North Dakota State University
CROP & PEST REPORT
NDSU EXTENSION

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entomology

CEREAL APHIDS IN WHEAT AND BARLEY

Low levels of cereal aphids (1 to 12% of stems infested) were found by the IPM scouts in 8% of the wheat fields scouted south of Hwy 2 in eastern ND. IPM scouts for MN found cereal aphids in a third of the fields scouted. Aphids were found south of Hwy 200 to southern Minnesota. Incidence of aphids were higher in southern Minnesota, with some fields near or above the economic threshold of 85% of the stems infested (Source: Dr. Jochum Wiersma, UMN Extension small grains agronomy specialist).

Only one reports of cereal aphids in barley in ND, Trail County. Minnesota had four barley fields with cereal aphids and a higher percentage of infested stems (50-72%).

Scouting for cereal aphids is easy and should begin at stem elongation. Look on the undersides of leaves and near the base of the plant for the tiny ⅛-inch long, greenish and pear-shaped aphids. IPM scouts observed both winged and wingless aphids as well as a mother aphid with young. The most common species observed last week was the English grain aphids in ND wheat fields, but an IPM scout found bird cherry oat aphids in one wheat field of Minnesota (Source: Dr. Jochum Wiersma, UMN Extension). Bird cherry oat aphid is known for being the most effective vector of BYDV. Barley yellow dwarf can stunt plants and reduce yield. Symptoms of BYDV is a yellowing to reddish color near tips of leaves, often the flag leaf.

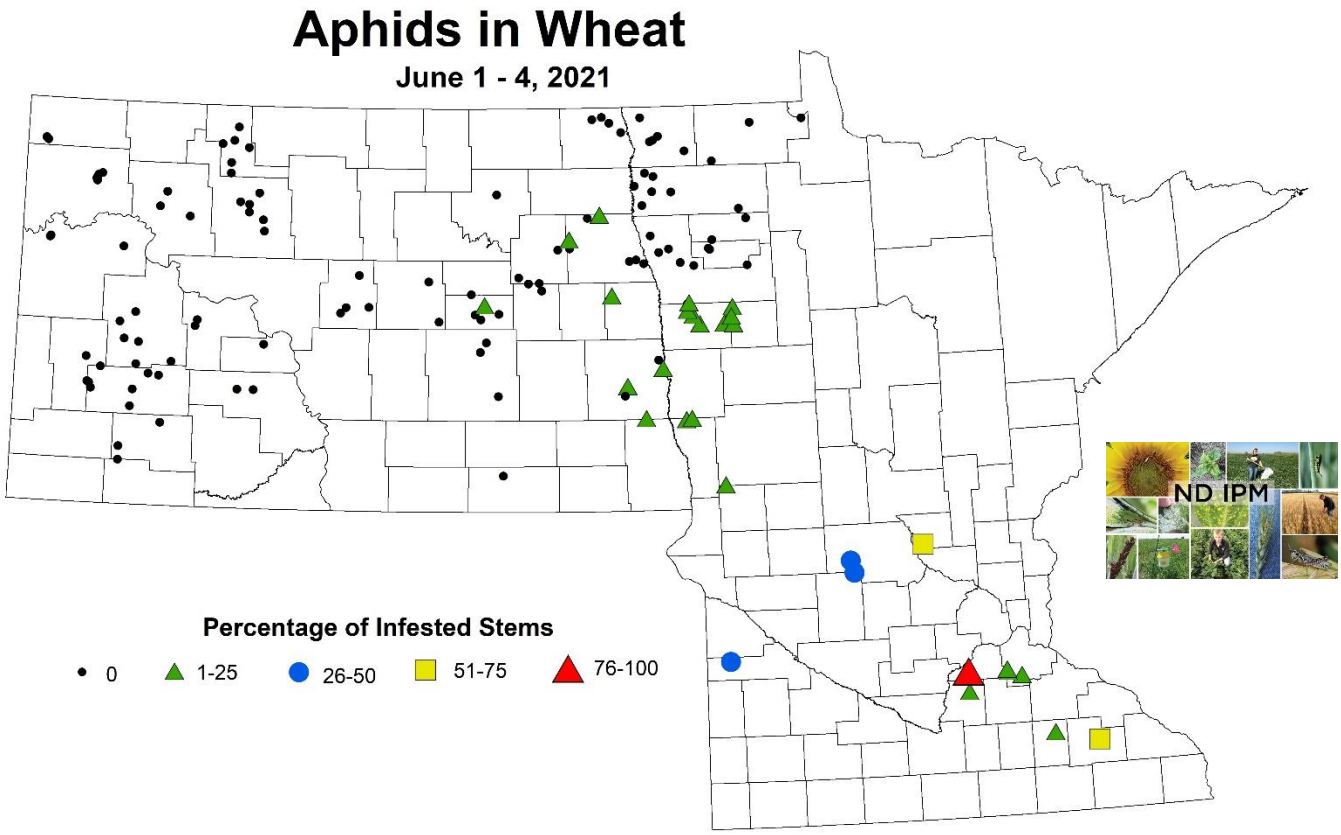
Barley yellow dwarf virus

When temperatures are in the low to mid-80s F, conditions are favorable for fast aphid reproduction in <7 days. Drought stress also can increase the susceptibility of wheat or barley crop to feeding injury by cereal aphids.

Continue scouting for cereal aphids for the next month in wheat (spring, durum and winter), oat and barley, or until the crop gets past the end of heading stage.

For a scouting protocol, walk a Z or W pattern across the field and inspect 10 randomly selected stems at 5 sites for cereal aphids. Calculate the percent of infested plants (incidence) with one or more aphids. The **economic threshold is 85% of the plants infested and prior to the completion of heading**. Heavy infestations of cereal aphids can reduce grain quality (protein and test weight). No insecticides are necessary after the onset of flowering, since the negative impacts of cereal aphid feeding are reduced (no yield loss).

Left to right: Greenbugs, bird cherry oat aphids (both photos by James Kalisch, UNE) and English grain aphid (Patrick Beauzay, NDSU)



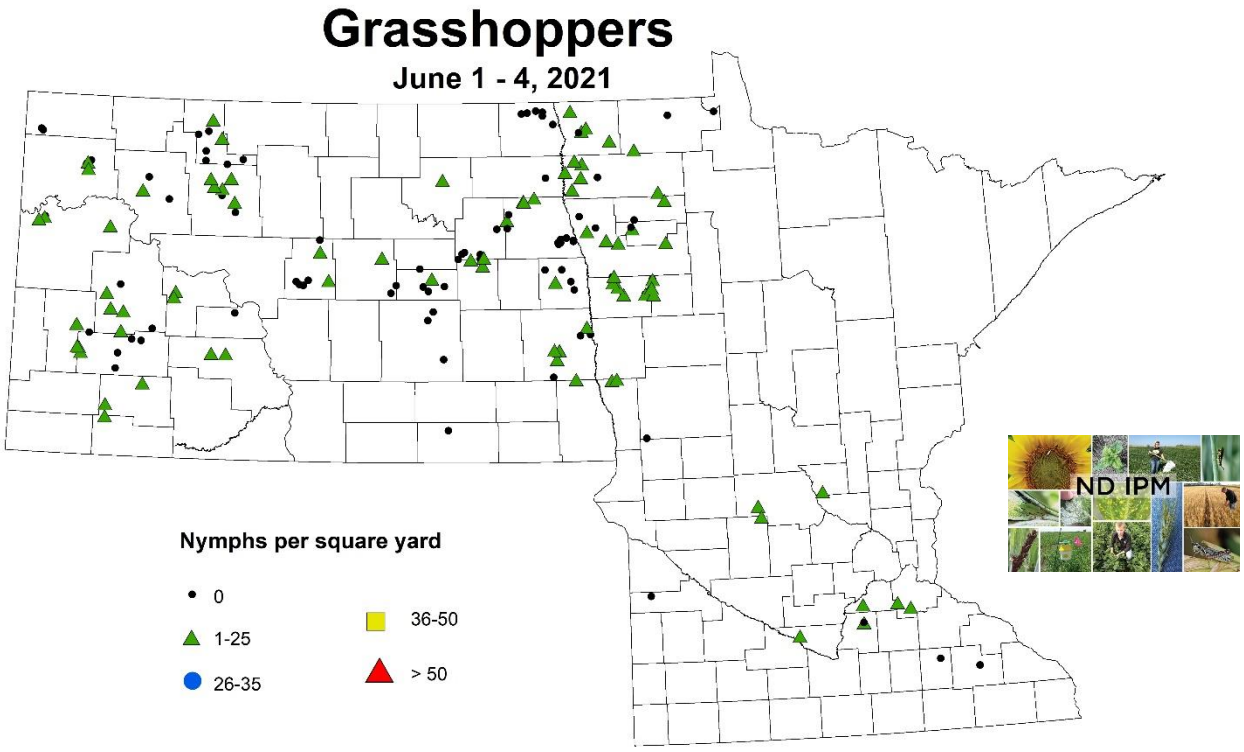
GRASSHOPPER UPDATE

IPM Scouts of ND and Minnesota found grasshopper nymphs in about half of the barley, wheat and soybean fields scouted last week. Populations are still below the economic threshold of *50-75 nymphs per square yards in field margins or 30-45 nymphs per square yard inside field*.

Continue to scout for nymphs to see if they will start to move into field edges and if populations will increase due to the favorable hot, dry weather. However, if the drought continues to be 'extreme,' it can have negative effects on grasshoppers as well as the crops:

- Poor egg hatch
- Grasshoppers can starve from lack of food
- Low egg production by female adults in fall

For more information, see the past article on grasshopper scouting in the Crop & Pest Report #4, May 20, 2021.



Janet J. Knodel
Extension Entomologist

plant science

PLANT STRESS 2021

The term "plant stress" is used when conditions interfere with normal plant growth. Some of the recent stress factors have been a frost event at the end of May, continued dry conditions throughout the state, and extreme heat for the time of the year. Drought causes a water deficit therefore plants do not develop at normal rates. Water deficit affects the translocation of water in the plant, reduces leaf expansion, lowers the gas exchange in the leaf, reduces photosynthesis, and consequently leads to reduced yield potential. Plant growth depends on the photosynthetic rate per leaf and total leaf area. In water deficit conditions, plant photosynthetic activity is reduced due to the decreased carbon fixation rate since hot temperatures often induce stomatal closure.

During hot conditions, plant leaves are rapidly losing water, and the plant may not be able to supply the demand for water quick enough. Plants try to minimize water loss by closing leaf stomata and sometimes curling the leaves. Water stress can also reduce N_2 fixation in legume crops. The reduced N_2 fixation activity is partially due to fewer photosynthates available for translocation to the nodules and water deficiency in the nodules.

Unfortunately, there are no quick options to alleviate drought and or water stress conditions without irrigation.

Soybean plants recovering from frost damage on May 28, Photo taken June 7, 2021.

Soybean plants under drought stress. Leaves are curled to reduce water loss.

Hans Kandel
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plant pathology

ABIOTIC (NON-INFECTIOUS) SYMPTOMS IN WHEAT

The extreme differences in temperature, low relative humidity, and water stress has led to unusual leaf spots on wheat. This year several reports of wheat with bizarre and unusual leaf lesions have been received and can be misdiagnosed as a disease. This report will review some of the key diagnostic features of abiotic (non-infectious) disorders.

Color banding

The extreme differences in nighttime and daytime temperatures has led to several reports of color banding in wheat. Symptoms of color banding include yellowing and/or purpling of leaves that have recently emerged (Figure 1). These first leaves are sensitive to soil temperature and injury can commonly occur. We usually observe this abiotic disorder early in the growing season during frost events. This year we have observed color banding on late emerging wheat that has been exposed to temperature extremes. Heat canker (leaf tissue death) is another abiotic disorder that is commonly observed on wheat emerging during hot days. Regardless, wheat will recover from this injury and it should not impact crop development.

Figure 1. Photo on the left shows characteristic color banding (yellowing and purpling) on leaf tissue (Credit: Friskop). Photo on the right shows yellow color banding and heat canker (Credit: Mark Huso, HusoCrop Consulting).

Brown Irregular Spots

Brown to chocolate colored lesions have been reported from several fields (Figure 2). The brown spots have been observed on the natural fold of the leaf or confined to certain leaves. These lesions can be confused with fungal leaf spots due to the color and appearance on a leaf. Fungal leaf spot lesions (ie: tan spot or Septoria) will often have a definitive margin, have an ellipsoid shape, will not be confined to a certain leaf, and will be found in fields near wheat residue experiencing several days of prolonged leaf wetness. The brown abiotic lesions are likely a physiological response to the environment and will not affect crop development.

Figure 2. Brown irregular shaped lesions have been commonly reported this year and likely a physiological response to the environment (Photo credit: Tommy Crompton, NDSU IPM Scout).

Bleached spots

Crop injury from a chemical application has also been observed this year. Chemical injury can occur if pesticides are applied during hot days or can result from an off-target application (Figure 3). Lesions caused by chemicals may be irregular, necrotic, have a bleached center (Figure 3) or may have a distinct "halo" surrounding the lesion. Necrotic lesions can sometimes be caused by oil adjuvants or oil-based herbicide formulations, but the injury is usually associated with a contact herbicide. Lesions with a distinct halo and bleached center are typical of paraquat and group 14 herbicides. Chemical injury will often follow a field spray pattern (ie: field wide or boom width) and be found on plant tissue available at the time of application. Finally, chemical injury will suddenly appear after an application has been made.

Figure 3. Irregular, bleached colored lesions due to a contact herbicide on wheat (Photo credit: Angie Johnson, Steele Co. Extension Agent).

Andrew Friskop
Extension Plant Pathology, Cereal Crops

Joe Ikley
Extension Weed Specialist

soils

POOR CORN GERMINATION AND ROOT DEVELOPMENT

The drought conditions have resulted in many fields experiencing poor corn germination, root development and early growth. There is some concern whether a primary reason for these symptoms is seed-placed starter fertilizer, or fertilizer rate in general. The primary reason for the symptoms is the drought, and any other factor that increased the severity of the condition cascaded from the dry soil. If seed-placed starter fertilizer rate was about 3 gallon or 10-34-0 or any other P-based starter, then the risk to the corn was minimal. As rate increased above this, the higher rate may have increased the severity, but without a check area with no fertilizer, it is impossible to confirm this. In my experience in the 1988 drought in central Illinois (experienced by North Dakota farmers also), a 6 gallon per acre 10-34-0 rate used by a farmer who had used the rate for years successfully resulted in stand loss, whereas farmers using a 3 gallon per acre rate experienced no reduction in stand. However, due to the drought, it's effect on yield was negligible because the yield was so reduced by the continuous 100-degree weather during pollination and continued drought that corn yields with or without stand loss were similarly poor.

The poor root growth and the 'burned off' appearance of roots that have emerged in dry soil is due to both the heat of the soil and particularly the extreme soil dryness. Roots will not grow into dry soil. A common thought is that 'roots grow to moisture', but this is untrue. Roots grow through moisture to get to more moisture, but any very dry layer of soil in between the root and deeper soil moisture restricts the root growth to the dry layer. Another factor to consider is the soil salt (EC value). Corn is susceptible to higher soil salts, and an EC greater than 2 would cause germination problems, early growth reduction and seedling death. An EC analysis of the soil from the surface to the depth of the roots would be very useful in finding the secondary cause of the poor corn growth/germination issue.

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HOW HEAT AND WATER STRESS EFFECTS WHEAT PLANTS IN VEGETATIVE STAGES

The first half of June is normally a cool, wet period in North Dakota, perfect for the development of tillers and adventitious (crown) roots in spring wheat. Sadly, this is not the case in 2021. What are the effects of heat and water stress in spring wheat during vegetative stages of growth?

A spring wheat plant consists of a main stem (what pushes out of the ground), and a variable number of tillers. The two most important tillers with regards to yield are the T1 tiller and the T2 tiller, which come from the base of the first and second leaves on the main stem (see Figure 1). The T1 tiller is initiated, or not, at the 2.5 leaf stage of the main stem, and the T2 tiller is initiated, or not, at the 3.5 leaf stage of the main stem. Normally, the lack of initiation of T1 or T2 tillers is related to a lack of nitrogen or phosphorus. It is rare, based on my 40 years of observation, for heat and water stress to interfere with T1 and T2 tiller initiation, although I did observe it in 1988.

Not obvious to the naked eye, however, are the "decisions" that the spring wheat plant makes between the 4 and 6 leaf stages of the main stem. The growing point of a wheat stem can produce leaves or spikelets. The number of leaves, and the number of spikelets on each stem, are affected by environment, and are "decided" between, roughly, the 4 and 6 leaf stage of the main stem. Heat and water stress between the 4-6 leaf stages of the main stem can cause the plants to go into what I call a "7-leaf habit," and the number of spikelets on the main stem will be reduced. Normally, most hard red spring wheat varieties produce 8 leaves on the main stem. That is, the flag leaf on the main stem is the 8th leaf on the main stem. However, heat and water stress can "rush" this process, and 7-leaf plants will occur.

7-leaf plants are invariably less productive than 8-leaf plants, because the same heat and water stress will also cause the plants to have fewer spikelets. In short, the heat and water stress we are now experiencing can cause spring wheat plants to have a 7-leaf habit. Also, head size will be reduced with either a 7 or 8-leaf habit. So, even if rainfall is plentiful the rest of the growing season, this current heat spell will reduce yield of plants currently in the 4-6 leaf stage of the main stem.

Some of the earlier-seeded spring wheat is past the 6-leaf stage, and will not be as affected with regards to head size and leaf number. However, if the drought continues, the plants will continue to adjust to the poor growing conditions, by shedding, or aborting, tillers. Eventually, if the drought is prolonged and severe enough, only main stems will remain, and the yield will be very low, as shown below (Figure 2).

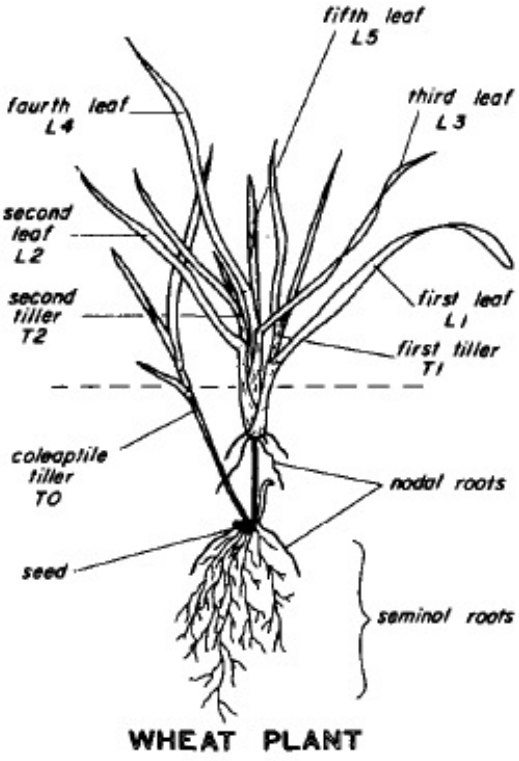

Figure 1. A wheat plant at the 4.5 leaf stage of the main stem (Klepper, et al. 1982).

Figure 2. Severe water stress in spring wheat in western ND. The tillers have essentially all aborted, leaving only main stems.

R. Jay Goos
Soil Science Professor

POSTEMERGENCE HERBICIDE APPLICATIONS IN HOT, DROUGHTY CONDITIONS

Some areas have received rainfall this week and that's a brief relief from the above 90° temperatures, but the weather forecasts still predict some hot and dry weather as we enter peak postemergence spray season. There are several things one needs to consider when making postemergence applications in these conditions.

Weeds

Depending on local rainfall patterns (or the lack of rainfall) or supplemental irrigation, weed height may be highly variable across North Dakota and Minnesota fields. For example, there are already reports of larger kochia, waterhemp, and lambsquarters in many fields. Also crops planted in minimal tillage situations may have allowed weeds a head start in germination and emergence, especially in fields where no burndown application was applied. Thus, strict adherence to labeled weed sizes on many postemergence herbicides is strongly encouraged.

Weeds will also be tougher to control if they are not actively growing due to drought stress. Herbicide performance is optimized when weeds are actively growing. Weeds that have endured hot, droughty conditions may have already developed a thicker cuticle than normal in an attempt to slow their rate of transpiration or water loss. Even after a field receives rainfall the weed's cuticle will not "shrink" back down immediately. This means any herbicide-containing droplet will have a tougher pathway to enter the plant. The use of oil adjuvants, and specifically MSO along with nitrogen fertilizers (AMS or UAN), can improve the herbicide uptake. Some may be wary of using oil adjuvants due to increased crop response, but many of our broadleaf crops, and specifically soybean, can recover from this type of injury. In most cases, the yield loss due to weed competition would be worse than any crop response from the adjuvant.

Herbicides that will have the largest drop in performance during drought conditions are usually systemic herbicides like Group 1 (ACCase inhibitor – e.g., Select Max, Assure II, and Puma, etc.) and Group 2 (ALS inhibitor – e.g., Raptor, and Pursuit, etc.) herbicides. Glyphosate and Group 4 (auxin mimics – e.g. dicamba and 2,4-D) will also have reduced efficacy in these conditions. On the other hand, contact herbicides, such as Group 14 (PPO inhibitors – e.g., Flexstar, and Cobra, etc.) and Group 10 (glutamine synthetase inhibitor - Liberty) herbicides become more active under higher temperature; however, the low humidity situation may reduce their efficacy. Finally, consider the leaf angle of weeds throughout the day. Like our grass crops, grass weeds will roll their leaves during the peak heat of the day to conserve moisture. Broadleaf weeds will usually be droopy. Both scenarios will lead to decreased spray coverage simply due to leaf architecture. Thus, spraying in the morning or evening will also help with coverage on weeds in hot dry conditions.

Fate of spray droplets

To even begin controlling weeds, we need to get spray droplets to the leaf surface. Hot and dry conditions also lead to increased evaporation of spray droplets. One tool to measure evaporation rate is Delta T. All NDAWN stations will currently report Delta T values, which can be helpful in determining the risk of spray droplet evaporation during application. A thorough explanation of Delta T can be found in this year's online Weed Guide supplemental pages. In brief, the higher the Delta T value, the higher the evaporation rate of spray droplets. When we have hot temperatures with low relative humidity, many of the smaller spray droplets will evaporate before reaching the leaf surface, and more will evaporate off the leaf surface prior to absorption into the leaf. This is of particular concern with contact herbicides when we are often using smaller droplets to increase spray coverage. Spraying in the morning and evening when Delta T is more favorable can help decrease losses due to evaporation, but we must also avoid spraying during a temperature inversion to avoid losses due to off-target movement. Temperature inversions typically set up in the evening several hours prior to sunset and dissipate soon after sunrise.

Volatility

The volatility of herbicides is also increased when temperatures are high. Dicamba is often the first herbicide that comes to mind when we discuss volatility due to the off-target movement concerns over the last several years. A reminder that any dicamba application in Xtend soybeans this year requires the use of a volatility reduction agent (VRA) to help decrease the risk of volatility in those applications. However, applications of dicamba in corn are currently taking place, and those labels do not require the use of a VRA. There will be an increased risk of volatility from these dicamba applications during hot weather. There is also a risk of increased corn injury from dicamba in hot and dry conditions. In general, it would be best to save dicamba applications in corn for more favorable weather.

Key points to consider for improving herbicide performance in hot and dry weather:

- Use recommended adjuvants at labeled rate to help spray droplets better-absorb into leaf surfaces by dissolving cuticles and slowing the evaporation rate
- Increase the spray volume to improve coverage
- If appropriate, use coarser droplets to minimize evaporation
- Make applications in the morning when plants have recovered from the heat and the leaves are oriented to intercept more droplets, but pay close attention to temperature inversions, which typically occurs before sunrise or after sunset.
- Pay close attention to weed size. Weeds may continue rapid growth despite dry conditions. Target small weeds when herbicides are most effective. The target weed size for any technology in soybean should be 4 inches or shorter.
- Scout fields 7 to 10 days after postemergence applications to judge herbicide performance. If a respray is warranted, then 14 days after the first application is a good target to shoot for. The longer we allow weeds to regrow from a failed application, the more difficult complete control will become.

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GROWTH STAGE CUTOFFS FOR HERBICIDE APPLICATIONS IN CORN

Despite our challenging start to 2021, many early planted corn fields are rapidly approaching the growth stage and height-restriction cutoffs for postemergence corn herbicides. If we go off of growth stage restrictions, we start losing many popular options once we reach V5 to V6 corn (5 to 6 visible leaf collars). If we base our staging on height, then some of the earliest cutoff timings are 8-inch corn for broadcast applications of 2,4-D, and any atrazine must be applied before corn reaches 12-inches in height. If corn is 12 inches or taller, the atrazine must be left out of the tank. Many premix herbicides also have a cutoff of 11-inches which is driven by the Group 15 (acetochlor) product in the premix. Keep in mind that the cutoff for many products is based on growth stage or corn height, whichever comes first. There are plenty of options available to apply to later growth stages, but be sure to know the cutoff for your product of choice. See the "When to Apply" column on pages 22 through 24 in the 2021 NDSU Weed Control guide for height and growth stage restrictions of postemergence herbicides in corn.

Joe Ikley
Extension Weed Specialist

COMMON LAMBSQUARTERS CONTROL WITH GLYPHOSATE IS CHALLENGING UNDER ENVIRONMENTAL STRESS CONDITIONS

One of my sugarbeet cooperative agriculturalist called and declared he has found a field with glyphosate resistant common lambquarters. Of course, I will investigate. However, I wonder if environmental conditions might explain this observation.

Weeds under environmental stress (to cold, to hot, to dry, to wet) are harder to kill than unstressed plants. Conversely, actively growing weeds are easier to kill weeds with POST herbicides because all biosynethetic processes (photosynthesis, synthesis of amino acids, proteins, and other cellular components, and meristematic growth) are operating at full strength. The negative impacts on plant growth are usually faster and more complete when we disrupt one or more of those processes with a POST herbicide. Now contrast this to a weed growing very slowly, or not at all, due to drought or heat stress. The same physiological processes are occurring but at a very slow rate and symptom development may be very slow and possibly incomplete if there is sufficient time for the herbicide to be metabolized or if it the herbicide does not translocate to other parts of the plant.

What about plant architecture? Drought or heat stress can reduce POST herbicides efficacy by physically changing plant architecture, leaf surfaces, and resultant spray droplet behavior. I have observed droopy leaves or leaves pull together like a tulip, changing the angle at which spray droplets are intercepted when plants are under moisture stress, and leading to a greater proportion of droplets bouncing off the leaf or running off after they are deposited on the surface.

Plants under hot and dry conditions produce a thicker cuticle with a higher proportion of waxy constituents. The plant cuticle functions to reduce losses to evaporation; however, it also functions as a barrier to the spray droplets applied to the leaf surfaces. Dry conditions can greatly impact the spray droplet performance itself. Droplets are subject to evaporation between the time they leave the spray nozzle and being absorbed by the leaf surface – this is much more dramatic under hot, low humidity conditions. In addition, the droplets may dry very quickly once they are on the leaf surface, leaving insufficient moisture to facilitate absorption of the herbicide into the plant.

I recommend going back to 'weed science basics' including using the highest labeled herbicide rate for a crop growth stage or weed size, being absolutely sure of the acid equivalent of the herbicide (glyphosate) formulation, and adjuvant loading, and optimizing adjuvant and adjuvant properties with herbicide and weed target. Finally, if you have flexibility, consider time of day when herbicides are applied. For example, morning applications when humidity is higher and temperature is lower as compared to afternoon or evening applications since weed targets are more hydrated.

Common lambsquarters under environmental stress, Bathgate, ND

EPA APPROVES ULTRA BLAZER IN SUGARBEET

The Environmental Protection Agency (EPA) approved our request for a Section 18 emergency exemption on June 2, 2021 for Ultra Blazer for control of waterhemp in sugarbeet in Minnesota and North Dakota. Section 18 exemption is for one application per season with ground operated equipment and targets waterhemp less than 4-inch tall in sugarbeet greater than 6-lf stage. Do not apply after July 31, 2021. Contact your sugarbeet cooperative agriculturalist or NDSU/UMN extension for more information.

Ultra Blazer (acifluorfen, group 14) is a postemergence broadleaf herbicide effective for control of redroot pigweed, waterhemp, common cocklebur, and smartweed and nightshade species. Ultra Blazer may provide some control of kochia, although results have been inconsistent in my experiments. Ultra Blazer is a contact herbicide activated by exposure to sunlight to form oxygen compounds, destroying plant tissue by rupturing plant cell membranes. Destruction of cell membranes results in a rapid browning (necrosis) of plant tissue. Herbicide injury symptoms can occur in one to two hours on a bright and sunny day. The emergency exemption is for control of waterhemp in sugarbeet that has escaped control due to inadequate rainfall to incorporate soil residual herbicides or in fields with a glyphosate resistant biotype.

Ultra Blazer will be applied at 1 pt/A with non-ionic surfactant at 0.125% v/v or 1 pint per 100 gallon water alone or with glyphosate in 15 to 20 gpa water volume through flat fan nozzles producing a droplet spectrum to promote good coverage in sugarbeet. Consideration should be taken on environmental conditions at application since risk of injury increases with air temperatures greater than 80F and sudden changes from a cool, cloudy environment to a hot, sunny environment.

CONTROLLING WEEDS UNDER DIFFICULT ENVIRONMENTAL CONDITIONS. HOW CAN I CONTROL WATERHEMP WITH ULTRA BLAZER WITHOUT INJURING MY SUGARBEET CROP?

The good news is sugarbeet growers have been granted emergency exemption to use Ultra Blazer in sugarbeet. The bad news is environmental conditions are challenging, sugarbeet stands are inconsistent, and sugarbeet growth stage range from cotyledon to 6-lf stage in commercial fields in 2021. What is the best way to utilize the Ultra Blazer Section 18 emergence exemption to control waterhemp without severely injuring sugarbeet?

Use of Ultra Blazer in sugarbeet may not be for everyone. Environmental conditions before, during, and after herbicide application impacted sugarbeet safety with Betamix and Herbicide 273 in sugarbeet. Ultra Blazer use will be no exception. Timing to sugarbeet stage, waterhemp height and environmental conditions will need to be very carefully managed with Ultra Blazer. Ultra Blazer is a contract herbicide that causes necrosis damage in crop and weeds as compared to essentially no sugarbeet injury from our current standard, glyphosate with RR sugarbeet. Our evaluation from 2016 to 2020 indicates sugarbeet growth reduction injury is greatest when Ultra Blazer is applied to small beets. Thus, Ultra Blazer application will be reserved for application after sugarbeet have reached the 6-lf stage.
Many contact herbicides are labeled for use with various additives. However, additives also increase the chance for crop injury and we observed less sugarbeet injury when Ultra Blazer was applied with a non-ionic surfactant as compared to oils. Even adjuvants in the glyphosate formulation increased sugarbeet injury when glyphosate was mixed with Ultra Blazer as compared to Ultra Blazer alone.

We have less experience with environmental conditions at application including temperature and humidity conditions. Most contact herbicides, including Ultra Blazer, become more active as temperatures increase. Increased activity may provide improved weed control, but can also result in greater crop injury. Ultra Blazer will need to be used with caution as temperatures increase to greater than 80F. The most critical time for crop injury following application of a contact herbicide is the first few hours after treatment. Therefore, injury can be minimized by applying the herbicide in late afternoon as temperature begins to decreased. Omitting the adjuvant or using the lower labeled rate of the recommended adjuvant will reduce injury potential from Ultra Blazer applied at high temperatures.

Is Ultra Blazer worth the crop safety risks in sugarbeet? I believe so. Ultra Blazer controls waterhemp and waterhemp is currently our most important weed control challenge in sugarbeet. Moreover, we currently do not have an effective POST waterhemp control herbicide since depleting our inventories of Betamix. Finally, yield trial results

indicate waterhemp robs sugarbeet yield and reduces recoverable sucrose. We did not observe yield loss or reduction in recoverable sucrose following Ultra Blazer application after the 6-lf stage.

Tom Peters
Extension Sugarbeet Agronomist
NDSU & U of MN

forestry

SCOUT FOR SPRUCE SAWFLY

In previous years, yellowheaded spruce sawfly larvae have been observed at about 830 Growing Degree Days (base temp 40F). With the recent very hot temperatures, that temperature threshold was met. The larvae feed on first- and second-year needles of all spruce species and can be very destructive. Sometimes whole needles are eaten; in other cases, the needles are damaged to the point where the ends dry out and turn a pink/brown color (see photos). Most of the damage has been seen in central and western North Dakota.

Larvae of the yellowheaded spruce sawfly. Notice that the tip of the needle in the lower right of the photo has been completely chewed off, reducing the needle to half its original length. Photo taken near Minnewaukan, ND (Scott Knoke).

These needles were damaged by the yellowheaded spruce sawfly larvae. The insects damaged these needles but did not consume them completely, resulting in brown/pink, dried-out needles. Photo taken in Richardton, ND (Joe Zeleznik).

Larvae feed for 30-40 days and are most susceptible to insecticides for the first two weeks of their development. Carbaryl and acephate are both labeled for sawfly control. For a small infestation, simply picking the larvae off the tree by hand and destroying them may be easier, and is equally effective. A strong jet of water may also help reduced sawfly populations on trees.

When using insecticides, be sure to read, understand and follow all label directions.

WIDESPREAD DEAD AND DYING BIRCH TREES

Throughout the state, many birch trees had a very tough winter. Some trees are showing dieback or small leaves in just the top part of the tree, while others appear to be completely dead or nearly so (see photos). Many different species and cultivars have been affected, including Dakota Pinnacle® Asian white birch, European white birch, river birch, and others.

We believe the damage is due to the warm temperatures in March, which were followed by a return to freezing temperatures in April. The trees began to break dormancy early, and were unable to re-harden once it got cold again. Top dieback on birch trees is normally associated with bronze birch borer, a native insect that attacks drought-stressed birch trees. However, the damage we're seeing is affecting trees in well-watered areas that have not suffered drought. Also, the state-wide pattern of damage goes far beyond what we would expect from insect damage.

Some trees did appear to push out small leaves this spring, while others did not. A quick way to tell if a branch is dead is to do a scratch test. With a fingernail, scratch off a small piece of bark on a small branch, one that's the size of

Dakota Pinnacle® Asian white birch in Bismarck. Although the tree is alive, the top is likely completely dead, which destroys the pyramidal form that this cultivar is known for. The top can be removed and the tree will send up one or more new leaders. However, creating the pyramidal form again with those new leaders will take several years of growth and corrective pruning. Photo courtesy of Greg Morgenson.

Weeping form of European white birch, Bismarck. Birch trees generally need cool, moist soils and this tree was likely receiving plenty of moisture. The tree is almost entirely dead and should probably be removed. Photo courtesy of Greg Morgenson.

your finger or smaller. If the branch is green, then it might be alive. If there is no green, then the branch is definitely dead.

If the branch or stem is dead, it can be pruned out at any time. The trees will send out one or more new upright shoots that may, over time, be trained into new leaders for the trees. However, this will take several years and much effort, and the ornamental structure of these trees will be compromised for a long time.

If the tops of the trees are not dead, then all we can do is wait it out and see what happens. And make sure the tree has enough moisture. Water if there's been no substantial rain for about 7-10 days. The soil should be moist after watering, not waterlogged.

Joe Zeleznik
NDSU Extension Forestry Specialist

around the state

AROUND THE STATE

NORTH CENTRAL ND

Last week continued the dry pattern of 2021 with high heat and a few showers over the weekend. Spray activity increased in the region after some relief from the high heat experienced last week. Crops in the North Central region are observed with different stages and conditions (Figure 1). Spring wheat ranges from Zadoks 15-25, although, we observed fields ranging from Zadoks 10-15. Several spring wheat fields have different growing stages in the same field. Canola stages were found ranging from the two to the sixth leaf stage with a wide variation within the field. Corn was observed up to the V4 stage while Soybeans ranged from the VC to V2 leaf stage with a wide variation of plant stages being observed. The wide variation in crop staging is likely due to the drought conditions in the region and is more evident in high saline locations where no germination was observed. We can see how management is crucial under dry conditions.

Figure 1. From the top left clockwise we can see an uneven soybean field; canola field; soybean field under no-till; spring wheat field.

Canola flea beetle activity continues to be observed across the area as temperatures warmed over the last week. Grasshopper activity continues to increase as well. With drought conditions in play, it is important to continue scouting protocols at this time. Pea Leaf

Weevil damage was reported in the NW part of the state. You can find more information on the Pea Leaf Weevil in the May 27th edition of the Crop & Pest Report.

Here are some quick precipitation reports as observed by area NDAWN stations over the last week (beginning June 1st): Minot: 0.06"; Bottineau: 0.36"; Garrison: 0.20"; Karlsruhe: 0.15"; Mohall: 0.05"; Plaza: 0.08"; and Rugby: 0.16". Additionally, the bare soil temperature at the NCREC is observed at 78 degrees F.

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NORTHEAST ND

Drought continues to be a concern in this region. Spotty fields and uneven emergences are common in every crop now. In some areas, crops are severely dry and producers are reseeding some fields. Last weekend rains were very spotty. Except for some parts of Pembina County, rest of the NE region received less than 0.5 inches of precipitation. Hail was reported in parts of Cavalier County that damaged few canola fields that went to reseeding. Heavy winds caused sand blasting on the beans and wheat on sandy grounds was blown away. Soybeans are emerging to unifoliate (maybe some at first trifoliate), but many looking stressed by wind and drought. Weed pressure is pretty intense in a lot of fields, and spraying has been difficult with hot temperatures and variability within the field/growth stage. Alfalfa is very short. First cutting has started with very low yields estimated at less than 50% of expected. Several canola fields were sprayed for flea beetles. Cutworm infestations were reported in dry beans and canola. Cereal aphids are showing up. Pastures are getting worse with the heavy grazing from last fall and low water levels with poor quality drinking water for cattle.

Anitha Chirumamilla
Extension Agent Cavalier County

NORTHWEST ND

Last week ended with some very high temperatures for early June. High's in Williston were 88, 96, 97, and 93, Thursday, June 3rd through Saturday, June 5th. Strong winds brought in a cold front on Saturday night and the high on Sunday, June 6th was only 75°F, a welcome break from the heat of last week. Scattered showers moved through the Northwest Friday through Saturday, though most locations saw less than 0.1" of total precipitation. A few areas picked up about 0.25", but unfortunately, higher totals were not common. High temperatures this week are predicted to be in the 80's with chances of scattered thunderstorms through mid-week.

The most notable issue with small grains at the moment is spotty stands and it is too early to tell what the heat stress of last week may have done to the crop. Soybean was just starting to emerge last week, so this week will be critical to see how stands look. The IPM crop scout has started at WREC and the only thing he has seen so far is a few grasshoppers at most locations.

Clair Keene
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SOUTH-CENTRAL/SOUTHEAST ND

Since late May, our region's crops have had to tolerate drouth and flooding (localized areas), high winds, frost, extreme high air temperatures (≥100 degrees), and localized areas of hail, plus POST herbicide injury. The result includes reduced and variable crop plant populations with variable growth stages and most plants recovering (or attempting to recover) from injury.

Rain this week has been reported ranging from 0 to 10 inches (LaMoure County). The driest area of the region is generally north of Hwy 200.

Alfalfa is generally short in height and flowering with harvest in progress. Advanced winter rye is flowering and spring-planted small grain are jointing (6 to 7 leaves). Corn is in the 4- to 5-leaf stage and early planted soybean in the V1-2 (trifoliate) stages. Soybean replanting (due to frost and wind blow-out) is nearing completed along with dry bean and sunflower, with many fields of the later two crops containing emerged plants. Pastures are generally poor and hay (alfalfa and grass) have significantly reduced yield potential.

Weeds are our major crop pest threat at the current time and herbicide application is a common field activity. Late-emerging weeds are now present including the nightshades (see picture). Absinth wormwood and leafy spurge appear to be especially abundant this season!

Seedling hairy nightshade.

Greg Endres
Extension Cropping Systems Specialist
NDSU Carrington Research Extension Center

SOUTHWEST ND

Variability would be the best descriptor for SW ND. A wide range of crop conditions from varying drought stress as well as from flooding and saturated soils. Differences in tillage practices, previous crop residue, and rainfall account for some of major visual differences. Wheat is coming along nicely in the Dickinson area. A majority of sunflowers have been planted in the region and herbicide applications have been active on days that the wind has allowed for. According to NDAWN from May 31st to June 7th Dickinson received 0.28 inch, Beach with 0.16, Amidon with 0.25, Bowman 0.54, Dunn 0.27, Hettinger at 0.03, Mott 0.17, and Mandan with 0.02.

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