

The logo features a stylized leaf icon on the left. To its right, the word "Northarvest" is written in a dark red, sans-serif font. Below it, the words "BEAN GROWER" are written in a large, bold, dark green font. The letter "O" in "GROWER" contains a white silhouette of a bean.

Northarvest BEAN GROWER

RESEARCH ISSUE 2024

AGWEEK

A wide-angle photograph of a large agricultural field under a clear blue sky. The field is filled with rows of bean plants. In the foreground, several rows are in full bloom with green leaves and developing pods. Other rows are more mature, with some plants showing yellowing and dried pods. In the background, a dense line of green trees separates the field from the horizon. A tall, thin tower structure is visible on the right side of the tree line.

Making beans better

A look at dry edible bean-focused research in the region

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North Dakota State University Extension conducts annual variety trials in different locations throughout the state.

Contributed / NDSU Extension



Funding research to make beans better

By Norm Krause



Norm Krause
Chair of the NBGA Research Committee and treasurer and district 2 representative of the Minnesota Dry Bean Research and Promotion Council

The research special is my favorite BeanGrower magazine issue every year. This is where NBGA gets to share all the information about projects we've supported this year and talk to folks about the behind the scenes efforts happening for our producers.

All of this research is really important because at the end of the day, it helps dial in best practices so that dry bean farmers grow more beans and do it more efficiently. It's an ongoing process. Research projects get greenlit in large part because of what we hear from our fellow growers — inputs cost concerns, pest and disease issues, weed control problems, interest in new varieties, and more. It's our job to help make sure the research being done is useful to all of us. Every year research projects are revisited, new proposals presented regularly as well, in order to make sure we're doing our very best for you in that department.

There is a lot of really great research work being done by our partners across two states and countless hours go into it. We appreciate the time & efforts by everyone. Inside this issue you'll find information on the latest variety trials (Greg Endres, NDSU Extension), nitrogen recommendations (Daniel Kaiser, U of MN), ground rolling advice (Joe Ikley, NDSU), dry bean breeding updates (Juan Osorno, NDSU), and much more. There is a lot of information in this issue, and we sure hope you find it as useful as we do as movement starts happening for spring.

Thanks you for being a part of Northarvest, thank you for doing your part to help keep our industry strong, and thanks for reading.

Best wishes for a safe and successful planting season. 

Hello,

On behalf of all of us at Northarvest, we hope this issue finds our fellow growers well and you're looking forward to a spring plant like the rest of us (feels like it'll be here before we know it). For more than 40 years, the Northarvest Bean Growers Association — along with Minnesota Dry Bean Research and Promotion Council and our North Dakota Dry Bean Council neighbors — has been funding research to help make growing dry beans better.

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Ground Rolling

Rolling your dry bean fields? Make sure you use a residual herbicide

By Jenny Schlecht | Agweek

About 67% of North Dakota and Minnesota dry edible bean growers roll their bean fields at some point, whether it's before planting, before plants emerge or after plants emerge, according to a survey of farmers, said Joe Ikley, North Dakota State University Extension weed specialist.

About half roll before beans emerge. Some roll before even planting, and about 5% roll after the beans come up, he said during a presentation on rolling at Bean Day 2024.

"I'll get questions every year. You know, basically, when can I roll as it pertains to my residual herbicide application? Is there any benefit to applying the herbicide first then rolling, or vice versa, doing it the other way?" he said.

Rolling pushes down rocks to keep them out of the way of combines, but the action also creates soil compaction, not unlike a "tire-track event," Ikley said.

"Where we have some compaction, we usually have more weed pressure," he explained. "And so wheel rolling looks similar to that. So we really wanted to take a look at just the influence of rolling on weed pressure in a field, and then again, focusing on the sequence of rolling compared to applying a residual herbicide."

The first "just-for-fun" tests that Ikley and his team ran were in soybeans, but he said the moral of the story was the same as what they'd later find in edible bean trials.

"Where we did not roll, no herbicides, we had about 100 grasses per square yard, 50 broadleaf," he said of the first tests in 2022. "Where we rolled, we basically doubled our grass pressure and tripled our broadleaf pressure. So the story we found from that 2022 trial was that when we did roll but did not apply that pre, we had a lot more grass pressure and more broadleaf pressure as well."



Joe Ikley, North Dakota State University Extension weed specialist, spoke at BeanDay on Jan. 21, 2024, in Fargo, North Dakota.
Jenny Schlecht / Agweek

Ikley's advice was pretty simple: "So basically, if you're gonna get your pre on and you're gonna roll, whatever works best logistically, we're not seeing any differences about the timing."

He further explained that rolling but also using a residual herbicide means that more weeds are getting germinated but were controlled.

"So that means we're basically killing more weeds that way," he said. "So that's kind of one of my takeaways is if we're going to roll, make sure we have that residual application on it and it may actually be a good thing for us in the end."

Ikley said rolling after crops emerged didn't seem to change things.

"We didn't really see much influence post emergence rolling on weed control on the crop itself," he said. "So that was looking pretty good for us as well." [NBGA](#)

Rolling a field pushes down rocks that can cause problems during harvest but also creates a compaction event that can lead to more weeds. Photo taken June 10, 2022, Reynolds, North Dakota.

Mikkel Pates / Agweek



Research tackles how much nitrogen is enough for dry edible beans

By Ann Bailey | Agweek

Updated fertilizer recommendations for edible beans being produced in Minnesota is underway at the state's land grant university.

Daniel Kaiser, University of Minnesota Extension soil science, plant nutrition management, is using funds from a Northarvest Bean Growers Association grant to study the amounts of nitrogen that should be used in dry edible bean production.

Minnesota produces a significant amount of the U.S. dry edible bean crop, harvesting 207,000 acres in 2023, according to the U.S. Agriculture Department National Agricultural Statistics Service.

Kaiser, who has worked in his position at U of M Extension since 2007, for the first several years didn't get many questions about fertility recommendations so he relied on previous recommendations, he said.

However, during the past few years the increase in black bean production in Minnesota prompted Kaiser to apply for a grant from Northarvest Bean Growers Association to study the nitrogen needs of black beans.

One of Kaiser's aims was to move away from the yield-based approach guideline to nitrogen fertilizer guidelines. Yield potential is not



University of Minnesota researchers are working on determining updated recommendations for fertilizer in black beans. Photo taken Sept. 15, 2023, in Johnstown, North Dakota.

Emily Beal / Agweek

strongly related to the amount of fertilizer required, research shows, and as a result, there has been a shift away from fertilizer guidelines for other crops that are based on expected yields. That is especially true for guidelines for nitrogen fertilizer.

Kaiser has conducted both in-field and on-farms trials at U of M Extension research plots throughout Minnesota.

The initial trial, in 2022, was made up of small plot nitrogen rate trials at farm sites, most planted to black beans and one planted to navy beans. Kaiser used rates from zero to 150 pounds of nitrogen per acre on the edible beans. The data showed that there was a significant yield response to nitrogen up to about 110 pounds per acre.

In 2023, Kaiser conducted nitrogen fertility research at Crookston, Staples, Becker and Lamberton. There was not much response to the nitrogen at the Staples and Becker research plot. However, Crookston showed a strong response to nitrogen application of 110- to 120-pounds per acre on black beans and navy bean responses were similar.

The response to nitrogen at the Lamberton research plots were roughly the same as they were at the Crookston plots, Kaiser said.

Most farmers and consultants target a single rate application, and Kaiser doesn't know whether the overall expected yield or yield goal factors into that decision. The goal of the nitrogen research is to determine whether yield goals should determine how much nitrogen farmers apply to their black bean acres or whether they should simply set a rate. **NBGA**

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Water Problems

NDSU research targets solutions to waterlogging, salinity problems

By Ann Bailey | Agweek

Having dry edible bean acres inundated by water is a common occurrence year in and year out in North Dakota and Minnesota, and as result, salts have risen to the surface creating saline soils.

Tom DeSutter, North Dakota State University agriculture and natural resources department professor, and Audrey Rhodes, an NDSU student pursuing her master's degree in soil science, are studying the response of dry edible classes and cultivars to excess moisture and saline soils.

The research, funded by a U.S. Department of Agriculture specialty crops grant, will

research water tolerance of released commercial cultivars.

It also will develop salinity tolerance protocols using a subset of lines from pinto, navy and black beans and then confirm the methodology using field trials.

The third goal of the research is to identify rhizobia within the nodules of bean plants that have grown under waterlogging and soil conditions, then evaluate their potential as salinity and waterlogging tolerant inoculants.

The identification of dry beans and rhizobia that can withstand soil salinity and waterlogging research got under way in 2022

in an NDSU greenhouse and in a research plot near Prosper, North Dakota.

The 2022 greenhouse research focused on screening edible beans to look at how factors such as waterlogging affect chlorophyll content and biomass.

In 2023, the researchers inundated dry bean plots at the Prosper, North Dakota, research site to determine how pinto bean, black bean, navy bean and great northern bean cultivars reacted to the excess water.

The research will be expanded in 2024 to studying cultivars and classes of dry beans to determine the yield response of the cultivars

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in the various classes to saline soil. The research will be conducted in farmers' fields up and down the Red River Valley of North Dakota.

In the short-term, the research findings will be used to recommend to farmers the cultivars and classes of dry beans that best tolerate waterlogging and saline soils. Long-term, the information can be used to develop new varieties.

"With managing salinity, finding the crops and cultivars that are most tolerant is the first step," DeSutter said. "The actual soil management will take longer."

That's because soil management is grower-specific and depends on factors such as whether investing in tile draining to mitigate waterlogging is a worthwhile economic investment.

"Choosing crops that are more tolerant is generally the first approach," DeSutter said. 



Wet conditions have been a common problem for dry edible beans, and the salinity that can follow wet conditions is a compounding issue. Contributed / Michigan Bean Commission



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NDSU Extension dry bean variety trials give growers selection tools

By Jenny Schlecht | Agweek

North Dakota State University's Dry Bean Variety Trials and Selection Guide are must-read information for farmers deciding on what varieties of beans to grow this season.

Greg Endres, NDSU Extension cropping systems specialist, presented about the publication during BeanDay 2024 and on the Getting it Right Dry Bean Production webinar put on by NDSU. At both events, he told the audience it was his first time at the helm of the publication, which gave him a lot of respect for the folks who've put it together in the past.

It also gave him some ideas for what could be included in the future. Things like soybean cyst



Greg Endres, NDSU Extension cropping systems specialist. Jenny Schlecht / Agweek



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nematode tolerance and additional bacterial blight ratings may be in editions in the coming years, he said.

But in the meantime, this year's guide provides more data, more tables and more pages on which to rely for variety decisions. The guide features 20 pages of information, with site-by-site detailed listings of how varieties performed at locations across the state. Growers can compare days to flowering, days to maturity, yield, seed weight and more, with some sites offering information about height, disease and other factors.

One new piece of information included in this year's guide was the direct harvest rating of pinto beans at the Carrington Research Extension Center. The guide defines the rating as "a relative score to estimate the percent of beans that would be harvested successfully in a direct/straight harvest system." Endres explained on Getting it Right that the scoring indicates "the success rate for bringing the beans home, bringing them to the bin." He said direct harvest is becoming more popular, and the rating is an indication of how it works for the varieties tested, as determined through visual evaluation.

"This information should help you make a decision about direct harvest," he said.

Endres and Juan Osorno, NDSU dry bean breeder, discussed the success of NDSU-bred varieties in the variety trials. For pintos, ND Rodeo rated 22% above average; for black beans, Eclipse rated 6% above average and ND Twilight rated 8% above average; for navies, ND Polar rated 7% above average; for kidneys, ND Redbarn rated 11% above average; and for great northerns, ND Pegasus rated 15% above average.

"NDSU varieties are performing very well, especially the newer released varieties," Endres said.

The guide is available in physical form through NDSU Extension offices or the NDSU bulletin room or can be viewed electronically at https://www.ndsu.edu/agriculture/sites/default/files/2023-12/a654-23_1.pdf. Variety trial information for all crops tested by NDSU are available at <https://vt.ag.ndsu.edu/list>.


"So one way or another, get your hands on the publication if you're making some variety decisions for the upcoming year," Endres told the BeanDay crowd. 

Table 2. 2023 Pinto, Black and Navy Bean Yield Expressed as a Percent of the Trial Mean at Each Location.

	Hatton	Forest River	Perham	Staples	Carrington	Carr. Irr.	Oakes Irr.	Hettinger	Langdon	Average ¹
PINTO										
-----Yield in percent of the trial mean for each location-----										
Cowboy	91	114	91	101	118	102	104	95	105	102
La Paz	103	77	103	97	86	97	99	109	113	98
Lariat	--	--	--	--	108	109	99	94	110	104
Monterrey	105	119	113	112	98	104	98	116	105	108
ND Falcon	103	89	78	95	91	96	92	105	82	92
ND Palomino ²	103	93	90	90	107	93	99	84	92	95
ND Rodeo ²	116	102	112	66	92	107	109	98	87	99
Torreón	101	117	101	112	104	95	98	91	89	101
USDA Diamondback ²	98	119	--	--	100	96	102	102	98	102
USDA Rattler	102	98	--	--	108	124	102	107	114	108
Vibrant ²	79	90	--	--	100	87	94	109	104	95
Windbreaker	98	83	112	127	87	89	104	88	100	99
Trial Mean lb/a	2,331	1,740	2,111	1,759	2,701	3,071	4,053	1,877	3,102	

²Slow darkening.

	Hatton	Forest River	Perham	Staples	Carrington	Carr. Irr.	Oakes Irr.	Hettinger	Langdon	Average ¹
Black										
-----Yield in percent of the trial mean for each location-----										
Black Tails	106	102	--	--	106	103	99	96	116	104
Eclipse	99	89	99	81	94	102	96	105	97	96
ND Twilight	92	95	101	119	99	103	101	103	81	99
Zorro	104	115	--	--	102	92	104	96	106	103
Trial Mean lb/a	2,340	1,704	2,228	1,429	2,825	3,166	4,085	1,908	3,029	

	Hatton	Forest River	Perham	Staples	Carrington	Carr. Irr.	Oakes Irr.	Hettinger	Langdon	Average ¹
Navy										
-----Yield in percent of the trial mean for each location-----										
Armada	102	92	--	--	102	108	103	100	98	101
Blizzard	101	99	--	--	86	89	100	90	103	95
HMS Medalist	94	116	99	93	105	109	98	103	104	102
ND Polar	92	83	96	113	100	96	94	109	96	98
T9905	111	109	105	94	108	98	105	98	100	103
Trial Mean lb/a	2,569	1,571	2,139	1,175	2,778	3,404	4,130	1,761	3,125	

¹Average of contributing locations.

A chart in the North Dakota Dry Bean Variety Trial and Selection Guide listing results from variety trials across the state as a percentage from average yield. Contributed / NDSU Extension



North Dakota State University Extension variety trials compile information annually about how different varieties stack up in different locations around the state. Ann Bailey / Agweek

White Mold Management

Fungicide timing for white mold is tough, but droplet size is an easy optimization

By Jenny Schlecht | Agweek

Timing fungicide applications for maximum management of white mold is “almost impossible” to get right, said Michael Wunsch, research plant pathologist at the North Dakota State University Carrington Research Extension Center. But he said progress is being made on how to best control the fungus in dry edible beans.

Wunsch has a long history of working on white mold control. Kendall Nichols, retired research director of the North Dakota Soybean Council, at Bean Day 2024 recalled Wunsch and his staff pitchforking soybean plants into the combine

after an early 2019 snow storm so they could continue their research.

“And he still kept his staff with him,” Nichols marveled.

While Wunsch said he hoped never to have to pitchfork crops into a combine again, his research into white mold management — particularly in soybeans, dry edible beans and sunflowers — has continued.

“We’ve made more progress on the soybean end than on the dry bean end, but we’re starting to get there on dry beans,” he said.

At BeanDay in 2023, Wunsch focused on the need to use a lower seeding rate on fields known to have white mold problems. Wunsch’s research presentation at the 2024 event focused more on what to do after planting.

Among the harder tasks has been figuring out when to apply fungicides. Wunsch explained that fungicides are not curative, so spraying after white mold emerges is too late. But new growth isn’t protected from previous fungicide applications, so spraying too early also doesn’t help.

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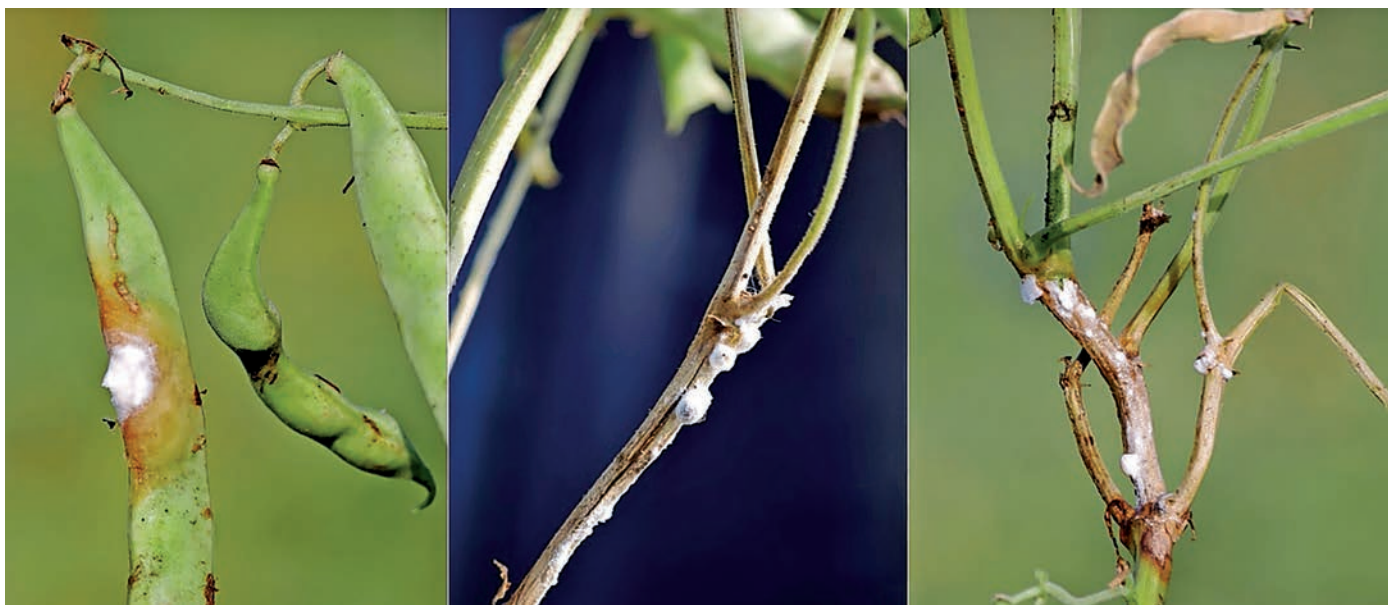
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White mold can be a significant problem in dry edible beans. Courtesy / Michael Wunsch, NDSU

“You’ve got to get the fungicide on before the pathogen infects. But if you go on too far in advance, you get all kinds of new growth that’s unprotected. This is why in our trials, we’ve seen a tremendous penalty to applying too early and applying too late.”

- Michael Wunsch



“You’ve got to get the fungicide on before the pathogen infects. But if you go on too far in advance, you get all kinds of new growth that’s unprotected,” he said. “This is why in our trials, we’ve seen a tremendous penalty to applying too early and applying too late.”

He said it’s imperative that when conditions are hot and dry and not conducive to white mold development that fungicide applications be delayed until conditions are favorable.

But Wunsch said it gets more complicated to determine when to spray when conditions are conducive to mold growth. Many factors have to be considered, including whether the farmer intends to spray once or twice, how far the canopy has closed, the temperature at the time of application, moisture levels at the time of

application and more. Add to that the fact that “not every day is a good day to spray,” and the window for protection continues to shrink.

“You have a lot of judgment calls to make,” he said.

When testing two applications of fungicide, the research has used an interval of 10 to 14 days between applications, Wunsch said. But he thinks the key likely will be tightening that up.

In soybeans, a tighter interval between applications “doubled the response” to fungicide, at least in early maturing varieties. But in later maturing varieties, it appears a third application might be necessary. While it hasn’t been tested in dry edible beans, the research so far suggests a seven-day gap would work.

“That is the most likely solution that I see to the challenge of getting our timing right,” he said. “This is gonna give us a lot more flexibility on making the application before infection occurs.”

Besides fungicide timing, Wunsch and his team also have been working on determining the correct droplet size for applications.

“This one’s a lot more straightforward,” he said.

In kidney beans in wide rows require the use of coarse droplets in both fungicide applications. That also goes for when the canopy is closed at the time of both applications or if it is very dense. More lodging also requires coarse droplets.

“The denser the canopy, the coarser the droplet,” he said.

CONTINUED ON PAGE 12

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In narrower rows with an unclosed canopy and no lodging, a medium droplet might work, he said.

He said the same held true in both pinto beans and black beans, that coarse droplets are necessary when canopies are closed or plants are lodged, with medium droplets being only marginally better.

"When you're targeting white mold, fine droplets are usually not optimal," he said.

Getting droplet size right is vital and requires nowhere near as much work as fungicide timing.

"That's just basically free money," he said. "I mean, the cost of getting a droplet size right is not high."

Another thing Wunsch is looking at in regards to white mold management is spray volume. While the research is not conclusive yet, he said right now, the data indicates that there is no gain to spraying 20 gallons per acre versus 10 gallons per acre. **NBGA**



Michael Wunsch, a plant pathologist with North Dakota State University, during the July 16, 2019, Carrington Research Extension Center Field Day. Jenny Schlecht / Agweek



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NDSU dry bean breeding program focuses on resistance, marketability

By Jenny Schlecht | Agweek

Fungicides are effective fungal disease control in dry edible beans, including for controlling things like rust. But from the standpoint of financial and environmental sustainability, breeding crops with resistance to disease is a winning strategy, North Dakota State University dry bean breeder Juan Osorno said at Bean Day 2024.

"Fungicides are actually pretty effective," he said. "However, genetic resistance is free."

Osorno, talking about the dry bean breeding program, explained that resistance is not something that necessarily boosts yields; however, having resistance means that disease is not dragging yield down when it's present.

"Genetic resistance is only effective when there is disease pressure," he said, telling the audience to think of resistance as "insurance."

Resistance to a variety of issues, including soybean cyst nematodes, common bacterial blight and white mold, continues to be studied, along with other issues important to the region's growers. Some very particular challenges that growers in the region struggle with are waterlogging and salinity.

"Even worse, in many cases you have both happening at the same time, which is not fun at all," Osorno said while explaining that the two problems together are more damaging to dry edible beans than either alone. "That's the real deal. That's what we need to really select for."

Osorno also highlighted other work done in dry edible bean breeding, including a new pink bean variety. The pink bean market isn't very big in North Dakota, but ND Rosalind showed the best color and highest yield in 20 environments from 2018 to 2023, Osorno said. Plus, its agronomic traits were on par with other varieties.

"Here is a great alternative for our North Dakota conditions," he said. "I'll take 15% higher yield every time."



Dry bean varieties are bred at the North Dakota State University with resistance to disease and usability in the northern Plains in mind. *Evan Girtz / Agweek*


Foundation seed is available for certified seed growers, he said.

Osorno said traits that the NDSU breeding program will be working on include slow-darkening pink, light red kidney and cranberry

beans; health and nutrition markers like higher iron levels; and desirable traits for bean processing.

Osorno also spent some time explaining the global need for insect and pest resistance and tolerance due to problems in Central America and the Caribbean from a new insect problem. Such things aren't likely to be a problem in the northern Plains.

"Our beautiful winter in North Dakota takes care of bugs," he said. "But I think it's something that puts the global landscape of beans into perspective."

The presence of the bug reveals possible opportunities for growers from this region in shipping beans to places with insect problems and also highlights the opportunities for having beans that are resistant to the damaging insects. Beans grown here with resistance to the insects could be more storable in the climates where the insects thrive, he said. 



Juan Osorno, NDSU bean breeder, shows bean plants in a greenhouse at North Dakota State University. *Contributed / Jed Brazier, Northarvest Bean Growers Association*

Irrigated Beans

Irrigated dry bean research continues at Central Lakes College Ag and Energy Center

By Ann Bailey | Agweek

Collaborative irrigated dry bean research trials between Central Lakes College Ag and Energy Center in Brainerd, Minnesota, and North Dakota State University in Fargo, North Dakota, continued during the 2023 growing season.

The trials are conducted to evaluate dry bean lines for genetics and physiology in Minnesota's central sand plains. Funding from Northarvest Bean Growers Association is used to support trial establishment and management, including planting, in-season operation and harvesting.

Central Lakes College of Ag and Energy Center staff, including Noah Boelter, the center's research analyst, and Juan Osorno, NDSU dry bean breeder, and his team are working on the research.

The Central Lakes College of Ag and Energy Center, established in 1968 for irrigation research and demonstration, is in Wadena County, Minnesota, one of the top three kidney bean counties in the state. The ability to irrigate the crop is one of the reasons it has become a consistent cash crop in area growers' rotations, Boelter said.

The collaboration between Central Lakes College of Ag and Energy Center and NDSU began six years ago when trials were established at the center. Osorno has been instrumental in providing insight into obtaining grants related to the center's kidney bean projects, Boelter said.

Northarvest Bean Growers Association continues to show interest in conducting research that will determine which varieties - genetically and physiologically - of dry beans will grow best on the irrigated sands of the central plains in Minnesota.

CONTINUED ON PAGE 25



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Bacterial inoculation shows promise toward reducing nitrogen fertilizer rates in dry edible beans

By Jenny Schlecht | Agweek

Paulo Pagliari and other researchers at the University of Minnesota are trying to see if a bacteria can be used to reduce the amount of nitrogen needed to grow crops.

Reducing nitrogen is important to Minnesota growers both because of the rising costs of fertilizer as well as rising concerns about how much nitrogen makes it to the water supply, Pagliari told the crowd at Bean Day 2024. Pagliari, an associate professor at University of Minnesota who is stationed at the Southwest Research and Outreach Center in Lamberton, appeared virtually during a Minnesota research panel at the event.

"If we have a technology here that could reduce 25% of the nitrogen inputs, I think that would be very beneficial to growers in Minnesota and would help us achieve that reduction strategy with a much easier strategy than just removing nitrogen from the application," Pagliari said.

Pagliari has done work with the bacteria — *Azospirillum brasilense* — as an inoculant in wheat and corn; now he's testing whether it can fix nitrogen in black beans, too.

"The reason I'm very excited about this particular product is because we've seen positive responses with every single trial that we have done so far," he said.

That's in stark contrast to trials of other biological products that he's done in the past 11 years.

"And 95% of the times that I tested those products, I never saw positive response," he said.

Azospirillum brasilense is a nitrogen-fixing bacteria, the most commonly studied strains of which are from Brazil. While the product used in the trials so far has been imported



With rising fertilizer prices, research into a bacterial inoculant that could help fix nitrogen is especially welcome to growers. Agweek file photo

from Brazil, Pagliari said that if it appears worthwhile, the goal would be to develop a local source of *Azospirillum*.

The team tested various rates of fertilizer with no inoculation, inoculation with rhizobium, inoculation with *Azospirillum* at two different rates and inoculation with *Azospirillum* and rhizobium together.


The initial Minnesota tests, at Lamberton and Becker, showed that inoculating with *Azospirillum* was not effective when full rates of fertilizer were applied. In fact, there was indication of "dragging yields" when full rates of fertilizer were used.

"But the best strategy that we see is when you're putting medium to low nitrogen rates, then the use of the bacteria really comes in and starts providing other nitrogen that could supplement what you are removing from the fertilizer," Pagliari explained. "If you're looking at cutting down the nitrogen needs, then the

bacteria seems to be doing what we want it to do."

The research will continue. Pagliari said they'll be analyzing nitrogen levels from when the beans were flowering "just to see what was happening with the nitrogen availability in the soil." They're also looking at the total nitrogen removal and the protein content of the beans. They want to determine the best way to use the technology before they make any recommendations about its use.

They're also going to try to determine why they saw decreasing yields with full rates of nitrogen. Pagliari said maybe there were issues with plant population and germination problems, or physiological problems like not enough chlorophyll or stress problems in the plants.

"The goal is to secure more funding for another two years to really understand the technology and see the potential for us," he said. 

Disease Survey

Dry edible bean survey shows no significant disease outbreaks in 2023

By Ann Bailey | Agweek

The 2023 dry edible bean survey of diseases did not reveal any significant outbreaks.

Malaika Ebert, a North Dakota State University Extension pulse crops researcher, and her team surveyed more than 40 fields in nine counties in North Dakota and Minnesota three times during the 2023 growing season.

NDSU plant pathologists for several years have been developing, testing and recommending to farmers strategies to manage diseases. Dry bean diseases include rust, common bacterial blight, root rot, brown spot, halo blight and anthracnose.

Besides identifying the plant diseases in the field, researchers gather samples of diseased plants to look at the pathogen in more depth in the laboratory so they know exactly with which they are working.

The North Dakota fields surveyed in 2023 were in the counties surveyed of Cass, Cavalier, Grand Forks, Pembina, Steele and Traill. In Minnesota, fields in the counties of Hubbard, Otter Tail and Wadena were surveyed.

"This year was special, because this year a survey was actually led by an undergrad. She's extremely talented, and she was responsible for planning the whole thing," Ebert told

farmers during a presentation at Northarvest Bean Day held Jan. 19 in Fargo, North Dakota. "She did extremely well."

The first survey, conducted between July 10-14, was for root rot; the second, conducted from July 31-Aug. 2, was for bacterial diseases; and the third, conducted from Aug. 15-17, was for white mold, rust and anthracnose.

During the survey, researchers walk through multiple locations in a field, scouring them for the diseases.

The 2023 survey found root rot, which is commonly sighted during surveys, Ebert said. The survey also showed a high number of

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Dual Magnum post-emergence approval among 2024 Weed Control Guide changes

Jenny Schlecht | Agweek

North Dakota State University Extension's 2024 Weed Control Guide was released in January and provides a summary of herbicide uses in crops grown in the state. The guide incorporates federal and state herbicide label information, along with research from North Dakota's ag experiment stations and information from the North Dakota Department of Agriculture.

The guide includes useful information about plant-back intervals, how to use various products on various crops at various crop stages, crop rotation restrictions, herbicide effectiveness, and known information about herbicide resistance, among other topics.

One change in the guide from previous years that pertains to dry edible bean growers is the approved usage of Dual Magnum for post emergence. Joe Ikley, NDSU assistance professor and Extension weed specialist who compiled the 2024 guide, explained during NDSU Extension's Getting it Right Dry Bean Production webinar series that the label for Dual Magnum indicates use in dry beans for pre-emergence and allows use post-emergence "after the first trifoliolate stage." While the label does not indicate an end date or stage for post-emergence use, Ikley indicated in the weed guide that it should be used "up to flowering."

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Kochia was named the weed of the year in the 2024 Weed Control Guide by North Dakota State University Extension. Contributed / NDSU Extension



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“Just for a crop safety standpoint, we want to make sure once we’re flowering, hopefully that Dual Magnum is already on if we decide to use that.”

- Joe Ikley



“Just for a crop safety standpoint, we want to make sure once we’re flowering, hopefully that Dual Magnum is already on if we decide to use that,” he said.

The guide explained why kochia is the 2024 “Weed of the Year.” NDSU officials have noted numerous cases of resistance to Group 14 herbicides as well as to dicamba. Additionally, recent dry weather patterns have strengthened kochia, which is known for its drought tolerance. The guide provides information about ongoing research on kochia control as well as recommendations about how to deal with it.

The 2024 Weed Control Guide is available at NDSU Extension offices throughout the state or online at <https://www.ndsu.edu/agriculture/extension/publications/north-dakota-weed-control-guide>. 

2024 Weed Control Guide.
Contributed / NDSU Extension

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Soil fertility icon George Rehm and the future he paved for coordinated research in Minnesota

By Noah Fish | Agweek

MANKATO, Minn. — George Rehm's obituary reads how as an extension specialist in nutrient management, he believed his job was to help farmers, and if the scientific community was affected, so be it.

Rehm, who worked at the University of Nebraska as an extension agronomist for 14 years before he returned to the University of Minnesota in 1983 as an extension specialist in nutrient management, died at the age 82 in January.

Rehm left behind a legacy of general goodwill between farmer and scientist, as well as a foundation he helped build for coordinated nutrient management research in the state.

That was on display at the University of Minnesota's Nutrient Management Conference, held in Mankato on Feb. 20. The annual event brings together soil scientists and educators from Minnesota and neighboring states to share their research and recommendations. This year's topics included nutrient bioavailability, agricultural biologicals, effective nutrient management with cover crops and of course, George Rehm.

"We've been putting this event on now for 16 years," said Warren Formo, executive director of Minnesota Agricultural Water Resource Center. "Prior to Fabian (Fernandez, a nutrient management specialist at the University of Minnesota Extension), George Rehm was the main planner of this conference."

The Minnesota Agricultural Water Resource Center coordinates and plans the event, along with the annual Nitrogen Management Conference, while University of Minnesota Extension does agenda development.

Formo met Rehm in early 2009 when the center was looking for a coordinator for its Discovery

**George Rehm died at age 82
in January 2024.**

*Contributed / University of
Minnesota Extension*



George Rehm, who worked for decades as a University of Minnesota Extension specialist in nutrient management, at a field day in the 90s.

Contributed / University of Minnesota Extension

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Farms program. They needed someone not afraid to get out and meet farmers, and he'd heard stories of Rehm for many years from his soil fertility outreach role at the University of Minnesota, which he had then recently retired from.

"He knew Minnesota farmers and the soils and the cropping systems so well," Formo said.

Formo said that Rehm's scientific mind was sharp when it came to the "nuts and bolts of soil, water and nutrients," and that he had the heart of an educator.

"He understood things so well, but he wanted to help people understand it," Formo said. "As a PhD, a super smart guy, he didn't come across that way when he was just chatting."

If Formo needed a piece of information relative to soils, chemistry and nutrients, he called Rehm, who was persistent when it came to healthy debates among colleagues.

"Obviously the research is moving forward and it keeps getting more complicated as these researchers here continue to discover, but George would have been sitting in here listening, and challenging Daniel Kaiser on phosphorus," Formo said with a laugh. "They wouldn't butt heads, but they'd kind of go back and forth, and both get smarter because of it."

Rehm retired from the Minnesota Agricultural Water Resource Center in 2019, after leaving his mark on the organization and coordinated research altogether.

Formo credits Rehm for championing the Agricultural Fertilizer Research and Education Council after he identified a need for soil fertility research in Minnesota but without a steady funding source.

"If it wouldn't have been for him, we probably wouldn't have it, quite frankly," Formo said of Rehm and the council.

Rehm himself had no issue with raising money for his research projects, but younger researchers without such history were often stifled by lack of funding for nutrient management, Formo said.

"George saw AFREC as a dedicated million dollars a year, that's competitive and that you have to apply for, but at least it's a pool of money that they're going to get funded for good projects," Formo said. "Now, you look at all the researchers who have come on board in Minnesota in the last 15 years, and they will all tell you how helpful it's been to have this funding."

Fernandez was one of those young researchers who met Rehm over 20 years ago while doing his undergraduate work. The two eventually became colleagues and partnered on efforts to hold the annual conferences.

Fernandez said Rehm had an "important influence" on the work he's done and is doing today.



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Zac Aanerud and his advisor Fabian Fernandez, professor in the Department of Soil, Water and Climate, work to find the “sweet spot” for sustainable corn production in Minnesota. *Contributed / University of Minnesota Extension*

“He was an icon of soil fertility across the U.S. and the Midwest, and certainly here in Minnesota.”

- Fabian Fernandez



“He was an icon of soil fertility across the U.S. and the Midwest, and certainly here in Minnesota,” Fernandez said. “And a person that I would always look up when I went to national conferences for soil fertility, so I could go listen to his talks and learn about what he was doing.”

Fernandez said nutrient management research wouldn’t be where it is today in Minnesota without the funding that Rehm pushed for through the Agricultural Fertilizer Research and Education Council, and his decades of outreach and coordination.

Fernandez said what made George Rehm special was his dedication.

“He was very dedicated to soil fertility and to the work that he did at the university. And I think he cared a lot for people. He cared for the farmers, and so they were his priority, and I think that shows,” Fernandez said. “Everybody knows George in Minnesota, because he was out there always, doing research and sharing the information with farmers. Ultimately, he was very interested in making sure that the information that he gained through research in the lab was in the hands of those that will have the most benefit out of it, which is farmers and the agriculture industry.”

Read Rehm’s full obituary at lundbergfuneral.com/obituaries/george-rehm. **NBGA**



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Minnesota research addresses drain tile for disease reduction in dry edible beans

By Ann Bailey | Agweek

University of Minnesota Extension researchers are studying how fungicide treatment to dry edible beans responds to tile drainage.

Research shows that drainage of fields has benefits to farmers, including earlier and more timely planting, improved plant stands and fewer plant diseases. Excessive moisture can leave plants susceptible to root diseases, including rhizoctonia solani.

Though there is a connection between excessive soil moisture and root disease, there

previously had not been research conducted to weigh the interaction between subsurface drainage spacing and traditional disease management in the Red River Basin.

The goal of drain tiling spacing is to provide the balance of water and air in the soil to create an environment that is conducive to plant growth.

A four-year research project, launched 2021, is underway to determine how drain tile spacing affects fungicides applied at the time of planting to control root diseases.

The research is being conducted by Jeff Strock, University of Minnesota soil, water and climate department professor; Ashok Chanda, U of M Extension sugarbeet plant pathologist at the Northwest Minnesota Research and Outlook Center in Crookston; and Lindsay Pease, Extension nutrient and water specialist at the Northwest Minnesota Research and Outlook Center Extension.

Despite the connection between soil moisture and root disease, the interactions between



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The research was conducted on a site of about 4 acres with drain spacings of 15-, 25-, 40- and 60-feet and on a control, which was not drained.

In 2023, the third year of the project, when soil conditions were about normal in April, dry in May and June and normal in July and August, edible beans planted on the part of the plot with 60-foot wide spacing or no spacing yielded better than parts of the plot that had narrower row spacing.

That outcome suggests that when tiling companies are designing systems, the 60-foot spacing is a good balance between the benefits provided by the removal of water and the cost of installing a dry tile system, Pease said.

The fungicide research, meanwhile, showed that Vibrance seed treatments performed better in 2023 than the in-furrow fungicide treatments and the control, Chanda said.

"Generally, the plants are better than the Vibrance seed treatment in 2023," he said.

The research project will be repeated at the Northwest Research Outlook Center in Crookston in 2024. [NBGA](#)

The goal of the research project at the Northwest Research and Extension Outreach Center in Crookston was to develop and evaluate drain spacing and fungicide application in a corn, beans, wheat and sugarbeet rotational cropping system. Photo taken Dec. 4, 2020, near Wahpeton, North Dakota. Mikkel Pates / Agweek

subsurface drainage spacing and traditional disease management options have never been studied in the Red River Basin. If farmers don't have that information, it is difficult to weigh the costs of subsurface drainage systems against the potential benefits for crop production.

The goal of the research project at the Northwest Research and Extension Outreach Center in Crookston was to develop and evaluate drain spacing and fungicide application in a corn, beans, wheat and sugarbeet rotational cropping system.

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Meanwhile, disease pressure, especially root rot and white mold, are a production problem in the central plains, and the dry bean lines also will be evaluated for resistance to diseases.

In 2023 the kidney beans were planted on June 12. The trials, located under a pivot irrigator at the center, were conducted on about three acres. They were made up of kidney bean variety trials, three miscellaneous variety trials and three kidney preliminary yield trials that were subdivided by market class — dark red, light red and white kidney — and early generation plant nurseries. The kidney bean variety trial had 88 entries, the miscellaneous variety trials had 60 entries and the preliminary yield trials had 198 entries, which were made up of 96 dark kidney beans, 60 light kidney beans and 42 white kidney beans.

"Based on plant size, there is likely to be a reduction in yield due to the herbicide



Todd Pollema samples soil in a kidney bean field at Central Lakes College Ag Center farm in summer 2023.

Michael Johnson / Agweek

damage the plots experienced early on in the growing season," Boelter said. The researchers may be able to determine the level of the response of the various varieties to the herbicide damage. NBGA

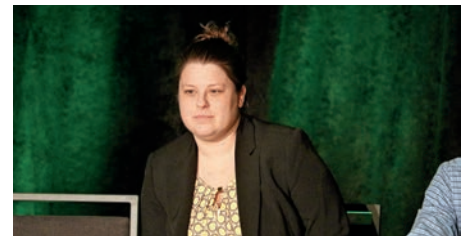
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common blight, brown spot and halo blight, which are bacterial diseases.

There also were some plants that had white mold found in the 2023 survey, but the number of fields it was found in was not high.

There was no rust or anthraxnose found, which is a "yay," Ebert said.

Besides identifying the plant diseases in the field, researchers gather samples of diseased plants to look at the pathogen in more depth in the laboratory so they have more information about the diseases and their mechanisms. NBGA



Malaiika Ebert. Jenny Schlecht / Agweek

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