SUNFLOWER BUD MOTH DAMAGING TO SUNFLOWER BUDS

Larvae of the sunflower bud moth, *Suleima helianthana* (Riley), have been observed damaging sunflower buds in R1-R3 sunflowers. Typically, most of damage occurs mostly in the stalk. However, this year sunflower bud moth emergence is delayed and larvae are feeding in the bud causing injury to the developing head (see photograph).

There are two generations of sunflower bud moth in North Dakota. Adults emerge from overwintering pupae between the last week of May to mid-June. A few days after adult emergence, eggs are deposited on the terminals of immature sunflower or on the receptacle of mature sunflower. Eggs also are deposited in leaf axils. The hatched larvae begin tunneling into the sunflower plant. The initial infestation in mid-June is characterized by an entrance hole surrounded by black frass, or insect excrement. Mature larvae pupate within the sunflower plant. Pupae move to the opening of the entrance holes formed in the stem or head tissue so that adults can emerge easily. The second generation adults appear in August. Infestation by the second generation larvae is not economically important.

A field monitoring scheme and economic threshold has not been established for this insect since it is not of economic significance most years. Insecticide use is NOT recommended for control of sunflower bud moth, because the larvae are protected when feeding within the sunflower plants. As a result, insecticides will have limited efficacy.
BANDED SUNFLOWER MOTH EGG LAYING UNDERWAY

Eggs of banded sunflower moth have been found on R3 stage sunflower fields. **Fields should be scouted now for egg laying activity, especially R3 sunflower fields.** Please refer to Issue 10 of the Crop & Pest Report for more information on scouting. The map from the pheromone trapping in North Dakota indicate increasing populations of adult moths, especially in the northern tier along the Canadian border.

NEW FORMULATION OF LORSBAN® FOR 2009

Dow AgroSciences will be releasing a new formulation of chlorpyrifos called “Lorsban Advanced®” in 2009. It features: lower odor than Lorsban-4E®, comparable efficacy, water-based formulation, and fewer VOCs (carbon-containing substances that, when exposed to air, volatilize into gases that contribute to ground-level ozone formulation). Lorsban Advanced® will be registered on the same crops as Lorsban-4E®, and listed in the North Dakota Field Crop Insect Management Guide for 2009.

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SOYBEAN APHIDS INCREASING IN RED RIVER VALLEY

Soybean aphid numbers are increasing in the Red River Valley area and eastern counties of North Dakota. Most fields still have low numbers, but a few fields are approaching threshold. This is the time to scout and monitor your fields for soybean aphid. The economic threshold for soybean aphid in the upper Midwest is:

250 aphids/plant in 80% of the field and with soybean aphid numbers increasing.

The economic threshold of 250 aphids/plant was arrived at through research conducted over a three year period at 19 locations in the northern US including North Dakota. The economic threshold was established to give growers a seven-day lead time for insecticide application before aphid populations reach a level where economic loss actually begins. Even though soybean market prices are high, the 250 aphid/plant threshold is still valid. This is because 250 aphids/plant is lower than the population at which yield loss can be measured and attributed to aphid injury. What this means in practical terms is that the lead time for insecticide application is reduced from seven days to three or four days. Therefore it is critical that growers monitor their fields closely.

NDSU Extension Entomology has received a few calls from growers asking whether they should tank-mix an insecticide with their last glyphosate application even though soybean aphid numbers are not at threshold. We do NOT recommend this practice, nor do we recommend any insecticide application when the economic threshold has not been reached. Applying insecticides too early to control soybean aphid may result in a second aphid invasion, which will require a second insecticide application. Insecticides also kill natural enemies of soybean aphid (such as lady beetles and damsel bugs), and re-invading aphid populations can increase very rapidly in the absence of natural enemies. Some vendors are offering guarantees on second insecticide applications. While the guarantee covers the chemical, it may not cover application costs. There is also the risk of spider mite flare-up in fields that have been treated twice with pyrethroid insecticides because beneficial mites have also been killed. This may require a third application using an organophosphate insecticide (such as Lorsban) to control the spider mites. Natural enemies keep aphid populations from growing rapidly and may even keep aphid populations from reaching threshold. **Conservation of natural enemies is of paramount importance in controlling soybean aphid - don’t spray unless and until you have to!**

Most fields are currently in the R1 growth stage (beginning flowering), though some are still in late vegetative (V) stages. The 250 aphid/plant threshold is valid from late vegetative through the R5 (early seed development) growth stage. Research has shown that insecticide applications at R6 (full seed) and beyond do not give a yield benefit. Therefore, insecticide applications for soybean aphid are not recommended after the R5 growth stage. Pyrethroid insecticides (such as Warrior) offer good control of soybean aphid. Several pyrethroids are labeled for soybean in North Dakota. Be sure to read and follow the label for application rates and pre-harvest interval restrictions.

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IMPACT OF DROUGHT STRESS ON CORN - 2008

More than half of the state is now rated abnormally dry or drier by the US Drought Monitor (http://www.drought.unl.edu/dm/DM_highplains.htm) and nearly a third of the state is under severe drought. Corn is one of the most water efficient crops grown in North Dakota. Nevertheless, it has a high water requirement because of its high yield potential and can be significantly impacted by drought. The impact of drought on corn growth and yield varies considerably depending on its timing and severity. Research has shown that there is little impact of drought on corn growth during early vegetative stages. During late vegetative development, however, short periods of drought stress (four days of sufficient stress to cause leaves to curl) during this growth stage can reduce yields by 5-10%. Currently most of the corn in North Dakota is in the 8 to 12 leaf stage. Kernels per cob are being set during this stage until just before silking, so drought stress now can impact the size of the cob. Drought stress during tassel emergence has the potential to reduce yields by 10 to 25%. The most sensitive period for drought stress in corn is during the period between silk emergence and the blister stage where yield losses between 40-50% can occur. Corn is most sensitive to drought during this stage because the male and female flowers are separated by a considerable distance and pollen and silks are sensitive to hot and dry conditions. When corn is severely stressed prior to flowering, silk growth is delayed and pollen shed will occur before the silks have emerged, resulting in barrenness. Silks can also dry before they are pollinated resulting in poor fertilization and missing kernels. Abortion of developing kernels is common, particularly towards the tip of the ears, with drought stress during early grain fill. Since the corn plant has the capacity to store considerable reserves in the stem, yield losses when drought stress is delayed until the dough stage usually are in the 20-30% range. These yield losses discussed above can be additive if stress occurs at more than one growth stage. With about half the growing season still ahead of us, the potential for yield losses due to drought appear to be quite high for a large part of the state unless we get some timely rains.

How is yield affected by late season drought stress?

During the first stage of stress, the upper leaves curl or roll towards the midrib during the hottest part of the day (see attached photo). If stress continues, premature leaf death begins at the bottom of the plant and proceeds upward. Leaf death is the first sign of permanent damage to the plant. With severe stress, the upper leaves roll so tightly that they appear like “onion leaves”. With less leaf area capable of photosynthesis, grain filling is slowed even while maturing at an accelerated pace. Carbohydrates that had been stored in the stem earlier in the season are moved to the developing ear. Not surprisingly, drought stressed crops are more prone to lodging because of poor stalk health. There may be some kernel abortion in the tips of the ears, but for the most part, kernel numbers are not reduced significantly with late season drought. Yield losses will largely be due to reduced kernel size and reduction in test weight. The amount of reduction will be related to the amount of stress prior to harvest.

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HAIL DAMAGE

Each summer hail damages field crops leaving producers wondering if the crop will recover and how much yield loss will be incurred. Hail events are unpredictable; developing during some summer thunderstorms but not others. Thunderstorms typically occur during the late afternoon and early evening. The temperature contrast between the Earth’s surface and the clouds can cause wind turbulence, creating up and down drafts within the storm cell. When water droplets are pushed upward into sub-freezing air layers the water freezes and frozen droplets eventually fall. The ice pieces may be pushed back up for several cycles increasing the size of the hail stones. Large hail stones, resulting from intense storm cells are more likely to cause severe crop damage compared to hail produced by weaker storm systems. In addition to hail damage, strong winds associated with summer storms may cause crops to lodge. The stage of crop growth and development at the time of a hail event is critical in the plant’s ability to recover and still produce a decent yield. Damage to the leaf tissue may result in plant stress. However, if ample moisture and fertility are available, the crop should be able to recover quicker than crops experiencing drought stress. Hail damage can vary considerably between neighboring farms or from field to field on individual farms. The variation may be a result of the different stages of crop development at the time of the hail event or because the amount of hail produced tends to be inconsistent even within short distances. Researchers at NDSU have conducted many years of simulated hail research on various crops to produce hail adjustment tables to estimate yield reductions that are based on the stage of growth and percent defoliation.

During a simulated hail study conducted from 2002-2004, researchers investigated soybean yield reductions based on different levels of defoliation at the reproductive stages R1 (Beginning of bloom) and R4 (pods are ¾ inch long at one of the four uppermost nodes on the main stem with a fully developed leaf). Zero (control), one, two, or three leaflets were removed from each fully expanded trifoliate leaf per plant to study the effects on yield (Table 1).

<table>
<thead>
<tr>
<th>Defoliation in %</th>
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<tbody>
<tr>
<td>Growth Stage</td>
</tr>
<tr>
<td>0</td>
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<tr>
<td>33</td>
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<tr>
<td>66</td>
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<tr>
<td>100</td>
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Yield in % of the check

| R1   | 100 | 99  | 93  | 92  |
| R4   | 100 | 92  | 87  | 44  |

Table 1. Soybean yield in % of the check at two growth stages and four defoliation levels. Research conducted at Prosper, ND, during the 2002-2004 growing seasons.

Source: Johnson and Petersen.

When the defoliation took place at the early reproductive stage (R1) the plants were able to compensate during the remaining season. Yield losses were 1, 7 and 8 percent at 33, 66 and 100 % defoliation respectively. Yield reduction as defoliation level increased was mainly a result of fewer pods per plant. Yields were lower when defoliation took place at the R4 growth stage compared with the R1 growth stage.

This research indicates that a plant has the ability to compensate for loss of leaves but it will depend on the growth stage of the plant and the remaining growing season. If defoliation occurs at an early growth stage, which allows more time to regenerate foliage, yield reduction will be less. This study was an attempt to simulate hail injury; however, in a real hail event the stems of the plant may also be damaged further reducing the plant’s ability to recover.

Although field crops may appear to be heavily damaged after a storm, the plants will try to recuperate and produce seed. Contact your insurance agent for advice before you decide to destroy a damaged crop.

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NDSU IPM FIELD SCOUTS RESULTS - July 18

NDSU field scouts are winding down their survey of wheat and barley in the state, as the crops are rapidly maturing. The field scouts surveyed 77 wheat fields and 31 barley fields during the week of July 14-18. During that time, the average growth stage of wheat fields surveyed was early milk stage, and the average growth stage of barley fields surveyed was early soft dough stage.

Wheat:
- Wheat leaf rust was observed in 16.8% of the wheat fields surveyed, with an average severity of 5.3%.
- Tan spot and Septoria were the most common diseases observed in wheat, found in 52% of fields surveyed which still had green flag leaves. Bacterial leaf stripe was observed in 7.7% of the surveyed wheat fields, and loose smut was observed in 9% of surveyed fields, with an average incidence of infected plants in these fields at 11.4%. This incidence of loose smut in symptomatic fields is very high, a level in which infected fields would certainly have received benefit from seed treatments that control loose smut. Fusarium head blight (scab) was only found in 5% of surveyed fields, with a field severity averaging less than 1%.

Barley:
- Barley leaf rust was observed in 20% of surveyed fields. Septoria leaf blotch in 20%, and Spot or Net blotch also in 20% of surveyed barley fields. Loose smut levels were lower in barley than in wheat, with only a 6% incidence in infected fields. Scab was found in less than 3% of surveyed fields, at very low severity, less than 0.1%.

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WHITE MOLD IN BEANS

White mold is a common problem on edible beans, and can be found in many soybean fields as well. Yield loss from white mold is possible in either crop, but white mold is more frequently a problem for edible beans. The disease begins when spores germinate on senescing flower petals, and infection progresses into the stem. An infected stem will take on a dried bone color and may be shredded (Figure 1). Sometimes a white fuzzy mold appears (where white mold gets its name), and small black survival structures are produced (sclerotia). Because the infection begins on the senescing flower petals, the most important time to assess disease risk is at early bloom.

The highest risk for white mold occurs when a few environmental factors come together.

Canopy wetness. Once spores are on the petals, a saturated canopy for a prolonged period of time (day or more) is necessary for the disease process to begin. Rainfall and heavy dews during flowering increase risk of infection.

Temperature. When it gets hot, white mold is less of a problem. Temperatures above 85 F will inhibit apothecia formation and disease development.

Soil saturation. The disease cycle begins when the survival structure of the fungus (sclerotia) germinates and produces a small mushroom-like structure (apothecia) full of spores. These spores are then dispersed, and can land on the senescing flower petals which can result in disease. For this to happen, researchers have estimated that the soil must be saturated for about 10-14 days. I took the apothecia photo in a wheat field near Langdon last Thursday, so there are areas in the state where conditions have been favorable for development.

VENTENATA - NEW GRASS WEED

Ventenata dubia is a weedy grass that has been identified in much of the western U.S. Prairie Provinces of Canada, and other areas. Confirmed establishment in Montana could mean, as weeds do, movement into North Dakota. There is not much written about this grass species but a quick google on the web (ventenada) will yield some sources of information. Some web sites are:

http://plants.usda.gov/java/profile?symbol=VEDU
http://www.cnr.uidaho.edu/range454/2004_pet_weeds/ventenata.html
http://www.kew.org/data/grasses_db/www/imp10735.htm

Ventenata control data is also limited. One research report from University of Idaho in 2002 shows:

<table>
<thead>
<tr>
<th>Rate (lb ai/A)</th>
<th>Ventenada Control %</th>
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<tbody>
<tr>
<td>Silverado + MSO 0.0134 + 1.5 pt</td>
<td>49</td>
</tr>
<tr>
<td>Silverado + NIS 0.0134 + 1.5 pt</td>
<td>66</td>
</tr>
<tr>
<td>Silverado + MSO 0.0089 + 1.5 pt</td>
<td>58</td>
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<td>2</td>
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Fig. 1. White mold in soybean field

Soil saturation. The disease cycle begins when the survival structure of the fungus (sclerotia) germinates and produces a small mushroom-like structure (apothecia) full of spores. These spores are then dispersed, and can land on the senescing flower petals which can result in disease.

Fig. 2. Apothecia produced by the white mold pathogen
WHY HERBICIDES KILL WEEDS – WHY NOT THE CROP? - QUICK REVIEW

Selectivity is the ability of a herbicide to kill one species and not harm another. We often take selectivity for granted. We apply herbicides at low rates and expect them to give adequate weed control but not kill the targeted crop.

By what processes do herbicides work or what is their mode of action? Herbicides kill weeds or damage crops through a four step process.

4 Steps in Herbicide Mode of Action
1. Contact or Retention - contact of the herbicide with the roots or retention of spray droplets on a leaf.
2. Absorption – uptake of the herbicide molecules into the leaf, shoot, or root.
3. Translocation – movement of the herbicide from the site of uptake to the location in the plant where it can cause damage such as translocation the roots to the leaves or from sprayed leaves to growing points or roots (contact herbicides don’t need to translocate).
4. Inhibition at the site of action – typically, the herbicide molecule binds to a specific enzyme, blocking the production of essential products such as amino acids or blocking photosynthesis.

Why are crops not harmed by herbicides? Simply, some plants are able to metabolize (or detoxify) the herbicide into non-toxic chemicals before they damage the plant. In most cases, the key to selectivity is a plant’s ability to rapidly metabolize the herbicide before it causes damage at the site of action. In these cases, the plant has other enzymes that can cleave off a side chain from the herbicide molecule. This often reduces the toxicity of the herbicide molecule because the molecules no longer has the right configuration or shape to bind tightly at the site of action. The next step in herbicide metabolism is often binding of sugars or amino acids to the molecule, which further detoxifies it. Safeners are added to some herbicides like Dual II Magnum, Harness, Option, and Laudis. These safeners trigger the crop to produce more enzymes to detoxify the herbicides, which increases crop safety. Under normal weather conditions, a crop plant may be able to metabolize a majority of the herbicide in several hours. On the other hand, a sensitive weed will only slowly metabolize the herbicide. During this time, the herbicide is able to bind to the site of action and kill the weed.

Herbicide selectivity is based on metabolism in most herbicide-crop combinations such as with Accent, Dual, Callisto, atrazine, or Banvel in corn or Valor, Pursuit, Cobra, or Sencor in soybeans. The exception to metabolism-based selectivity is when the crop has an “insensitive” site of action, which means the target enzyme in the crop has a slightly different shape so the herbicide does not bind to it. This is the case with Assure, Select, and Poast Plus on broadleaf crops like soybean and alfalfa. Since these herbicides cannot bind to the site of action, they do not damage these crops.

Roundup Ready corn and soybean are also resistant to glyphosate based on an insensitive site of action. The gene that was added to these crops produces an altered or insensitive enzyme that glyphosate cannot bind to. Therefore, the enzyme is not blocked and it keeps producing amino acids for the corn or soybeans. The Optimum GAT corn and soybean being developed by Pioneer uses a metabolism-based glyphosate resistance. In this case, a gene (GAT) was added to the crops, which produces a special enzyme to rapidly detoxify glyphosate before it damages the crops. Liberty Link corn and soybean also use metabolism-based resistance where the PAT gene was inserted into the crops, which produces an enzyme to rapidly detoxify Liberty.

This year we have received a larger amount of crop injury calls. Herbicides from many different chemistries applied alone or on tankmix combinations have produced crop injury. Both soil-applied and post-applied herbicides have caused crop injury. The cool/cold weather we had earlier in the season certainly reduced the metabolism in plants causing the plants to be affected by the herbicides. Multiple herbicide/fungicide combinations require plants to simultaneously degrade pesticide of several different modes of action in the presence of reduce metabolism. In addition, the cool, wet weather allowed plants to form thinner cuticles on leaf surfaces rather than thick cuticles in dry/drought conditions. Thin cuticles allow faster and greater penetration of pesticide active ingredients thus further taxing the metabolic system in plants. I am sure there are other factors involved in the crop injury many of us have seen this year but these are explanations that may help answer why it happened.

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2008 NDSU HORTICULTURE RESEARCH FIELD DAY

If you are interested in learning more about woody plant, fruit and vegetable research, then attend the North Dakota State University Horticulture Research Field Day on Saturday, August 2, 2008 at 9:45 a.m. at the NDSU Absaraka Horticulture Research Farm. A walking tour begins at 10:00 a.m. Participants are asked to bring a sack lunch, but drinks will be provided.

The walking tour will continue after lunch. NDSU tree and shrub selections and introductions, common and exotic species, dwarf conifers and juneberry, grape and vegetable research plots will be toured.

The 80-acre farm includes the 35-acre Research Arboretum, plus additional plot research areas. Dr. Dale Herman (woody plant selection and introduction research), Dr. Harlene Hatterman-Valenti (high-value crop research), and research associates at NDSU will conduct the tours.

Come and enjoy nature, plants and the great outdoors. There will be numerous tree and shrub door prizes.

For more information contact Dale Herman at dale.herman@ndsu.edu or Harlene Hatterman-Valenti at h.hatterman.valenti@ndsu.edu

Directions to Horticulture Research Farm

From East: Take I-94 west and turn north at Wheatland Exit 322. Follow pavement to the north, which curves to west shortly after passing through Wheatland. Turn north (right) on County Road 5 (paved road, sign posted). At Absaraka corner, road changes to gravel at a slight curve. Go north about 3/4 mile (sign posted). Turn east (right) on field road and proceed ½ mile to Horticulture Research Farm bordered by trees.

From West: Take I-94 to Buffalo Exit 314. Turn north on Highway 38 for seven miles. Turn east (right) on gravel at a dairy farm (silos). Go through Absaraka to County Road 5 (sign posted). Turn north (left) and go about 3/4 mile (sign posted). Turn east (right) on field road and proceed ½ mile to Horticulture Research Farm bordered by trees.

From North: Take I-29 south to Argusville Exit 79. Go west approximately 20 miles on County Road 4 (paved). Turn south on County Road 5 (gravel, sign posted) for approximately four miles. Turn east (left) prior to Absaraka corner (sign posted) and proceed ½ mile to Horticulture Research Farm bordered by trees.
weather

Last 7-Day Percent of Normal
Precipitation(%)  
7/16/2008-7/22/2008

Last 7-Day Departure From Normal
Temperature(°F)  
7/16/2008-7/22/2008
Helping You Put Knowledge To Work

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