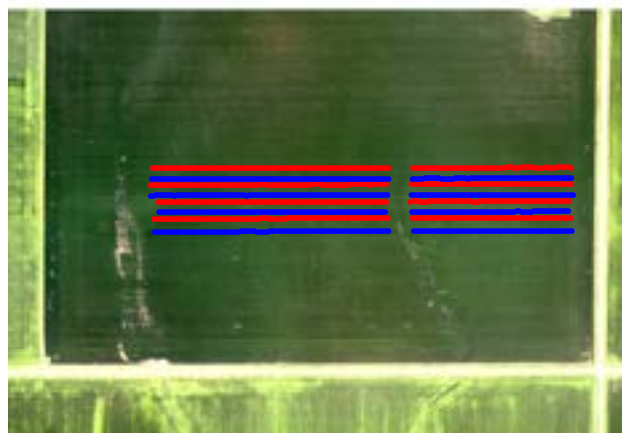
COMPARING HEADS UP® VS. UNTREATED ON SOYBEANS

Following Corn Rotation, Located in Cerro Gordo County, Iowa.



Treatment Layout and Results

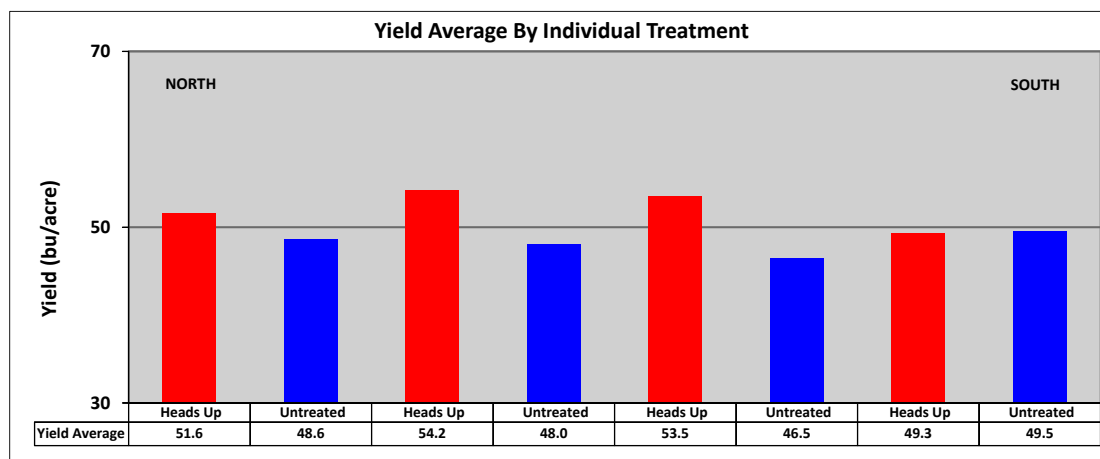
Trial ID: ST2018IA0156



Trial Type	Crop Protection - Seed Treatment
Trial Detail	Heads Up vs Untreated
Crop Rotation	Soybeans Following Corn
Planting Date	5/18/2018
Seed	Pioneer P22T69R
Application Detail	Planted on 5/18/2018
Harvest Date	10/17/2018
Trial Notes	

TREATMENT

- Heads Up
- Untreated



Yield Average for All Individual Treatments (bu/acre)	<u>Heads Up</u> 52.1	<u>Untreated</u> 48.2	<u>Yield Difference</u> 3.9	A randomization test suggested some evidence of a significant yield difference.
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© 2018 Iowa Soybean Association



DATA AND TRIALS RESEARCH DRY BEANS



HEADS UP® PLANT PROTECTANTS 2022 DRY BEAN TRIALS



The newest line of defense for your dry bean seed, Heads Up® and Heads Up® RTA Seed Treatments have proven performance against two major yield-robbing diseases — rhizoctonia root rot/damping off and white mold, one of the most devastating diseases for legume crops. Reduce your risk of disease and save on costs with these no-fuss formulations that activate biological plant defenses for season-long control.

APPLICATION EFFECTIVENESS

Heads Up can be applied in two ways:

- A water-soluble formulation (Heads Up)
- A dump-and-go, liquid formulation (Heads Up RTA)

Both are registered to protect against white mold, root rot and post-emergence damping off (caused by *Rhizoctonia solani*). A good dry bean disease control plan involves applying treatment in the spring as a pre-treatment for planting.

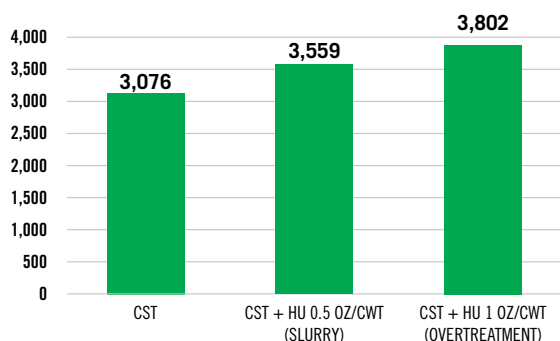
PERFORMANCE ADVANTAGE: HEADS UP DELIVERS

INCREASE YIELD (MICHIGAN — BAY, HURON, SANILAC, TUSCOLA) (*Scott Bales, Dry Bean Systems Specialist, Michigan State University*)

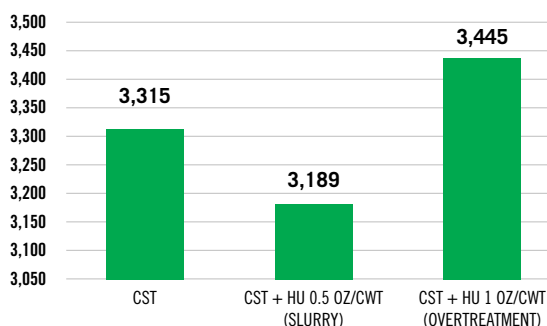
+214.3 LBS/ACRE AVG INCREASE at 0.5 oz/cwt

+380.8 LBS/ACRE AVG INCREASE at 1.0 oz/cwt

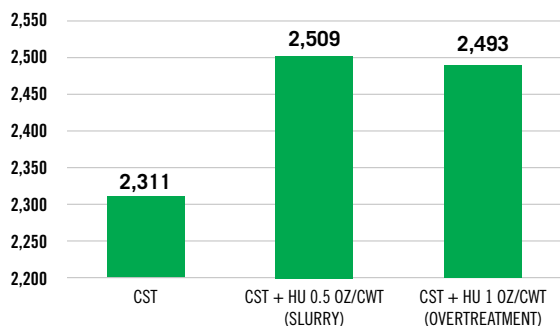
BAY COUNTY YIELD (LBS/AC)



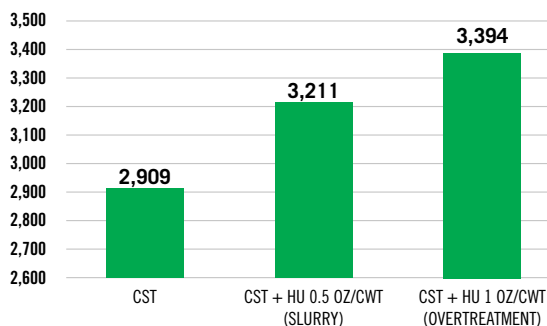
SANILAC COUNTY YIELD (LBS/AC)



HURON COUNTY YIELD (LBS/AC)



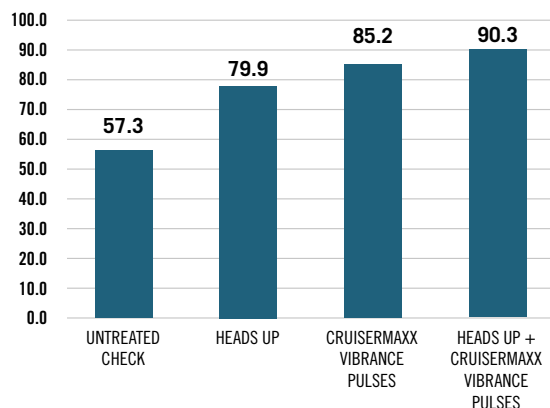
TUSCOLA COUNTY YIELD (LBS/AC)



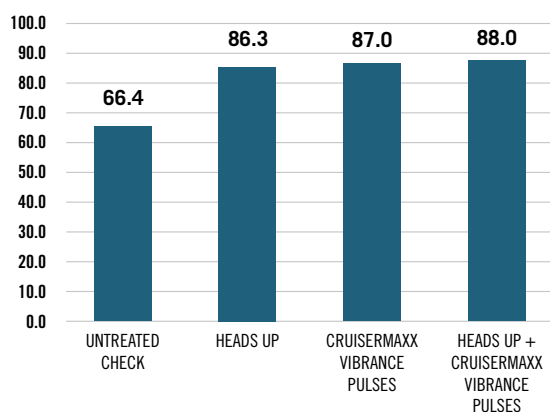
Across Blackbear trials in select counties of Michigan, MSU extension found Heads Up improves yield by an average of 214.3 lbs/acre when applied at 0.5 oz/cwt (slurry) and used with CST compared to CST alone. When applied at 1 oz/cwt (overtreatment) with CST, Heads Up increased yield by 380.8 lbs/acre on average.

IMPROVE EMERGENCE (DEWITT, MICH.)
MID-MICHIGAN AGRONOMY
CLASS: SNAP BEANS; VARIETY: BLUE LAKE BUSH

PLOT YIELD (CWT)



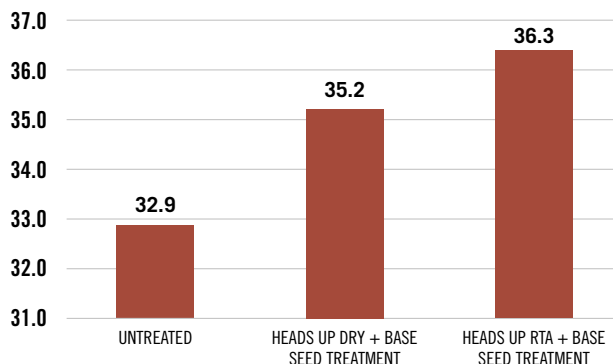
EMERGENCE % OF PLOT (@26 DAP; 13 DAE)



In snap bean trials conducted by Mid-Michigan Agronomy, Heads Up improved overall emergence of the plot by 20% when compared to untreated and 21.6% when used with CruiserMaxx Vibrance Pulses.

IMPROVE IRRIGATED DRY BEAN YIELD (YORK, NEB.)
NE AG RESEARCH
CLASS: DRY BEANS; VARIETY: GREAT NORTHERN
+2.3 BU/ACRE INCREASE
+3.4 BU/ACRE INCREASE

YIELD EXPRESSED IN (BU/AC)



Heads Up increases yield by 2.3 bushels/acre when used with base seed treatment compared to untreated, and Heads Up RTA proves to grow yield by 3.4 bushels/acre when used with base seed treatment compared to untreated.

NE Ag Research used Great Northern seed variety.

Data taken from 2022 university and third-party research conducted in Michigan and Nebraska.

"Through four years of trials at Brooks and Lethbridge (Alberta), Heads Up® often outperformed the other products. We were looking at (foliar) fungicides for the management of white mold, but we weren't seeing a transformation in the ability to control white mold. Heads Up® showed significant improvement in most years, or a trend to improvement in others."

— Dr. Michael Harding, Plant Pathologist, Alberta Agriculture and Forestry

The Heads Up yield advantage is in the data!

Talk to your local seed dealer about Heads Up and Heads Up RTA Seed Treatments — commercially available throughout the United States and Canada. Learn more at WWW.HEADSUPST.COM or call us toll-free at 866-368-9306. Or simply scan the QR code to the right.

LEGAL: Heads Up® RTA Seed Treatment is applicable as a disease preventive only. The directions for use of this product are based on test plots, greenhouse trials and the opinions of experts. They are believed to be reliable and correct; however, it is not possible to eliminate all possible detrimental effects associated with use, whether they are crop injury, ineffectiveness or other unintended consequences which may occur as a result of weather or other materials, or the manner of use or application, beyond the control of the manufacturer or the seller. To the fullest extent permitted by law, the buyer shall assume all risks.

Heads Up® is a trademark of Heads Up Plant Protectants, Inc.



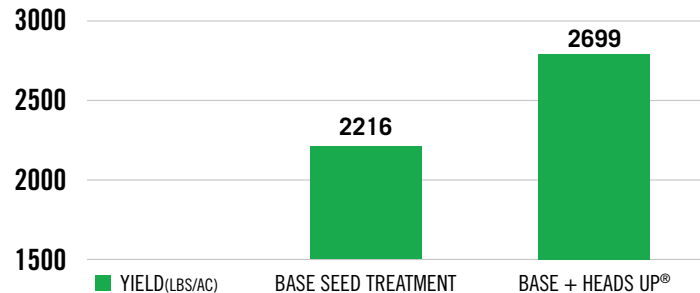
SCAN FOR MORE INFORMATION.

HEADS UP® SEED TREATMENT

2019 DRY BEAN TRIALS

MERRILL, IOWA

+483 LBS/AC YIELD INCREASE WITH HEADS UP®



STUDY DETAILS

Location: Merrill, Mich.

Elevation: 660

Current Crop: Dry Beans, Navy

Previous Crop: Continuous Beans

Plot Size: 6' x 25', 4 reps, Harvest 3'x15'

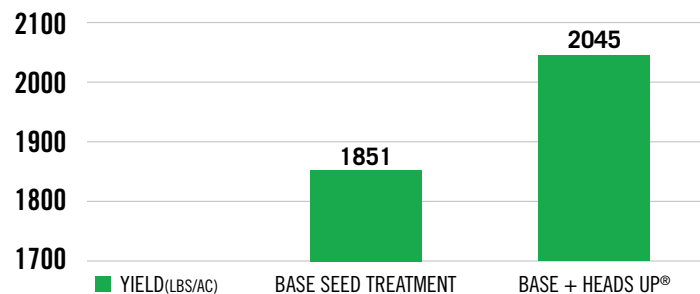
Planting: 6/17/2019 – Late

Maintenance: 16oz Basagran, 4oz raptor, 8oz reflex, 12oz select max, 1% crop oil, 2lbs AMS, 9oz asana

Late Season: 70-75lbs N as Urea white mold & insect control sprayed at full bloom

CARRINGTON, N.D. - NDSU RESEARCH STATION

+194 LBS/AC YIELD INCREASE WITH HEADS UP®



STUDY DETAILS

Location: Carrington, N.D. – NDSU Research Station

Elevation: 1,562

Current Crop: Dry Beans, DRK

Previous Crop: Spring Wheat

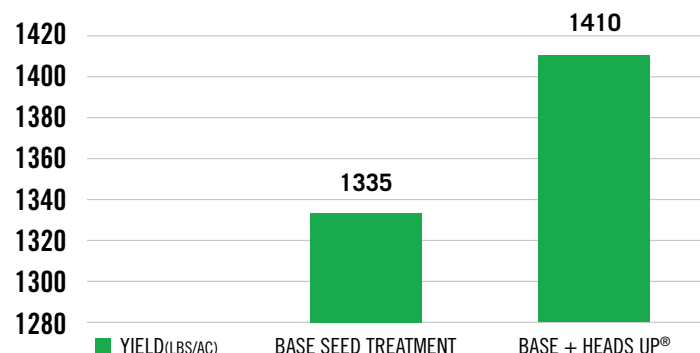
Plot Size: 5' x 30', 5 reps

Planting: 5/17/2019

Inoculum: Plots inoculated in-furrow with Rhizoctonia/ Fusarium-infested proso millet and wheat, and Pythium-infested sorghum

JEROME, IDAHO

+75 LBS/AC YIELD INCREASE WITH HEADS UP®



STUDY DETAILS

Location: Jerome, Idaho

Elevation: 3,672

Current Crop: Dry Beans, Cranberry

Previous Crop: Spring Wheat

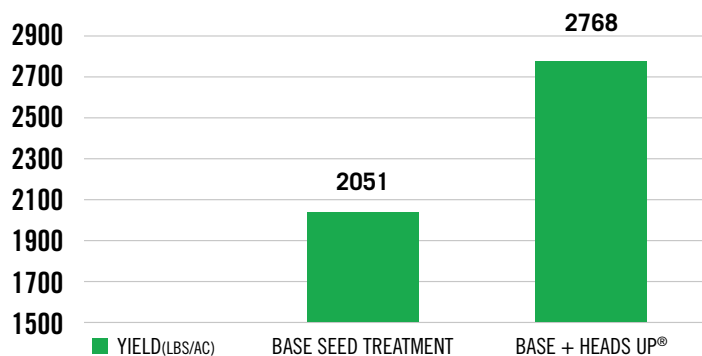
Plot Size: 5' x 30', 4 reps

Planting: 6/11/2019

HEADS UP® SEED TREATMENT 2019 DRY BEAN TRIALS

CARRINGTON, N.D.

+717 LBS/AC YIELD INCREASE WITH HEADS UP®



STUDY DETAILS

Location: Carrington, N.D.

Elevation: 1562

Current Crop: Dry Beans, Dark

Previous Crop: Spring Wheat

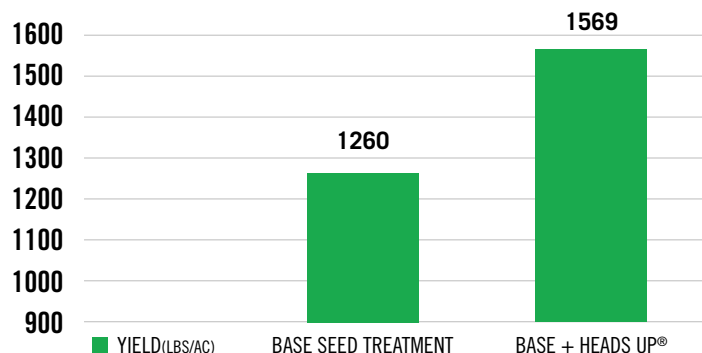
Plot Size: 5' x 30', 5 reps

Planting: 5/17/2019

Inoculum: Plots inoculated in-furrow with Rhizoctonia/
Fusarium-infested proso millet and wheat, and
Pythium-infested sorghum

PERHAM, MINN.

+309 LBS/AC YIELD INCREASE WITH HEADS UP®



STUDY DETAILS

Location: Perham, Minn.

Elevation: 1,390

Current Crop: Dry Beans, Montcalm Dark Red Kidney

Previous Crop: 18 - corn (potato, corn, bean)

Plot Size: 120' x 300', 6 reps

Planting: 5/30/2019

Data adapted from The McGregor Company 2019 Research Compendium

EVALUATING FOLIAR FUNGICIDES FOR CONTROLLING SCLEROTINIA WHITE MOULD ON DRY BEAN CROPS

Michael Harding and Brian Storozynsky, Alberta

Agriculture and Forestry Completed Research | Beans | 2013, 2014, 2015 and 2016
Yield | New Growers and Producers

A better way to protect beans from white mould

IN 2017, ALL DRY BEAN SEED BROUGHT TO ALBERTA WAS TREATED WITH A PRODUCT KNOWN AS HEADS UP®. RESEARCH FUNDED BY APG AND OTHERS HELPED MAKE THIS ADVANCE POSSIBLE.

Until this year, the agronomic package for dry bean production in Southern Alberta might have been described as a case of two out of three isn't bad.

That's according to Michael Harding, Brooks-based Research Scientist, Plant Pathology, with Alberta Agriculture and Forestry.

"We now have good early-maturing, high-yielding varieties," Harding said, "and pretty good tools for weed control. But disease has continued to be an issue. In most years, white mould is the biggest or one of the biggest constraints to dry bean production in southern Alberta."

In 2013, Harding and a team of researchers embarked on a four-year study to evaluate foliar fungicides for controlling white mould in dry beans.

Among the products for testing was one that was unique. It was a product derived from saponins from a plant called *Chenopodium quinoa*, and had been brought to Harding by an agribusiness entrepreneur who'd wanted to see if it provided a white mould response and hoped to find a market for it.

"It's a product that's normally applied as a seed treatment," Harding said. "White mould usually comes in July or August, so it was hard to imagine it would be effective. It turned out to have a significant effect, possibly due to a phenomenon known as resistance priming. You can prime the plant to use its own natural resistance to the disease. It's a different way of poking at the problem."

A NEW APPROACH ON WHITE MOULD

Through four years of trials at Brooks and Lethbridge, Heads Up® often outperformed the other products. Before long, Harding's results had helped complete a package of performance data that would ultimately support its registration.

The product, now known commercially as Heads Up® Plant Protectant, was used to treat all dry bean seed brought to Alberta by Viterra in 2017.

"We were looking at fungicides for the management of white mould, but we weren't seeing a transformation in the ability to control white mould," Harding said. "That one product showed significant improvement in most years, or a trend to improvement in others. Normally we'd start in the lab and the greenhouse and do growth cabinet trials. In this case, we clearly saw the potential of this product and fast-tracked it to small plot trials."

Another component of this study looked at the use of micro-nutrients within a white mould management program. Despite flashes of performance, no configuration performed consistently enough to offer a real advantage, in Harding's eyes.

Still, this 2013-16 study helped bring dry bean growers a piece of the agronomic puzzle they've long lacked: a new way to manage white mould.

"Part of our job is to try things out so the growers don't have to, so there's less risk for them," Harding said. "That's the purpose. We tried a product out and it was adopted by industry. In that sense, it's one of those projects that has been really satisfying."



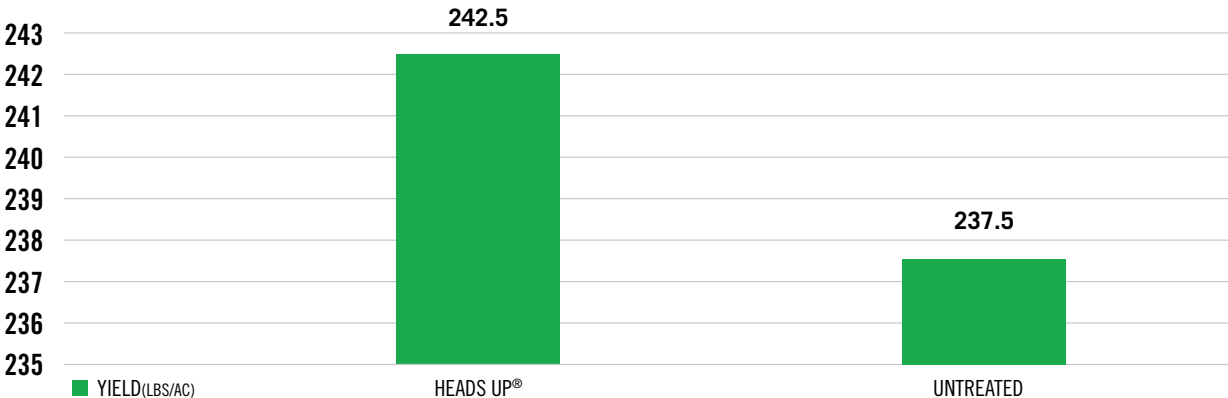
DATA AND TRIALS RESEARCH CORN



GREAT HARVEST ORGANICS (BECK'S) 2019 ORGANIC CORN TRIALS

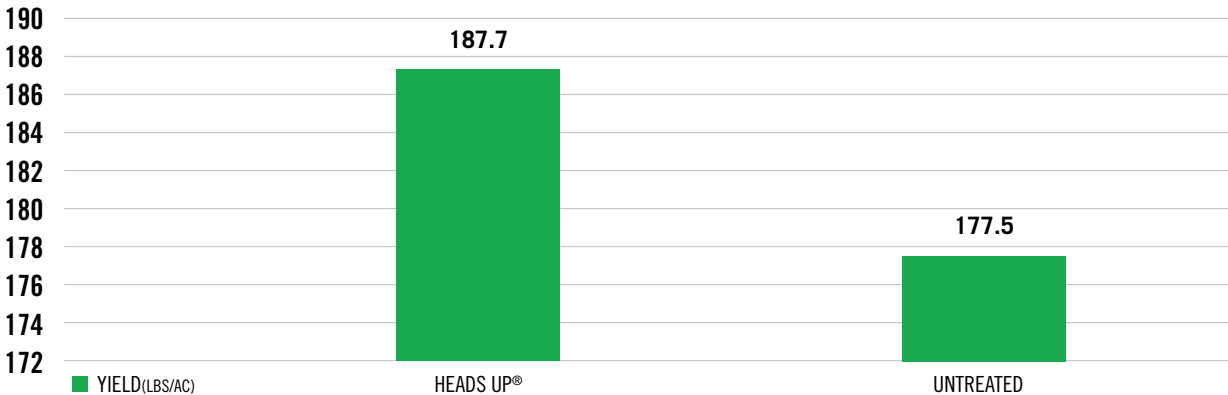
MARSHALLTOWN, IOWA

+4.7 BU/AC YIELD INCREASE WITH HEADS UP®



RIDGEWAY, KY.

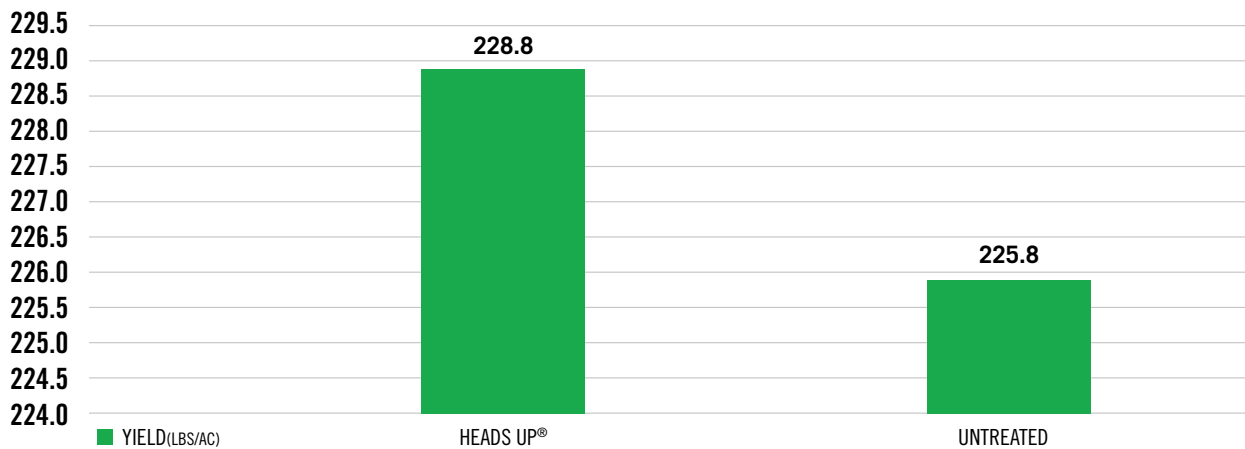
+10.2 BU/AC YIELD INCREASE WITH HEADS UP®



GREAT HARVEST ORGANICS (BECK'S) 2019 ORGANIC CORN TRIALS

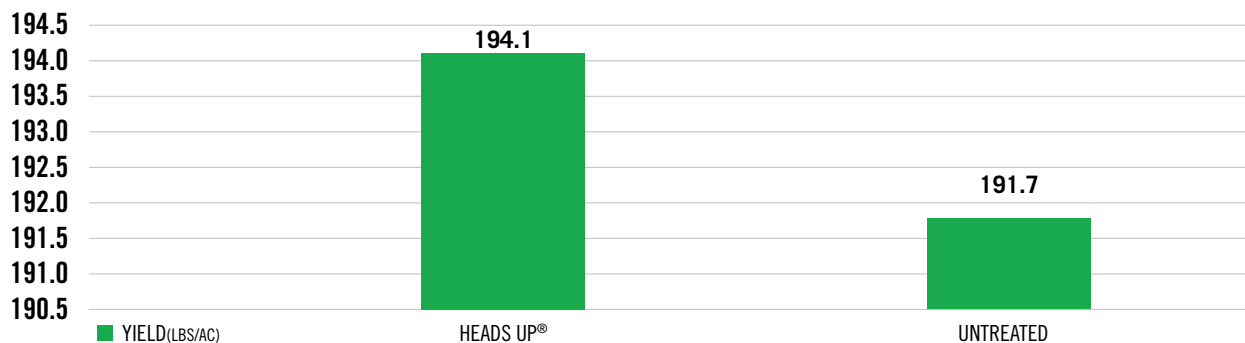
BOURBON, IND.

+3 BU/AC YIELD INCREASE WITH HEADS UP®



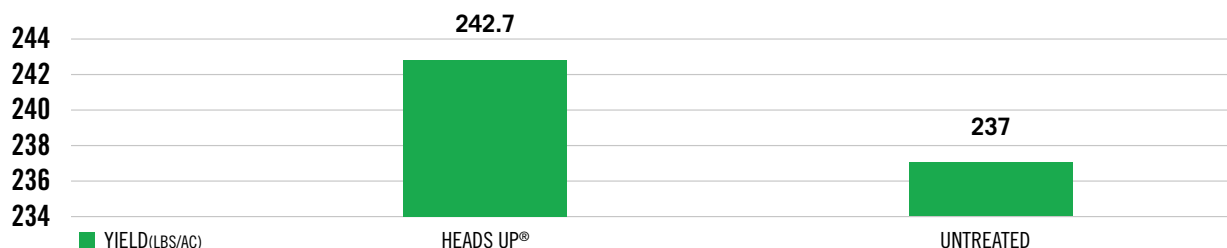
ATLANTA, IND.

+2.4 BU/AC YIELD INCREASE WITH HEADS UP®



MOUNT PLEASANT, IOWA

+5.7 BU/AC YIELD INCREASE WITH HEADS UP®



HOW HEADS UP® WORKS:

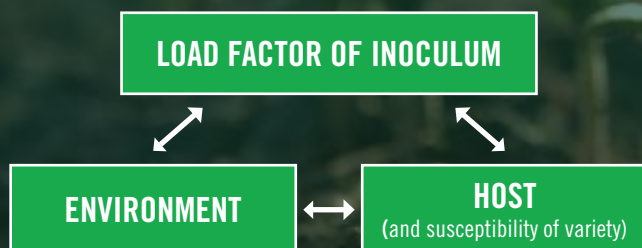
WHAT IS SYSTEMIC ACQUIRED RESISTANCE?

SYSTEMIC ACQUIRED RESISTANCE

All plants have innate resistance and the ability to defend themselves against fungal and bacterial disease. Extensive breeding in soybeans has led to the ability for many seed companies to be able to rank their seed varieties from moderately susceptible to moderately resistant against different disease pathogens. These rankings are based on field tolerances exhibited as a result of genetic selections/crossing.

HOW HEADS UP® WORKS THROUGH S.A.R.

1. When a plant is attacked by a fungal disease pathogen (for example: ascospores, which infect soybeans at R3 (end of flowering/ beginning pod development)), the plant, realizing it is under attack, stimulates defensive “warning signals” which translocate throughout the plant and stimulate/evoke innate defense. This signaling event activates the key defense pathways, i.e. jasmonic and salicylic acid, leading to the accumulation of Salicylic Acid (helps to stop localized infection), and enables P.R. (pathogenesis related) proteins.
2. While the defensive signaling at infection will help to slow down the spread of infection and in turn prevent future yield loss, yield loss depends on factors associated to the disease triangle below. Yield loss will be greater for some diseases (like Sclerotinia sclerotiorum) if you have an extremely wet, cloud covered environment, with a high load factor of sclerotia in the soil and a susceptible soybean cultivar.



3. **HEADS UP®, WHILE NOT ACTIVE ON THE DISEASE ITSELF, STIMULATES THE DEFENSIVE ABILITIES OF THE PLANT UPON GERMINATION.** In turn, by early activation of the key defensive pathways, which happens prior to the infection of the pathogen, the plant is able to better utilize its genetic resistance by “priming” or establishing itself in a “ready state” before disease sets in.
4. **THIS UNIQUE MODE OF ACTION (S.A.R.) HAS SHOWN A SIGNIFICANT EFFECT IN REDUCING YIELD LOSS BY EARLY DISEASE RESISTANCE PRIMING.** Systemic acquired resistance, while not active on any particular disease itself, has proven to be a broad spectrum systemic and provides a full season response.
5. For a complete strategy, always pair Heads Up® Seed Treatment with a variety selected to best suit your unique growing environment. Heads Up® is compatible with other fungicide/ insecticide seed treatments or inoculants and can be used in seed treatment blends for multiple modes of action. The product can also be used alone and is OMRI certified for Organic use.

KEY NOTES:

- Whether using Heads Up® alone or in combination with other seed treatments, always ensure that total liquid applied to the seed at time of treating is between 5-8 oz/cwt.
- Apply Heads Up® before or at the same time as applying other treatments.
- Heads Up® does not contain any living organisms and has a stable shelf life. When applied by itself, Heads Up® can be applied to the seed without any time restrictions to planting.



The following **chart** highlights recommended application rates by crop, diseases targeted and restrictions.

Remember — always read and follow label directions!

HEADS UP® RTA SEED TREATMENT			
Application rates for 100-ounce solution of Heads Up RTA Seed Treatment			
Crop	Target Disease	Products Use Rate fl.oz./ CWT (100 lbs. of seed)	Remarks/Restrictions
Soybeans	Rhizoctonia Root Rot/Damping off (Rhizoctonia solani); White Mold (Sclerotinia sclerotiorum); Sudden Death Syndrome (Fusarium virguliforme)	0.5 oz.	Total volume of all liquid/all products being applied must achieve 5–8 fl. oz./100 lbs. of seed.
Soybeans	Pythium spp.	0.5 oz.–1.0 oz.	Total volume of all liquid/all products being applied must achieve 5–8 fl. oz./100 lbs. of seed. Under high Pythium spp. pressure use the high rate (1.0 fl. oz./100 lbs. of seed).
Dry Beans	Rhizoctonia Root Rot/Damping off (Rhizoctonia solani); White Mold (Sclerotinia sclerotiorum)	0.5 oz.	Total volume of all liquid/all products being applied must achieve 5–8 fl. oz./100 lbs. of seed.
Corn (includes field corn, sweet corn)	Common rust (Puccinia sorghi)	1.0 oz.	Total volume of all liquid/all products being applied must achieve 5–8 fl. oz./100 lbs. of seed.
Chickpeas	Seedling diseases caused by Fusarium and Rhizoctonia spp.	1.0 oz.	Total volume of all liquid/all products being applied must achieve 5–8 fl. oz./100 lbs. of seed.
Field Peas	Seedling diseases caused by Fusarium and Rhizoctonia spp.	0.5 oz.	Total volume of all liquid/all products being applied must achieve 5–8 fl. oz./100 lbs. of seed.
Wheat	Seedling diseases caused by Fusarium and Rhizoctonia spp.	0.5 oz.	Total volume of all liquid/all products being applied must achieve 5–8 fl. oz./100 lbs. of seed.
Potatoes (cut or whole tubers used for planting purposes)	Rhizoctonia Canker and Black Scurf (Rhizoctonia solani); Brown Spot (Alternaria alternata)	See remarks	See instructions below.
SITES			
Potatoes			
APPLICATION RATES			
Seed Potatoes (as cut or whole tubers used for planting purposes)			
100-ounce container of Heads Up RTA Seed Treatment will treat 12,760–33,756 lbs. of seed.			
Use rate is 0.2962 oz./100 lbs. to 0.783 oz./100 lbs.			
APPLICATION			
Seeds must be prepared and ready for seeding. The object is to achieve a wet shiny appearance to the seed. This will dry off or be absorbed by the seed; however, the treatment will remain in effect. Treat the seeds by dipping, spraying or dribbling the solution into a rotating auger conveyor or some other approved seed treatment device. Spray applications to seeds within an enclosed spray booth or other enclosed spray devices are also acceptable providing thorough coverage is achieved.			
For seed potatoes , whether fresh cut or suberized, Heads Up RTA Seed Treatment must be applied to germinating seed potatoes , as indicated by obvious sprouting activity coming from the potato eyes. This sprouting activity can be from peeking to full sprout length, but before green leaves appear.			
Proper calibration and operation of application equipment is essential. Treat only the seed that you intend to plant and ensure all treated seed is used for planting purposes.			
Recommended use: bulk up Heads Up RTA Seed Treatment (through dilution with other products/water/additional liquid carrier at application) to achieve 0.5–1 gallon total volume of liquid per ton of seed to ensure adequate and complete coverage of seed (cut or whole tubers used for planting purposes).			



HEADS UP® IS AVAILABLE THROUGH MOST OF THE LEADING RETAILERS AND DISTRIBUTORS IN THE UNITED STATES



Need help finding where to buy Heads Up®? Interested in becoming a dealer?
Feel free to call us directly or visit us online.

www.headsupST.com • 1-866-368-9306

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All rights reserved. Trial data provided by Heads Up® Plant Protectants Inc.

Performance assessments are based upon results or analysis of third party testing, public information and field observations.

All product and company names are trademarks of their respective holders. Use of them does not imply an affiliation with or endorsement by them.

Crop yield claims based on individual field studies, industry funded university research or used with permission of organization.

Results will vary based on variety/hybrid selection, growing conditions and soybean sudden death syndrome / white mold pressure associated with each field.

Individual results may vary from year to year. EPA reg. No 81853-1.

Fungicides mentioned in comparisons used at label rates. The foregoing is for informational purposes only