IPM STUFF 2001-1
4/12/2000

He's back

This is the first of the season for a series of irregularly issued and randomly distributed newsletters. And just when you thought it was safe to check your e-mail. Hopefully, they will provide you with current and useful information on the detection, assessment and control of crop pest problems.

Current weather and dry soil conditions: Some small grains are emerged and look good. I have heard rumors of some corn being planted. April 11 was evidently a very long day this year. At this point alfalfa survival at the SWROC looks very good. However, this might still change if some unusually inclement weather occurs yet this spring.

April 6th was an incredibly good day for sharing with your next-door and further neighbors. I think it is safe to say that a considerable amount of topsoil changed landscape position. Since sand particles were moving at 40 miles per hour, many of our little buddies, the Soybean cyst nematode, were also getting some rapid and effective transportation. The weather system that brought the welcome precipitation in the form of snow to this part of the state was a good omen. The moisture was coming from the Gulf of Mexico. Hopefully, we can get a lot more of these during the growing season. There is a downside to these systems as they can also bring Potato leafhopper, black cutworm and others in from the areas where they over winter.

Dry soil conditions may cause problems in planting and weed control. Each tillage pass will dry soil.

Pre-emerge herbicides, in general, will not be as effective with less than ½-inch of rainfall. Rotary hoeing or harrowing may be needed to assist your herbicides. It might pay to make sure these implements are ready to go. The ones that need to be chopped out of the box elder saplings might take a little longer to get ready. Unfortunately, based on the 1998 study conducted at the SWROC, SROC, and WROC, as well as others, soybeans cannot tolerate weeds for as long a period of time under droughty conditions. Corn is less tolerant of early season competition. We may experience a bit more herbicide carryover than normal due to the dry summer, winter and early spring. I am mainly concerned in those fields where the replant restrictions envelope was pushed.

Injury from in furrow pop-up fertilizer is increased under dry soil conditions. Watch rates. George Rehm, U of M extension soil scientist, advises to limit 10-34-0 to 5 gallons/acre in furrow under dry conditions.

Damage and yield loss from nematodes may be worse under drought stress.

Crop emergence can be slow or uneven if seed lays in dry soil. With this in mind I would pay particular attention to seedbed preparation and planting. Producers only get one chance to do this correctly and seed costs are not a small investment. I would work ground as little as possible to get it ready for planting.

My 4th annual plea for adequate planting depth on corn: Proper depth control is an issue.This spring shallow planted corn may take a long time to germinate and the risk of poor root systems increases as they try to develop in dry soil. If you suspect herbicide carryover from dry conditions the problem may actually be due to this phenomenon. Moderate planting speed is critical to maintaining proper seeding depth. Based on observations of planting speeds last spring, there are a lot of broken radar units or speed/hour meters on tractors. I drug the following article on planting depth from the archives. I believe the potential problem(s) still exists. History has a habit of repeating itself. I just wish it wouldn't do so as often. Most of my aversion to shallow planting is based on my own mistakes. It ain't pretty.

> 5/19/98
> **Corn:**
> **Corn depth of planting**: As corn emerges, some growers noticed areas in the field where stand is thin. Corn seed was laying not germinated in dry soil. In a couple of cases I know of, the corn was planted too shallow. I seem to remember a lot of problems occurring last year because of shallow planted corn. These included poor plant vigor and problems with herbicide injury. What seems to be happening is that growers are checking their planting depth and it is at 1 1/2 inches. What they are not taking into account is that when some fields are worked, especially those with one pass, they can be quite loose. Settling of the soil causes the actual planting depth to be much shallower than it appeared. I always liked stepping on the row before I checked planting depth behind a corn planter. Corn, unlike orchids, does better when covered with a layer of soil. 1 1/2 inches should be considered a **minimum** depth for planting corn. It's safer to err on the deep side when planting. Shallow planting depth on soybeans is not quite as critical but 1 1/2 inches works well for them also. On the other side, planting to moisture does have practical limits in light of hard crusting rains. Perhaps implement manufacturers are putting too wide a range of depth adjustment on their planters. This is meant to be a reminder and not a high-toned lecture (I tend to fall off high places like soap boxes). Sometimes stuff happens. I planted part of a soybean plot with one of four rows dropping seed behind the closing wheels. Fortunately, cussing and muttering, kicking dirt over the offending rows and some timely rain let things work out ok.

Finally, if you were planting at a reasonable rate, I would not lower corn-seeding rates in anticipation of a drought for two reasons. Firstly, we are all planning for dry weather so odds are it will be too wet this season. You do not want plant populations to limit yield if adequate soil moisture exists. Secondly, the corn plants have a way of fighting it out. With modern hybrids you may have some barren stalks and smaller ears. Yields, however, should not decrease at the higher populations.

Picking the correct variety/hybrid for a field is an important decision. The following may not help pro-actively, but I anticipate that in the near future a lot of us will be trying to figure out what went wrong. The following may help.

Defensive characters in soybean varieties
When evaluating a soybean field, symptoms of disease, soybean cyst nematode, or nutrient (iron) often appear. These symptoms can be confused. Fortunately, variety resistance and tolerance to these problems is available. One of the first questions to be asked when uncertain of the cause of a particular symptom is: What is the expected resistance of the variety? We tried to obtain this information on as many commercially available varieties grown in Minnesota.

We developed a table based on information obtained from seed company sales manuals. The Good, Average and Poor ratings for tolerance to iron chlorosis, disease, and soybean cyst nematodes (SCN) were based on Seed Company assigned ratings (1-5, 1-9). These ratings are subjective and may not be comparable across companies. This information is presented for educational purposes only and trade or brand names herein are supplied with the understanding that no discrimination is intended or endorsement by the University of Minnesota Extension Service is implied. This variety listing was too large to e-mail but it can be view and downloaded from http://swroc.coafes.umn.edu/Variety/defensive_characters.html.

Unless otherwise listed (Eg. Pio 9234 Peking), the resistance source for SCN is PI 88788.

More objective ratings for iron chlorosis tolerance and nematode resistance can be found for varieties that were tested by the University of Minnesota. These scores are listed in the University of Minnesota Varietal Results 1999.

We are certain that we have unintentionally omitted some companies and varieties and that our interpretation of tolerance scores may not have been what was intended in some sales literature. We hope, however, that this effort will save some work on the part of producers and ag professionals.

I would like to thank Molly Werner (SWROC) for her patience in entering these data.
Let me know if you would like to see this table continued or improved in the future.

Soybean seed treatments
So you can't find a soybean variety with soybean cyst nematode resistanc, iron chlorosis tolerance and the k gene for *Phytophthora*. A seed treatment may help protect seedlings from damping off. However, it must contain metalaxyl, or its replacement mefenoxam, to be effective. This compound is also effective on the related fungus *Pythium*. The fungicide will not provide very early season control. Whether the seed treatment will pay depends on the variety and moisture. The fungus needs moisture for infection but can infect soybeans season long. If it rains a lot in July you can still get a raging *Phytophthora* root rot epidemic in a field planted to a susceptible variety. We are working on a chart for common soybean seedling diseases and control methods.

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Progress
Rain delays in planting are not in the immediate forecast and reduced yield from late planting does not appear to be an issue this year. At the Southwest Research and Outreach Center (SWROC), we are well behind in soil moisture (3.5 inches below long-term average according to Lee Klossner, Assistant Scientist SWROC) with rainfall and humidity hard to come by. Jean Spohr reports that the West Central Research and Outreach Center has received little precipitation as well. We will need a lot of timely rains for the high yield potential from early planting to be realized in most areas. I enjoy the Wyoming climate but fly-fishing trips will be less enjoyable if we have the same weather here.

The bulk of the corn planting has been completed. Early planted corn at the SWROC (and producer's fields) has started to emerge. Soybeans are emerging as volunteers and in an early April planting date (no, this is not a recommendation) study. Soybean planting is well underway. Should they be going in this early? Data suggests that optimum yields occur with early May planting and decline thereafter. Sure soybeans may freeze with a hard frost late this spring. However, they could also succumb to any number of unusual climatic disasters with a later planting and have a lower yield potential to start with. Additionally, if spring conditions allow for planting to be complete before fishing opener, why fight it. Why do you gain yield with early-planted soybeans? The soybean plant will have a longer period to grow vegetatively and close canopy before shortening day length induces reproduction. This allows the crop to obtain maximum use of available sunlight. The canopy closure also aids in weed control. Early planting, as most things, has a couple of drawbacks. A later flush of weeds will not be controlled with pre plant tillage. The early canopy closure that is conducive to yield may also prolong the period of time where conditions favorable to disease, white mold for example, occur.

Weeds
We are into the weed control season. I guess I need to start calling it invasive species control season. In addition to the factors we normally need to consider with weed control, dry conditions might have an impact on weed control this season. If this section seems to be more coherent than most, it is because I recruited Dr. Jeff Gonsolus, University of Minnesota Extension Weed Scientist and Jodie Getting, SWROC Assistant Scientist to help with this dissertation.

There are many factors that should be considered when managing weeds. The following factors can influence when, where, and how to control weeds. This list is not written in stone and there are probably other, more effective, ways to view the universe.

Weed management-the basic rules
1) The crop needs nutrients, water, and light
2) Weeds compete with crops for nutrients, water and light.
3) Yield loss, caused by weeds, depends on which species are present, when the weeds are present, weed density and growing conditions

4) Weed species differ in how well they compete with crops and the germination and emergence of an individual species is based on soil temperature, soil moisture and light requirements.
5) Weeds can be controlled with tillage, herbicides, and the crop itself (crop canopy)
6) Economics dictate that weeds should be controlled when the cost of weed control is less than the cost in lost yield from weed competition. Unfortunately, biology dictates that weeds left uncontrolled produce seed for future weed problems.
7) Effective weed control requires matching the operation or herbicide to the weed species a field, crop and weed stage and growing conditions (yes, this applies to Roundup too).
8) Herbicides can cause crop injury and may carry over to injure the next crop.
9) Effective and economical weed management should be conducted on a field specific basis.
10) Weed control practices, or lack thereof, will change the weed species present in a field over time.

Weed management under dry conditions
Weed control under drought conditions is affected by the factors listed above.

Water is the most limiting factor in crop production under dry conditions. Weeds, being plants, require the same resources as the crop. Additionally, some species are more effective at obtaining these resources than the crop. Weeds are not good at sharing. This allows them to out-compete the crop and will eventually make light a limiting factor as weeds shade the crop. Therefore, the crop cannot tolerate weed pressure for as long a time period under dry conditions. Timely weed control is more critical under drought stress.

For most weed species, a moisture event is a requirement for germination. Therefore, compared to average, weed flushes may be delayed. In species where there is a maximum temperature for germination, there may be reduced total emergence for the season. In the case of delayed germination, weeds that would normally be controlled with pre-plant tillage will escape.

Several pre-emergence herbicides rely on rainfall for movement from the surface into the area where weed germination occurs. Rainfall of ½ to ¾ inch is generally considered adequate. Weed control by these herbicides will be poorer when spring rainfall does not occur within 7-days after application; the time when weeds generally begin to emerge. Pre-plant incorporated herbicides will be less impacted by dry conditions because they are already incorporated into the weed emergence zone.

Rotary hoeing will provide weed control for early season weed escapes. Some stand loss can occur with rotary hoeing but this is generally outweighed by reduced weed competition.

Cultivation of row planted corn and soybeans will also provide control of weed escapes. Shallow row cultivation (1-2 inches deep) will not drastically reduce soil moisture and may have a beneficial effect by mulching the soil surface and sealing cracks.

Post emerge herbicide treatments are affected by drought conditions. Weeds under moisture stress tend to have an increased wax layer on the surface, stomates are less open and weed

respiration is reduced; in general, weeds are less actively growing. These factors reduce the effectiveness of herbicides. Adjustments of adjuvants may be required. Adjuvant recommendations are herbicide specific. Refer to the label for details on adjuvant recommendations for a particular herbicide. Control of weeds at the large end of labeled size range, in particular, can be reduced. Crop growth, and weed control provided by the crop canopy, will be reduced under drought conditions. Split herbicide applications to control early and late emerging weeds while they are less than 2-3 inches tall can help.

Dry conditions the previous year can increase the chance for herbicide carryover, especially when a loose interpretation of the label was used. For example, several growers extended their tall waterhemp control well into late July of 1998. In 1999, these growers experienced some herbicide-induced crop injury to their corn from products not normally associated with carryover. In the heat of battle, the growers lost track of the potential consequences of late-season herbicide use. Most herbicides with residual activity rely on hydrolysis and microbial activity to break down. Both of these require water. Unfortunately, drought effects on the crop can mimic ALS and DNA herbicide injury making field diagnosis difficult. Symptoms of growth regulator and triazine carryover are easier to distinguish than those of ALS and DNA herbicides.

Insect trapping

The black light trap at the SWROC was started May 1. I will put the Fulda and Lamberton light trap data on the web again this year. I am not expecting any European corn borer for a couple weeks. Some interesting species occur before corn borer flights. It sure helps maintain perspective to occasionally look at things that aren't trying to destroy someone's crop. I mainly get calls about problems. Because of this I am usually pretty well convinced that the world is ending by the Fourth of July.

We had several scattered pheromone trap locations that reported significant captures of black cutworm moths. It appears that we had two flights. One occurred the 3rd week of April and another the 4th week. Fields that were not worked by that time are at the greatest risk, although by no means certain, for damage. Leaf feeding may start to become visible late this week or early next week. Black cutworm infestations tend to be more common in low lying and weedy areas of the field. During the day, the larvae are often found at the boundary between wet and dry soil. Black cutworm is just one reason to scouting corn and soybeans at emergence. Some caution in treating for cutworm in corn is required. There are several species of cutworm that attack corn in Minnesota. These species do not have the same potential for cutting corn below the growing point. For example, dingy cutworm, a species that overwinters as small larvae, rarely cuts corn below the growing point. Therefore, corn would seldom benefit from control of this species. Black cutworm often feed on corn below ground, cutting the plants off below the growing point or tunneling into the growing point. Plants attacked in this manner die. A bean plant cut off below the cotyledons is also dead.

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I said that these would be irregular.
This is not pest management information. I am just trying to help the 2000 crop get out of the ground so I have some pestilence to look at this year. I figured most soybeans were in the ground but evidently not all of them.

Soybean planting

Some soybean producers may be wondering whether to delay planting soybeans due to extremely dry soil conditions in much of southwestern Minnesota. Some fields are dryer than others because they were tilled several times with the tillage passes timed to occur on hot, windy days. Each field presents a unique situation and there are several factors to consider.

Soybean yield potential will decrease with delayed planting. Producers who delay planting to wait for improved soil moisture may be kept out of the field for an extended period of time if we are fortunate enough to get a rainy period. While delayed planting of a portion of a producer's soybean acreage (driest fields) may be beneficial, delaying the planting of all soybean acres should be avoided.

Weeds are germinated and will continue to grow. Delaying soybean planting will cause soybeans to be at a competitive disadvantage if fields are not worked before planting or a "burn-down" herbicide is not applied. The first option will further dry soil and the second option costs money. Weed control may be one reason to delay planting. With the early warm, dry weather many producers had DNA herbicides on early and were able to hit the field with a single pass and plant. Fields where DNA herbicides were not applied early will need incorporation for proper control. This will dry soil. Producers may opt for postemergence herbicides using only as much tillage as needed to level ridges and clods before planting.

Dry surface soil and subsurface soil conditions may lead to stand establishment problems. Time of stand emergence may not be uniform. Seeds planted into dry soil may not germinate until rainfall. This may also happen in some cornfields this year. Due to their ability to compensate for stand density, this situation will not be as detrimental to soybeans as corn.

Planting into dry soil is not as detrimental as planting into soil that dries before the plant can establish. Limited soil moisture may lead to sprouting of soybean seed with subsequent death of sprouts and seedlings, as roots are unable to reach deeper soil moisture. However, this may happen regardless of planting date unless significant rainfall occurs. Shallow planting of soybeans would make them more susceptible to germinating and running out of water from limited soil moisture of light rainfalls. Shallow planting should be avoided in dry years.

Some producers may opt to use trash whips to remove a layer of dry soil and allow planting at a shallower depth while planting into moisture. This is using equipment outside design specifications - but may provide some help. They should realize that soil applied herbicides will

be moved out of the way and in-row weed control will suffer. High winds may also blow soil back into the row and increase seed depth.

Some fields may have surface soils dried to a depth where soybeans cannot be planted into moisture. Planting soybeans too deep is a concern if heavy rains cause soil crusting. Additionally, varieties differ in the length that hypocotyls can elongate. However, producers may have soil moisture closer to the surface than they realized. Soils worked up extremely well in many fields. Extremely loose topsoil will provide little resistance to emerging soybeans. Considerable compression of soil can occur with rainfall and time. Check planting depth by stepping on the soil to determine the level of soil after settling. Soybean emergence from 2 inches is usually not a problem. Emergence from depths greater than 2 ½ inches is more risky, although it often happens.

Corn

Dry soil conditions may have prevented the movement of anhydrous ammonia from the band it was applied in. This could lead to a nitrogen-burning situation of corn where anhydrous ammonia was *shallowly* applied. A row might be missing if application was parallel to planting. Look for patterns of poor emergence and poor vigor in the direction of anhydrous application. Nothing can be done for this problem if it occurs. It might be confused with herbicide, cutworm or wireworm damage early or corn rootworm damage later in the season. However, the species of these insects, occurring in SW Minnesota, do not feed in straight lines. Steve Commerford, New Ulm, MN consultant reported seeing this phenomenon already this spring.

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Welcome rain
The recent rains were welcome and will help the 2000 crop get a good start. Some areas may develop soil crusting develop if we get a hot, windy day. Soybean emergence could be affected if they don't make it out of the ground before crusting occurs. The rain will also trigger a weed emergence. Additionally, rain and wind delays might make corn postemergence herbicide applications a bit difficult. Watch weed heights and crop stages carefully and pay attention to product labels. The alternative to this strategy is weed escapes and injured corn. Every year I get the opportunity to look at corn that was treated at a liberal interpretation of 8 inches in height.

Warm, wet soils create an ideal environment for Phytophthora and Rhizoctonia root rots. Areas that had heavy rains may see these problems develop on soybeans.

I would like to thank Dr. Ken Ostlie, Extension Entomologist, University of Minnesota for his help with the following insect related topics.

Corn rootworm
Good news on the corn rootworm front. Lee French, French Ag Research, Lamberton, reported that in 1999 egg production per female rootworm appears to be lower than usual, possibly 30 % of average. French's comments apply primarily to western corn rootworm. The extent of the phenomenon in northern corn rootworm is unknown. In addition, this has little relevance in 2000 for producers suffering from problems with extended diapause. These eggs would have been produced in 1998.

Why is fecundity lower? Several factors might be involved but it may be due to the quality or quantity of food source (silks and pollen) being reduced by dry weather last summer.

Cutworms
Ken Ostlie will post the results of the 2000 black cutworm pheromone-trapping network and cutting projections on the web at http://www.mnipm.umn.edu/BugWeb. However, all trap locations have not yet reported 2000 data. We have had three flights this spring, the first occurring April 18, but they have not been widespread. Leaf feeding from the earliest flight might be visible at this time. Soybeans may be attacked as well as corn but are better able to handle reduced stands. The warm, dry soil conditions would have been detrimental to eggs and larvae. Fieldwork progressed rapidly this spring and many fields had been worked by the time these flights occurred. Additional late flights may occur but field corn should be at a growth stage where it will be safe from cutting by later flights. You can include cutworm scouting in your normal early season corn and soybean schedule. You should be looking at stands and early season weeds anyhow. Bugweb will also have data on European corn borer flight this summer.

Grasshoppers
Grasshopper hatch (two-striped) should be underway with the recent rain. Rich Kvols, extension educator, Yellow Medicine County, reported populations of nymphs in the western portion of the county. Pay special attention to sites where adults were common last fall. These include grass

areas and 1999 soybean fields. Grasshopper hatch will continue into July depending on species and weather. Early instar nymphs are negatively impacted by cool, wet weather. We did not have extremely high or widespread populations last fall, but it would be worth the effort to scout for grasshoppers this spring and summer. We could be in a building year on the off chance that the 2000 season is dry. The Minnesota Department of Agriculture will be conducting surveys of crop pests in 2000. Updates can be obtained from http://www.mda.state.mn.us/pestsurvey. They currently have a map available of grasshopper populations during 1999. I would use the August map for estimating where grasshoppers may be heavier. Please remember that each field is different and pest management decisions should be made accordingly.

Bean Leaf Beetle

The 2000 growing season could see higher than usual populations of this insect. Bean leaf beetles were relatively abundant during 1999 and the mild winter probably allowed good survival of overwintering adults. Iowa is reporting large populations of bean leaf beetle this spring.

The bean leaf beetle adult (figure courtesy of Ken Ostlie) overwinters in clumps of grass and leaf litter especially in sheltered wooded areas. Adults become active in spring. Adult beetles were observed in sweeps of the SW Research Outreach Center alfalfa 5/08/2000. Adults will feed and may deposit some eggs in alfalfa. These adults will move to soybeans as they emerge or alfalfa is cut.

Early planted and emerging soybeans are usually the first infested. Edges of soybean fields next to overwintering sites and alfalfa are initially colonized. The beetles will eventually move into the field interior to feed and lay eggs but movement is not rapid. This aspect of bean leaf beetle behavior is exploited in some areas of the country. Portions of fields are planted well ahead the rest of the soybean crop. These early-planted areas are treated with a systemic insecticide at planting or sprayed when beetles colonize the trap crop.

Damage to emerging soybean often includes chewing on and clipping of cotyledons, and round to oval holes in unifoliates and early trifoliolate leaves. Leaf veins limit this leaf feeding. These feeding symptoms contrast with those of cutworm larvae or grasshoppers, which have a more ragged appearance, and more often occurs at leaf edges. Damage from the overwintering adults, although sinister in appearance, is usually not economic. Yield loss can occur with severe defoliation or if feeding destroys cotyledons before leaves have developed. Treatment for early season bean leaf beetle is only warranted in cases of very high beetle populations and the resulting possibility of severe defoliation. Treatments of portions of fields may be the most cost effective. Treat early-season vegetative soybeans if defoliation reaches 50 % leaf area. Rice and Pedigo, Iowa State University, present economic thresholds based on soybean price, growth stage and beetle numbers in the 5/12/2000 issue Integrated Crop Management Newsletter (http://www.ent.iastate.edu/ipm/icm).

Bean leaf beetle larvae feed on soybean nodules and other roots parts but damage is not economic. Adults will emerge in late July to August and feed on soybean leaves and pods. One generation will occur in the northern part of the state with the possibility of two generations in the south. Fields with high populations early in the season are more likely to be damaged later in the season. However, multiple environmental and biological hurdles need to be overcome for high populations to continue into fall. The potential for yield loss from beetles emerging in the summer is more severe than from overwintering beetles. Pod clipping obviously causes a direct yield loss. Feeding on the pods can also cause entry points for several diseases that may infect seed. These diseases include *Alternaria* and Pod and Stem Blight. The bean leaf beetle can also vector several viruses, including Bean Pod Mottle virus. Treat late season bean leaf beetles when populations will cause 35% defoliation (25% defoliation during pod fill). Late-season thresholds based on crop price, treatment cost and number of beetles per sweep or per row-foot and thresholds based on the number of damaged seeds/foot of row are also available.

For additional information refer to The Minnesota Soybean Field Book. Ed. Bennett, M.J.; Hicks, D.R.; and Naeve,S.L. University of Minnesota Extension Service.

Handbook of Soybean Insects.1994. Ed. Higley, L.G. and Boethel, D.J. Entomological Society of America.

Corn flea beetle

After the press coverage of this beetle in the Iowa State Newsletter and several calls about the potential for this problem in Minnesota, I thought a brief discussion might be in order.

Corn flea beetles are small (about 1/16 inch) black beetles that have the unusual (for beetles) ability to jump on specially adapted hind legs. There are two problems associated with this insect. Very heavy populations can severely defoliate corn seedlings. Feeding appears as thin light streaks between the veins. A more serious problem is that corn flea beetles can transmit Stewart's wilt, a bacterial disease. Sweet corn and some field corn in-breds are especially susceptible to this disease. An unusually high percentage of overwintering beetles were infested with the Stewart's wilt bacterium in Iowa. High levels of bacteria in beetles combined with better than normal survival of flea beetles are leading to concern to our south.

The flea beetle overwinters as an adult. Overwintering occurs in the soil under grasses. The Stewart's wilt bacterium is able to survive the winter in the digestive system of the beetle. In spring adults seek out corn and begin feeding. Plants can be infected if fed on by a beetle carrying the bacteria. Corn flea beetles are messy eaters and regurgitate saliva and plant sap as they feed. The Stewart's wilt infection can be spread within and between fields throughout the growing season as beetles feed on infected plants and subsequently on healthy plants. However, every beetle does not contain the bacterium and every feeding event will not cause a successful infection.

Corn flea beetles are not uncommon in Minnesota cornfields. However we do not usually experience the magnitude of flea beetle and Stewart's wilt problems in Minnesota, as do states to our south. The winter climate in Minnesota is harsher than that in southern Iowa. Beetle populations have to increase through immigration and reproduction. Winter survival of the corn

flea beetle is markedly increased with mild winters. One study suggests that winter survival is improved when the total of mean monthly temperatures in December, January and February total more than 90. Weather data from the SWROC showed mean monthly temperatures of 25, 14.5, and 27 degrees totaling 66.5 for December 1999- February 2000. Iowa State University uses 24 degrees per month as an indication of severity. Three months with mean temperatures greater than 24 F would be high risk and two of three months (similar to the Lamberton data) greater than 24 F posing moderate risk of Stewart's wilt resulting from good flea beetle survival. Using the Iowa method Lamberton would be at moderate risk. However, due to a lack of an historical track record of Stewart's wilt problems on field corn I would be inclined to take a wait and see attitude. Then again, that's my attitude most of the time.

If you observe large numbers of flea beetles on field corn I would suggest using Iowa State's threshold of 50 percent of the plants with severe defoliation and 5 or more beetles/plant in corn less than V5 growth stage. Use 10 percent severely defoliated plants and 2 or more beetles per plant in susceptible inbreds. I would appreciate hearing about any problems with this insect in SW Minnesota.

For further information refer to Handbook of Corn Insects. 1999. Ed. Steffey, K.L.; Rice, M.E.; All, J.; Andow, D.A.; Gray, M.E.; Duyn, J.W. Entomological Society of America.

Flea Beetles in field Corn.. M. Rice. Integrated Crop Management Newsletter, 5/01/2000 ISU. (http://www.ipm.iastate.edu/ipm/icm/2000/5-1-2000). Note that Gaucho is not labeled as a corn seed treatment in Minnesota.

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WEATHER or NOT

We've had crops too dry for germination to being underwater. We've gone from incredibly warm weather in March and April before planting to freezing twice in mid-May. We've had crops hailed off and cut off by high winds. No wonder I'm an optimist. Some corn and somewhat more soybean replanting is underway due mostly to hail. Corn for the most part recovered as the growing point was below ground. Soybeans should recover if cotyledons are intact. Rotary hoes and cultivators were out in full force trying to roughen soil for erosion prevention 5/23 –24. Art Frame, Nobels county Extension Educator commented that "a lot of real estate exchanged hands without a broker" due to high winds. Scouting for cutworms also got a lot more interesting in some fields.

CORN

European corn borer

SW Minnesota black light traps began to capture European corn borer (ECB) the past week. The Fulda location caught 2 ECB 5/22 and the Lamberton trap caught a male 5/24. Moth flight will continue to increase over the next week. At this time it is a bit early to start scouting. In this area, I have not seen any corn 18 inches tall yet. This information is intended as a reminder only. These three moths do not indicate an outbreak. The tallest most vigorously growing corn is the most attractive to first generation ECB. When scouting, several of the tallest corn fields in an area, non-Bt of course, can be used as sentinel fields to determine the potential for problems in field corn.

To spray or not to spray

Some corn is rapidly reaching the stage when application of some herbicides is risky. Please read specific labels for information regarding labeled growth stage of weeds and crops. As previously mentioned, the corn, as well as the growers and ag professionals, in several areas of SW Minnesota has experienced stress. The labels of many herbicides specifically advise against treating corn under stress from drought, frost, or wind damage. Sound familiar? Application of an herbicide to stressed corn should be avoided if possible. The growth of new leaves indicates that recovery is underway. Watch the growth stage. Changing to an herbicide with a later window of application may be necessary. I have feeling that it is going to be an extremely difficult year to sort out herbicide injury from environmental stress.

White grubs

White grub problems were reported from the several areas in SW and southern WC Minnesota. The adult of this insect is the June beetle that is common around lights at this time of year. There is no rescue treatment available for white grub larvae. The use of a labeled corn rootworm insecticide would be warranted in replant situations. White grub activity usually diminishes as soils warm (see spider mites below).

SOYBEANS

Bean leaf beetle

Feeding is underway. We were in the process of preparing to treat several experimental plots at the Southwest Research and Outreach Center. Defoliation was still below economic threshold, but we did not want to bean leaf beetle confound experimental results. We decided to let hail confound them instead. Watch the re-growth in hail damaged fields carefully.

Root rot complex

I am expecting areas that experienced flooding or saturated soil conditions will start showing symptoms of root rots. With the possible exception of Pythium, root rot pathogens can cause problems any time environmental conditions are favorable. Not much can be done at this time. However, cultivation can sometimes stimulates new root growth.

Spider mites

Jim Boersma, Pioneer sales agronomist, brought a sweep net full of Two-spotted spider mites into the SWROC recently. They were abundant in the border of an alfalfa field west of the SWROC. Evidently, they had not heard that they were supposed to succumb to heavy rains. Spider mites should not cause problems in alfalfa. Watch soybean fields bordering alfalfa for spider mites.

ALFALFA

Potato leafhopper

This insect came into the area last week. We initially picked up 0.3 leafhopper adults per sweep in early bud alfalfa. Sweep for this insect at regrowth. Tarnished plant bug was also present in low numbers. Do not confuse potato leafhopper with aster leafhopper, which is also present in alfalfa now. The former is a bright pea green (see photo below) while the latter is a dull greenish gray.

Alfalfa Weevil

I have not heard of any fields that needed treatment before first cutting. Watch alfalfa regrowth especially in early cut fields. I can't add anything to the recent crop news articles by Hutchison and Burkness except the following picture from a sweep of alfalfa at the SWROC last week. Note the Potato leafhopper in the lower right hand side of the picture. Multiple pest problems can and do occur.

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IPM STUFF 2000-6
5/31/2000

IPM Stuff is a combination of my own observations, conversations with Ag professionals and University of Minnesota staff and faculty. I try to credit sources but if I make an omission I apologize in advance. I have added a section on things to scout for. Other things can happen so keep your eyes open.

WEATHER
It rained. The SW Research and Outreach Center, Lamberton, received 6.59 inches rainfall for May.

Ann Bonestroo, University of Minnesota Extension Service, reported that several Rock County corn fields needed replanting. Two frosts, a hailstorm, and a couple of windstorms were too much to overcome. This may be a problem in any area that has experienced the above weather events. I am also concerned by some of the soybean fields I have observed with sandblasting injury. I would re-check soybean stands in these areas.

The rain and cool weather has been detrimental to Alfalfa weevil, grasshoppers (I haven't seen one yet this spring at Lamberton), Potato leafhoppers, Spider mites and etc. Several species of fungi may be happy about the recent weather conditions. At least March and April had nice weather.

Armyworm
Armyworms are the larvae of a moth in the Noctuidae or cutworm family. The moth is light brown or tan with a small silvery dot in the center of the forewing. The olive to nearly black larvae are 1 ½ to 2 inches long when mature. They can be distinguished by a series of lengthwise stripes on the body. Two pale orange to pink stripes with white borders separated by a dark stripe on the side of the body are a diagnostic tool.

Armyworms are not known to overwinter in Minnesota. The moths migrate into the state with weather fronts extending from the south central states (Kansas and south) northward into Minnesota. We have experienced several of these this spring. The moths lay eggs in grasses. Preferred sites for egg laying include lodged areas of small grains and portions of fields with high densities of grassy weeds, especially foxtail. Corn and small grains are attacked. Eggs hatch in 7 to 10 days, depending on temperature. It takes 20 to 30 days from egg hatch until larvae are full grown. The larvae are nocturnal and often hide under crop residue and soil clods during the day. When disturbed they roll into a ball like other cutworms. Larger larvae consume more food and damage, therefore, is often unnoticed until the larvae are nearly fully grown. Larvae feed in the area they hatch until they pupate in the soil or run out of food. In the latter case, they will migrate in groups. These migrating swarms or "armies" eat and destroy crops as they move. Historically, Northwest and West Central Minnesota experience more problems with this insect. Localized problems occurred in Southwest Minnesota during 1997.

Preliminary scouting for armyworm in small grains can be done with a sweep net. If larvae are easily found with a sweep net, shake plants vigorously and count the number of larvae on the ground in a square foot area. Pay close attention to areas that are lodged or weedy. Do this in at least 5 locations in the field. The treatment threshold for armyworm larvae in small grain is 5 per square foot.

Corn scouting should examine plants for feeding damage and larvae. Larvae can often be found in the whorl. Pay close attention to grassy areas within the field or areas with high levels of grass weed pressure at this time (5/31) and field borders when scouting for armyworm. The threshold for whorl stage corn is two larvae per plant on 25 % of corn plants or one larva per plant on 75% of the plants. Again, examine at least five sets of plants (10 - 20) from different areas of the field to delimit the extent of the problem. Scouting during early morning, evening and cloudy days is most productive as the larvae will be active and up on the plants rather than under clods and debris.

Partial field or border insecticide treatments for armyworm are often sufficient when infestations are found early.

Why am I mentioning this insect? We have had sporadic captures of armyworm moths in the Southwest Research and Outreach Center (SWROC) and Fulda black light traps throughout the spring. The black light trap at Fulda (Murray county) captured 79 armyworm moths 5/31(60 moths on 6/01). This is a relatively large number of moths and should be of some concern. I have started to pick up occasional early instar larvae in sweeps of grassy areas. These larvae represent flights earlier in the season.

The predictability of armyworm damage from light traps is not good. High populations of larvae may not develop. Additionally, outbreaks may occur in areas other than where the large numbers of adults were captured in light traps. It is far from a certainty if or where we will experience problems from this insect this growing season. The recent light trap capture should, however, serve as a reminder to check corn and small grain fields as the growing season progresses.

Larva from this recent flight should be detectable in two to three weeks. Larvae from earlier flights are already out there. On the bright side, I have seen armyworm work as very efficient grass control in broadleaf crops.

CORN

European corn borer

SW Minnesota black light trap captures continue to be low as expected from 1999 populations. The Fulda trap captured 6 adults, a mix of males and females, on 5/31/2000. Cool nights have lessened flight activity. Warm humid weather the next few weeks would be optimum for flight activity and egg and early instar survival. Egg laying and larval survival tend to be poor on smaller corn (less than 6 leaf). As mentioned last week scout the best corn first. We are at 83

degree-days (base 50) since the first moth at Lamberton. Egg hatch should begin at 212degree days. With the recent cool weather we have only been accumulating about 10 degree-days per day. Unless we get into a drastically warmer period, I would not expect to see much shotholing until June 10th.

Weed control
Watch weed and crop stage carefully when making herbicide decisions. Refer to herbicide labels for intervals between herbicide application and cultivation. Also as mentioned previously, those fields with heavy grass pressure at this time should be scouted for armyworm in 2 to 3 weeks.

Suggested corn pest scouting for next week
Stand evaluation in fields that took a beating from weather
Weed control success or lack thereof
Common stalk borer especially in fields where you are killing giant ragweed
With recent cool weather I would still look for white grub problems

SOYBEAN
Bean leaf beetle
Feeding activity continues. Rich Kvols, Yellow Medicine Co. Extension Educator
Reported a field where the field border was destroyed by this insect. Keep records of fields where defoliation is heaviest for later in the season.

Root rot complex
Symptoms of root rots will be increasingly common in soybean fields that experienced wet soil conditions. Note the variety, causal organism and extent of damage in fields where root rots are common. This information may prove useful for future variety and seed treatment decisions. For the current season, row cultivation may help survival of plants with root rots. Read herbicide labels for intervals between cultivation and herbicide application.

Disease Diagnosis
It is often not easy to determine which species of fungus is causing root rots of soybean. The University of Minnesota Plant Disease Clinic can isolate fungi from infected plants. Do not seal plants tightly within plastic bags when submitting for culturing. Place plant roots in plastic and leave tops exposed when shipping. Try to avoid having plants arrive during the weekend. Cost is $20.00 for culturing root rot pathogens.

Submit diseased plants to:
Plant Disease Clinic
University of Minnesota
Department of Plant Pathology
495 Borlaug Hall
1991 Upper Buford Circle
St. Paul, MN 55108

Suggested scouting for next week
Bean leaf beetle

Weed species and density for herbicide timing and selection
Stand evaluation (cutworm, seed corn maggot, white grub and weather damage)
Root rots
Bacterial blights may be a problem where rain has splashed soil on leaves.

Alfalfa
Potato leafhopper
I have not heard of economic infestations of potato leafhopper in SW Minnesota. However, I have not been in every alfalfa field. Sweeps of early bloom alfalfa at the SWROC averaged 0.5 / sweep. Sample the regrowth after first cutting. Pay close attention to new seedings.

Alfalfa Weevil
Fields I looked at have after first cutting (chopped) have had dramatic reductions in alfalfa weevil populations. Alfalfa weevil larvae in fields harvested before the wind may have ended up in Wisconsin. This population decline should have been anticipated as I had planned to put out an insecticide efficacy trial. Pupation has started so populations will continue to decline.

Suggested scouting for alfalfa regrowth after first cutting
Sweep nets sampling for: Potato leafhopper, Plant bugs, preliminary estimation of Alfalfa weevil populations.

If regrowth is slow, try to determine the cause. Alfalfa Weevil, and several root and vascular diseases can cause stand decline. Split crowns and roots and look for discoloration.

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M STUFF 2000-7
06/14/2000

Corn is uneven and stands have been thinned in some fields from cold weather, excess moisture and having been beat on by wind and frost. Some plants are showing evidence of root rots. This could translate to stalk rot later in the season. The crop should improve with warm weather**.** Soybeans look like they are faring better. Both crops need heat.

European corn borer

2000 is shaping up to be another poor year for European corn borer. SW Minnesota trap captures, although higher than 1999, have still been quite low compared to outbreak years. First generation flights of over 100 moths per night are not uncommon during outbreak years. Ah, the good old days…if you're a corn borer population, that is. Between a population collapse from parasitism, poor weather conditions for reproduction and larval survival, and unfavorable hosts (Bt corn), SW Minnesota corn borer are experiencing a bit of a genetic bottleneck the past few years. It will be interesting to see how they come out the other side.

At this point, it looks like the peak of first flight in SW Minnesota occurred last week (see second attachment). The graphs for these to traps will be updated at the Southwest Research and Outreach Center website http://swroc.coafes.umn.edu/index.html under crop and pest development. Degree-day models agree with this. The following web site has degree-day maps for European corn borer: http://bob.soils.wisc.edu/wimnext/corn/euroborer.html. Between wind and cold nights, there have not been many good nights for ECB flight this spring. There is corn out there that is large enough for good corn borer survival and I would suggest scouting those areas first. Prime areas for initial scouting would be taller corn that is sheltered by groves or windbreaks.

Armyworm

It is not wise to ignore scouting corn for insect problems just because corn borer may be low. I have observed armyworm feeding in some cornfields the past week. In contrast to the shotholing caused by corn borer, armyworm will create larger more ragged holes in corn leaves Larvae will be found in the whorl or under residue and soil clods at the base of plants. Scout small grains, corn and sweet corn for armyworm during the next week. Refer to the previous issue of IPM stuff for thresholds and scouting tips.

Soybean damping off

The images show soybean seedlings with symptoms of attack by *Pythium* or *Phytophthora*. The roots had symptoms also. I did not have the sample cultured. I can't tell the two genera apart at this stage. We have had warm wet, soils and cold, wet soils so either one could be causing the symptoms. Symptoms range from wilting (left plant, right healthy) to "bald head" or loss of the main growing

point with scarring of cotyledons. Seed corn maggot injury can be similar to the latter but usually cause greater tunneling in cotyledons. Plants not killed outright by damping off pathogens may survive. Plants may die prematurely or yield will be reduced when a chronic infection is initiated.

Potato leafhopper
Populations are increasing on second cutting alfalfa. Frazer Norton, Rock County Extension Educator, reported alfalfa at treatment threshold for this insect. Mark Bernard, Agro Economics, New Richland, MN mentioned that they have plenty of leafhoppers in that part of the world. At this point, it appears that Potato leafhopper populations may be higher to the east. This is fairly typical as they get more of the weather systems bringing the insect from the Gulf. Tarnished and alfalfa plant bug populations also bear watching.

Yellow Soybeans
Iron chlorosis is showing up in some fields. Check the iron chlorosis tolerance score of varieties in these fields. It could be more than a nutrient uptake problem, however. Wet soils may have initiated root rot problems. Additionally, Curt Reese, Southern research and Outreach Center reported seeing the first white females of soybean cyst nematodes last week. Nematodes were observed on early May planted soybean roots. Check for nematodes on the roots of stunted or chlorotic plants. If you don't observe nematodes, check roots again in a couple weeks or submit a soil sample.

Barley yellow dwarf
SW MN small grains and those I have seen in WC Minnesota have headed. In most cases, they look good. Barley yellow dwarf appears to be fairly common in wheat and oats this season. Aphids transmit this MLO caused disease. Symptoms include stunting, reduced yield and yellowing of leaves of wheat. Leaves of infected oats tend to have a reddish coloration. Oat red leaf is another name for this disease. The severity of the disease symptoms, and yield loss, depends on the stage of plant when infected. There is no cure once plants are infected.

Soybean weed control
Weeds are gaining the upper hand in some fields. Refer to herbicide labels for weed and crop height restrictions. Several herbicides specifically mention they are not to be applied to crops under stress. This includes chlorosis and suffering from excessive water.

SW Minnesota Scouting ideas (or things to do in your spare time or lack thereof)
Corn
- European corn borer, Armyworm

Soybeans
- Weed problems and herbicide selection
- Determine causes of thin stand and iron chlorosis

Alfalfa
- Sweep net samples for Potato leafhopper and plant bugs

Small grains
- Armyworm

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IPM STUFF 2000-8
07/05/2000

Hope you all had a good Fourth of July holiday. Warm weather and adequate moisture has aided crop growth. Early-planted soybeans are at full bloom. Corn is looking better from the road. However, corn stands have suffered from the adverse weather that occurred earlier. Common stalk borer and occasional armyworm damage is visible on field borders where these insects have moved from grasses. Potato leafhoppers populations are at lower levels than last year. Scattered fields have threshold levels.

European corn borer

The univoltine European corn borer (ECB) flight is underway (see attachment graph). For other trap results see the bug web at http://www.mnipm.umn.edu/BugWeb/. Low numbers have been observed for the past week. The Fulda location captured 20 moths July 2nd and 12 on July 3rd. The Southwest Research and Outreach Center trap captured 14 moths July 5. We should know in a few days if this was the peak. I am not expecting great things from the 2000 univoltine flight. This biotype suffered from high levels of *Beauvaria* parasitism in 1998 along with the second-generation multivoltine biotype. This flight tends to occur over a longer period that first generation multivoltine ECB and can overlap the beginning of the second-generation multivoltine flight. However, the task of scouting for univoltine corn borer should occur for the next few weeks in areas of SW Minnesota that have a history of problems from this biotype. This flight will be attracted to corn that is furthest along in development or pollinating corn. Larvae will feed on pollen, leaf axils and in the developing ear. Once tasseling occurs, shotholing is no longer a reliable indicator of larval presence. This, combined with a longer flight, makes scouting this biotype more difficult than first generation. After tasseling, most egg masses will be located on the underside of the three leaves above and below the ear leaf. Leaves and tassels should be examined for the presence of univoltine larvae and egg masses.

Soybean Root Rots

Remember the cold wet spell? A good time was had in SW Minnesota soybeans by fungi. *Fusarium* root rot is rampant in some fields. The image shows symptoms ranging from plant death and necrotic tap rots to necrosis of lateral roots and decayed root cortex. Plants that were not killed are trying to develop a new root system, sometimes at the soil surface. These plants may survive with good growing conditions. I would be suspicious of soybean cyst nematode in fields with large amounts of *Fusarium* root rot.

We are not safe from soybean root diseases with the warmer weather. *Rhizoctonia* prefers warm wet condition and *Phytophthora* can tolerate warm soils as long as it's wet. Any of these fungi can cause chronic infections which limit yield and can lead to premature mortality. I wonder why I have such a good attitude during the growing season?

Yellow Soybeans

Iron chlorosis type symptoms continued to increase. Postemerge herbicides were harder than usual on some fields. As mentioned in the previous newsletter, soybean cyst nematode (SCN) might be at least part of the blame. Now through soybean maturity is an excellent time to scout

for SCN. Soybeans do not have to be yellow to have symptoms. The extent of chlorosis is dependent on several factors such as soil type and variety. When rating a county soybean variety trial last week a variety with high iron chlorosis tolerance was observed to be stunted but did not turn chlorotic under nematode pressure. Other varieties exhibited typical chlorosis symptoms. Under some conditions, potassium deficiency rather than iron chlorosis symptoms occur. Severe to mild stunting and slow canopy development is a symptom as well. Sometimes symptoms are subtle. Check for female SCN on the roots of stunted or chlorotic plants. If you don't observe nematodes in suspicious areas, check roots again in a couple weeks or submit a soil sample.

If it looks like a skunk does it have to be a skunk?

Last week many soybeans started to show symptoms that looked like growth regulator (2,4-D, dicamba) injury. Leaves exhibit puckering and strapped veins. Some aspects of this problem indicate that herbicide drift may not be to blame. The symptoms are across fields and no herbicide drift pattern is visible. Growing points are not injured. Broadleaf weeds, if any survived, in the field show no symptoms. I am not aware of a relationship to the soybean herbicide used and symptoms. I have been unable to find an insect damage relationship.

A relationship to the onset of reproductive phase and symptoms was observed in date of planting plots at the Southwest Research and Outreach Center. Symptoms are severe in plots that are flowering but absent in adjacent plots planted later. The cause of this phenomenon is not clear. These symptoms have occurred in previous years. There is a possibility that it may be related to a plant virus. It may, more likely, be a soybean hormonal response to environmental conditions or the onset of reproduction.

Unfortunately, there are cases of herbicide drift to soybeans this season. However, there are a lot of fields that look like they have herbicide injury that probably do not.

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IPM STUFF 2000-9
08/21/2000

It's almost over or… you win a few, you lose a few.
I pounded this issue out in hurry and only a month late. Please ignore the grammar, syntax and spelling errors**.**

Crop conditions are variable but generally good. Some areas need additional moisture to finish the crop. Some areas have had a bit too much moisture, with some in the solid state. Some areas are just about right. The SW Research and Outreach Center received high winds and subsequent lodged corn. Unfortunately, the corn was far enough along so much of it remains horizontal. This will add to the consternation normally experienced at harvest.

Pay attention to field conditions as the crop matures. Now is one of the best times to gather information for the next year's battle.

Some fields have suffered from less than perfect weed control. Late emerging weeds to not cause as much yield loss as those emerging with the crop. It is too late to try to control weed escapes. Weed control is often a study in chaos theory. However, you can usually figure out what variable was not taken into account when weed control was applied. Record weed escapes and use this information in planning next years weed control efforts.

Pay attention to poorer appearing areas of fields.Try to determine the cause, fertility or disease for example. The latter can be addressed the next time the crop occurs in the rotation. We experienced our share of problems in SW Minnesota from extended diapause northern corn rootworms and white grub this year. These, unlike many insect problems, do not tend to go away the next year. Include these in next year's crop plans.

Late season scouting can help determine the cause of poor performance and may be the only way to make sense of those colorful yield monitor maps.

White mold or not
White mold is readily visible in some fields. However, given the cool, wet spell we experienced about three weeks ago, the disease appears to be fairly limited at this time. The disease may still develop later this season. With luck, any late season white mold development may cause less yield reduction. As mentioned above, note the fields and varieties where white mold problems occur.

All prematurely dead soybean plants are not caused by white mold. The white mycelium and sclerotia are diagnostic. You may have to split stems to see these. Prematurely death of soybean plants may be caused by several other causes. Most common are root rots. I have also been seeing Anthracnose (*Colletotrichum*). The initial

appearance is that of a white mold lesion on the stem. However, sclerotia and mycelium are lacking. Additionally, there will be black fruiting structures scattered in the lesion. You may see these in the above image. Pod and Stem Blight (*Diaporthe*) produces rows of black fruiting structures.

Soybean cyst nematode
I have received several calls of soybeans with late season yellowing. Soybean Cyst Nematode (SCN) has caused the symptoms in the fields I have examined. Two types of symptoms are occurring this year. The first appears as a yellowing of leaflet margins. The symptoms look like potassium deficiency. In fact, they may well be. Inhibition of root function by the nematodes can reduce the ability for K uptake. The second type of symptom is yellowing of individual leaflets near the top of the plant. The root systems look good in some cases. However, under close inspection white female SCN can be seen emerging form the roots.

These symptoms are occurring in some fields where SCN resistant varieties were planted. This is not entirely unexpected. Nematode resistance prevents reproduction but juveniles will attempt to feed. Where symptoms occur in resistant beans one of several things could be happening. The variety may be only partially or moderately resistant. SCN resistance is hard to accomplish with current breeding methods. Resistance may be working but the nematode populations may be so high in area of the field, feeding from large numbers of juvenile SCN damage root systems. The numbers of females observed on the roots may not be directly related to the number of nematodes in the soil.

Females are observed on the root system indicate that resistance was not complete or you are seeing nematodes that can overcome the resistance in the variety. The latter is more serious. These nematodes will reproduce and increase as a percentage of the population. You are watching the SCN population overcoming of resistance as it happens. When a large number of females are found on resistant varieties, producers have two options. They can try to rotate the variety and resistance source or they can plant several years of a non-host crop before returning to resistant soybeans.

There are widespread symptoms of SCN in fields this year. Evidently, it has been a good year for the nematodes. Producers who tried to sneak an extra year of susceptible beans in infested fields may find unacceptable yields.

As if we did not have enough to worry about
A new (to the US) aphid species that attacks soybeans has been identified in the Midwest. Refer to http://www.vegedge.umn.edu/mnvegnew/vol2/818new.htm for more information. It appears that we are developing a more complete compliment of biological control agents for soybean.

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IPM STUFF 2000-9b
08/21/2000

I forgot to attach this section to yesterday's email. It's an unfortunate result of doing this in my spare time.

Bean leaf beetles
Leaf feeding is very common. I have not been in any fields with high levels of defoliation or pod feeding. Pod clipping and pod feeding are the main issue at this time. Loss from pod clipping is obvious. Feeding on the pods can open the seed up to fungal pathogens including *Phomopsis spp*. and *Alternaria.* It is worth the time to check for bean leaf beetle feeding. The threshold is 10% pod feeding. Iowa State University has a developed a threshold based on beetle numbers and insecticide cost. For these thresholds, see Marlin Rice's recent article at http://www.ent.iastate.edu/ipm/icm/2000/8-21-2000/lblroof.html

Corn harvest may be closer than you think
This is entirely unrelated to pest management but pay close attention to corn moistures for silage harvest. I have talked to several people last week who were taking early moisture tests for silage. Some fields are at seventy percent moisture or less in spite of being barely dented. The milk line rule may not work well this year.

And now for something completely different
John Eidenshink,Pioneer agronomist emailed a digital image of caterpillars infesting corn ears. They were evidently quite numerous in the field. Without a specimen to key out, they appear to be western bean cutworm. This is a known but infrequent corn pest in this part of the world. Western bean cutworms are related to other Noctuid cutworms such as armyworm and corn earworm. The larvae are tan, similar to armyworm in size and shape, have no body stripes and a dark area with white stripes behind the head. Unlike other many other cutworms western bean cutworm tends to feed on the tassel and ear of corn. As the name implies, they also feed on beans. Control is ineffective once the larvae are inside the ear.

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IPM STUFF 2000-10
09/05/2000

Late season corn stress = stalk rots

Corn stalk rots are starting to show up. Premature senescence and plants dying from the top down indicate that fungal stalk rots be present. These diseases (several species of fungi might be involved) tend to be worse when corn plants are stressed late in the growing season. I would guess that the lack of late season rainfall in this part of the world would qualify. The disease may have been initiated early in the season as a root or crown rot. Insect feeding in roots or stalk can provide an entry point for the fungi. Stalk rots decay the pith and vascular system of the stalk. Stalk rots can limit kernel fill and yield by reducing nutrient and water transport. The potential for losses due to lodging exists even when stalk rot becomes severe late in the grain fill period. The pith of plants with stalk rot will be discolored and decayed.

Fusarium/Giberella, and most other fungal stalk rots, are confined to the roots, crown and stalk. Anthracnose caused by *Colletotrichum*, can also cause a leaf blight.
Check corn for stalk rot by pinching the lower internodes. Plants with stalk rot will be spongy or soft. As maturity progresses, you can use an even quicker estimate the severity of stalk rot in a field. Grasp stalks and push them sideways to about a 45 to 60 degree angle (note: all corn remains lodged when pushed 90 degrees from vertical). Plants with significant stalk rot will not spring back. Check several plants in several spots of the field. Fields with a high percentage of this disease should be scheduled, where possible, for early harvest.

European corn borer (ECB)

Although light trap captures at the SW Research and Outreach Center, Lamberton, were dismally low during 2000, I have observed plants with uni-voltine or second generation larvae infesting the ear and tops of plants. These flights had good environmental conditions for mating, egg lay and larval survival. I have not seen anything approaching economic levels in SW Minnesota. Flights and larval populations appear to be higher to the east. I have not, however, scouted fields in these areas as I lead a sheltered life. We should have a better idea of where in Minnesota ECB populations are highest after the annual fall survey conducted by the Minnesota Department of Agriculture.

We will know, for sure, next June and July how successful at reproduction and survival corn borers were. After all, that's when it counts.

Brown stem rot of soybean

Late season symptoms of brown stem rot (BSR) are common in many soybean fields. The fungus, *Phialophora gregatum*, over-winters on stem tissue in the soil. The infections actually occurred earlier in the growing season through roots and lower stems. As the season progresses the fungus grows upward through the stem. Disruption of water and nutrient flow results from infection. The fungus is usually more severe under moisture stress conditions.
If environmental conditions are favorable, foliar symptoms become visible on *some* varieties. Foliar symptoms are wilting and the browning and rapid drying of tissue between the leaf veins. Unfortunately, leaf symptoms are not always visible. The image shows moderate to severe foliar

symptoms (along with bacterial blight and bean leaf beetle feeding). A more reliable method of assessing BSR problems is to split the lower few nodes of stems and look for a brown discoloration. This discoloration may extend through the entire pith or may be limited to nodes.

The following example illustrates the potential for underestimating the incidence of this disease based on foliar symptoms. In a 2000 study at the SWROC, 8 % of plants showed obvious foliar symptoms. However, 42 % of plants had brown stem rot based on splitting stems.

You can scout for BSR in a harvested but un-worked soybean field by looking for discolored pith in standing soybean stubble. This method supposes that you are looking for things to do between soybean and corn harvest. Based on windshield surveys, I have seen a fair bit of this disease in SW Minnesota and NE South Dakota. It was markedly absent in western South Dakota and Wyoming.

Choose a soybean variety with brown stem rot resistance the next time fields with a BSR problem are planted to soybeans.

Root rots and more root rots

Just because it has been dry doesn't mean root rots of soybean, and other crops, cannot be a problem. Plants infected earlier (when it was wet) may have reduced root systems. The lack of root development causes these plants to succumb to droughty soils earlier than plants with healthy root systems. Root rots have been killing quite a few soybeans recently.

***Septoria* leaf spot (Brown spot) of soybean**

This disease is also prevalent in some soybean fields. The fungus, *Septoria glycines,* overwinters on residue and seeds. Spores move upward on the plant by wind and rain splash. The disease is favored by warm wet weather. Late in the growing season, the fungus can cause premature leaf drop. Several diseases look similar to brown spot and field diagnosis are iffy. However, the University of Minnesota, Plant Disease Clinic has cultured *Septoria* from several samples. As with a lot of pest problems, yield loss will be minimal when the disease becomes severe late in the season. In other words, you need fewer leaves when you're ripe. Additionally, before blaming premature leaf drop solely on Brown spot make sure you haven't overlooked another stress that predisposed the plant. (e.g. SCN, root rot, drought).

Barring any unpredicted disasters, this will be the last issue of this newsletter for the 2000-growing season. Let me know any thoughts you might have on how to make this newsletter better, whether I should just give up and just go trout fishing more often, etc.

Have a good and safe harvest.

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The Role of Variety Selection in Pest Management

Producers are being asked earlier and earlier in the season to make corn and soybean seed decisions for the following year. This timing does show creativity and aggressiveness on the part of those marketing seed but does put producers at somewhat of a disadvantage for evaluating yield and other variety characteristics. Selecting a variety/hybrid is the most important decision producers make to help insure good yields.

Unfortunately, we have enough pest problems in corn and especially soybeans that selecting a variety based only on yield, maturity and price is not the best option for many fields. Selecting good varieties is one of the more important steps a producer can make in integrated pest management program.

You may be hearing of offensive varieties. My understanding of the term is; they yield extremely well in the absence of stress. Planting an offensive variety may uncover yield-limiting factors existing in a field. It is a rare field that has no pest problems or a single pest problem interfering with optimum yield. Producing varieties with defensive traits and high yield potential is difficult. Producing high yielding varieties with multiple defensive genes is even more difficult. Genetics for insect or disease resistance characteristics do not increase yield. They often tend to lower top end yield potential of the variety. These characteristics do, however, protect against yield reduction in the presence of the appropriate pest.

It is, therefore, important to prioritize, pest problems in a field and use field specific variety selection to combat pest problems that you can expect to reoccur in a field. This is especially true for pest problems that cannot be countered with tillage, rotation or crop protection chemicals. In order to prioritize pest problems, it is critical that fields are monitored for problems during the growing season and field specific problems are recorded. In other words, what you don't know *can* hurt you.

Some biotech events are cleared for export and some are not. Growers planting varieties and hybrids containing non-cleared genetics need to consider potential problems when storing and marketing. Growers should also consider the large and long-term impacts of producing unapproved varieties. Contaminating U.S. grain stores with unapproved varieties reduces grain prices and hurts all U.S. grain farmers.

The following list is a portion of corn and soybean traits to look for when making a seed decision and where they can be appropriate. Seed companies use their own rating systems and *scores are not standardized across companies*. Some are inverted (i.e. a high number can be good or bad depending on the company). Finally, do not lose sight of the fact that yield pays the bills when making a seed decision.

Corn

Root lodging /strength is a factor to consider where extended diapause northern corn rootworm damage to corn following soybean is anticipated. Hybrids with poor root systems have been

known to fall over without the help of rootworms. Larger, more vigorous root systems may help lessen root lodging. Corn rootworms can induce lodging before yield loss. Maintaining standability with hybrid selection might make combining a bit more pleasant and is much cheaper than an insecticide. High populations of rootworms, especially when hatching at an early stage of corn growth will overwhelm any root system. For those fields where you are **sure** extended diapause will occur, an insecticide might also be considered. For corn following corn, a reasonably accurate assessment of the need for insecticide can be obtained from adult beetle counts the previous year.

Stalk strength can help prevent stalk lodging from stalk rots or European corn borer damage. It does not prevent yield loss from these organisms.

Corn borer resistance/tolerance Hybrids differ in resistance to European corn borer attack or tolerate damage with less stalk breakage. This can be through concentrations of DIMBOA, a feeding deterrent, for first generation corn borer or by plant characteristics such as stem architecture (see stalk strength) for second generation. These do not provide absolute control and can be overwhelmed when high populations of corn borer occur.

Bt Hybrids are genetically modified to contain this toxin and provide very good control of European corn borer. Planting Bt corn on a portion of a producer's corn acres would allow time to do a more thorough job of scouting the remaining acres to determine the need for an insecticide. If a producer chooses to use Bt corn it is probably a wise choice to determine a percentage they are comfortable with and stick to it. We are currently at a lower point in corn borer populations. However, changing the amount of Bt corn planted by trying to outguess corn borer populations will cause undue angst for both the producer and his seed dealer. Coincidentally, some of the newer higher yielding hybrids just happen to have the Bt gene.

Other disease ratings that might be considered include scores for anthracnose leaf blight and other leaf spots. These should be considered if there is a history of the disease in the field or area. These diseases can be important in continuous cornfields, particularly those with no or minimal tillage.

Some companies rate hybrids for resistance to one or several of the **stalk rot** fungi. If you are trying to avoid a stalk rot problem it is important to know which species you have a problem with. All stalk rot is **not** anthracnose. No matter how sure you are the stalk rot looks like *Gibberella,* Anthracnose, etc., culturing diseased tissue at a plant pathology lab best determines which species killed your corn.

Herbicide resistance is available in some corn hybrids. Resistance to some herbicides was developed with traditional breeding (eg. Clearfield) and some are the result of biotechnology methods (eg. Roundup Ready). These traits are specific to herbicide compound and good record keeping is essential for avoiding application of the wrong herbicide. Some have restriction for use and export. Hybrid selection is based on herbicide resistance is best done with a particular weed problem in mind.

Soybeans

Iron chlorosis is not a crop pest. However, root rots, soybean cyst nematode and herbicides can aggravate the problem. If iron chlorosis is a problem in the field, make sure it is not wholly or partly disease or nematode related. It is very possible that you may need an iron chlorosis tolerant soybean with SCN resistance or *Phytophthora* root rot resistance. Iron chlorosis can have several causes and vary based by weather conditions, soil type and geographic area of the state. Therefore, rating iron chlorosis tolerance is difficult and as mentioned earlier these ratings are not standardized between companies.

Phytophthora root rot (PRR) resistance is available for fields with a history of this disease. Genetic resistance is available through several ***Rps*** genes that are each effective on several races of the *Phytophthora* fungus. In southern Minnesota, we currently have races of the fungus that can attack all current RPS resistance genes, including ***Rps*** 1K, the newest gene, used in breeding programs. By continuing to use the same ***Rps*** gene in a field it is possible to select for, or increase the percentage of, races able to overcome the gene. Therefore, performance of PRR resistance should be monitored when using these genes.

Some seed companies rate field tolerance to PRR. Tolerance is different than resistance and is not absolute. These ratings are subjective and not standardized between companies. Tolerance will usually not be sufficient in fields with severe PRR problems.

Other root rots occur in soybean and can be caused by several fungus species individually or in combination. Genetic resistance for *Fusarium* sp. and *Rhizoctonia* root rots is not available. There may be tolerance differences but these are not documented in varieties adapted for Minnesota. As with corn stalk rots, to be sure of the organism causing a root rot, laboratory culturing of diseased tissue is often necessary.

Fungicide seed treatments may help reduce root rots when genetic resistance is not an option.

Brown Stem Rot is often a problem in reduced tillage. Non-rotated soybeans are often the most severely affected. This disease has been observed at high levels in SW Minnesota the past two years. Seed companies usually provide resistance scores to this disease.

White mold scores are subjective. Genetic resistance is not yet available. Varieties can perform differently in different areas. Performance may be related to any one or a combination of canopy architecture, flowering habit or biochemical processes. Any current variety can be overcome when favorable conditions for disease development exist. Nevertheless, it is best to avoid varieties with poor white mold scores in fields with a history or potential of white mold.

Soybean cyst nematode (SCN) resistance works. More and higher yielding SCN resistant varieties continue to be released. Soybean growers should start to consider using resistant varieties when SCN is found in a field. Early implementation of resistant varieties will help maintain productivity in infested fields. Ignoring an SCN problem can lead to high populations of nematodes. This can prevent even SCN resistant varieties from yielding well. SCN resistance, like other defensive traits has a slight yield penalty attached and they are sometimes out yielded by susceptible varieties even in fields with SCN problems. However, growers should look at

resistant varieties as a long term management strategy designed to maintain soybean productivity in a field.

Roundup Ready or Glyphosate resistance should be considered a defensive character. Its best fit is in fields with hard to control weed problems. This is a new trait. Soybean breeding programs have not had much time to combine this gene other defensive genetics. Roundup Ready may not be your best choice in fields with problems, more serious than weeds, which require defensive genetics.

Seed companies may rate **other defensive characters**. Consider them only of you have the problem.

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