

No. 1 May 11, 2023

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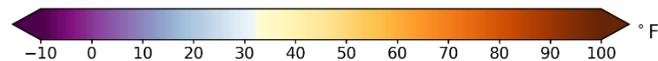
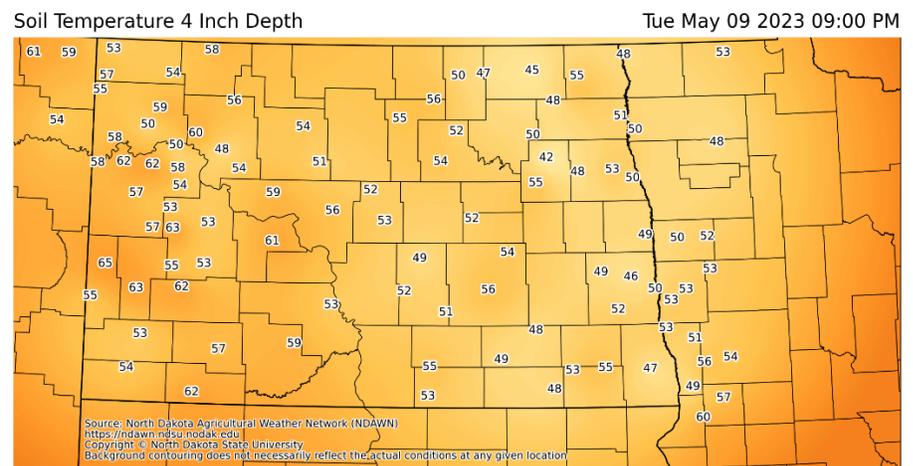
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entomology

SOIL TEMPERATURES WARM ENOUGH FOR WIREWORMS

Soil temperatures at the 4-inch depth range from 40°F to >60°F in North Dakota as of May 9, 2023 (see map below). At 50°F, soils have warmed enough for some insect activity to begin.



Wireworms: When soil temperatures reach 50 - 55°F during the spring, larvae and adults move nearer the soil surface. Adult females emerge from the soil, attract males to mate, then burrow back into the soil to lay eggs. Females can re-emerge and move to other sites where they burrow in and lay more eggs, resulting in spotty infestations.

Larvae also become active feeding on seeds, roots and tunneling into stems. Wireworms inflict most of their damage in the early spring when crops are in the seedling stage.



Wireworm larva (on left, Kevin Wanner, Montana State University)
Wireworm feeding on wheat seed (on right, Kristie Michels, PSA Agronomy)

During the summer months the larvae move deeper into the soil. When soil temperatures become too hot (>80 °F) or dry, larvae will move deeper into the soil to seek more favorable conditions. Later as soils cool, larvae may resume feeding nearer the surface, but the amount of injury is usually minimal due to a matured crop.

If you know that your field has a history of wireworm damage, **insecticide seed treatments** are a preventative means of reducing wireworm damage (plant stand loss through dead plants) to growing crops.

- **Systemic neonicotinoid seed treatments** (Group 4A), such as thiamethoxam, imidacloprid and clothianidin, do not cause significant long-term wireworm mortality. Rather, wireworms that ingest a neonicotinoid will become moribund (sick) and stop feeding for a while, thus giving some crop protection. In cool, wet conditions, the crop is more susceptible to wireworm attack. A seedling may live or die depending on the timing and extent of feeding injury. Seedlings that do survive usually have delayed growth and less vigor.
- **Broflanilide seed treatment (Terraxa, Terraxa F4)** is a newer product registered in 2022 for use in small grains. NDSU Extension Entomology trials found that Broflanilide provided the highest stand counts and resulted in significant wireworm mortality. Broflanilide is a Group 30 (meta-diamides) insecticide, and is not systemic. The idea here is that including broflanilide used in the crop rotation will reduce overall wireworm populations long-term.

Soil applied insecticides also are effective in reducing plant stand damage caused by wireworms by providing a zone of root protection. Pyrethroids (Group 3A) also do not cause enough mortality to reduce overall wireworm populations. Pyrethroids repel foraging wireworm larvae away from the seed. Seedling root growth within the in-furrow application zone is protected, but a seedling is still susceptible to wireworms attacking outside the zone of root protection.

For insecticides registered for control of wireworms by crop in North Dakota, please refer to the [2023 North Dakota Field Crop Insect Management Guide](#).

[Janet J. Knodel](#)
Extension Entomologist



USING AN "ERGOTY" WHEAT SEED SOURCE

One question that has become more common over the past couple years is "Can I use an ergoty wheat seed lot as a seed source?" If you quickly search this subject on the internet, you will find several articles and publications indicating that you should not use an ergoty seed source as it could re-introduce the pathogen into the field. However, in North Dakota, our situation is very different. First, we have a reported 59 grass hosts of ergot in our state (most in the USA) with the biggest carrier being smooth brome (widely prevalent in road ditches and section lines). Second, the survivability of an individual sclerotium (ergot body) is around a year. The sclerotium has a high sugar content that will attract both insects and soil dwelling saprophytic microorganisms that cause it to degrade quickly (Figure 2). Finally, the mushroom structures that germinate from a sclerotium will often reach a maximum length of ¾ inch (Figure 2). Growers often will

plant wheat at depths at 1.5 inches (or more). This means there is some reasonable certainty that the ergot bodies will be planted at depths similar to wheat and prevent the mushroom structures from reaching the surface (Figure 3). For the aforementioned reasons, I believe using an ergoty seed lot should be considered to be low risk and will have a minimal effect on ergot incidence in a field. Most of our inoculum is likely coming from the other widely predominate grass hosts in the state.



Figure 1. Photo from research experiment to determine viability of ergot left on the soil surface. Note heavy infestation of springtails actively feeding on ergot bodies.



Figure 2. A germinated ergot sclerotium (ergot body) with spore bearing mushroom stalks (stromata). Note the maximum length of the stromata is around 3/4 inch.

FUNGICIDE SEED TREATMENT USE IN WHEAT

A few questions are asked every year pertaining to the use of fungicide seed treatments in wheat. First, fungicide seed treatments are most effective at managing seed-borne diseases like loose smut. They are also labeled for early-season protection against seedling blights and root rots caused by *Fusarium*, *Pythium*, and *Cochliobolus*, and should not be viewed as having season long protection. The use of a fungicide treatment will be based on several factors including field history, seed source, and past experiences with using seed treatments. Another potential benefit of a seed treatment is improving stand. For the past few years, I have presented the stand response (% difference in stand compared to naked seed) from using a fungicide seed treatment in wheat. The data set now represents 203 replicated data points obtained from 50 research trials conducted from 2003 to 2022 (Figure 1). Results suggest that there is 7.7% improvement in stand when a fungicide seed treatment is used. Additionally, a positive stand response (greater than 0%) was observed 69% of the time.

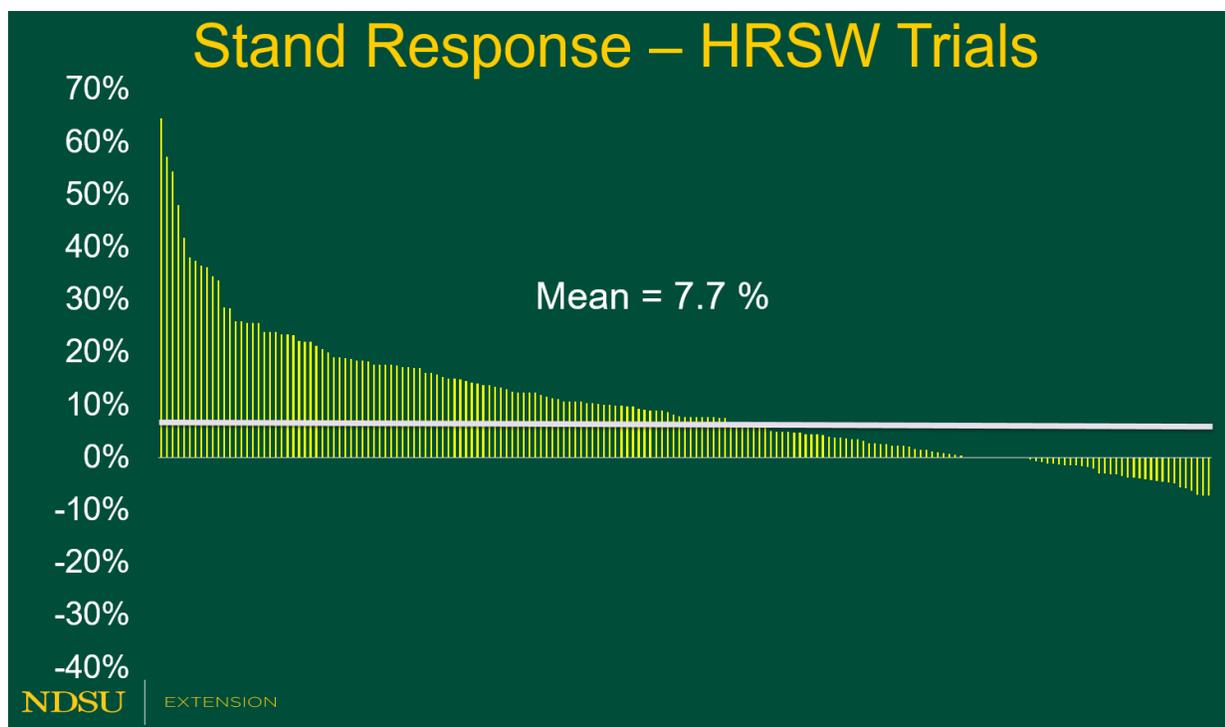


Figure 1. Distribution of stand responses when a fungicide seed treatment was used.

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FIELD PEA PLANTING DATE

Green- and yellow-seeded field peas are used for human consumption, in livestock rations and pigeon feeds. Field pea is of the indeterminate (climbing) type or determinate (bush or dwarf) type. Flowers are reddish-purple or white. Pods are about three inches long and can contain four to nine seeds. A cool growing season is necessary for optimum pea yields (a mean temperature of 55 degrees to 65 degrees F). Hot weather during flowering may result in reduced seed

set. Field pea requires the same length of growing season as wheat. On average, it requires 60 days from planting until bloom and the crop matures in 95 to 100 days. Because pea is a cool season crop it is important to seed the pea early in the planting season. Late planting will reduce yields substantially (Figures 1 and 2).

Short-vine and semi-leafless pea varieties are used for straight harvesting compared to varieties with indeterminate and prostrate-vine growth. For field pea production, see the 'Pulse Crop Production [Field Guide](#)'.

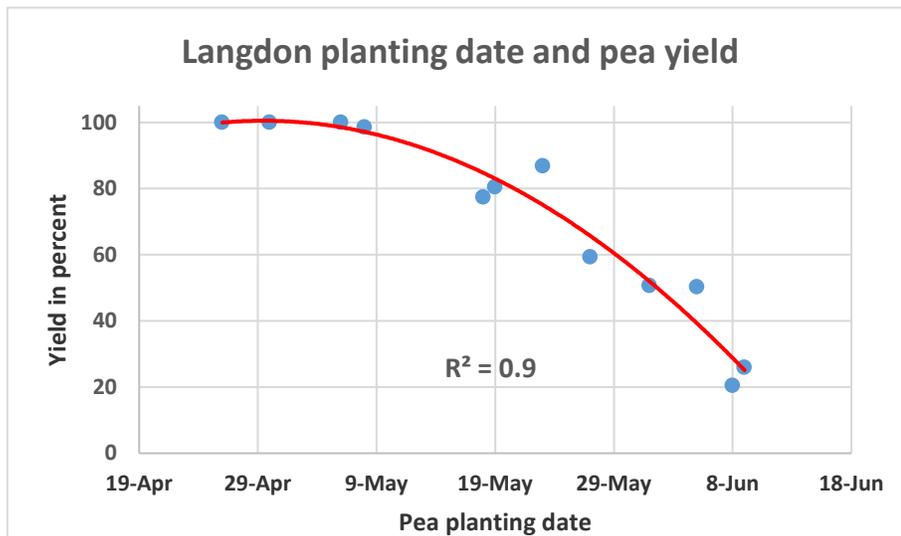


Figure 1. Langdon pea yield expressed as percent, based on data from three growing seasons.

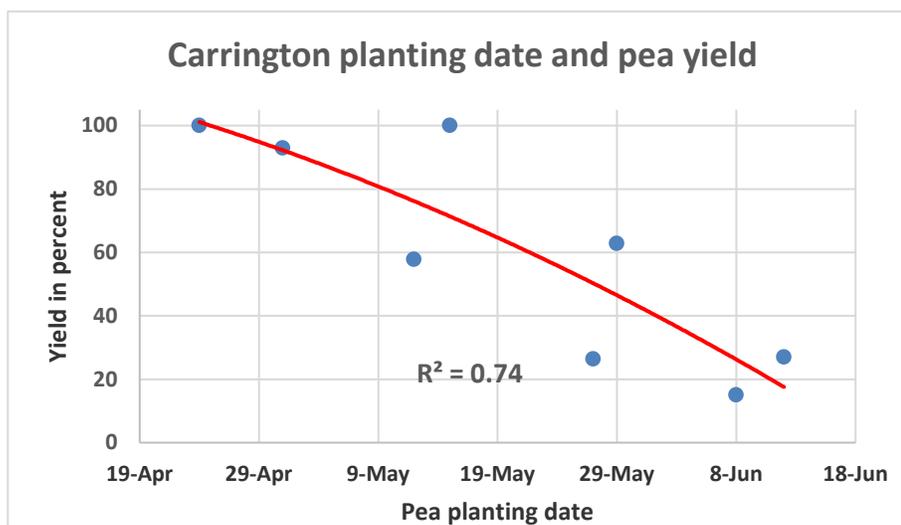


Figure 2. Carrington pea yield expressed as percent, based on data from two growing seasons.



Semi-leafless dry pea variety with flowers and developing pods, mid-summer in North Dakota

[Hans Kandel](#)

Extension Agronomist Broadleaf Crops

CUTTING POTATO SEED TUBERS

When a tuber is cut or damaged, water loss and risk of infection by bacterial and fungal pathogens is greatly increased. The damage to the tuber must heal by developing protective layers of new cells, or the tuber will rot. If cutting and planting immediately, seed tubers can heal in the soil if conditions are favorable for wound healing. The challenge is controlling the environment in the soil for the time needed for suberization. Ideal soil conditions are when soil moisture is 60-65% and at temperatures of 50-60 °F. Skin will take approximately twice as long to heal when temperatures are 45 °F compared to 52 °F and even longer at cooler temperatures (Table 1). Tubers will heal faster at warmer temperatures, but there is a higher risk of pathogen development, especially bacterial soft rot.

Table 1. Approximate number of days to achieve different wound healing stages (adopted from Pringle, et al., 2009).

Temperature °F	Light suberization	Complete suberization	Start of periderm formation	Two layers of periderm formed
37-41	7-14	21-42	28	28-63
50	4	7-14	7-14	9-16
68	1-2	3-6	3-5	5-7

Pre-cutting seed has advantages and drawbacks compared to fresh cut seed. Pre-cut seed has been reported to emerge earlier, have more vigorous early growth, have a higher plant population, healthier plants, and improved yield compared to fresh cut seed. However, pre-cutting seed is costly and can increase risk of pathogen entry and breakdown when the pre-cut seed is not properly stored and suberized. Additionally, pointed corners resulting from cutting are more susceptible to damage when handling pre-cut seed, creating new wounds.

How does tuber skin heal? This process can be simplified into two stages. First suberin, a hydrophobic waxy material, is formed within hours to prevent water loss. Establishment of the suberin layer will prevent bacterial soft rot entry in approximately 3 days. Second is the formation of the phellogen layer, or periderm. In general, cutting and suberizing in good storage conditions will take about 7 to 21 days for a wound periderm to form. This periderm or new skin is as effective as the original skin at protecting the seed piece. However, it takes roughly 14 to 21 days for sufficient periderm formation to prevent *Fusarium* dry rot.

Ideal conditions for suberization of cut seed are 95-99% relative humidity (no free water), seed tuber temperatures of 52-60 °F, and abundant oxygen to prevent carbon dioxide accumulation. If the previous conditions cannot be met this greatly increases risk of cutting and suberizing seed. When free water is left on the cut surface, this will promote bacterial diseases. It is a challenge to maintain adequate air flow, temperature, and humidity if the height of cut seed piles are greater than 6 feet.

If insufficient humidity is present in the bin or soil during wound healing, a layer of dry and dead cells may cover the cut surface and could be mistaken for a suberized layer. The resulting seed will feel dry to the touch but when planted has high risk of seed piece decay as the seed is still not healed. An easy test is to apply gentle pressure across the surface with your thumb. A layer of dead cells will usually come off, while a suberized layer remains in place.

Well managed suberized cut seed can be successfully held like whole seed. The questions of how long and what temperature to hold the pile are important. This will depend on planting schedule, variety, length of storage, and physiological age of seed. Cultivars that tend to have a lower stem and tuber count typically, or that are physiologically young, can be stored at 52-55 °F for 1 to 3 weeks. This has been demonstrated to help overcome dormancy challenges and lead to more uniform sprouting and emergence. A seed treatment can be applied prior to piling and suberization, but avoid dust treatments with talc compounds that can absorb moisture and interfere with suberization. A liquid seed treatment can be used with ultra-low volumes that dry quickly so they do not interfere with wound healing.

Other cultivars that tend to have too many stems or tubers or that are physiologically old can be suberized for a shorter time, approximately 3-14 days, and then planted. If planting is delayed, well-healed seed can be cooled to 45 °F to prevent excessive sprouting.

When the seed is taken to the field, ideally seed temperature should match soil temperature when planting. However, this is not always possible, so it is recommended to keep seed and soil temperatures within 10 °F of each other. Ideal soil temperatures for planting are 50-55 °F. Cold seed pieces promote condensation. A film of condensed moisture around the tuber from condensation or saturated soils at 50 °F for 6 hours will favor the development of soft rot.

In summary, plant disease-free seed and handle seed potatoes as little possible to prevent damage. When the tubers are pre-cut the best healing conditions are 52-55 °F, 95-99 % relative humidity, and with plenty of oxygen from fresh air. The length of time to completely heal is 7-21 days, but this is highly influenced by variety and healing conditions. Cutting potato seed and the healing period can be managed to influence the dormancy of the seed potatoes and can influence the number of stems and resulting tubers per acre. When you take your seed to the field to plant, manage seed temperature to be at least as warm as soil temperature to avoid condensation on the seed. Ideally, seed and soil should be the same temperature at planting.

[Andy Robinson](#)

NDSU/U of M Extension Potato Agronomist



UREA PLACED ON OR NEAR THE SOIL SURFACE

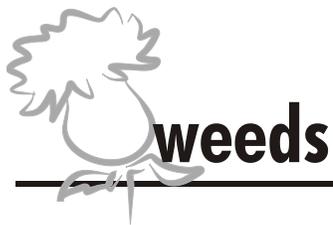
Urea placed on or within 2 inches of the soil surface is subject to ammonia volatilization after a couple days if rainfall does not move it sufficiently into the soil or the urea was not treated with NBPT or NPPT (urease inhibitors). There are many NBPT containing products on the market. The only NPPT containing product is Limus from BASF, but availability is limited, as I understand. The important point for any NPPT containing product is to make sure that 1.8 lb a.i. NBPT is applied per ton of urea. If that is done, then the urea applied with the urease inhibitor is nearly 100% effective for about 10 days; longer if cool, a little shorter if hot. Research has indicated that simply surface tillage to cover the urea with soil, as a vertical tillage pass would do, does not make the urea safe from ammonia loss. Urea placed 2 inches or deeper in the soil is safe and needs no urease inhibitor. Shallow placement should have an inhibitor as insurance against loss.

COMMERCIAL N-FIXING BACTERIA EFFICACY REPORT

Researchers from 10 states associated with the Agricultural Experiment Station North Central regional committee on Non-conventional Additives and Amendments have published a report of over 60 studies across the region, including several in North Dakota. The report finds that the products tested had a low frequency of any benefit to crops. The report can be accessed at https://www.ndsu.edu/fileadmin/snrs/Files/SF2080_Performance_of_Selected_N-fixing_Products.pdf

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UPDATE ON HERBICIDE RESISTANT KOCHIA

Kochia continues to plague crop production across North Dakota. Over time, NDSU has confirmed herbicide resistance to 2,4-D, fluroxypyr, dicamba (corn and small grain rates), atrazine, metribuzin (on railroad tracks), Group 2 herbicides, and

glyphosate. Then 2022 happened. Images and details of kochia populations surviving field use rates of carfentrazone (Aim) and saflufenacil (Sharpen) began to emerge early last winter. Preliminary greenhouse screening suggested a strong possibility of herbicide resistance. Since then, NDSU researchers have conducted herbicide resistance screenings and bioassays for Group 14 (PPO-inhibiting) herbicides on kochia populations from several fields across the state.

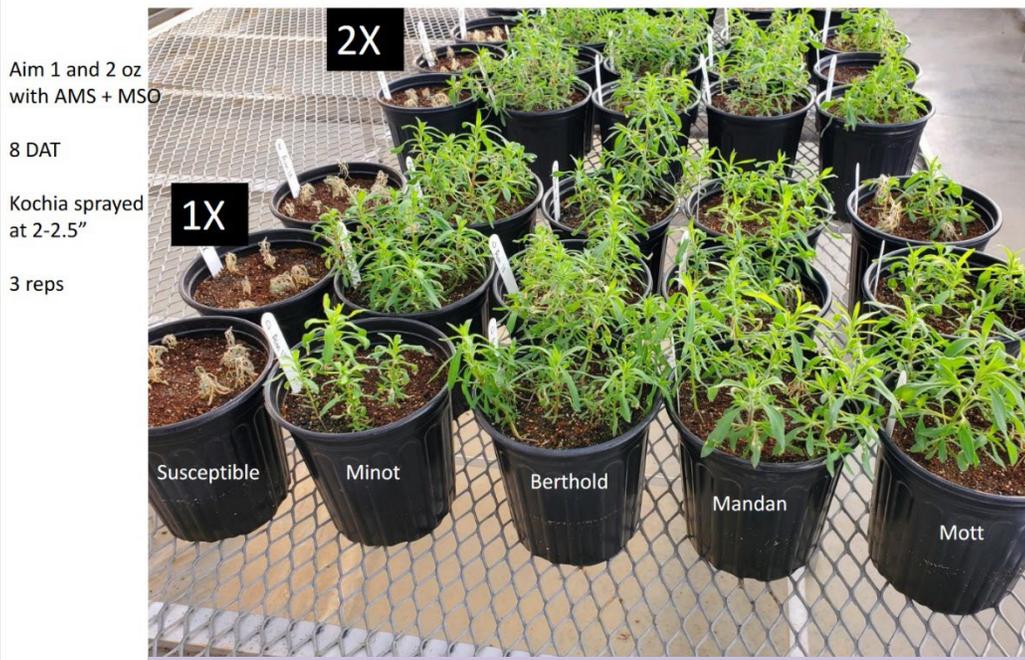


Figure 1. Kochia with 1 and 2 oz per acre of Aim (carfentrazone). Image courtesy Dr. Brian Jenks

Sharpen 1 & 2 oz with AMS + MSO
 8 DAT
 Kochia sprayed at 2-2.5"
 3 reps



Figure 2. Kochia populations treated with 1 and 2 oz per acre of Sharpen (saflufenacil). Image courtesy Dr. Brian Jenks

These initial findings led to a winter full of testing other Group 14 herbicides in greenhouses both in Fargo and in Minot. NDSU researchers tested other foliar Group 14 herbicides used in row crop production in our state. These treatments were applied to six different putative Group 14 resistant populations, and two susceptible populations when plants were 2 to 3 inches tall. We

found that all Group 14 herbicides controlled both susceptible populations. On resistant populations: carfentrazone, saflufenacil, pyraflufen (Vida), and tiafenacil (Reviton) only caused cosmetic leaf burning, and plants ultimately were not different than non-treated checks. Flumioxazin (Valor) and sulfentrazone (Spartan) applied to emerged kochia provided some suppression on resistant populations. The good news is that acifluorfen (Ultra Blazer), fomesafen (Flexstar), and lactofen (Cobra) controlled all populations tested.

Minot Susceptible



Figure 3. Susceptible kochia population treated with 9 different Group 14 herbicides (plus a non-treated check). Trade name of products is in white within each treated pot. There are four replications in the picture. Pictures taken 2 weeks after treatment. Image courtesy Dr. Brian Jenks.



Figure 4. Putative resistant kochia population treated with 9 different Group 14 herbicides (plus a non-treated check). Trade name of products is in white within each treated pot. There are four replications in the picture. Pictures taken 2 weeks after treatment. Image courtesy Dr. Brian Jenks.

The next step was to test soil applied herbicides for residual control on these kochia populations. The two Group 14 products producers rely on for residual control of kochia are flumioxazin and sulfentrazone. We tested these at 1× and 2× of typical use rates in the field (flumioxazin = 3 and 6 fl oz of Valor EZ per acre; sulfentrazone = 4 and 8 fl oz of Spartan per acre). Once again, we observed complete control on susceptible populations at both rates tested for both products. The response was more variable in the populations of concern. In general, several plants survived both rates of flumioxazin across all populations tested. The response to sulfentrazone was more variable, with some populations completely controlled, while others survived both rates tested.

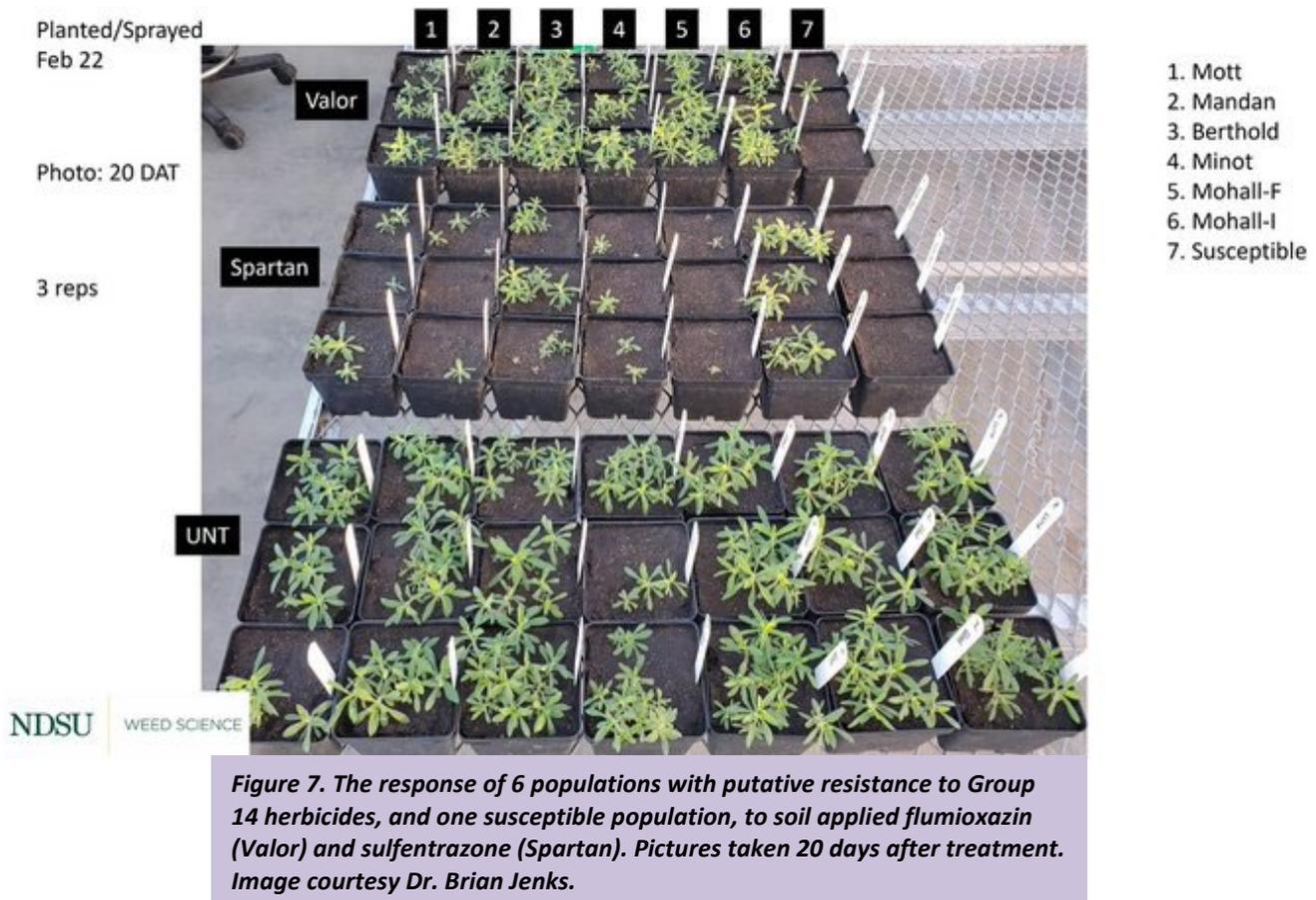
Minot
Susceptible

Figure 5. Susceptible kochia population treated with soil applied flumioxazin (Valor) and sulfentrazone (Spartan), plus a non-treated check. Trade name of products is in white within each treated pot. There are four replications in the picture. Sp4 = Spartan at 4 fl oz/A; Sp8 = Spartan at 8 fl oz/A; V3 = Valor EZ and 3 fl oz/A; V6 = Valor EZ at 6 fl oz/A. Pictures taken 3 weeks after treatment. Image courtesy Dr. Brian Jenks.

Mandan



Figure 6. Putative resistant kochia population treated with soil applied flumioxazin (Valor) and sulfentrazone (Spartan), plus a non-treated check. Trade name of products is in white within each treated pot. There are four replications in the picture. Sp4 = Spartan at 4 fl oz/A; Sp8 = Spartan at 8 fl oz/A; V3 = Valor EZ and 3 fl oz/A; V6 = Valor EZ at 6 fl oz/A. Pictures taken 3 weeks after treatment. Image courtesy Dr. Brian Jenks.



The final piece of the puzzle was to fully confirm resistance to Group 14 herbicides applied POST. In order to officially classify a population as herbicide resistant, we must conduct a dose response study that subjects a putative resistant and a known susceptible population to a wide range of herbicide rates; from sub-lethal to what should be excessively high rates. For our testing, we chose Sharpen rates ranging from 0.01 fl oz/A (1/100×) to 100 fl oz/A (100×). Plants from two resistant populations consistently survived the 10× rate, with some even surviving 100×; meanwhile plants from both susceptible populations tested were consistently controlled with 1× and even 0.1× rates. At time of article submission, we have confirmed resistance to saflufenacil (Sharpen) in two separate kochia populations. We are confident that the other putative resistant populations that were not subjected to the dose response are also resistant due to very similar phenotypic responses to saflufenacil in all other tests.

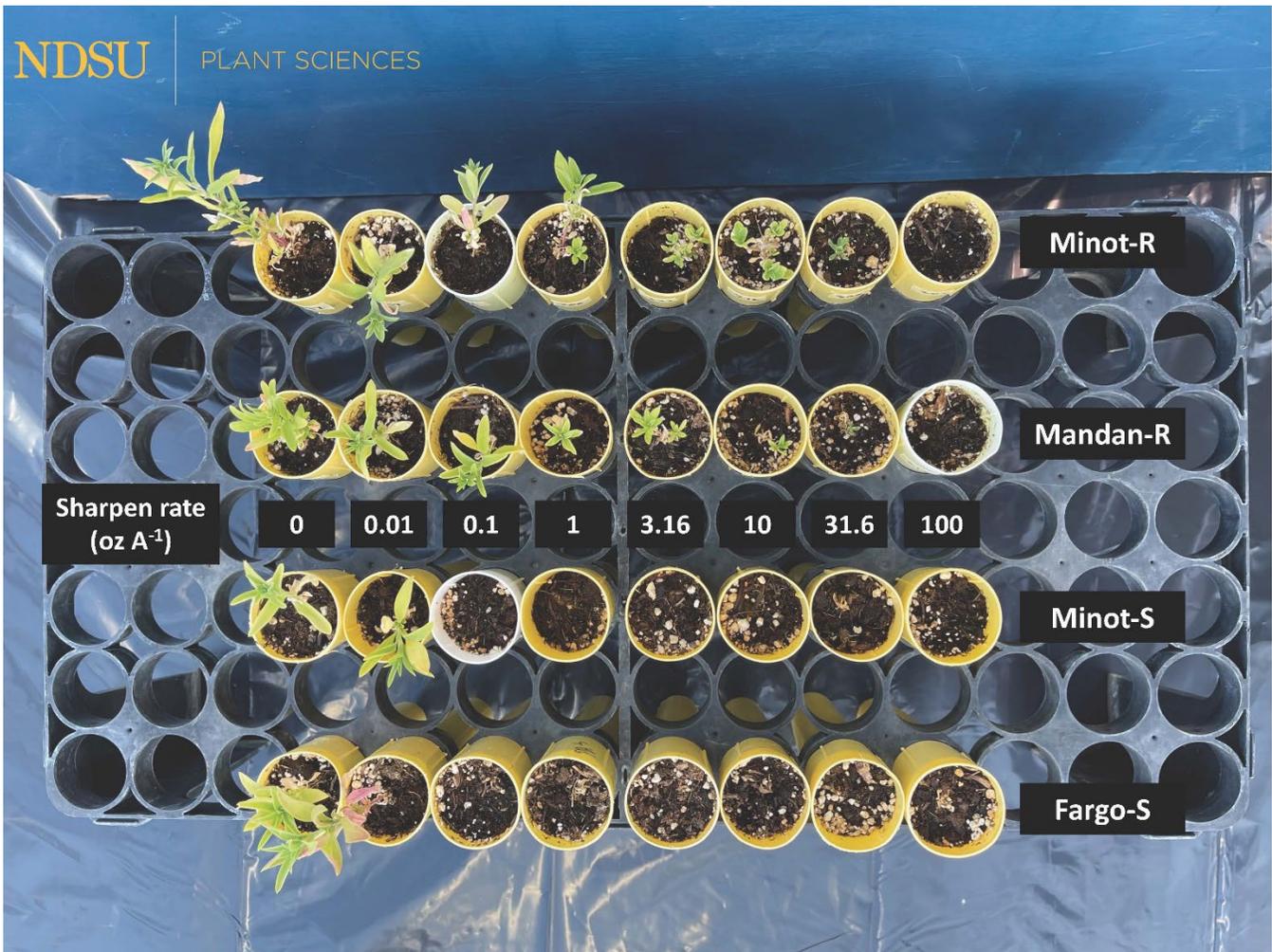


Figure 8. Dose-response for saflufenacil (Sharpen) on two Group 14 resistant and two susceptible populations. Rates of Sharpen (in ounces per acre) are in the middle. Pictures taken 28 days after treatment. Image courtesy Dr. Quincy Law.

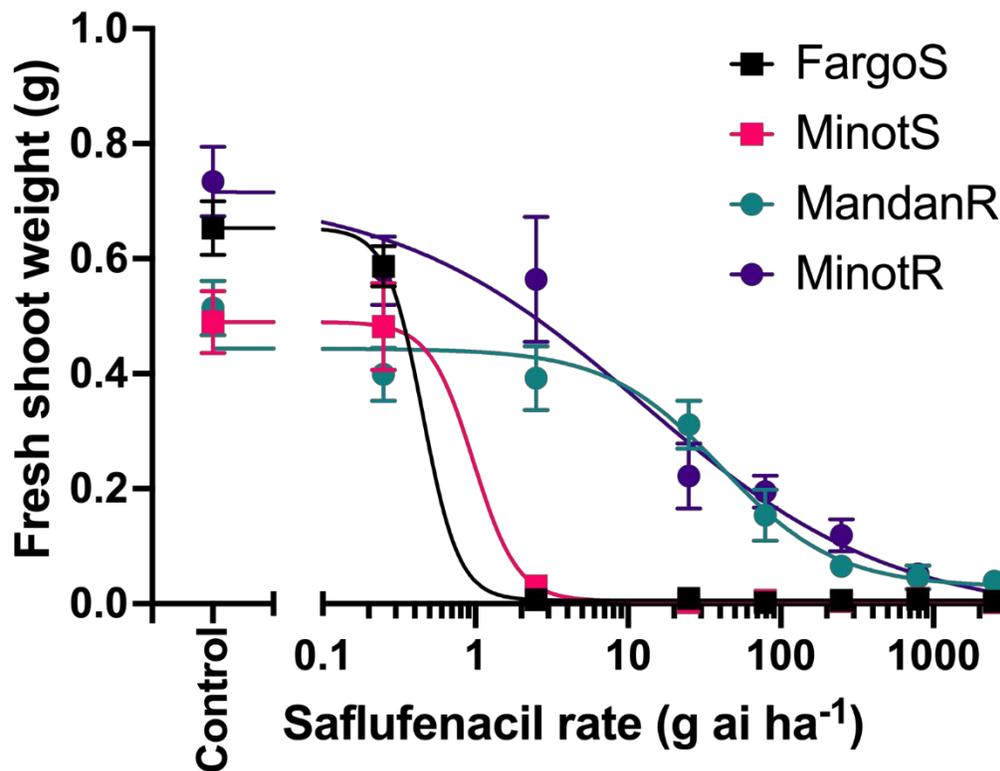


Figure 9. Fresh shoot weight 4 weeks after application for two susceptible and two resistant populations across 10 experimental blocks. Data were subject to nonlinear (sigmoidal) regression. Image courtesy Dr. Quincy Law.

To summarize, we do have several populations from across North Dakota that are resistant to saflufenacil and likely carfentrazone. These populations are controlled with diphenyl-ether herbicides (acifluorfen, fomesafen, lactofen). It is important to remember that kochia must be less than 3 inches tall to expect control with these diphenyl-ether products in the field. The Group 14 resistant populations we tested are not controlled by soil applied flumioxazin, and there are population to population differences for how these respond to sulfentrazone (some are controlled, others are not).

However, that is not the end of the herbicide resistance story in kochia. While the heavy focus this winter was on testing for Group 14 resistance; concurrently, we were also testing several populations that were reportedly surviving field use rates (0.5 lb/A) of dicamba in dicamba-resistant soybean. I'll keep this part of the article brief, since the results are less surprising. We have confirmed dicamba resistant kochia in 5 different counties this winter. A dose response was conducted to confirm resistance. Rates ranged from 0.0625 lb/A (1/8 \times) to 2 lb/A (4 \times).



Figure 10. Dose response treatments on a kochia populations that is susceptible to dicamba. Rates from left to right are dicamba at 0, 0.0625, 0.125, 0.25, 0.5, 1, 2 lbs per acre. Pictures taken 21 days after treatment. Image courtesy Dr. Joe Ikley.



Figure 11. Dose response treatments on a kochia populations that is resistant to dicamba. Rates from left to right are dicamba at 0, 0.0625, 0.125, 0.25, 0.5, 1, 2 lbs per acre. Pictures taken 21 days after treatment. Image courtesy Dr. Joe Ikley.

We also wanted to determine how well dicamba might work preemergence on these resistant populations. We conducted a small study evaluating one rate (0.5 lb/A or 1×) on the populations that showed the least amount of symptoms to postemergence dicamba. In short, dicamba provided suppression to control across the different replications. In some pots, kochia was completely controlled, while in others the plants had severe dicamba symptomatology, but were actively growing.

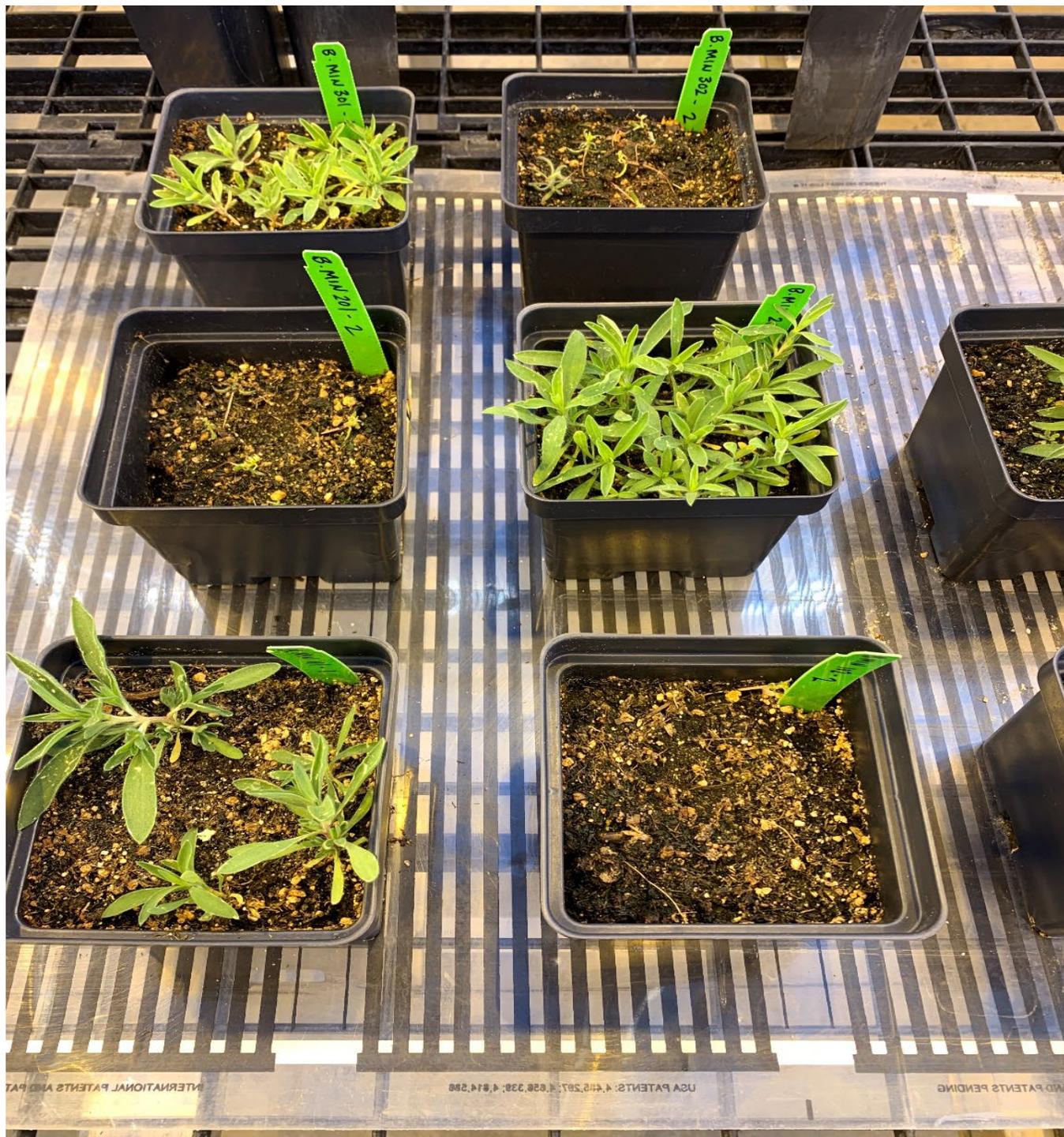


Figure 12. Dicamba (0.5 lb per acre) applied preemergence to a dicamba-resistant kochia population. Pots with largest kochia were not treated. Three replications are represented in the picture. Pictures taken 21 days after treatment. Image courtesy Dr. Joe Ikley

The populations resistant to dicamba were also subjected to postemergence herbicides from other herbicide sites of action. Unfortunately, these dicamba-resistant populations are also resistant to Group 14 herbicides (similar resistance as mentioned earlier in this article).

The Good News (yes, there is some): Since the late spring has kept us out of the field, we have tested additional herbicide sites of action on several of these populations. Preliminary data shows the following herbicides still control the populations mentioned in this article: bromoxynil (Buctril; Group 6), bentazon (Basagran; Group 6), atrazine (Group 5), metribuzin (Group 5), topramezone (Armezon; Group 27), paraquat (Group 22). It is important to note that combinations of herbicides from Group 5/6 plus either Group 22 or Group 27 will result in synergistic control on kochia.

It will be important for anyone involved with kochia control to pay attention to herbicide performance this year. The Group 14 resistance is the latest case of kochia defeating another herbicide site of action. We encourage anyone applying those products to scout within 7 days after application to determine the success of that application. Our resistance screening has served as confirmation that this resistance is in several parts of the state, but we are still not sure exactly how widespread this resistance is across the state. We will be testing additional populations next winter, so please contact us if you have populations survive Group 14 herbicides this year.

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Extension Weed Specialist

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Noxious and Invasive Weed Science

[Kirk Howatt](#)

Small Grains Research Weed Science

SPIN-AID FOR KOCHIA AND COMMON LAMBSQUARTERS CONTROL IN SUGARBEET

Belchim Ag obtained a 24(c) Special Local Needs registration for Spin-Aid use in Minnesota and North Dakota. Spin-Aid (active ingredient phenmedipham) was registered in 1970 and sold under trade name Betanal through 1981. A pre-mix of phenmedipham and desmedipham (1:1 ratio) was registered and sold as Betamix from 1982 to 2014.

Spin-Aid can be applied at use rates ranging from 12 to 48 fl oz/A, once sugarbeet reach the 2-lf stage. We are recommending Spin-Aid be tank-mixed with ethofumesate or Spin-Aid tank-mixed with ethofumesate and glyphosate at 0.98 lb a.e. per acre. A repeat application will be required for kochia control after 5-7 days or after 10 days when Spin-Aid is mixed with glyphosate. A maximum of three applications or 6 pints per acre total product is approved for use in sugarbeet. The Preharvest interval for Spin-Aid is 75 days.

Spin-Aid is a photosynthetic inhibitor that kills susceptible broadleaf weeds by stopping the production of sugars in the chloroplast, and the disruption of this process produces reactive compounds that destroy cell membranes. Herbicides in this group may be either systemic or contact herbicides.

KOCHIA CONTROL IN SUGARBEET

Sugarbeet growers rely on the crop sequence, especially wheat preceding sugarbeet, for kochia control. Unfortunately, wheat stands have not provided sufficient competition to suppress kochia the last two seasons. That means more kochia in sugarbeet.



Strip tillage in a dry bean field near Appleton, MN

Kochia control must be a planned program for control to be effective. The following five step program will reduce kochia interference with sugarbeet:

1. Use ethofumesate soil applied. Ethofumesate (Nortron, Ethotron, Nektron, Ethofumesate 4SC) applied at 6 to 7.5 pt/A either preplant or preemergence for kochia control is our only effective soil residual herbicide. The danger is PRE applied ethofumesate doesn't get activated before kochia germination and emergence.
2. Scout sugarbeet fields for kochia and apply paraquat before sugarbeet emergence.
 - a. Paraquat alone or in tank mixtures can either be ground or aerially applied.
 - b. Use spray nozzles that create medium to coarse droplets.
 - c. Use a minimum of 10 gal/A carrier volume by ground or 5 gal/A for aerial application.
 - d. Use an adjuvant, non-ionic surfactant (preferred) at 0.25% v/v (2 pt/100 gal). Crop oil concentrate or methylated seed oil at 1.0% v/v (1 gal/100 gal).
 - e. Use rate depending on vegetation; for example, Gramoxone SL 3.0 at 1.3 to 2 pt/A (max rate is 2.7 pt/A).
 - f. 24 hr re-entry.
3. Spray glyphosate resistant kochia escapes when they are less than 2-inch tall.
 - a. Consider mixing Spin-Aid and ethofumesate with glyphosate for control of dime-sized kochia.
 - b. Make a repeat Spin-Aid with ethofumesate application after 5 to 7 days or after 10 days when Spin-Aid is mixed with ethofumesate and glyphosate.
4. Spray glyphosate sensitive kochia before it is 2-inches tall. Control of glyphosate sensitive kochia diminishes as kochia size increases. Kochia size is especially important in strip tillage fields where kochia size might be different within the row as compared to between the rows.

5. Plant either Xtend or XtendFlex or Enlist, LibertyLink or LLGT27 soybean in the crop sequence with wheat and sugarbeet.
 - a. Apply Fierce MTZ (18 months crop rotation restriction), Authority MTZ (24 months crop rotation restriction) or Authority Edge (36 months crop rotation restriction) followed by a dicamba product or Liberty.



Kochia must be less than 2-inch tall for reliable control in sugarbeet

PREEMERGENCE HERBICIDES ARE CRITICAL TO STOP WATERHEMP EMERGING WITH SUGARBEET

Sugarbeet growers in Minnesota and North Dakota made excellent progress, planting an estimated 225,000 acres of sugarbeet the week of April 30, 2023.

Approximately seven in ten sugarbeet growers identify waterhemp as their most important weed control challenge in sugarbeet. My rule of thumb is the earliest waterhemp will emerge by May 5th and waterhemp will be emerging in general by May 15th. That means waterhemp will be emerging the same time as sugarbeet in 2023.

In 2023, like 2022, it is absolutely paramount that producers use a soil residual herbicide at sugarbeet planting. We have three choices, ethofumesate, Dual Magnum using a 24(c) special local needs label in Minnesota and North Dakota, and Ro-Neet SB.



Waterhemp emergence, May 2, 2020, Mapleton, ND. Greg Krause, Minn-Dak

Ethofumesate is applied at rates ranging from 2 to 7.5 pt/A either preplant incorporated or preemergence. I recommend preemergence application for rates less than 3 or 4 pints since we don't want to dilute the product with tillage. Dual Magnum applied preemergence alone or mixed with ethofumesate should always be applied preemergence. We recommend Dual Magnum at 8 to 16 fl oz/A alone or Dual Magnum at 8 to 12 fl oz/A when mixed with ethofumesate.

Ro-Neet is making a return to sugarbeet acreage in 2023. Ro-Neet SB rate is dependent on soil type and must be incorporated after application.

Why the urgency with herbicide application? Sugarbeet must be at the 2-If stage before we can use either S-metolachlor products, Outlook or Warrant, in sugarbeet. Waterhemp emerging between planting and 2-If sugarbeet are often difficult to control since our fields are a mixture of glyphosate sensitive and resistant biotypes.

Do not exceed 2 pints per acre ethofumesate if you are planting a nurse crop with sugarbeet. Consider applying ethofumesate with Dual Magnum at 2 pt + 0.5-0.75 pt/A instead of a higher rate of ethofumesate.

[Tom Peters](#)
Extension Sugarbeet Agronomist
NDSU & U of MN



AROUND THE STATE

NORTH CENTRAL ND

The 2023 growing season is at a low pace in the North Central region. A cooler March and blizzard in April impacted farmers' ability to enter the fields. Very few farmers were able to plant recently. Some minimal tillage is observed in the region. The following are precipitation observations across the area as noted by local NDAWN stations (Since May 1st): Bottineau: 0.01"; Garrison: 0.17"; Karlsruhe: 0.48"; Minot: 0.13"; Mohall: 0.01"; Plaza: 0.14"; and Rugby: 0.24". The forecast is showing rain for the week of 9-12 of May, which may cause more delays in the planting dates. On the other hand, air temperatures are forecasted to be in the seventies for the week, which will help the soil to dry out.

The planting date for small grains will be pushed further into the optimal planting date for the North Central region, so producers will need to adjust the seed rate accordingly. Weeds are growing in the region and there are some weed control activities in the field.

[Leo Bortolon](#)

Extension Cropping Systems Specialist
NDSU North Central Research Extension Center

NORTHEAST ND

Fields in the northeast region are mostly wet and cold with snow around the shelter belts. Soil temperatures in the region ranged between 44-50°F and soil moistures around 32% in the top 4 inches of soil. Small grains and sugarbeet plantings are happening in the Grand Forks County. Farmers are anxiously waiting to get into their fields.

[Anitha Chirumamilla](#)

Extension Cropping Systems Specialist
Langdon Research Extension Center

SOUTH CENTRAL/EAST ND

The geographic area covered by this report includes a northern border of Sheridan County and east to Steele County, southward to Sargent County and west to Emmons County. Reports will include information obtained from the region's county Extension agents.

Some initial planting of small grain and corn began before the past weekend rain, primarily in southern and southwest counties of the region. At the Carrington REC, planting of small grain and pulse crop research trials began on May 4. According to NDAWN, rain received during May 6-8 ranges from 0.4 inches at Linton to 2.6 inches at the Carrington REC, with most of the region receiving 1-2 inches. Snowbanks can still be found in the area!

Besides kochia, common lambsquarters and volunteer grain (see picture of spring wheat), perennial and ND noxious weeds have begun growth including quackgrass, absinth wormwood, field bindweed, knapweed species and houndstongue (see second picture).

While we impatiently wait for weather and soil conditions to allow cool-season crop planting, NDSU Extension has resources available for review on crop plant establishment and nutrition, and early season plant protection. Videos



and reference lists are available from this winter's Getting-it-Right canola, corn, dry bean, soybean and sunflower production virtual meetings:

<https://www.ndsu.edu/agriculture/ag-hub/getting-it-right>.



[Greg Endres](#)

Extension Cropping Systems Specialist
Carrington Research Extension Center



WEATHER FORECAST

Weather Summary, and Outlook for May 11 through May 17

Field preparation and planting are beginning. However, recent rainfall has probably halted field work, at least in the eastern half of North Dakota. Figure 1 shows the total rainfall over the past 7 days, most of which fell from May 6 through May 7 as a slow-moving system crossed North Dakota from the southwest. Showers and thunderstorms developed in south central ND ahead of a warm front on the evening of May 9 and tracked eastwards over southeastern ND into west central MN through the overnight hours, dumping from 1 inch to over 2.5 inches of rain along the storm tracks. A severe thunderstorm about 15 miles south of Beulah in Mercer County, ND, dropped up to golf ball sized hail in addition to heavy rain. Hail also was reported from Morton, Burleigh and Kidder Counties.

Total Rainfall Past 7 Days (in)

Wed May 10 2023 08:21 AM

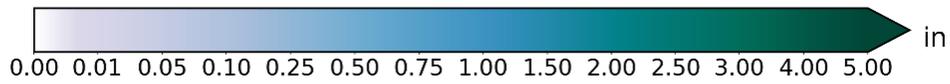
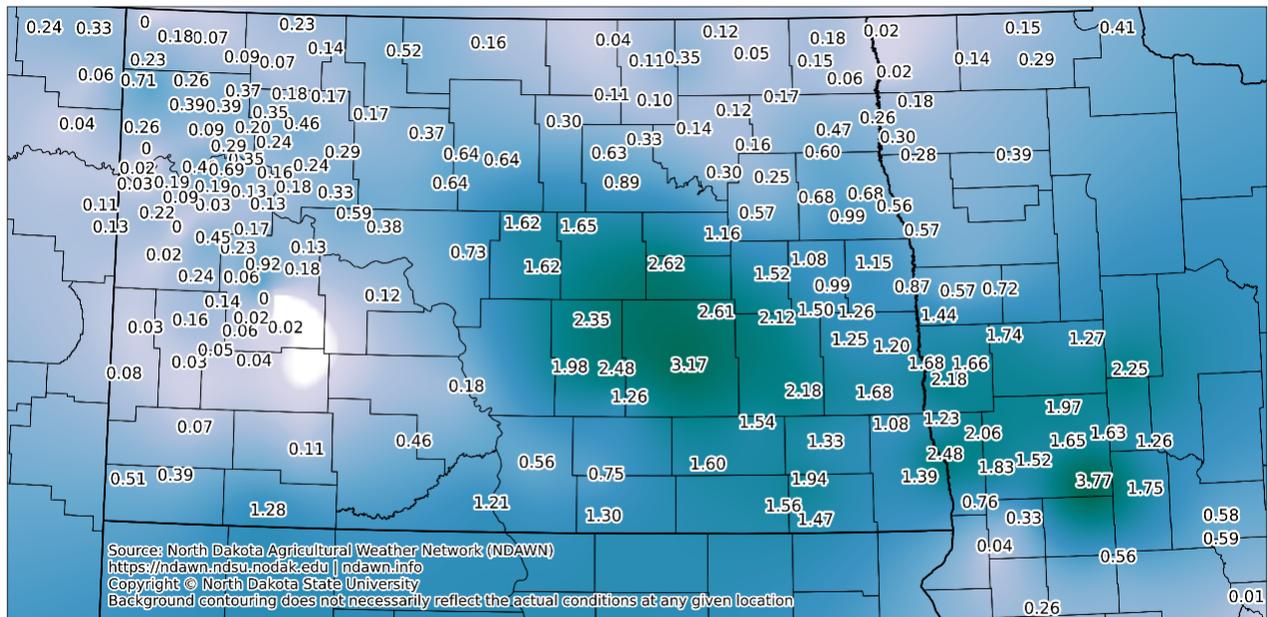


Figure 1. Total rainfall for the past 7 days ending 8:21 a.m. CDT on Wednesday May 10, 2023 at NDAWN stations.

Soil temperatures at the 4-inch depth (Figure 2) have warmed to near or above 50°F across the state, except in the northeast where the snowpack lingered longest. Soil moisture at the 4-inch depth is optimum to excessive across most of the state (Figure 3), and rain is in the forecast statewide through Saturday.

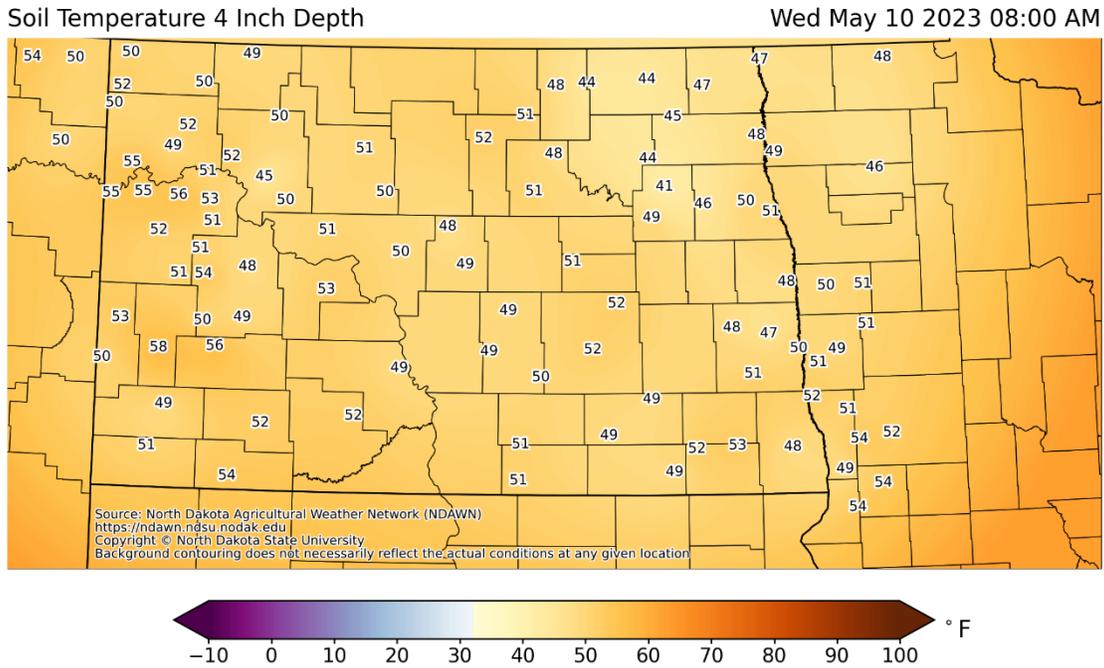


Figure 2. Soil temperature at 4-inch depth at 8:00 a.m. CDT on Wednesday May 10, 2023 at NDAWN stations.

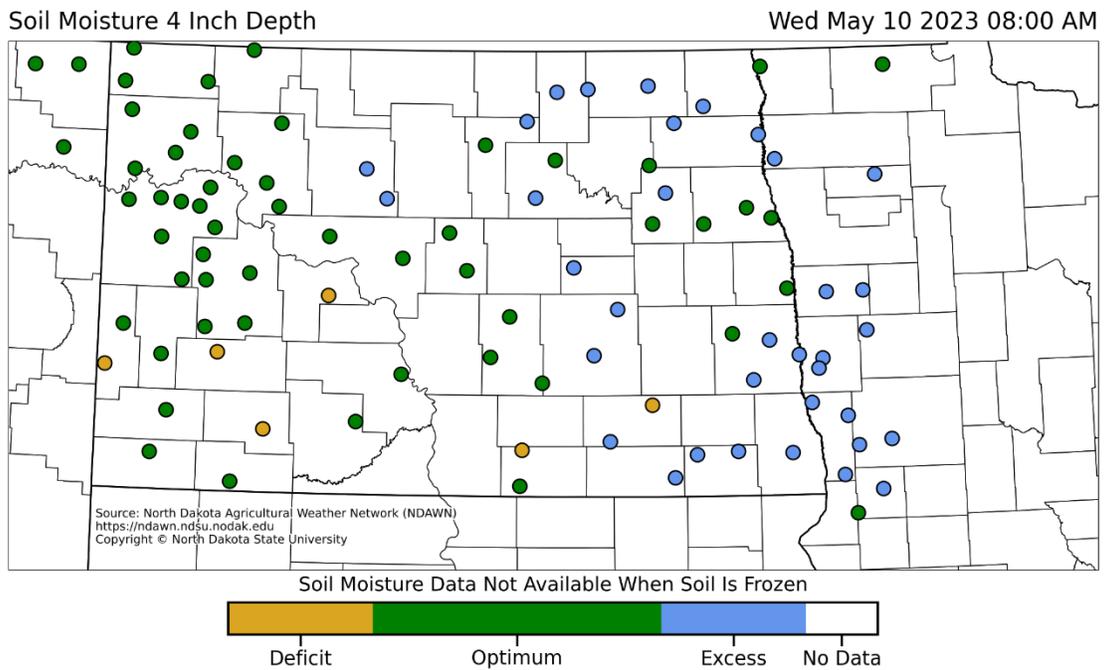


Figure 3. Soil moisture at 4-inch depth at 8:00 a.m. CDT on Wednesday May 10, 2023 at NDAWN stations.

Average air temperatures for May have been near normal for most of North Dakota, with the southwest and northwest experiencing above normal temperatures through May 9 (Figure 4).

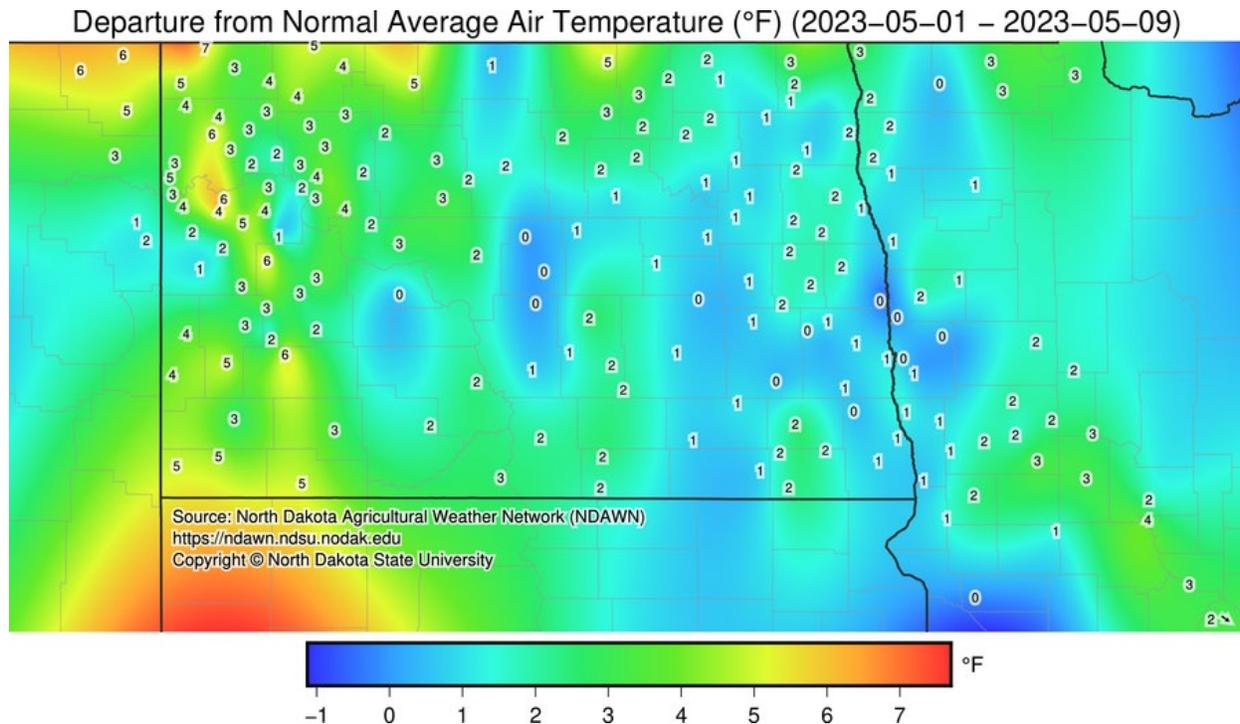


Figure 4. Air temperature departure from normal for the period May 1 through May 9, 2023 at NDAWN stations.

The graphics in Figures 1-3 were generated at the [NDAWN.info](https://ndawn.info) website. This is a mobile-friendly website that contains much of the information on the main [NDAWN](https://ndawn.ndsu.nodak.edu) website, plus some quickly accessible, useful maps and tools. The website is really intuitive, and I encourage you to get in and start exploring if you haven't already. One of the useful tools found at [NDAWN.info](https://ndawn.info) is the Growing Degree Days (GDD) forecast tool, which features 7-day forecast maps for GDD at base 32°F and 50°F (Figures 5 and 6). GDD graphics specifically for corn, soybean, sugarbeet, canola and sunflower can also be found at [NDAWN.info](https://ndawn.info), and you can quickly view GDD graphics for any of these crops for the past day, 2 days, 7 days, since April 20 for wheat, sugarbeet and canola, and since May 1 for all listed crops. For the most accurate GDD accumulations for your crops, use the main [NDAWN](https://ndawn.ndsu.nodak.edu) website. Go to 'Applications', select your crop GDD model, select the nearest NDAWN station from the station list, select any departures from normal, 5-year average, or compare with a previous year, enter your planting date, and select 'Get Table'. The resulting table will give you daily GDD and accumulated DD, plus any departures and previous year comparisons you selected. I'll revisit GDD as the growing season progresses.

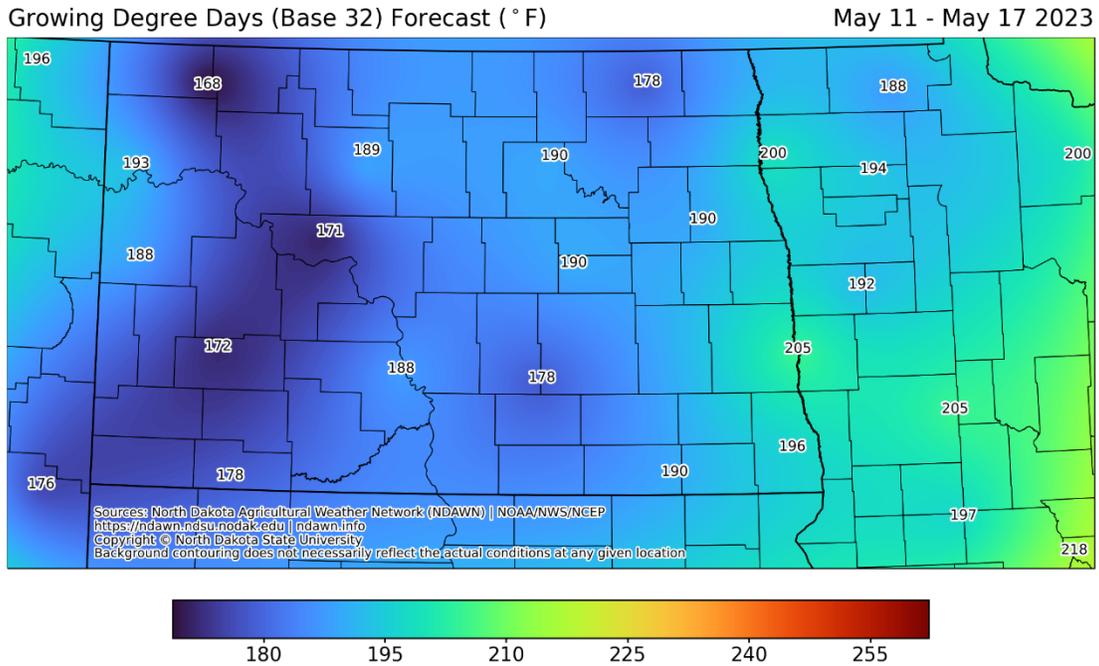


Figure 5. Growing degree day forecast (base 32°F) for May 11 through May 17, 2023.

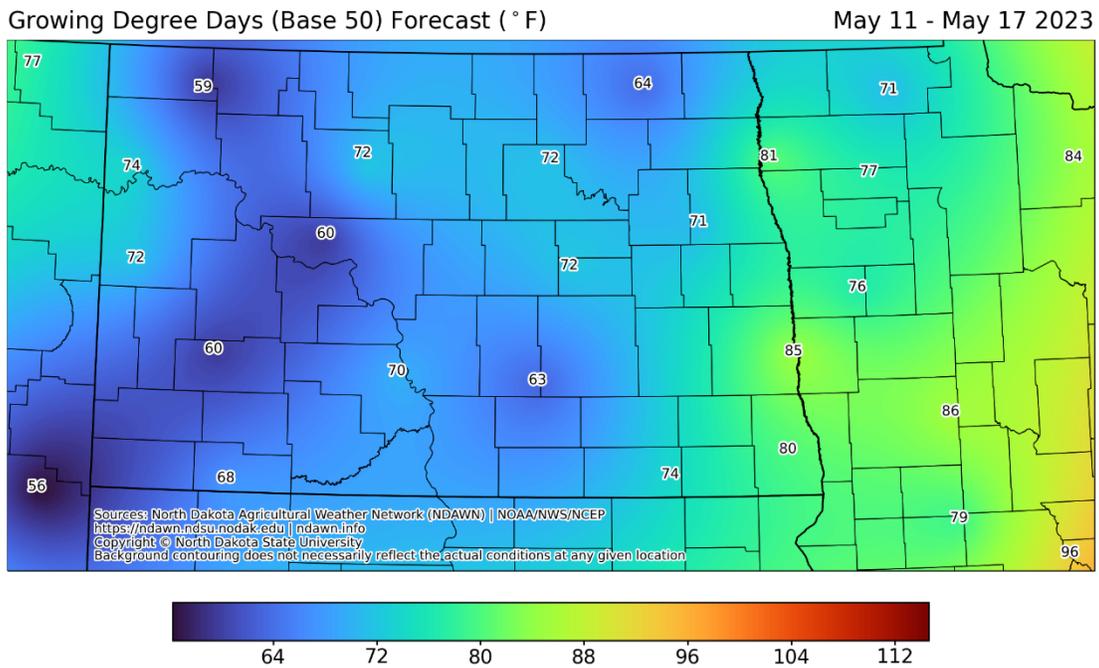


Figure 6. Growing degree day forecast (base 50°F) for May 11 through May 17, 2023.

Outlook for The Week Ahead

An unsettled weather pattern will remain in place through Saturday evening. A complex, slow-moving low-pressure system is expected to move out of the Rocky Mountains into the central and northern Great Plains on Thursday and slowly move across the Great Plains through Saturday. An ample supply of low-level moisture streaming northwards from the Gulf of Mexico will result in widespread rain across the central and northern Great Plains, especially Thursday and Friday. Rainfall amounts through Saturday of well over 1 inch are possible across most of ND, especially in western and central ND where even higher amounts may occur (Figure 7).

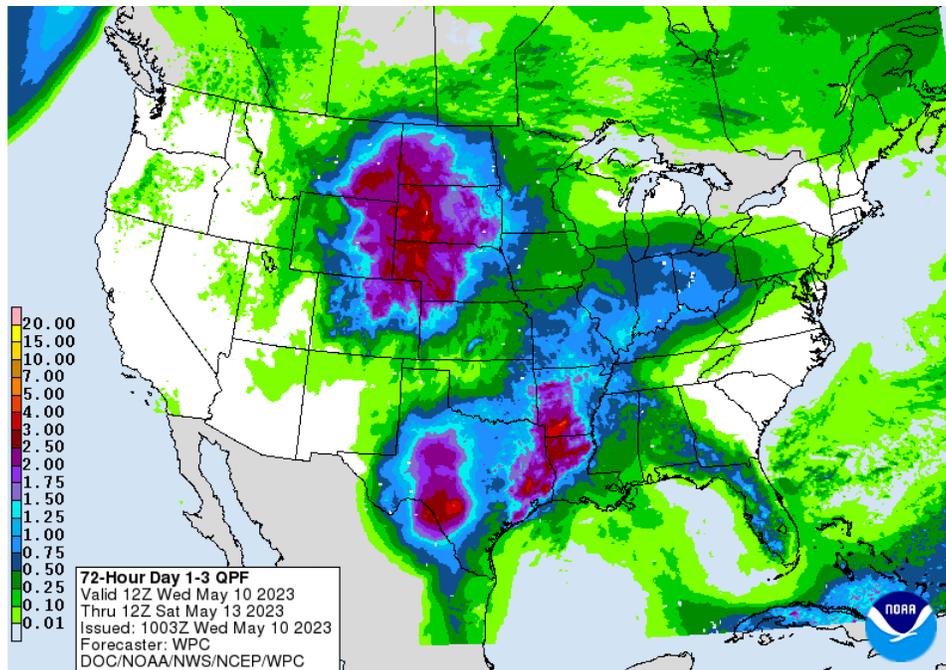


Figure 7. Precipitation potential for the continental United States from 7:00 a.m. CDT May 10 through 7:00 a.m. CDT May 13.

Lesser amounts are likely in northeastern ND and western MN. There is a marginal risk Thursday for severe thunderstorms in southern ND south of I-94, and heavier rainfall can be expected in thunderstorms. Temperatures will be seasonable through Saturday, and no freezing temperatures are expected. Once the system moves out on Sunday, a ridge of high pressure is expected to move in and bring warm, dry conditions through at least mid-week.

Lastly, I want to give a huge thank you to Daryl Ritchison, NDAWN Director, for his helpful guidance as I fill in for the Weather Column in this year's *Crop & Pest Report*. The tireless efforts of Daryl and his staff in making NDAWN a valuable asset for our region's agriculture and livelihood are much appreciated!

[Patrick Beauzay](#)

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