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Entomology

CLEAN-UP GRAIN BINS TO PREVENT INSECT INFESTATIONS

You may have triumphed over insect pest problems on small grains during the growing season, but take some time now to prepare your storage bins and prevent potential stored insect problems through good bin management. Several species of insects infest stored grains - confused flour beetle, Indian meal moth, rice weevil, lesser grain borer, red flour beetle. Damage caused by these insects includes reduced grain weight and nutritional value, contamination, odor, mold, and heat damage, all of which lowers the grain quality. Good grain bin management practices include:

1) Before treating with protectant, make sure that the bins are free of insect-infested grain. Leftover grain should be removed from the bin, and the walls should be swept and vacuumed. All grain handling equipment, including augers, combines, trucks and wagons, should be thoroughly cleaned and grain residues removed before harvest.

2) A residual bin spray, such as malathion, Tempo, or Storcide II, should be applied to all interior bin surface areas 2 to 3 weeks before new grain is placed in the bin. The treatment will kill insects merging from their hiding places (cracks, crevices, under floors and in aeration systems). Also, insects crawling or flying in from the outside will be killed. Apply the spray to as many surfaces as possible, especially joints, seams, cracks, ledges and corners. Spray the ceiling, walls and floors to the point of runoff. Use a coarse spray at a pressure of more than 30 psi and aim for the cracks and crevices. Spray beneath the bin, its supports, and a 15 ft border above the base of the outside foundation. Treat the outside surface, especially cracks and ledges near doors and fans.

The increased use of metal bins with perforated floors for grain drying and aeration has helped produce a serious insect problem in farm-stored grain. Grain dockage (broken kernels, grain dust, and chaff) sifts through the floor perforations and collects in the subfloor plenum creating a favorable environment for insect development. Unfortunately, the floors are usually difficult to remove, making inspection, cleaning and insecticide spraying in the plenum difficult, if not impossible. The infested plenum may be disinfected with an approved fumigant. Note: Fumigants are **extremely hazardous** for the user and only certified applicators may purchase and apply fumigants. Please remember to read and follow the label.

3) Remove any vegetation / weeds that may attract and harbor insect pests within 10 ft of a bin and preferably the whole storage area. Follow by spraying the cleaned area around the bin with a residual herbicide to remove all undesirable weedy plants.

4) Repair and seal all damaged area to grain storage structures. This helps prevent insect infestation and reduces water leakage which leads to mold growth.

5) Whenever fans are not operated, they should be covered and sealed to reduce the opportunity for insects and rodents to enter the bin through the aeration system.

6) If newly harvested grain and/or insect-free grain must be added to grain already in storage, the latter should be fumigated to prevent insect infestation.

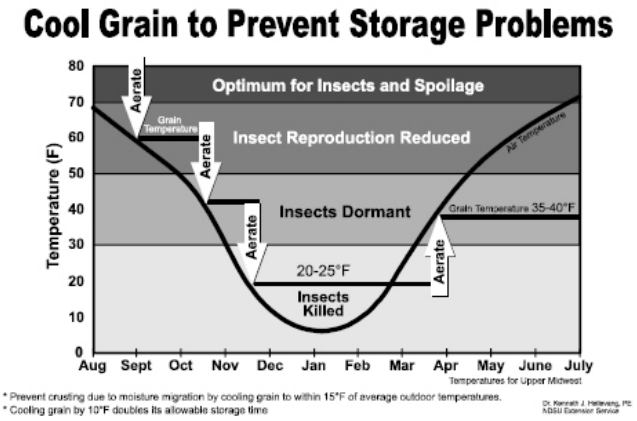
7) It is recommended that grain be treated with approved insecticides as it is augered into the bin if it will be in storage for one or more years. Grain protectants kill insects as they crawl about or feed on treated grain and/or grain fragments. Do not apply grain protectants prior to high temperature drying because extreme heat will result in rapid volatization and reduced residual qualities of the pesticides. Grain protectants applied to 13% moisture grain will have a greater residual life than grain at 15% or great moisture.

Please consult the 2008 Field Crop Insect Management Guide for a complete list of stored grain insecticides.

http://www.ag.ndsu.nodak.edu/aginfo/entomology/entupdates/ICG_08/21_StoredGrain08.pdf

After binning, some grain protectants may be applied as a surface treatment "top dress" to control surface feeding insects such as the Indianmeal moth larvae. Insecticide product should be applied into the top few inches to improve efficacy. No-pest strips (dichlovorous impregnated strips, DDVP) can also be hung in the open space of grain bins to help control flying insects. It is recommended to suspend one strip per 1,000 cubic feet of air space. No-pest strips may need to be replaced during summer.

When temperatures are above 50 F, bins should be inspected for insect activity every two weeks. Stored grain insect pests are generally inactive at temperatures below 50 F (see diagram).



Use a grain probe to determine the extent of infestation within the grain mass. It's important to know what species of insect pests are infesting your stored grain. The Federal Grain Inspection Service differentiates between grain that is infested and grain that is "weevily." Grain is only graded weevily if it contains an internal feeding insect, such as weevil or lesser grain borer. The only option with weevily infested grain is to feed it, sell it at a discounted rate, or fumigate it. Remember, stored grain insects can be thought of as very expensive, unwanted livestock!

SOYBEAN APHID MOVING TO BUCKTHORN!

There have been several reports of soybean aphid moving out of soybean fields and back to buckthorn. The soybean aphid can survive winter only in the egg stage, as is true of other aphids in temperate zones. Buckthorn (*Rhamnus* spp.) is the only known overwintering host. Leaves of common buckthorn (*Rhamnus cathartica*) are dark green and glossy with three to four pairs of upturned veins (see photograph).

Buckthorn tree

Green leaves often remain on trees well into the fall. Small, yellow-green flowers are clustered at the base of leaves in spring. Recent research from NDSU in the Red River Valley determined the supercooling point of winter-acclimated eggs was found to be -38 degrees F in Fargo, ND. In other words, aphid eggs are very winter hardy and can survive extended periods of very cold temperatures. Soybean aphids hatch in the spring and are expected to have two to four generations on buckthorn, with winged females developing during each generation and leaving the overwintering host in search of soybean. Numerous generations of wingless females will develop on soybeans before a winged generation of females and males migrate back to buckthorn in late-summer/early fall to mate and lay eggs.

HESSIAN FLY-FREE DATES STILL VALID AFTER 70+ YEARS?

There have been some questions about Hessian fly and control this fall. Hessian fly causes stunting in seedling plants and lodging as wheat matures. It overwinters in the shiny brown 'flaxseed' stage that is generally found at the base of the plants or below broken stems under leaf sheathes in the stem.

Hessian fly pupae

Hessian fly adults are killed by freezing temperatures and cannot lay eggs. Therefore, delayed planting until after the first freeze is one of the traditional control methods for preventing Hessian fly infestations in winter wheat. In North Dakota, suggested winter wheat planting dates for the northern area are from September 1 to September 15, and for the southern area are from September 15 to 30. However, recent research from Kansas has indicated that the established fly-free dates are too early in regards to Hessian fly activity (source: J. Whitworth and P. Sloderbeck, KSU). Potential contributing factors as to why fly-free dates are too early for reducing Hessian fly populations include: increased reliance on reduced tillage and slight increase in average temperatures in fall. One of the other benefits to planting later is breaking the 'green bridge" that supports the survival other pests, such as wheat curl mites which vectors Wheat Streak Mosaic Virus.

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plant science

SOYBEAN VARIETY SELECTION

At this time of the year, the soybeans are turning yellow and will soon be harvested. Many of the seed companies already are starting to market soybean varieties for the 2009 season. Soybean variety selection should be based on maturity, yield, seed quality, lodging, iron deficiency chlorosis tolerance, and disease reaction.

Later maturing varieties tend to yield more than early maturing varieties when evaluated at the same location. After determining a suitable maturity for the farm it would be important to compare yields of varieties that are of similar maturity. Although later maturity increases yield potential, later maturing cultivars are more risky to grow than earlier maturing cultivars because an early fall frost may kill a late maturing cultivar before the beans have filled the pods, which will greatly reduce yield.

Varieties of maturity groups 00 (double zero), 0 (zero), and 1 are suitable to eastern North Dakota and northwestern Minnesota. Maturity group 00 is very early and primarily grown in the northern Red River Valley. Maturity group 0 is adapted to Traill, Cass, Richland, Barnes, Sargent and Richland counties. Maturity group 1 is primarily suitable for southern areas. These maturity groups are further subdivided. For example, a 0.1 maturity group is an early group 0 variety and a 0.9 is a late maturity group 0 variety.

The best way to select a high yielding variety is to use data averaged across several locations and years. Because weather conditions are unknown in advance, averaging across several years' data will identify a variety that will likely yield well across different weather conditions. Selecting a variety that has performed well in dry and moist conditions is the best way to identify a cultivar that does relatively well, regardless of weather fluctuations. An extensive excel spread sheet was prepared with the 2007 variety information. This tool (www.ag.ndsu.edu/pubs/plantsci/rowcrops/a843.pdf) provides multiyear and multi location information about the performance of tested soybean varieties.

Phytophthora root rot is the number one disease problem of soybeans in North Dakota. Phytophthora root rot tends to be more of a problem in the Red River Valley and on poorly drained, heavy soils, but the disease can cause significant stand reduction and yield loss in other areas when conditions are favorable. Most varieties have Phytophthora root rot resistance genes. Each gene for resistance confers resistance to a different race (or races) of Phytophthora. For example, a gene that may confer resistance to Race 3 may not confer resistance to Race 4, and vice versa. According to a recent survey of Phytophthora races done by NDSU's soybean pathologist Dr. Berlin Nelson, races 3 and 4 are most common in North Dakota. However, numerous other races are found in the state. Based on his findings, resistance genes RPS 6 and RPS 1K (commonly called the 'k gene') are the most likely genes to provide resistance against the races common in North Dakota. Although selection of RPS6 or RPS 1K does not guarantee control, selection of one of these two resistance genes will maximize the likelihood you will have some protection against Phytophthora root rot next year.

There are genetic differences among varieties for tolerance to white mold. Varieties that are less susceptible to white mold should be grown on fields where white mold has a past history of causing problems. The same pathogen causing white mold in soybeans causes white mold in other crops (dry bean, sunflower, pea, canola, etc.), therefore recent white mold problems in any crop in that field should be noted.

Iron deficiency chlorosis (IDC) is a major problem in the eastern part of ND. Iron chlorosis symptoms are present during the two to seven trifoliate leaf stages. Plants tend to recover and start to turn green again during the flowering and pod filling stages. However, IDC during the early vegetative stages can severely reduce yield. Some varieties are more tolerant to IDC than others. For high pH soils with known IDC problems, select an iron chlorosis tolerant variety of suitable maturity that is high yielding.

The soybean cyst nematode (SCN), *Heterodera glycines*, is a small plant-parasitic roundworm that attacks the roots of soybeans. Soybean cyst nematodes are now found in Cass and Richland Counties of North Dakota and are causing yield losses in infested fields. Crop rotation is one of the most important management practice growers must use to control the nematode disease. Growers may

want to consider testing their soils for SCN. See Berlin Nelson's article in the plant pathology section for more information. If there is a nematode problem in the field only tolerant soybean varieties should be planted.

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NCR-SARE ANNOUNCES 2008 FARMER RANCHER GRANT CALL FOR PROPOSALS

Many farmers and ranchers have great ideas for innovation. Sometimes there is a little risk in trying out new farming methods. Farmers and ranchers have the opportunity to reduce their risk by applying for a sustainable agricultural grant and be part of a research project.

The 2008 North Central Region Sustainable Agriculture Research and Education Program (NCR-SARE) Farmer Rancher Grant Call for Proposals is now available online at www.sare.org/NCRSARE/prod.htm.

Farmers and ranchers in North Dakota can submit proposals for grants to support sustainable agriculture project ideas initiated by them. Projects should emphasize research or education/demonstration. Grants can range from $6,000 for individual farmers and up to $18,000 for groups of 3 or more farmers.

NCR-SARE expects to fund about 50 projects in the twelve-state North Central Region for the 2009 growing season.

With this call, the Farmer Rancher Grant Program will now accept project proposals by email. NCR-SARE is asking applicants to complete a brief budget narrative in their project proposal. Also, beginning farmers and/or youth may apply. The deadline for proposals is Monday, December 1, 2008 at 4:30 p.m.

Potential applicants with questions can contact Joan Benjamin, NCR-SARE Farmer Rancher Grant Program Coordinator, at jbenjamin2@unl.edu or 402-472-0809.

The NCR has funded more than 650 farmer rancher grants worth more than $4,300,000 since the inception of this program.

Each state in SARE's North Central Region has one Professional Development Program State Sustainable Agriculture Coordinators. In ND, Frank Kutka is the State Sustainable Agriculture Coordinator and he is responsible for administering sustainable agriculture activities and educational events, and providing educational opportunities for potential grant applicants. For more information about the SARE program in ND visit www.DakotaSARE.info or e-mail frank.kutka@ndsu.edu

Farmers and ranchers are encouraged to involve their local extension staff in developing a project and grant proposal.

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ASSESSING CORN MATURITY AND MOISTURE

Corn in North Dakota is still 150 (or more) corn growing degree days (GDDs) behind normal. With typical GDD accumulations of only 8-9 per day this time of the year, there is continuing concern that corn will not mature and that the moisture content of the grain will be excessive at harvest. The good news is that there is no frost forecast for the near term and temperatures will be in the mid-to high- 70s for the remainder of this week and into next. This will help the crop progress, but given the significant temperature deficit for the season, the crop will still likely be behind normal by the first killing frost. The most recent USDA Crop Report indicates that 55% of the corn crop is in the dent stage. Based on extrapolations of data from other states, assuming that an 85 relative maturity hybrid is grown and that our growing degree day accumulations will be normal for the rest of the period, dented corn will need between 12 and 19 days to reach physiological maturity (Table 1). A killing frost before maturity, of course, does not mean that the crop will be lost, but means that yield will be reduced and that the harvested grain will have a lighter test weight (Table 1). Additionally, it means that dry-down in the field will starts at a much higher moisture level than normal (e.g. 47% for a crop in the late dent stage, verse 30% for a mature crop). Excessively wet grain, not yield and test weight losses, will in fact, be our biggest challenge this fall.

Table 1. Characteristics of corn grain at differing growth stages[1].

Stage	Grain moisture content	GDD to reach PM[2]	Frost-free days needed to reach PM[3]	Test weight[4]
Blister	85	800	88	-
Late Milk/ early dough	70	600	66	-
Early dent	59	400	44	47
Full dent	51	200	19	50
Late dent	47	110	12	53
Physiological maturity	30	-	-	58

[1]Adapted from Coulter, 2008 and Thomison and Geyer, 2008.
[2]Assuming 85 day relative maturity hybrids are grown. PM= Physiological maturity.
[3]Assuming 9 GDDs are accumulated each day. Nine GDDs per day is normal for late September.
[4]Test weight values assume that the plant is killed by frost at this growth stage and no additional increase in grain weight occurs.

FIELD DRY-DOWN OF CORN

Given the above scenario, how dry will corn get before harvest in 2008? Unfortunately, the answer to that question, like so many in agricultural is, that it depends. It depends on the moisture content of the grain at the time when grain dry-down starts (wetter grain dries at a faster rate than drier grain), the temperature (warmer air can hold more moisture and will dry grain at a faster rate), the relative humidity, and the hybrid grown. Figure 1 shows the rate of dry-down of hybrids with differing maturities at Carrington in 2007. Using these data, starting from September 7th, the average rate of moisture loss ranged from 0.42% to 0.58% per day. However, starting from September 21st (closer to where we are today) it averaged 0.23% to 0.33% per day. It is interesting to note from this figure that most of the drying occurred in September, when temperatures were warmer. In fact, we actually observed an increase in the moisture content in late October as we had rain and unusually cool temperatures at that time. Unfortunately, we did not follow the drying process into November. Though normally we do not expect much drying to occur in November because temperatures are too cold. In 2007, November was warmer than average and there was measurable drying if corn was still in the field. Nevertheless, combining corn in December, I am told, is not a preferred task.

Figure 1. Corn dry-down as affected by hybrid maturity, Carrington, 2007.

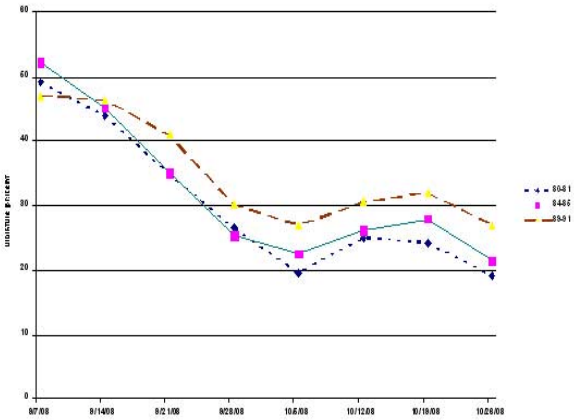

Figure 1

By applying the rates of drying we measured in 2007 (0.33% per day and 0.58% per day), moisture losses will range from 15-25% between now and November 1st. For mature corn, that is good news, as it means that no artificial drying will be needed if harvest occurs in late October. For the corn that is in the dent stage (more than half the state), it looks like the corn crop will indeed still be wet at the beginning of November. This analysis suggests that significant artificial drying will be needed, so plan accordingly. Options for corn that will be too wet to be harvested for grain include earlage and silage especially if they can be used on-farm.

References

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Thomison, P. and Geyer, A. 2008. Assessing the risk of frost injury to late maturing corn. Available at http://corn.osu.edu/story.php?issueID=255&layout=0&storyID=1584 (verified 17 September 2008). The Ohio State University Extension Service.

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ag engineering

POST-HARVEST TIPS FOR LATER MATURING CORN

Yield potential for corn frozen during the milk stage is low. Ears are difficult to pick and shell, kernel tips may stay on the cobs, and grain will be very chaffy. Therefore, green chopping or ensiling whole plants may be the only reasonable options. Corn silage should be harvested at 60 to 70% moisture. The length of cut should be about 0.5 inch long with not more than 10 to 15% being 1 inch or longer. A bunker or horizontal silo should be crowned in the center, have a wall slope of 1:6 to 1:8, and be covered with six mil polyethylene. To be effective the plastic must be held down over its entire area. Temperatures above 120 degrees after 4 days indicate that excess air is getting into the silage.

Test weights will be much less, probably 40 to 45 lb/bu., for corn frozen in the dough stage. Although corn will eventually dry to acceptable harvest moisture, it will take at least a week longer than mature grain. Ear molds will likely develop if warm ambient temperatures follow the frost. The only means of stopping mold growth are drying the grain or ensiling.

Standing corn in the field may dry 0.6 to 0.9 percentage point per day during warm, dry fall days with a breeze. Normally about one-half percent per nice drying day is expected in North Dakota early in September, may reduce to about 0.3 to 0.4 during October and 0.15 to 0.2 or less in November (see Joel Ransom's article). Immature, frosted corn can mold on the stalk. Based on the equilibrium moisture content for the average monthly temperature and relative humidity, corn might be expected to dry to about 15.5% moisture content during September, 16.0% during October, and 19% during November. Field

drying is normally more economical until mid to late October and mechanical high temperature drying is normally more economical after then.

Shelled corn should be at 25 to 30% moisture for anaerobic (without oxygen) high moisture storage in silos or silo bags. Any tears in the plastic bag must be promptly repaired to minimize storage losses. Whole shelled corn can be stored in oxygen-limiting silos, but a medium grind is needed for proper packing in horizontal or conventional upright silos. Wet grain exerts more pressure on the silo than corn silage, so conventional concrete stave silos may require additional hoops or the silo must not be completely filled.

Natural air and low temperature drying should be completed as much as possible in October because the drying capacity is extremely poor during the colder temperatures in November. Corn above 21% moisture should not be dried using natural air and low temperature drying to minimize corn spoilage during drying. An airflow rate of 1.25 cfm/bu is recommended to reduce drying time. Adding heat does not permit drying wetter corn and only slightly increases drying speed. The primary effect of adding heat is to reduce the corn moisture content. Natural air drying in the spring is the most energy and cost effective method of drying.

Shelled corn can be stored in a grain bin at moisture contents up to about 25% if it is kept below 30 degrees using aeration. Corn kernels above about 25% moisture may freeze into a clump that causes unloading problems.

Dryers will be operated more hours than usual, so examine them carefully and perform needed maintenance before harvest. Use the maximum allowable drying temperature in a high temperature dryer to increase dryer capacity and energy efficiency. Be aware that high drying temperatures result in a lower final test weight and increased breakage susceptibility. In addition, as the drying time increases with high moisture corn, it becomes more susceptible to browning. Use in-storage cooling instead of in-dryer cooling to boost capacity of high-temperature dryers. Cooling corn slowly in a bin rather than in the high temperature dryer will also reduce the potential for stress cracks in the kernels.

In-storage cooling requires a positive-pressure, airflow rate of about 0.20 cfm/bu or 12 cfm/bu-hr of fill rate. Cooling should be started immediately when corn is placed in the bin from the dryer. Dryer capacity is increased 20 to 40% and about one percentage point of moisture is removed during corn cooling. Condensation problems can be reduced by cooling the corn in the dryer to about 90 degrees before placing it in storage.

Dryeration will increase the dryer capacity about 50 to 75%; reduce energy used by about 25% and remove about 2 to 2.5 points of moisture. (0.25% for each 10 degrees the corn is cooled.) With dryeration, hot corn from the dryer is placed in a dryeration bin with a perforated floor, allowed to steep for 4 to 6 hours without airflow, cooled, and then moved to a storage bin. There will be a tremendous amount of condensation during the steeping and cooling process, so the corn must be moved to a different bin for storage or spoilage will occur along the bin wall and on the top grain surface.

A dryer that captures the heat from cooling the dry corn and a portion of the air from the final drying portion of the dryer can reduce the energy used to dry the corn by about 20%. Newer dryers typically have incorporated features to make them more energy efficient than older dryers.

Using the maximum drying temperature that will not damage the corn can also reduce energy consumption. The amount of energy required to remove a pound of water is about 20% less using a drying air temperature of 200 F than at 150 F.

Propane cost for high temperature drying corn can be estimated using the following formula. Cost/bu. – pt. = 0.022 x propane price/gal. For example, the drying cost is $0.044/ bu.-pt. if the cost of propane is $2.00, 0.022 x $2.00. It will cost about $53.00 for propane to remove 10 percentage points of moisture from 120 bushels of corn using $2.00 propane.

The estimated quantity of propane needed to dry is 0.02 gallons per bushel per point of moisture removed. For example, 24 gallons of propane is needed to dry 120 bushels of corn from 25% to 15%. (0.02 x 120 bu. x 10 pts.) This is based on 0.72 pounds of water being removed per point of moisture per bushel, 2,500 Btu of heat required to remove a pound of water in a high temperature dryer, and a propane heat content of 91,500 Btu/gallon.

The weight of water removed during drying can be calculated using the following formula. Initial Weight = (100-Final Moisture Content)/100-Initial Moisture Content) x Final Weight For 56-pound corn with an initial moisture of 25% and final moisture of 15%, the initial weight would be 63.5 pounds per bushel. The weight of moisture removal is 63.5-56 = 7.5 pounds per bushel.

Moisture shrink is the reduction in weight as the grain is dried one percentage point. Moisture Shrink Factor = 100 ÷ (100 – final moisture content). The shrink factor drying corn to 15.5% is 1.1834. The shrink drying corn from 20.5 to 15.5 would be 5 x 1.1834 = 5.92%.

Moisture meters will not provide accurate readings on corn coming from a high temperature dryer. The error will vary depending on the amount of moisture removed and the drying temperature, but the meter reading may be about 2% lower than true moisture. Check the moisture of a sample, place the sample in a closed container for about 12 hours, and then check the moisture content again to determine the amount of error. Moisture meter errors increase as corn moisture contents increase, so readings above 25% should only be considered estimates.

In addition, moisture meters are affected by grain temperature. If the meter does not automatically measure the grain temperature and adjust the value, then it must be done manually. Even if the meter does it automatically, it is recommended to cool a sample in a sealed container to room temperature before measuring the moisture content.

Then compare the moisture content of the room temperature sample to the initial sample to verify that the adjustment is done accurately.

Normally, corn test weight increases about 0.25 pound for each point of moisture removal during high temperature drying. However, there will be little increase in test weight on immature or frost-damaged corn.

More fines are produced when corn is wet, because more aggressive shelling is required, which causes more kernel cracking and breaking. There is also more potential for stress cracks in kernels during drying, which leads to more breakage potential during handling. In addition, immature corn contains more small and shriveled kernels. Fines cause storage problems because they spoil faster than whole kernels, they have high airflow resistance, and they accumulate in high concentrations under the fill hole unless a spreader or distributor is used. Preferably, the corn should be screen-cleaned before binning to remove fine material, cob pieces, and broken kernels.

Immature corn has a shorter storage life than mature corn. Therefore, cooling the grain in storage to about 20 to 25 degrees for winter storage is more important than for mature corn. More frequent checking of the storage is recommended, and immature corn is not recommended for long-term storage.

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plant pathology

SUNFLOWER RUST

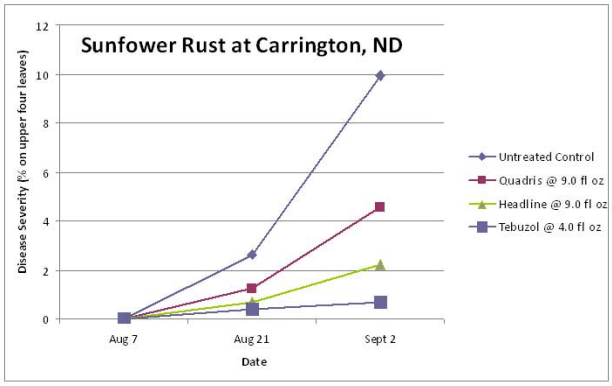
This year sunflower rust was a big problem in localized parts of the state. Although not widespread, the disease appeared very early in some locations, and although environmental conditions were not *perfect* for disease development, they were conducive enough to cause heavy infection. It is likely that rust will overwinter in North Dakota, and if it appears early in the season next year, we will have to deal with this problem again.

Selection of a resistant hybrid may be important for those who had heavy rust infection this year, particularly if next year's sunflowers will be next to a heavily rust field this year. However, even if a susceptible hybrid is selected, the good news is that rust can be controlled by fungicides. Fungicide trials are currently being conducted in collaboration with the Carrington Research Extension Center, the Langdon Research Extension Center, CHS seeds (trial near Casselton) and Vision Research Park (trial near Mohall). Although we have yet to harvest plots and analyze data, we know that we have low disease pressure in Casselton, low-moderate disease pressure in Langdon, moderate-high disease pressure in Carrington, and high disease pressure in Mohall.

Although we have not yet finished all evaluations and harvest is several weeks away, we are seeing good control with fungicide applications. At three locations, a single fungicide application seems to have limited rust development. At the Mohall location, where infection started very early, one application is inadequate for disease control.

Below is some preliminary data from the sunflower rust trial at the Carrington Research Extension Center. Borders around the trial were infected with rust, and the trial is irrigated. Both measures were taken to try and create a high disease environment. The colored bars represent disease progression over time when four different fungicides were used. Rust was first observed on August 7th, and the fungicides were applied on August 13th, at approximately R5.2-R5.5. The graph below shows disease severity (percent) of the upper four leaves (as a reference, data from overseas suggested a fungicide application needed to be made before 3% severity for yield loss to occur). The preliminary data indicated that the fungicide application reduced rust severity on the upper four leaves. Differences among fungicides appear in the graph, but data from other locations and statistical analysis must be done before any conclusions can be drawn.

I feel comfortable saying that rust is a manageable problem if fungicides are on the table as control options. Selection of a resistant hybrid, crop rotation, and destruction of wild sunflowers will help manage the disease as well.



SOYBEAN DISEASE SURVEY

North Dakota soybean growers have not had to think much about soybean diseases that occur above the ground. Sure we get a little white mold, we know we get some bacterial spots, maybe a little septoria brown spot, but much of the disease we think about is root rots. However, the disease pressure on soybeans will increase as soybeans continue to be grown in ND. It's not unreasonable to think that we may have disease pressure similar to southern Minnesota or Iowa in the future.

To try and get a handle on what 'emerging' diseases we have in the state, the North Dakota Soybean Council supported a fairly exhaustive survey in the 12 southeastern counties in North Dakota this summer. We have scouted over 120 fields, focusing on the diseases present on the leaves, stems and pods. Although we are still in the process of culturing and identifying pathogens, entering data, and assessing our disease spectra, it is fair to say we have found high levels of some diseases, and low levels of quite a few other diseases. Without going into numbers or geography, here are some thoughts about what we have found so far.

Virtually every soybean field surveyed had septoria brown spot and bacterial brown spot. In some cases, the amount of disease was quite high, while in others it was fairly limited. Yield loss from these two diseases is somewhat unknown. It is commonly thought that yield loss is minimal.

Also found were downy mildew, alternaria leaf spot, anthracnose, powdery mildew, white mold, charcoal rot, and several other pathogens that need to be confirmed. Some of these diseases, like white mold, were expected, others, although known to occur rarely, were found in a surprising number of fields.

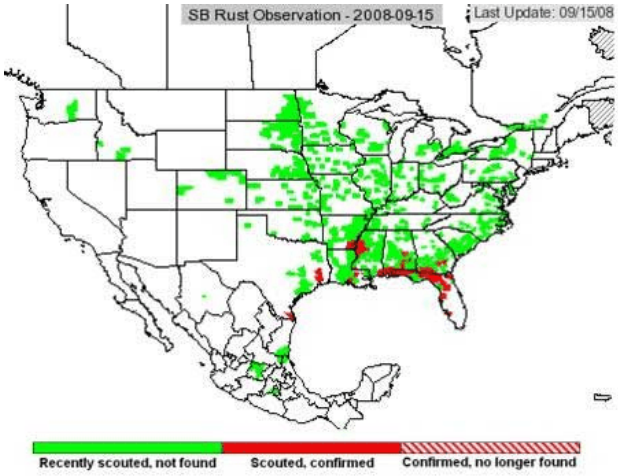
The information gained from this survey will help us assess the disease spectra in North Dakota as it changes. Ultimately, this will lead to management recommendations and research projects that will help growers address diseases issues as they emerge, and help soybeans remain a profitable crop in the state.

SOYBEAN RUST UPDATE

No news is good news when it comes to soybean rust, and as you are all aware, there is virtually no news.

Since soybean rust was introduced into the US several years ago, it has spread north during each growing season. Last year rust spread as far north as Iowa. However, the pathogen can't survive freezing temperatures, so soybean rust is killed each fall. The only place the pathogen has been able to overwinter is along the gulf coast states. For soybean rust to cause problems in other states, it would have to spread north from its overwintering locations. Judging from winds currents and the historical spread of other diseases (wheat rusts in particular), spores from Texas or Louisiana would be more likely to reach our area than those from states east of the Mississippi River.

To keep track of soybean rust, the spread is monitored by plant pathologists across the country in 'sentinel plots', which is an area in a soybean field that is scouted once a week for rust, aphids, and other pests. This information is used to generate maps of the disease spread **(Figure 1).** Additionally, information about other soybean diseases found in North Dakota's sentinel plots are included in the state commentary section.



To date, soybean rust has not progressed out of Texas and Louisiana, and spread very little within either state. At this time last year soybean rust had been found much further north than it currently is. Because soybean rust can move so quickly, it's too early to say the disease won't move into other states. However, most soybeans are at or past R6, so soybean rust is no longer an economic concern for 2008.

For more information about the current spread of soybean rust go to www.sbrusa.net

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SOIL TESTING FOR SOYBEAN CYST NEMATODE

If you suspect you have soybean cyst nematode (SCN) or if your neighbors have it, you should test your soil for the presence of SCN eggs. Take soil cores (about 8 inch deep) in a zig-zag pattern over the field (about 20 cores per 10 acres) and bulk the samples, mix it thoroughly, and send a pint of the mixed soil to a laboratory that tests for SCN. Thorough mixing of the soil is imperative. Often SCN is found in patches in fields, thus sampling sections of fields and testing the soil from each section is a better way to find out where SCN is most common. It can be difficult to notice SCN damage in fields when populations are low and growing conditions are good, even though there can be yield losses. Soil sampling is the best method to detect the nematode. Early detection allows you to make management decisions before you experience a large yield loss in your soybeans. Resistant varieties and crop rotation to reduce egg levels are the only two useful controls. When SCN populations are high, it is difficult to lower them with crop rotation.

The rule in managing SCN is "keep the egg populations low". You can not eliminate SCN, but you can manage it. For more information on SCN consult the following web sites: www.ndsu.nodak.edu/soydiseases/cyst.shtml and www.plantpath.iastate.edu/dept/labs/tylka/node/125.

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WHAT'S WRONG WITH MY SOYBEAN LEAVES?

Recently, we have received quite a number of calls and samples of soybeans with bronzing/purpling leaves. Severity ranges from localized spots in the field on just the upper leaves to death of the top four or five leaves (resembling a frost). The symptoms started appearing a couple weeks ago, and have been seen in just about every region in the state. This has puzzled us, and unfortunately we don't have a definitive answer as to what we are seeing, so the best we can offer at this point is a discussion.

Bronzing on the leaf surface.

Bronzing on the underside of the leaves.

One of the first things many people suspected was disease. We have received numerous samples from different regions of the state, but have not been able to isolate any pathogen. The symptoms don't resemble something that a root rot or stem disease would cause. There is at least one foliar disease that has symptoms similar to what we are seeing, but we have not been able to isolate any pathogen from infected tissue, so we rule that out. We visited with Dr. Berlin Neslon about the symptoms, and he has observed these symptoms in the past (usually late in the season like we are now), but he has never been able to attribute it to any known disease either. So a disease seems unlikely. Make no mistake; we have seen different bacterial and fungal diseases on our leaves (see Sam Markell's article in the plant pathology section), but they are not the culprit.

Sometimes the leaves can show injury of applied herbicides or insecticides. The growth stage, weather conditions, soybean variety, tank mixed chemical components like adjuvants may affect the amount and severity of crop injury. However the symptoms did not show up till later in the season and therefore we assume the injury was not related to herbicides.

As the bronzing is observed on different varieties and over a large geographical area the thought is that the bronzing might have be induced by this year's growing conditions. The early season was cool and dry. Mid season we had rain and after bloom the plants were under drought stress before receiving rain in August. This year we also have seen soybean aphids in many fields.

Sometimes we do see sunburn of the soybean leaves, a condition that may occur in late summer and causes soybean leaves, especially the undersides, to turn a bronze color. Bronzing due to sunburn usually does not progress over time.

The season is nearly completed and it is not expected that the late season discoloration of the leaves will influence the yield at this time of the year.

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Kasia Kinzer, Plant Diagnostician

SURVEY OF ROOT ROT PATHOGENS IN PEAS

Root rots have become a problem for pea growers in recent years. Damage from root rots can be caused by numerous pathogens. Consequently, the first step to management of root rots is to understand which pathogens are causing disease. To understand this, a survey of pea fields was supported by the Northern Pulse Growers Association this year. Although all data is not yet analyzed, Fusarium species tended to be recovered most frequently for pea fields. Rhizoctonia and Ascochyta (from the base of the stem) were also recovered. Pythium species were not recovered in this survey, but this is likely due to the extremely dry spring in most of the pea growing areas in the state. Hopefully this information will lead to greater management of root rots in North Dakota.

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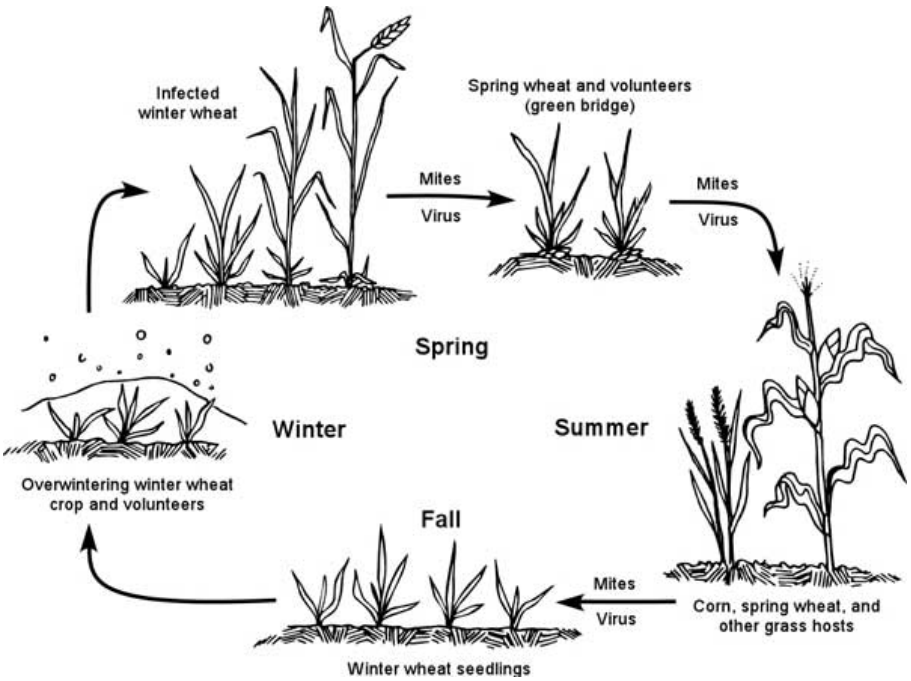
WHEAT STREAK MOSAIC MANAGEMENT

Producers wishing to plant winter wheat this fall are concerned about wheat streak mosaic virus (WSMV) infection in that crop. Two key practices reduce the risk of WSMV: control of grassy weeds and volunteers two weeks prior to planting of the new winter wheat crop; and appropriate planting date. Each of these practices is aimed at preventing wheat curl mites from moving from an infected crop or grassy weed into the newly emerged winter wheat crop. If the green bridge allowing mite survival can be broken, the mite is no longer alive and available to transmit the virus into the wheat crop. The following figure illustrates the wheat curl mite cycle and locations where the green bridge can be broken.



WSMV life cycle

Two questions I often get about recommended WSMV management practices:

1) Why do we recommend 14 days between the herbicide control of grassy weeds/volunteers and the planting of a new winter wheat crop?

The wheat curl mite completes its life cycle, from emerging from the egg to development of new eggs, in 10 days. If the grassy weeds are sprayed with herbicide on day 1, and mites are present, these same mites may not lay eggs until several days later and these eggs won't hatch for another 10 days. (Herbicides don't have any effect on the mites). If a newly emerged winter wheat field was present or just across the road, these newly hatched mites would have a green crop to live on. But if the field and nearby fields don't have a green host present, the newly hatched mites will die. The mites are wingless and don't actively seek new crops; they are carried very short distances by wind currents. So, the extra 14 days recommended for absence of a susceptible crop is to assure that no green plants are around for the newly hatched mites.

Volunteer wheat (background) infected with WSMV adjacent to no-till wheat field (foreground) prepared for planting. This volunteer should be destroyed.

2) Why is a later planting date recommended, instead of late August or early September?

Wheat curl mites reproduce more rapidly and produce more eggs with warmer temperatures. When temperatures drop, generally in mid-September, mite reproduction slows and there are less mites available for transmission of the virus and a smaller mite population develops in the

crop before freeze-up. Data from 11 years of studies in northwestern South Dakota indicated that the optimum time for planting in that location was between September 14 and September 24th, resulting in the highest yields and the lowest infection levels of WSMV. In this study, a Sept. 24th planting date versus a late August planting date resulted in a 50% reduction in WSMV infection and approximately a doubled yield return.

UNIFORM FUNGICIDE TRIAL RESULTS ON SPRING WHEAT AND BARLEY, FARGO, 2008

Uniform fungicide trials, sponsored by the US Wheat and Barley Scab Initiative, were conducted at several sites in ND, to evaluate fungicides for Fusarium head blight and leaf disease suppression. The following data are from trials done at Fargo. Some differences among treatments were observed in Fargo although disease pressure was very low because of warm, dry conditions and drying winds in July. The test varieties at Fargo were Alsen spring wheat and Tradition spring barley. DON levels were very low and non-significant.

Alsen Spring Wheat

Treatment (at flowering)	Rate fl oz /A	FHB Index %	Leaf rust %	Leaf spot %	Yield bu/A	Twt lbs/bu
Untreated		3.3 a	4.2 a	16.7 a	44.8 b	61.7 ab
Folicur	4	0.9 cd	0 b	3.8 c	47.4 ab	61.6 b
Proline	5	0.3 d	0.8 b	3.3 c	50.6 a	62.2 a
Prosaro	6.5	0.4 d	0.1 b	2.4 c	51.5 a	62.0 ab
Caramba	10	1.3 bc	0.2 b	3.3 c	50.9 a	61.8 ab
Caramba	14	0.9 cd	0.1 b	2.6 c	49.6 a	61.8 ab
Topguard*	14	1.5 b	0.1 b	6.9 b	48.9 ab	61.8 ab
Numbers with different letters are significantly different at 95% level *Topguard = flutriafol; not registered; all other treatments registered						

Tradition Spring Barley

Treatment (at flowering)	Rate fl oz /A	FHB Incid. %	FHB Index %	Leaf spot %	Yield bu/A	Twt lbs/bu
Untreated		91.3 a	1.8 a	9.9 a	75.5 b	48.0 a
Folicur	4	52.5 cd	0.7 c	2.1 b	86.9 a	48.4 a
Proline	5	45.0 d	0.5 c	1.7 b	92.1 a	48.1 a
Prosaro	6.5	48.8 cd	0.6 c	1.2 b	90..0 a	48.2 a
Caramba	10	63.8 bc	0.8 bc	1.0 b	91.1 a	48.2 a
Caramba	14	46.3 d	0.61c	0.3 b	91.3 a	48.2 a
Topguard*	14	71.3 b	1.0 b	2.5 b	86.7 a	48.3 a
Numbers with different letters are significantly different at 95% level *Topguard = flutriafol; not registered; all other treatments registered						

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soils

COPING WITH HIGH FERTILIZER COSTS AND "IFFY" CROP PRICE PROSPECTS

The continuing high fertilizer price quotes at the local and national scale, as well as interviews I watched on the TV show "Fast Money" of the CEO's of Agrium and PotashCorp that the moderators described as "almost giddy" convince me that fertilizer costs will remain high at least through the first of the year. However, most people, including those that were giddy, cautioned that these fertilizer levels will only remain at these levels if crop prices remain high. Wheat prices have fallen to below $7/bu at some country elevators and corn to about $5/bu from their summer highs. At these crop prices, many growers are looking for ways to reduce fertilizer costs.

It is important to note that in the many site-years of data that studied nitrogen rate on wheat, the check plot, regardless of beginning soil nitrate levels never was zero yield. This means that our current recommendation of 2.5 X yield potential is not correct. In fact, the check plots are often much higher than zero. This year at Hazelton, Washburn and Valley City, my N rate check plots were within 20% of the highest yields in the plots. Even in low residual N experiments after barley, the rate of N required for good protein and highest yield (near 70 bu/a) was between 90 and 120 lb N/acre. So my suggestion is that being conservative on rates is not a bad thing. In a really poor growing year, rate won't mean much at all (i.e. this year in the southwest of ND), while in a good year (Jamestown east where the crop didn't experience flooding) moderate N rates still produced exceptional yield and protein. In areas that had low protein, look for N timing problems and improvements in application technique.

The continuing reluctance and belligerence of many growers towards hiring soil sampling continues to baffle me. With fertilizer prices this high, any grower who doesn't hire a reputable soil sampler should hire a therapist.

Banding P and K is a viable option to reduce P and K rates. There are many ways to accomplish this. Remember that any band farther than 2 inches away from the seed is not a starter application, although the efficiency of the application will still be higher than broadcast. Also remember that yield increases from added P is rarely more than 25% in this region, and that most of that 25% will be achieved through modest P rates. Ask for University recommendations. Buildup/maintenance programs will not pay with the current P cost/crop price situation. Even a maintenance program is a buildup program, because it does not acknowledge release of P from the soil. At most, a maintenance program less 20% would be

advised until either crop prices increased or P prices decreased.

Watch sulfur on coarse-textured soils. We have had a lot of rain in the east over the last month. Going into winter we will be wet. Any spring rains will leach out any sulfur remaining. Application of S is therefore encouraged for any crop on low organic matter sandy soils, especially on hilltops and slopes.

SEVEN STEPS TO BETTER CROP NUTRIENT MANAGEMENT

1. Soil test-

Even with high fertilizer costs, probably only 20% of farmers soil test. It is time to step out into the 21st century and try a more scientific approach. What worked OK for $3 wheat and 10 cent N will not work well with $8 wheat and $1 N. Find a reputable soil sampler that understands the critical value of a well-taken soil sample. Soil sampler providers- make sure your employees understand the value of taking a sample well and the stakes resting on a poorly-taken soil sample/field. There are numerous people in ND and the region who are professional about taking a soil sample. Find them. Hire them.

2. Use University recommendations from your soil test-

University recommendations are based on real data from your area. Other recommendations often originate in marketing board rooms.

3. Band P and K-

$1/lb P2O5 should have your attention. There is plenty of time to plan on banding. Look around for equipment that will work with you. Plan ahead for the logistics of supplying the planter, or even banding in the fall. Banding farther away than 2 ½ inches from the seed will not act as a starter. Starter is important for canola, sugarbeets, potatoes, small grains and corn. It is not important for sunflower, legumes and remember not to apply any P to flax. If banding in a separate trip than planting, and you have a crop that responds to a starter, a few gallons of 10-34-0 will be helpful in most years. Line up your 10-34-0 soon from someone that will follow-through with your order to avoid problems like the shortage we had last spring. Banding P and K will enable you to reduce P and K rates between ½ and 1/3 depending on the crop you plan to raise.

4. Apply N below the surface-

There is plenty of time to line up equipment to enable you to apply N below the soil surface in no-till/one-pass seeding systems. This is not the year to again risk the whims of mother nature to incorporate urea. Get it below the surface! And don't have it spread on frozen ground! Look around and see what kind of equipment will work for you and SET IT UP!

5. Consider the timing of N applications based on calendar and soil texture-

Fall application in the state/region works well on medium to heavier-textured soil when the chances of soil saturation in the spring are small. Fall application does not work well on sandy loam and coarser soils, or on fine-textured soils that seem to saturate most years (i.e. Hillsboro, Fargo, fields next to the Red River). Be prepared in variable textured fields to treat different soils differently. Consider side-dressing or splitting N applications on heavy problem soils or sands. Consider slow-release N products on irrigated sands. Do not begin fall application in ND before October 1, and then only if the soil temperature at 4 inches taken between 8AM-10AM falls to 50 degrees or less. From that date, wait another week to begin banding urea. Wait still another week to begin broadcasting urea and incorporating it.

6. Consider sulfur on sandy soils if fall or early spring rainfall is normal or higher-

Sulfur deficiency in all crops on lighter soils has become commonplace. Site-specific application with a fertilizer buggy on sandy soils within a field will reduce total fertilizer costs and prevent yield losses on sandier soils in most of our glacially-derived soils and even in the west.

7. Use micronutrients only when needed and not as "insurance"-

Zinc deficiencies are found in corn, dry beans (not soybeans), potatoes and flax. All other crops grow fine on any soil zinc level we can find. Use zinc when the soil test calls for it on sensitive crops. Avoid buying things you don't need.

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weeds

2008 FARM BILL FINALLY BECOMES LAW

In the Commodity Programs Title, it is important to remember that before farmers can receive direct payments, counter-cyclical payments, or average crop revenue election payments, they must agree to "effectively control noxious weeds" during the crop year for which the payments are made and in exchange for the payments. In other words, all federally listed noxious weeds must be controlled on any land enrolled in the USDA Commodity Programs. That's an important point to emphasize over and over again, especially from our university Extension personnel.

A new provision in the Conservation Title involves the Conservation Reserve Program (CRP). Now producers are allowed to do routine grazing or prescribed grazing for the control of invasive species without penalty or loss of their CRP contract. The producers, in coordination with their State technical committee must develop appropriate vegetation management requirements and stocking rates for the land that are suitable for continued routine grazing and must establish the frequency during which routine grazing may be conducted, taking into consideration regional differences such as climate, soil type, and natural resources.

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horticulture

WHITE GRUB CONTROL IN TURF

Damage caused by white grubs often becomes evident in late summer and early fall. Look for large patches of dead grass. Lifting the turf beneath dead patches and adjacent green grass often reveals white grubs in the root zone where they have been feeding all summer. Unfortunately, control of white grubs is usually not successful in late summer and early fall. Cool weather causes the grubs to stop feeding and dig deeper into the soil where they become dormant for the winter. It is difficult or impossible to reach the grubs with an insecticide. If active grubs are found in the root zone during late summer, some control can be achieved using carbaryl (Sevin).

White grubs *(photo by David Cappaert, Michigan State University, Bugwood.org)*

The best strategy to control white grubs is to use imidacloprid products labeled for turf grass and apply them in the spring when the grass begins to green up. Imidacloprid is a systemic insecticide that is taken up by the roots of the grass. Grubs ingest imidacloprid when they begin to feed on the roots. Additional applications may be necessary through the spring as older applications wear off and new grubs appear. Be sure to use adequate water to get the insecticide to the roots, but not so much water that the soil becomes waterlogged. Be sure to read and follow the label when using insecticides.

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around the state

South-Central ND

During the first half of September, the region received rain ranging from 1.1 inches at Linton and Robinson, to 3.7 inches at Fingal, based on NDAWN (North Dakota Agricultural Weather Network). This late growing-season moisture helped seed development in the longer-maturing or later-planted row crops, but also will help start recharging soil moisture for next year's crops.

Scattered spring wheat and canola fields can still be found that are left to be harvested in the northern part of this region. With the exception of areas generally west of Hwy 3, small grain yield and quality have been good to excellent. Dry bean are being knifed and swathed, and some harvest has started. Flax harvest also is in progress. Soybean and sunflower are nearing or are at physiological maturity.

Corn stages generally range from early to full dent, and the crop continues to be behind in development compared to previous years. Corn planted on May 1 at Carrington was at about 1790 growing degree day (gdd) units, Linton at 2020 gdd units, and Oakes at 2140 gdd units as of September 16, with these sites at minus 110 to 170 gdd units compared to the 5-year average. As a rule-of-thumb, corn at full dent will require another 10 to 15 days to reach maturity and corn at early dent will require another 20 to 25 days to reach maturity before a killing frost. We can likely count on wet corn this fall, but if the killing frost is delayed until early October, corn generally should have high yield and acceptable test weight.

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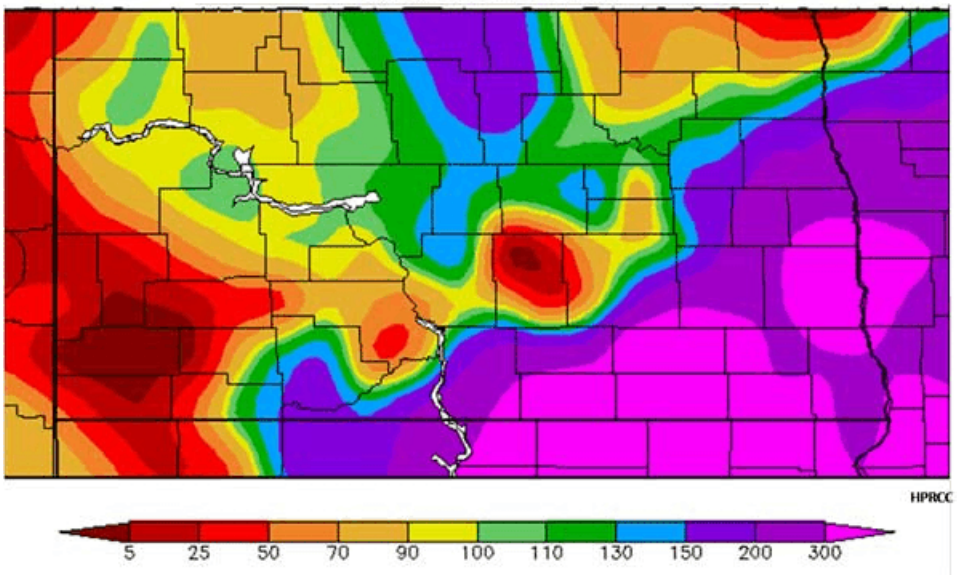
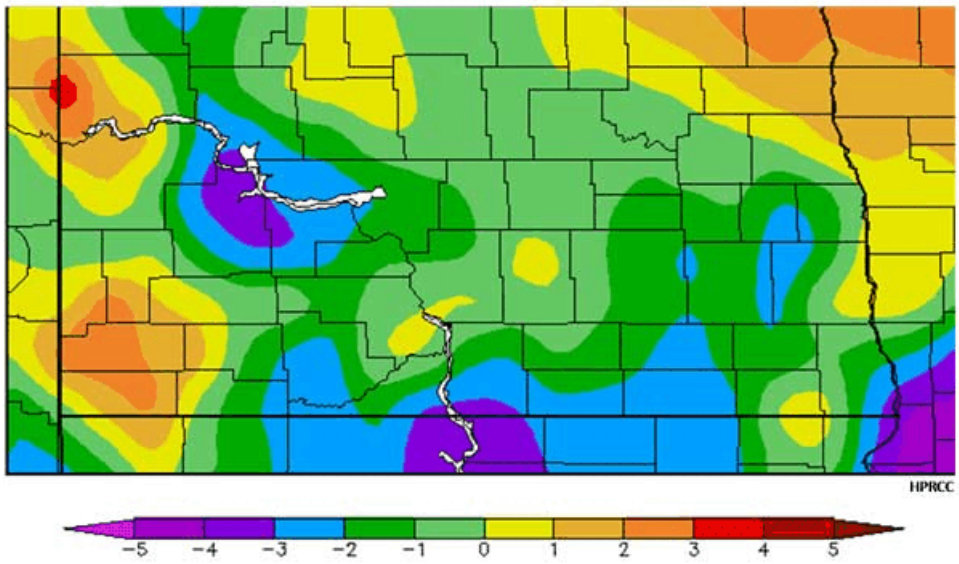
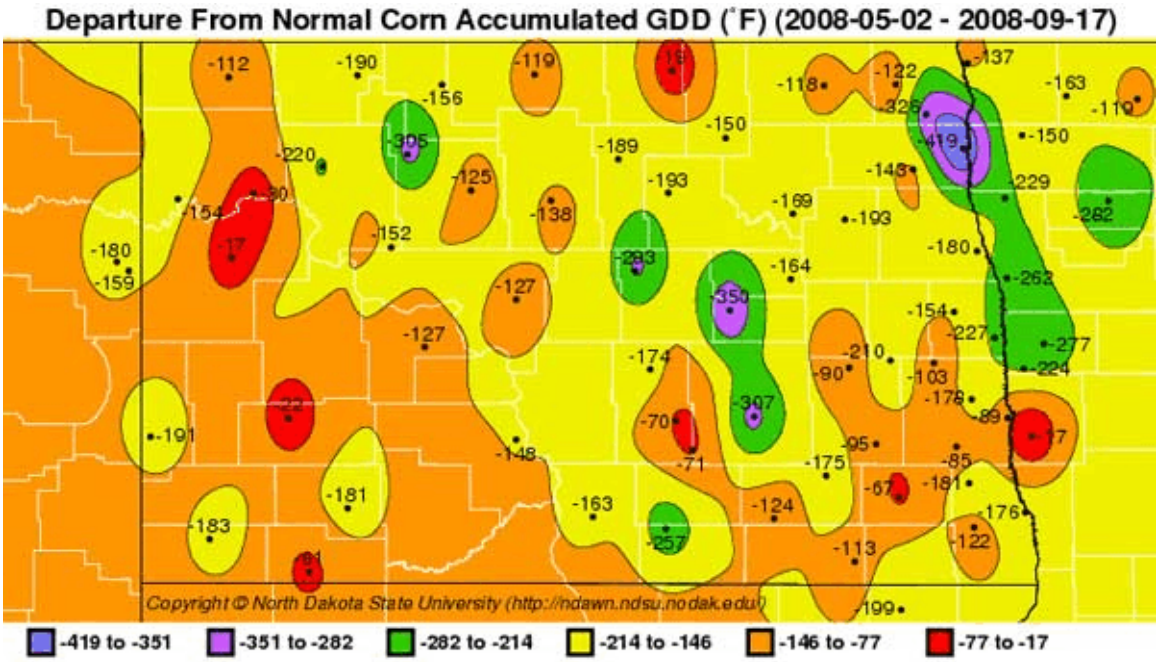
weather

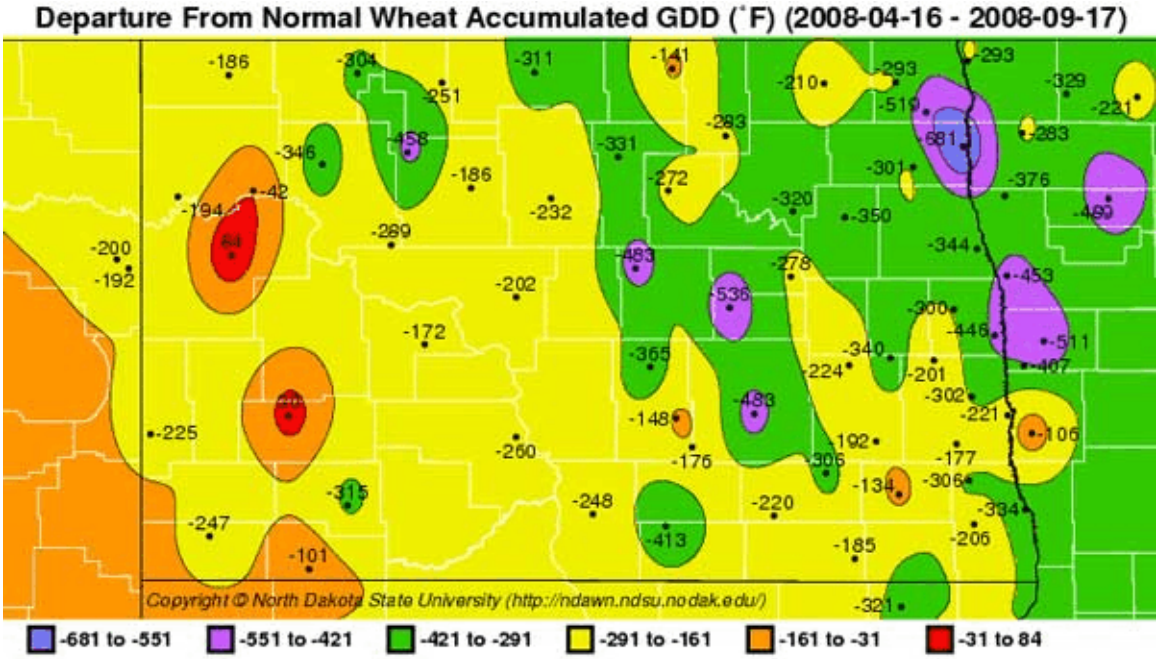
Last 7-Day Percent of Normal
Precipitation(%)
9/10/2008-9/16/2008



Last 7-Day Departure From Normal
Temperature(°F)
9/10/2008-9/16/2008







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