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Insect Degree-Days Running Behind

Day-degree accumulations have been slow this spring due to the mostly cool weather. Insect development is temperature dependent, so degree-day models are useful for predicting their development. Degree-day models are commonly used in Integrated Pest Management (IPM) to help forecast insect emergence, peak emergence and insect growth stages. They are important IPM tools for managing insect pests and are used for timing of scouting activities and control measures.

Alfalfa weevil is a good example of an insect pest whose development is temperature dependent. Adults overwinter in sheltered areas and under plant debris in ND. The degree-day model for alfalfa weevil uses a base of 48°F (Table 1). Accumulated degree-days will help you time when to begin scouting (early larval instars), when heavy plant feeding might occur in the 3rd and 4th larval instars, and when control action might be necessary.

To assess the DD model, go to the NDSU’s NDAWN website and Applications – Insect DD. Then, click on the Map tab and select 48 F for your base temperature and Degree Days (DD) for your map type.

The current map (next page) indicates that no egg hatch is occurring in ND yet. At 200 degree-days accumulation, adult weevils will just be emerging, as shown in southwest and northwest ND. NDAWN indicates that our current ND weather is running about -50 to -140 degree-days behind the 5-year average for alfalfa weevil development!

For more information, see the NDSU Extension publication: Integrated Pest Management of Alfalfa Weevil in North Dakota E1676.

<table>
<thead>
<tr>
<th>Life Stage</th>
<th>DD Required to Complete Life Stage</th>
<th>Accumulated DD</th>
<th>Typical Feeding Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg hatch begins</td>
<td>300</td>
<td>300</td>
<td>Light</td>
</tr>
<tr>
<td>1st instar development</td>
<td>71</td>
<td>371</td>
<td>Light</td>
</tr>
<tr>
<td>2nd instar development</td>
<td>67</td>
<td>438</td>
<td>Light</td>
</tr>
<tr>
<td>3rd instar development</td>
<td>66</td>
<td>504</td>
<td>Heavy</td>
</tr>
<tr>
<td>4th instar development</td>
<td>91</td>
<td>595</td>
<td>Heavy</td>
</tr>
<tr>
<td>Pupation</td>
<td>219</td>
<td>814</td>
<td></td>
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<tr>
<td>Adult emergence</td>
<td>—</td>
<td>&gt;814</td>
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</table>
Varieties

Factors to consider when selecting an appropriate field pea variety should include market class, yield potential, harvest ease, vine length, maturity, seed size and disease tolerance. The green and yellow cotyledon types are the primary market classes. All field pea varieties can be used as feed peas, but only selected varieties are acceptable for the green or yellow human edible market.

A good source of information to aid in variety selection is field trial data generated by the various NDSU Research Extension Centers across the state. The most recent “North Dakota Dry Pea Variety Trial Results and Selection Guide” (A1469) provides the test information and can be found hyperlinked.

Field Selection

Field pea can be grown on many soil types ranging from light sand to heavy clay. Field pea has moisture requirements similar to those of cereal grains. However, pea plants have lower tolerance to saline and water...
logged soil conditions compared to cereal grains. Avoid saline soils with electrical conductivity (EC) greater than 1.5 millimhos/centimeter.

Fields with perennial weed problems, such as Canada thistle, perennial sowthistle and field bindweed, should be avoided. In addition, previous soil-applied herbicides may result in crop rotation restrictions. Consult the most recent NDSU Extension Publication W253, “North Dakota Weed Control Guide,” and herbicide labels for rotational restrictions.

**Seeding**

Field pea can be grown in a no till or conventional-till cropping system. Field pea is grown in narrow rows (6 to 10 inches). Field pea should be seeded as early as possible so flowering will occur during potentially cooler weather in June and early July. Seeding pea into moisture is critical and seeding into dry soils should be avoided. A seeding depth of 2 inches is recommended.

Field pea seed size varies and will range from 1,600 to 5,000 seeds per pound. Plant on a pure live seed basis to establish a plant density of 300,000 to 350,000 plants per acre or seven to eight plants per square foot.

**Seed Treatments**

For a listing of registered seed treatments and specifics on disease control, consult the most current version of NDSU Extension publication PP622, “North Dakota Field Crop Plant Disease Management Guide.” Consult the seed treatment label for its effect on rhizobium inoculants is important.

**N-fixing Bacteria**

A common requirement for efficient production of field pea is inoculation with specific N-fixing bacteria. Field pea should be inoculated with *Rhizobium leguminosarum*, designated a Class C inoculant. Inoculants usually are available as a granulated, liquid, or powder product, which requires an adhesive agent. About 50 to 90 percent of the N used by field pea during a season comes from N-fixation by the symbiotic N-fixing bacteria.

As the pea plant starts to grow, it will go through vegetative growth before it changes to the reproductive phase.

<table>
<thead>
<tr>
<th>Table 1. Vegetative growth stages of field pea.</th>
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<tbody>
<tr>
<td><strong>Vegetative Growth Stages</strong></td>
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<tr>
<td>VE</td>
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<td>V1</td>
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<td>V4</td>
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<tr>
<td>Vn</td>
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CONSIDERATIONS FOR LATE PLANTED CORN

The area planted to corn in North Dakota increased substantially this past week and conditions are favorable for further progress in corn planting this week. Never the less, many corn acres will be planted later than is considered optimum due to unfavorable weather conditions this spring. When corn planting is delayed beyond May 25th, we recommend switching to a hybrid that is five or more days earlier maturing than what is normally grown. This will help ensure that it will reach physiological maturity before the first killing frost and that the grain is not excessively wet at harvest time in the fall. When following our current corn hybrid maturity recommendations, hybrids planted in early May should reach physiological maturity well in advance of the first killing frost. Growing a hybrid that matures before using all of the season’s frost-free days for growth might seem to significantly limit yield. However, this strategy is recommended so the crop can dry sufficiently before harvest, will not be so wet that it will be expensive to dry, or difficult to harvest late in the fall (i.e. begins snowing).

The rate of corn drying is related to the temperature, and average temperatures drop quickly in October. A great tool for looking at the relationship between planting date and the development of corn hybrids of differing maturities is the Corn Growing Degree Day Decision Support Tool. This tool, as an example, predicts that a 90 day RM hybrid planted in Cass County on May 15th would reach maturity on September 28th (see Figure 1 for this example of the graphical output of the tool), but if planting is delayed until May 25th it would not reach maturity until October 12th (data not shown).

Another question often asked regarding late planted corn is, "Should plant populations be altered as planting is delayed?" Most published report suggest that staying with the originally intended populations is the best course of action, even when planting is delayed beyond the period of optimum corn yield.

![Corn Growing Degree Day Tool](https://example.com/corn_growing_degree_day_tool.png)

*Figure 1. Graphical output of the Corn Growing Degree Day Tool, using input for Cass County, a planting date of May 15, and using a 90 Day RM hybrid.*

Joel Ransom
Extension Agronomist for Cereal Crops
REVISITING MANAGEMENT TOOLS AND FUNGICIDE RESOURCES FOR WHEAT

Planting season is in full force and I cannot help but ponder the crystal ball question: What wheat diseases will be problematic in 2019? The 2018 growing season had statewide issues with bacterial leaf streak, a few pockets of Fusarium head blight, and a few pockets of ergot (2018 Curveball Disease Award Winner, self-proclaimed). The start of 2019 may suggest an increase in disease risk, but things can change quickly. Given this uncertainty, it is best to revisit the management tools we can use to manage wheat diseases. This article will discuss the importance of crop rotation, host resistance and foliar fungicides.

**Crop rotation** – Crop rotation is one of the oldest disease management tools in agriculture. For example, planting wheat after broadleaf (soybean, dry bean, canola, etc.) will reduce the in-field risk for tan spot, Septoria, Stagonospora and Fusarium head blight (FHB). Also, it is important to remind small grain growers that Fusarium head blight risk will be higher if planting wheat after corn (preferred host for the Fusarium head blight pathogen).

**Host resistance** – Our most valuable and sustainable disease management tool. It is extremely important to understand the level of disease resistance in a variety as this can influence in-season management decisions. Varieties with resistance to leaf rust and stripe rust will likely not benefit from a fungicide application at flag leaf (Figure 1). Using less susceptible varieties is our primary management tool against bacterial leaf streak. For FHB, host resistance in combination with a fungicide is the best approach to suppressing FHB and accumulation of deoxynivalenol/vomitoxin.

Figure 1. A stripe rust resistant wheat variety on the left and susceptible variety on the right.
**Foliar fungicides** - There are several good fungicides that can be used to manage fungal diseases, *not* bacterial diseases. A few resources that can be used to help with fungicide selection and timing are:

1. 2019 NCERA-184 Wheat Fungicide Efficacy Table (Direct Link to table)
2. 2019 North Dakota Plant Disease Management Guide (Direct Link to Full Guide, PDF document, 2.77 MB)

As a reminder, the North Dakota Plant Disease Management Guide is available as a hard copy document, on the NDSU Extension Plant Pathology website, and on the NDSU Extension Pest Management App.

Andrew Friskop  
Extension Plant Pathology, Cereal Crops

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**START CLEAN, STAY CLEAN**

Planting activity is now finally in full swing in the Red River Valley. Reports indicate that many fields in the rest of North Dakota have already been planted or are currently being planted. This is an important time of the growing season for weed control, regardless of your location or tillage method in North Dakota. One important concept that applies to each and every crop field across the state is **Start Clean, Stay Clean**. Planting into a field with live, green weeds is one of the worst things we can do from a weed control perspective. Failure to control difficult weeds like kochia, horseweed, common ragweed, and even good old common lambsquarters prior to planting can often have negative consequences. Weed control with herbicides becomes increasingly difficult once the crops have emerged.

Anyone who has taken an introductory weed control class has been taught the concept of “many little hammers” for weed control. We lose many of these hammers if we fail to control weeds prior to planting and emergence. Several preemergence herbicides cannot be applied once our crops begin emerging. Clearly, nobody wants to cultivate an entire field after crop emergence. In this era of herbicide resistance, we must emphasize weed control prior to planting, and not just be concerned with weed control after planting. We will all be rushed to plant our crops in this delayed spring, but we may have regrets starting in a few weeks if we do not also focus on controlling the weeds that have emerged prior to planting and can last until we send them through our combines.

Joe Ikley  
Extension Weed Specialist

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**APPLY GLYPHOSATE AT FULL RATES FOR COMMON LAMBSQUARTERS CONTROL**

Weed seed from weed escapes was collected and evaluated in a greenhouse screening trial in the winter. Glyphosate (PowerMax) at 0, 32, and 64 fl oz/A was applied when seedlings were approximately 2 inches tall. Visible growth reduction was observed 7, 14, and 21 days after application.

Fifty-nine percent of the samples collected and evaluated in the greenhouse screening were common lambsquarters. Twenty-nine percent of samples were kochia, and 12% of samples were waterhemp. No common ragweed or redroot pigweed samples were collected in 2018.

Common lambsquarters, kochia and waterhemp control were classified based on their sensitivity to glyphosate. Weeds either resisted glyphosate at 32 and 64 fl oz/A (*resistant*), were sensitive to glyphosate (*susceptible*) or were controlled at 64 fl oz but not at 32 fl oz/A (*rate dependent*). Control was defined as greater than 90% visible growth reduction compared to the untreated check. Screening results are summarized in the following table.
Kochia samples submitted were either resistant or rate dependent to glyphosate. Waterhemp samples were either glyphosate resistant or susceptible.

Results on lambsquarters were most surprising. First, twice as many lambsquarters samples were submitted compared to kochia and five times as many samples were submitted compared to waterhemp. Next, although lambsquarters was controlled with glyphosate, the time to achieve 90% control was much longer in some samples than others. Surprisingly, there were some samples not controlled with glyphosate at 32 fl oz/A.

The conclusions from the lambsquarters screening are critical for producers that consider lambsquarters their most important or second most important weed. First, use full rates of glyphosate combined with non-ionic surfactant and ammonium sulfate. Second, consider repeat applications, especially under hot and dry conditions when glyphosate absorption through the cuticle is difficult. Finally, use tank-mixtures with glyphosate delivering a second effective herbicide for common lambsquarters control. Discuss your observations with your county agent, ag-retailer, consultant or university specialist if you observe evidence of weed resistance.

Tom Peters
Extension Sugarbeet Agronomist
NDSU & U of MN

**BUGS IN MY HOME**

As spring temperatures warm up, homeowners are calling in about insects crawling around on their floors or walls to find out what they are and how to get rid of them. Most of these insects successfully overwintered in the home and now they are trying to get back outside. The main culprit has been dermestid beetles, such as the larder beetles or carpet beetles. Most dermestids are scavengers and feed on a wide variety of products of both plant and animal origin. Larvae do most of the damage, while adults are thought to feed mainly on flower pollen outdoors.

Larder beetles and carpet beetles mainly eat animal products, such as dried meat or dead insects in lamp fixtures. Both larvae and adults of the larder beetles will also invade stored cereal products, such as dry pet foods or cereal foods. For the carpet beetles, larvae mainly feed on carpet, clothing or furniture (wool fabric).

**Pest Management:** Sanitation is the best method of control and prevention at present. Keep in mind that these tiny insects can survive on small pieces of food or even crumbs. Therefore, controlling Dermestid beetle pests should include the following steps:

*Continued on next page*
• Discard all infested foodstuffs and place all newly purchased food into glass or plastic canister-type containers with tight fitting lids.
• Thoroughly clean the cupboards and storage containers of all refuse material. Be sure to clean out the cracks along the shelves and top of the cupboard. Scrub out these areas with soap and water, adding a little household disinfectant.
• Purchase foods in quantities small enough so they may be used up rapidly.
• Animal or cereal products that sit for a long time are more susceptible to Dermestid infestations.
• Watch out for “leaky packages” in supermarkets; broken packages are more likely to harbor insect pests.

For nonchemical control, heating infested product in an oven at 130°F for thirty minutes or super-cool by placing it in a deep freeze at 0°F for four days.

Janet J. Knodel  
Extension Entomologist

around the state

AROUND THE STATE

NORTH CENTRAL ND

Planting continues at full power throughout much of the north central region of North Dakota. Most small grain planting is likely wrapping up, or at least close to it. Canola, pulses, and soybean appear to be leading the efforts for planting at the moment. As canola goes into the ground, take some time to consider some scouting protocols as Canola Flea Beetle is emerging. Some of my traps in Mohall and Minot have picked up some low population numbers.

During the last week, 0.11” of rain was observed at the North Central Research Extension Center. Looking at the seven-day forecast, several chances of rain are a possibility throughout the region.

TJ Prochaska  
Extension Cropping Systems Specialist  
NDSU North Central Research Extension Center

NORTHWEST ND

With the sunnier weather and warmer temperatures, planting is progressing at a rapid pace in Northwest ND. Farmers are rushing to get crops in the ground this week as rain is forecast to start Friday and continue through late next week. Rain will be welcome as the top soil is quite dry across the region. However, I’m sure everyone could use another day or two to get more done before the rain starts. There have been a few calm days the last week as well, and the spray rigs have been busy. Weeds are up and I have seen kochia and downy brome (aka, cheat grass) growing in fields at the Williston REC. Even though fields were planted 2 and 3 weeks ago, very little has emerged. Temperatures in the 70’s and sunshine yesterday, today, and tomorrow will help warm up the soil and get crops out of the ground.

Clair Keene  
Extension Cropping Systems Specialist  
NDSU Williston Research Extension Center
NORTHEAST ND

Fertilizing activity remains high. Weather has finally turned warm over the weekend and helps farmers seeded acres with our late spring start. The Langdon area is seeding wheat and early canola. Outside of the area, it is a mix of crops being seeded: small grains, canola, corn, and soybeans. I have not seen any crop emergence yet. I found my first crucifer flea beetle and spring-emerging adult grasshopper this week.

Lesley Lubenow
Area Extension Specialist/Agronomy
NDSU Langdon Research Extension Center

SOUTH-CENTRAL

As of May 10, a few scattered snowbanks could still be found in the region! According to NDAWN, the region’s average daily bare soil temperature at 4-inch depth during May 10-13 ranged from the low- to mid-50s. Rainfall from May 1-13 ranged from none (Harvey) to 0.6 inch (Edgeley and Wishek). Planted and emerged crops should respond nicely to the predicted weekend rain.

Alfalfa regrowth has reached 6- to 8-inches in height. Winter cereals are tillering and nearing the jointing stage. Nearly all spring crops are being planted currently and the list will soon include dry bean and sunflower. Small grain and pulse crops planted during the week of April 21 have emerged during the past week.

BLACK AND NAVY BEAN RESPONSE TO ROW SPACING AND PLANT POPULATION IN EASTERN ND

NDSU conducted field research trials from 2014 to 2018 in eastern North Dakota (Carrington, Prosper and Park River) to evaluate potential yield increase of black and navy bean with greater plant populations and narrower rows compared to the traditionally recommended plant density (90,000 plants per acre) in wide rows.

The following is a general summary of the research results:

*Black bean* seed yield was similar among the three row spacings (14-, 21- and 28-inches). The greater plant population (slightly more than 140,000 plants per acre) increased yield only 3% compared to the low population (slightly less than 100,000 plants per acre).

*Narrow (14-inch) rows with navy bean plant populations of greater than 115,000 plants per acre increased yield 24% to 28% compared to wide rows with slightly more than 90,000 plants per acre.

The NDSU Extension publication “Black and navy bean response to row spacing and plant population in Eastern North Dakota” provides details of the research and is available online.

Greg Endres
Extension Cropping Systems Specialist
SOUTHWEST ND

Farmers are pushing to get acres planted and sprayed this week with the forecast for potential moisture over the weekend. The high winds and warmer temperatures over the last week have some concerned about lack of moisture in the sandier soils in the region. A majority of wheat and pea acres are planted, and many are pushing to get canola acres seeded. According to NDAWN, the average bare soil temperature in Dickinson reached 60 degrees on May 13th. Rainfall recorded from May 7th to May 13th in Dickinson totaled 0.08 inch, and over the same time period Hazen recorded 0.28 inch, Hettinger with 0.44 inch, Mott with 0.32 inch, and Bowman with 0.16 inch.

The earlier planted spring wheat began to emerge towards the end of last week. For the winter wheat acres, be sure to check for any potential stand loss.

Ryan Buetow
Extension Cropping Systems Specialist
NDSU Dickinson Research Extension Center

WEATHER FORECAST

The May 16 through May 22, 2019 Weather Summary and Outlook

Some much warmer temperatures moved into the region this week, yet, overall, the temperatures were still a bit below average for the seven day period ending May 14. The next seven days look to be quite cool with temperatures expected to be well below average.

The warmth of the past few days did push soil temperatures close to or above 50° in most areas. Figure 2 gives the weekly average bare soil temperature at 4 inches but on Tuesday, May 14, 2019 much of the NDAWN mesonet was
reporting a daily average close to 60°. The projected cooler (and damp) weather over the next week will cause the bare soil temperatures to likely drop into the 40s and probably not warming up to current levels again until Memorial Day weekend.

![Average Soil Temperature (°F) Under Bare at 4” Depth (2019-05-08 – 2019-05-14)](image)

Figure 2. Average Bare Soil Temperature at a Depth of 4 inches from May 8 to May 14, 2019

There were pockets of quarter inch or greater rain totals this past week, but most of the region recorded much less than that. Figure 3 summarizes the weekly rainfall totals at the NDAWN stations but do not include what fell yesterday (Wednesday, May 15).

![Total Rainfall (inch) (2019-05-08 – 2019-05-14)](image)

Figure 3. Total Rain for the period of May 8 through May 14, 2019
As already hinted, the warmth from the past few days has ended for now and we will be back into the cooler than average temperature regime that has dominated the weather since the middle of January. With the coolness, several rain threats will come in the next week. Some parts of North Dakota may record rain every day from Friday (May 17) through next Friday (May 24). Granted, not all locations are going to record some rainfall each day, but most locations will probably record rain on several days in the next week. The upper-level wind flow will be coming in from the southwest over the next week bringing with it several disturbances plus ample moisture from the Gulf of Mexico. There will be several days of severe weather to our south, but that will stay to our south. Instead, we will deal with periods of cold rain. Western North Dakota may even be cold enough to record some snowflakes. Because cloudy conditions on many days can add to the coolness, frost will also be possible on any morning that the sky would happen to be clear.

Because of the cool and overall damp pattern of the next week, there will be few Growing Degree Days (GDDs) recorded. In fact, few if any, Base 50° GDDs are expected (used for corn and soybeans). Although all of the region is expecting rainfall in the next week, the Red River Valley has the highest potential to record the most rain. Because several periods of rain are expected, each event may not necessarily bring high amounts of precipitation, but over the next six to ten days, 1 to 2-inch amounts are clearly possible in some areas and, of course, localized areas may always get more. My projected GDDs for the period of May 16 through May 22 is presented in Figure 4. Base 50 is not included this week since the weekly totals at that level will be near zero at most locations.

![Projected GDDs](image.png)

**Figure 4. Projected Growing Degree Days for the period of May 16 to May 22, 2019**

_Daryl Ritchison_  
Meteorologist  
Interim Director of the North Dakota Agricultural Weather Network
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