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Rainfall and Growing Degree Days (GDD)

Location	Cooperstown	Finley	McHenry	Pillsbury
Barley/Wheat GDD (Plant date: 4/15/2017)	500	521	523	538
Compared to 2016	-28	-25	4	-4
Corn GDD (Plant date: 5/1/2017)	152	154	155	176
Compared to 2016	14	16	34	29
Rain Since 4/15/2017	3.07	3.06	2.27	1.60

Note: Actual rain amounts may vary.

WEATHER

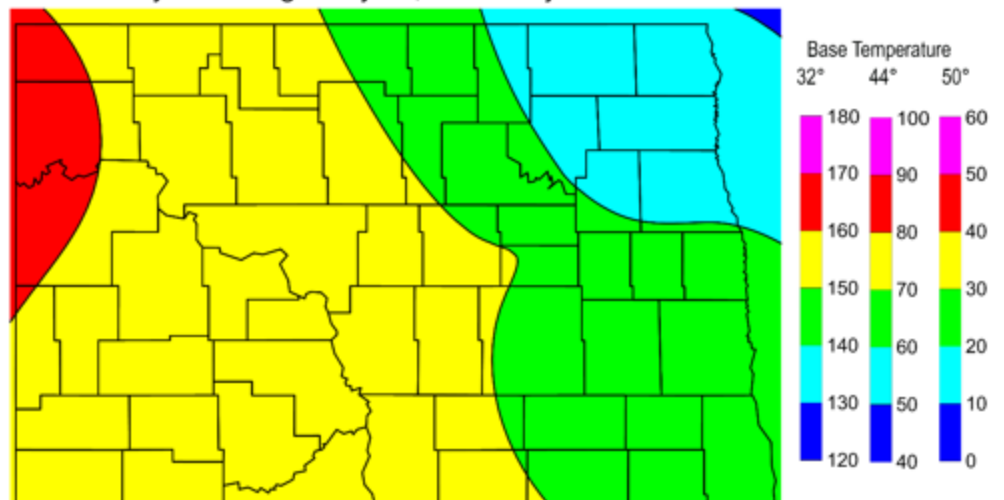
The May 18 through May 24, 2017 Weather Summary/Outlook

Most of the North Dakota Agricultural Weather Network (NDAWN) stations recorded temperatures between 3° to 6° above average during the past week. The exception was in northeastern North Dakota into far northwestern Minnesota where temperatures were closer to the 30 year average. This next 7 day period is expected to record temperatures at or below average for all locations.

As we all know, rain does not fall evenly. This past week rainfall amounts across the NDAWN varied from 0 to around 1 inch. Outside of NDAWN stations, there were reports of 1-2 inches of rain in isolated areas right along the North Dakota / South Dakota border in southern Dickey County as well as some locations in southern Richland County. Some rain occurred on Sunday, but much of the rain fell on Monday Night into Tuesday. A stronger system impacted the region on Wednesday, but that rainfall was spread across South Dakota and southern and central Minnesota missing most of North Dakota.

That stronger system that missed North Dakota on Wednesday has and will be impacting our weather for the next several days. The wind and cooler temperatures the past couple of days were associated with that storm system drawing in cooler air from Canada. That storm system, plus another one following in a similar track will keep well below average temperatures in place through the weekend. The upper-level wind pattern is shifting from a southwesterly flow to a

May 18 through May 24, 2017 Projected GDDs



northwesterly flow during this time period. This tends to bring lighter precipitation events to the northern plains and usually below average temperatures. This switch to a northwesterly flow will occur after the storm system expected to pass through the upper-Midwest on Saturday.

Before that next chance of rain on Saturday, there will be a break in the clouds and with below average temperatures in place, there will likely be some frost not only this morning (Thursday) but also Friday morning. Plus, after that rain chance on Saturday in especially eastern North Dakota, there may once again be lows in the 30s in some locations on Sunday morning. Beginning on Sunday afternoon into early next week, although temperatures are expected to remain below average, the northwest flow aloft will bring sunnier weather which in turn will bring higher temperatures and in turn many more growing degree days.

Planting dates will vary greatly, but May 10, 2017 will be used for the rest of this season to give an approximation to the number of corn growing degree days for future Crop and Pest Reports. The exact numbers based on your actual planting date(s) can be found on the NDAWN Center Website under Corn Growing Degree Days.

Using a planting date of May 1, 2017, the number of wheat growing degree days is presented below. The exact numbers based on your actual planting date(s) can be found on the NDAWN Center Website under Wheat Growing Degree Days/Growth Stages and Midge Degree Days.

Daryl Ritchison
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PLANT SCIENCE

Biological Nitrogen Fixation

Legumes including alfalfa, chickpea, field pea, lentil, soybean and dry bean, have the ability to establish a symbiotic relationship with rhizobia bacteria to biologically fix nitrogen gas (N₂) into plant available nitrogen (N). The fixed N provides part of the crop's N requirements and most plants will also utilize soil available N for plant growth. Inoculants containing living rhizobia bacteria can be applied in liquid, peat-based powder, or granular form. Increasing the number of bacteria near the roots of the legume may increase the number of nodules per root and therefore improving the N supply to the plant. The various legume crops grown in the region need to be inoculated with the crop-specific rhizobia bacteria (Table 1). Field pea and lentil can use the same inoculum since identical species of bacteria form associations with both pea and lentil. If a legume crop has never been grown in a field before, inoculation with the correct species of bacteria is essential.

Fields which already have a specific rhizobium population, which occurs when a host crop has been grown in recent years, may not always give a positive yield response to additional inoculation. Since the bacteria in the inoculum are living organisms, high temperatures (for instance seed pre-treated with an inoculum sitting out in the hot sun) may reduce the number of live bacteria.

Table 1. Legume and Specific Rhizobia Species.

Legume	Rhizobia Species
Alfalfa	<i>Rhizobium meliloti</i>
Chickpea	<i>Mesorhizobium ciceri</i>
Field pea and Lentil	<i>leguminosarum</i> biovar <i>viciae</i>
Soybean	<i>Bradyrhizobium elkanni</i> <i>Bradyrhizobium japonicum</i> <i>Sinorhizobium fredii</i>
Dry bean (Black, Navy, Pinto, and other classes of beans)	<i>Rhizobium etli</i> <i>Rhizobium leguminosarum</i> biovar <i>phaseoli</i> <i>Rhizobium tropici</i>

Field pea

Once the crop is established, nodules will form on the roots of the legume. About 2-3 weeks after emergence, field pea should begin nodule formation on root hairs. To check N-fixing, open the nodule and look at the color inside the nodule. If the color inside is pink, then the nodule is actively fixing N_2 into plant available N. If the inside of the nodule is brown, green or white, the N fixation is not taking place. Nitrogen fertilization in pea (or soybean) is not generally recommended because with excessive soil N available to the plant, the nodulation will be delayed and possibly fewer nodules will be formed. However, if the plants appear pale green or yellow due to lack of N, and the roots do not exhibit nodulation, then N top-dressing may be a rescue option (make sure that the yellowing is due to lack of N and not due to other reasons).

When checking the pea root, also observe if there are diseases present, as diseased roots will have lower nodulation ability. When checking for nodules it would be best to dig up plants with a small spade, wash the roots in a bucket of water and observe the roots. Check at several locations and several plants per sampling site. The principles for checking other crops like lentil, chick pea, or soybean are similar to checking field pea plant roots.

Hans Kandel

Extension Agronomist Broadleaf Crops

PLANT PATHOLOGY

Early-Season Fungicide Application for Wheat

A common agronomic practice that will be considered in the upcoming weeks is tank mixing a fungicide with a herbicide. Here are a couple reminders when making the decision on an early season (tillering) fungicide in wheat.

Diseases Being Targeted

An early-season fungicide is geared at managing residue-borne diseases. The pathogens responsible for these diseases are able to overwinter on host residue and can start an epidemic under conducive environmental conditions in the spring. The most common residue-borne diseases for wheat include tan spot, Septoria, and Stagonospora. Often times, more than one disease can be found on a leaf and is referred to as a leaf disease complex (Figure 1). For more information on fungal leaf spot diseases of wheat please reference Extension Publication PP1249.

The Decision to Spray

When scouting tillering wheat fields, an early season fungicide is likely recommended if fungal leaf spots are already found on the oldest leaf tissue. Another way to assess the value of an early-season fungicide application is to assess disease risk. The greatest amount of disease risk occurs when a susceptible variety is grown in a wheat on wheat production system, with minimal tillage and favorable conditions for disease development. Favorable conditions for fungal leaf spots are cool temperatures and prolonged periods of leaf wetness including rain and dew (Figure 2). NDSU routinely conducts fungicide-timing studies for management of fungal leaf spots in wheat. As a quick summary of 59 replicated fungicide trials from 2008-2015, trials were categorized into the three disease risks (low, moderate and high) based on environmental conditions and production practices. Based on this data set, when compared to a non-treated control, the mean positive yield response for an early-season fungicide was 0.1%, 3% and 4% for low, moderate and high disease environments, respectively. Although a robust statistical analysis has not been conducted on this data set, the general rule of thumb is that the likelihood of a positive yield response from an early-season fungicide will increase as disease risk increases.



Figure 2. Prolonged periods of leaf wetness can be a result of rain or morning dews.



Figure 1. Fungal leaf spots of wheat can often occur as a disease complex.

Fungicide Efficacy and Expectations

There are several fungicides labeled that have efficacy on all three residue-borne leaf spot diseases. For more information, please consult the 2017 Fungicide Guide or use the NCERA-184 fungicide efficacy table. Fungicides are best used in a preventative manner and will only protect available leaf tissue at time of application. Also, it is

important to remember the movement of a systemic fungicide should not be compared to the movement of a systemic herbicide. Most systemic fungicides are locally systemic (moves short distance from droplet), translaminar (moves from top side of leaf to the underside), or moves upward with xylem to a leaf tip. Therefore, as the wheat crop progresses and new leaves emerge, continue to scout fields to track disease development and progression.

Andrew Friskop
Extension Plant Pathology, Cereal Crops

SOILS

Supplemental Nitrogen for Small Grains

Growth stage of spring wheat/durum varies from near jointing in the far south in North Dakota to barely emerged in other areas. Some growers choose to split N applications similar to what is commonly done in Europe. To contribute to increased yield if N is limiting, supplemental N should be applied before early jointing. Nitrogen applied after this stage contributes to yield with decreasing efficiency, but may contribute to greater protein concentration. To promote beneficial wheat tillering, application during the 3-4 leaf stage if not sooner would be ideal. When small grains are emerged, application should be stream-bar applied UAN or urea solution, containing sulfate/thiosulfate sulfur if needed, or urea treated with the proper concentration of NBPT urease inhibitor as presented in earlier Crop and Pest Reports. For greatest protein enhancement, application of broadcast N immediately post-anthesis (after flowering) should be used. This application will be explored in much more depth in a future report.

For barley, except for barley destined as feed grain, supplemental N is not advised, as protein content of grain may increase to the point of rejection as malting grade. Only when no N has been applied, or precipitation has been high enough that major N losses have been realized should supplemental N for malting barley be considered.

Dave Franzen
NDSU Extension Soil Specialist

WEEDS

Waterhemp has Emerged in 2017

Waterhemp has emerged in Minnesota and North Dakota. First confirmed fields with waterhemp were near Willmar and Breckenridge, MN on May 9, 2017. Emergence date tracked closely with first confirmed sighting in fields in 2016. Waterhemp is a member of the pigweed family including redroot pigweed and palmer amaranth. Distinguishing different pigweed species is challenging, especially in the seedling stage. Waterhemp cotyledons are more egg-shaped than the narrow, linear cotyledons of redroot pigweed. First true leaves are generally longer and more lanceolate than redroot pigweed (see image). Seedlings are free of hairs with leaves that are dark green with a waxy or glossy sheen.

Waterhemp is common in southern Minnesota and in western MN and eastern ND to the Canada border. Waterhemp thrives in wet areas of fields, but has adapted to a variety of conditions. Waterhemp germinates and emerges in mid-May and continues to emerge following precipitation well into August. We have seen evidence waterhemp will emerge following small grains harvest and produce viable seed if not properly managed.

There is great genetic diversity with waterhemp that has led to herbicide resistance including ALS inhibitors (SOA2), photosystem II inhibitors (SOA5), PPO inhibitors (SOA14), and glyphosate (SOA9).

Tom Peters
Extension Sugarbeet Agronomist
NDSU & U of MN



APPS for AG

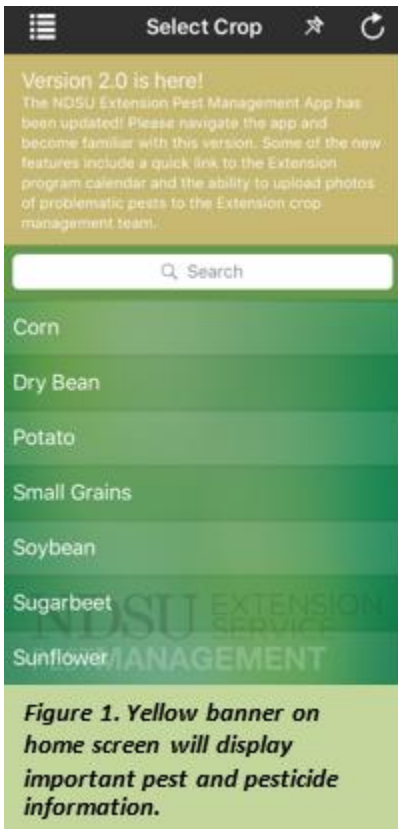


Figure 1. Yellow banner on home screen will display important pest and pesticide information.

Andrew Friskop
Extension Plant Pathology, Cereal Crops

New Features for NDSU Extension Pest Management App

The NDSU Extension Pest Management App (which houses information from the Plant Disease Management Guide, Insect Control Guide and Weed Control Guide) has recently been updated with new features. These features include a banner, a pest identification help tool and calendar function. The banner is displayed on the home screen of the app and will highlight important pest and pesticide information throughout the growing season (Figure 1). The pest identification help tool allows for digital diagnosis of pests through photos submitted by app users (Figure 2). This will help with preliminary assessments of pests, but for a more complete diagnosis, individuals may be asked to submit samples to the NDSU Plant Diagnostic Lab. The calendar function provides information on upcoming Extension events (Figure 2).

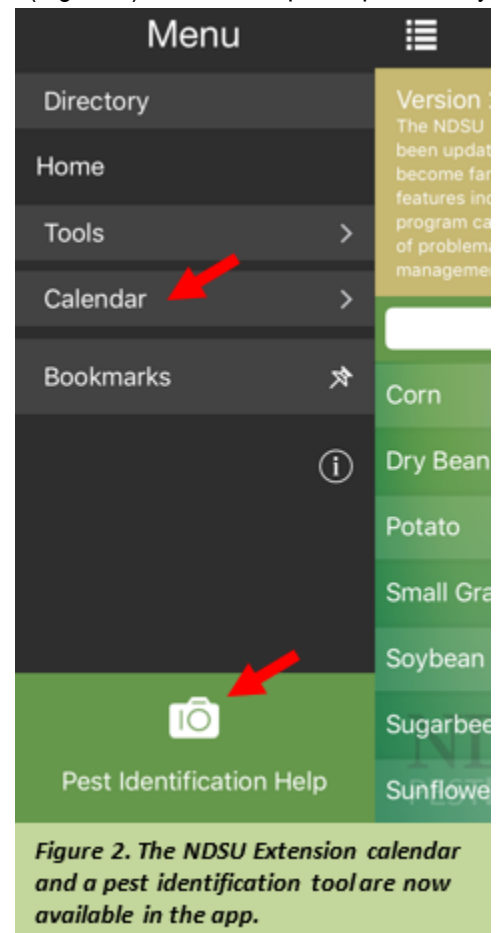


Figure 2. The NDSU Extension calendar and a pest identification tool are now available in the app.