INTEGRATED CROP MANAGEMENT

IC-498 (18) | 215 | July 9, 2007

Plant Diseases

Sample now for most corn nematodes

by Greg Tylka, Department of Plant Pathology

There are many different species of plant-parasitic nematodes that feed on corn, and the different species vary greatly in their ability to cause damage. For example, the damage threshold for spiral nematode (*Helicotylenchus*) on corn is greater than 1,000 per 100 cc (a little less than a half cup) of soil, but only one needle nematode (*Longidorus*) per 100 cc soil can be damaging.

Also, some nematodes that feed on corn are endoparasites—that is, they feed from within the root tissue. But most corn nematode species are ectoparasites, living in the soil and feeding from outside roots.

For most plant-parasitic nematodes that feed on corn, samples should be collected mid-season, when nematode numbers likely are greatest, so that the numbers can be compared to damage thresholds established for corn. The only exception would be if needle nematode damage is suspected, then samples should be collected in the spring or fall, not in the summer. Needle nematodes migrate down into the soil in the middle of summer, when soils are warmest, and they may not be recovered from mid-season soil samples.

But the needle nematode occurs only in very sandy soils (>70% sand). So unless a needle nematode problem is suspected in a sandy field, fields should be sampled to check for possible nematode damage to corn mid-season (i.e., now), not in May or June.

Endoparasitic lance nematodes (stained purple) in root. ***(Greg Tylka)***

In this issue

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Soil and roots needed

A few species of nematodes known to damage corn are endoparasites that exist primarily in roots, not soil, during the growing season. So a root sample is needed in addition to soil to properly check for a nematode problem. One of the most common plant-parasitic nematodes that damage corn in Iowa is the lesion nematode (*Pratylenchus*), and the lesion nematode is an endoparasite. Another common endoparasitic nematode of corn is the lance nematode (*Hoplolaimus*). The results in the table below illustrate how damaging population densities of lance and lesion nematodes on corn would have been undiagnosed had a root sample not been submitted in addition to soil.

Number of lance and lesion nematodes recovered from soil and roots collected from a corn field in Iowa.

Nematode	No. in Soil (per 100 cc)	No. in Roots (per g root)
lance	18	1,667
lesion	26	5,467

Following are guidelines for collecting a good sample to check for nematode damage to corn:

- Collect a soil core or small trowelful of soil from the upper 12 inches of the soil profile from the root zone of 20 or more plants within the area suspected of being damaged.
- Collect the roots from around two or three affected plants.
- Place soil and roots in a moisture-proof bag and submit for processing as soon as possible.
- Keep samples cool until they are sent for processing.
- Avoid sending samples late in the week to prevent their storage in hot conditions in transit over the weekend.
- Submitting a companion soil and root sample collected from nearby, healthy-looking corn plants often provides a helpful comparison.
- Samples can be sent to the ISU Plant and Insect Diagnostic Clinic, 327 Bessey Hall, Iowa State University, Ames, IA 50011. The test for corn nematodes is called a complete nematode count.
- Samples sent to ISU should be accompanied by a completed *Plant Nematode Sample Submission Form* (ISU Extension publication PD 32) and a check for the $30 per sample processing fee.

Collect soil cores from root zone of corn. *(Greg Tylka)*

Collect 12-inch-deep soil cores. *(Greg Tylka)*

Collect four or five root systems in addition to soil cores. *(Greg Tylka)*

Greg Tylka is a professor of plant pathology with extension and research responsibilities in management of plant-parasitic nematodes.

Insects and Mites

Soybean aphids exceed the economic threshold in northeast Iowa

by Marlin E. Rice and Matt O'Neal, Department of Entomology

The soybean aphid population at the research site in northeastern Iowa near Decorah exceeded the economic threshold of 250 aphids per plant the first week in July. According to information provided by Brian Lang, extension field agronomist, the population jumped from 30 per plant on June 28 with 95 percent of the plants infested to 405 per plant on July 5 and 100 percent of the plants infested. The population trend is not as great as the outbreak year of 2003, but it certainly is tracking to be a bigger aphid year than in 2005 (Table 1).

Table 1. Soybean aphid population trends, Decorah, 2002–2007 (ISU Extension Soybean Aphid Research Site).

Date	2002	2003	2004	2005	2006	2007
			Infestation (%)			
June 1	—	—	0	6	0	2
June 7	—	—	0	15	2	23
June 14	—	40	0	33	6	56
June 21	7	90	0	31	12	59
June 28	15	100	0	85	13	95
July 5	70	100	4	99	24	100
July 12	93	100	8	100	71	
Date	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
			Aphids/Plant			
June 1	—	—	0	0.1	0	0.1
June 7	—	—	0	1.4	0.4	3.4
June 14	—	10	0	2.5	0.3	5.8
June 21	1	115	0	4.0	0.8	6.6
June 28	2	341	0	48	0.7	30
July 5	14	745	0.5	179	1.8	405
July 12	25	2,803	1	713	6.6	

Now is the time to start scouting soybean fields for aphids, but at the same time, it is critical to understand several important factors regarding insect pest management: economic thresholds and scouting.

Economic thresholds. Two concepts are very important in integrated pest management for understanding pest and yield loss relationships. These are the economic injury level and the economic threshold. The economic injury level is the lowest population of insects that will cause economic damage, i.e., yield loss that equals the cost of control. In 2003, a preliminary economic injury level of 1,000 aphids per plant was reported based on research from the University of Minnesota. Since then, data from additional states, including Iowa, have refined both with the economic injury level at 654 aphids per plant during the R1–R5 growth stages for 30-inch-row soybeans.

Soybean aphids and an ant on a soybean stem. *(Marlin E. Rice)*

Look for the multicolored Asian lady beetle, a major predator of soybean aphids. *(Marlin E. Rice)*

The economic threshold is a similar concept, but it is the pest density at which management action should be taken to prevent an increasing pest population from reaching the economic injury level. Based on data from multiple states over several years, the suggested economic threshold is approximately 250 aphids per plant.

The *economic threshold of 250 aphids per plant and increasing in size* is the number that should be used to justify an insecticide application to a soybean field. This economic threshold incorporates a 5- to 7-day lead time before the aphid population would be expected to pass the economic injury level—and cause economic damage. Populations that average less than 250 aphids per plant should not be sprayed; there is little to no evidence that populations below 250 aphids result in yield loss. Fields with small aphid populations should be scouted every 2–3 days to determine if they reach the economic threshold. Heavy rains and beneficial insects may reduce low or moderate populations. Insecticides are most likely the only option for control once the population reaches the economic threshold. Control aphid populations before the symptoms of heavy honeydew, sooty mold, and stunted plants appear in the field. An insecticide may still be of value after these conditions occur, but the optimum time for treatment has passed. The benefit of any insecticide application is reduced after soybeans reach the R5.5 growth stage.

Field scouting. It is imperative that field scouting be conducted to determine if aphid populations are reaching the economic threshold. Begin scouting for soybean aphids now if you have not already done so, especially in northeastern Iowa. Check the upper two or three trifoliolate leaves and stem for aphids first. Aphids are most likely to concentrate in the plant terminal early in the growing season. Scout five locations per 20 acres. Also, look for ants or lady beetles on the soybean plant—they are good indicators of the presence of aphids. Lady beetles feed on aphids while ants tend the aphids and "milk" them for honeydew. Regular field scouting should occur weekly until plants reach the mid-seed stage (R5.5) or the field is sprayed.

Speed scouting. When aphids are found, estimate the population size per plant. Count all the aphids on several leaves and plant terminal to establish what 100 or 250 aphids look like and then use this as a mental reference for gauging populations on other plants. A quicker scouting method, called speed scouting, has been developed at the University of Minnesota. See **www.soybeans.umn.edu/crop/insects/aphid/aphid_sampling.htm** regarding how to employ speed scouting—including a training video game. Speed scouting uses the number of infested plants (40 or more aphids per plant = an infested plant) as a guide for determining whether an insecticide application is justified. This is not a new threshold but rather a sampling tool that helps determine if the soybean aphid population within a field is above the 250 aphid per plant threshold.

Marlin E. Rice is a professor of entomology with extension and research responsibilities in field and forage crops. Matt O'Neal is an assistant professor of entomology with research and extension responsibilities in field crops.

Crop Production

Too early to harvest dry corn for early silage, but do consider nitrate accumulation risks

by Stephen K. Barnhart, Department of Agronomy

When the weather turns dry and the corn leaves begin to roll from heat and moisture stress, producers sometimes begin to think about "salvaging" the crop as an early silage harvest. Conditions probably don't merit that drastic decision yet.

It is not, however, too early to consider elevated levels of nitrate in harvested grass forages. Plants (usually grasses and some broadleaf weeds) will continue to take up soil nitrate during drought and stress periods but not metabolize it into protein and normal plant constituents. The accumulation of nitrate is not damaging to the plant but can be a physiological risk to livestock that eat it. Nitrates are often of concern in drought-stressed corn being harvested early as silage but also can be a risk in small grains and emergency warm-season annual forage grasses being grazed or harvested during moisture deficit periods. The standing crop can be sampled and tested for nitrate concentration. Nitrate levels do not diminish when cut and stored as dry hay but can be significantly lower following ensiling. If there are concerns about high nitrate levels in forage crops, contact your forage-testing lab for sampling instructions and have the forage tested before feeding.

Stephen K. Barnhart is a professor of agronomy with extension, teaching, and research responsibilities in forage production and management.

Weed watch: Wild parsnip and poison hemlock

by Kristine Schaefer, Department of Entomology

Conditions the last few years have been especially favorable for two weeds in the parsnip family—wild parsnip (*Pastinaca sativa*) and poison hemlock (*Conium maculatum*). Wild parsnip and poison hemlock are non-native plants that originated in Europe. The edible roots of wild parsnip were consumed in ancient Greece and Rome while poison hemlock was used as a poison, most notably known as the poison that killed Socrates. Both can pose health hazards that many people may not be aware of.

Identification

Wild parsnip and poison hemlock typically act as biennials (occasionally as perennials), forming a rosette of basal leaves the first year, overwintering, and then flowering the second year. Wild parsnip flowers primarily from May through July; poison hemlock flowers from May through August.

The basal rosette of wild parsnip consists of large, pinnately compound leaves that resemble celery leaves. Leaves that develop on the stem are alternate, pinnately compound, with saw-toothed edges. The lower leaves have petioles (leaf stalks) whereas the upper leaves are attached directly to the stem (sessile). The stem is hollow and grooved, 2 to 5 feet in height. The flowers are small, predominantly yellow (occasionally white), and five-petaled, arranged in an umbel spanning from 2 to 6 inches.

Poison hemlock basal rosette leaves are pinnately compound and fernlike. Leaves formed on the stem are alternate, finely divided, and clasp the stem at the nodes. Stems are hollow between nodes, ridged, and hairless with purple spots and blotches. Poison hemlock grows from 4 to 10 feet. The flowers are white with five notched petals arranged in an umbel approximately 2 to 3 inches across. The lack of hairs on the leaves and stems of poison hemlock can be used to distinguish it from wild carrot (Queen Anne's lace).

Habitat and distribution

Wild parsnip and poison hemlock typically inhabit roadsides, pastures, field edges, or natural areas. Poison hemlock prefers moist conditions along streams and low-lying areas. Wild parsnip favors calcareous soils and sunny areas. Both are adaptable to different environments and can be found throughout most of the United States and Canada. They produce a large amount of seed, which contributes to their persistence and spread. Poison hemlock is listed as a secondary noxious weed in Iowa.

Wild parsnip ***(Kristine Schaefer)***

Poison hemlock ***(Kristine Schaefer)***

Special warnings

Wild parsnip plant parts contain a substance called psoralen, which can cause a condition known as "phytophotodermatitis." This reaction occurs when plant juice gets on the skin and the skin is exposed to sunlight. The results are skin reddening, rash development, and in severe cases, blisters and burning or scalding type pain. Wild parsnip burns often occur in elongated spots or streaks. Dark red or brownish skin discoloration develops where the burn or blisters first appeared and can last for several months.

All parts of the poison hemlock plant are highly toxic to humans and animals and may result in death if ingested. Most of the recent cases of human poisoning have resulted from mistaking poison hemlock with edible species of the carrot family. Livestock poisoning usually occurs from the presence of poison hemlock in hay or when pastures are overgrazed and other sources of food have been depleted.

Extra care should be taken to wear protective clothing before working with or exposure to wild parsnip or poison hemlock.

Control measures

Cultural methods that favor the growth and development of desirable plant species are the best measures to deter wild parsnip and poison hemlock. Mechanical removal of flowers and seeds by hand pulling, digging the root crown, or repeated mowing can be effective control methods. Elimination of seed production is the goal. Since flowering does not occur all at once, the area must be monitored for several weeks. Chemical control options are available if mechanical methods are not feasible. Glyphosate can be spot sprayed on basal rosettes, applied in early spring or late fall when most desirable vegetation is dormant. Other options include phenoxy herbicides, such as 2,4-D or dicamba, applied in early spring or late summer/fall. Avoid contacting desirable plants with these herbicides. The area should be monitored as additional herbicide applications or mechanical control measures may be necessary for the next couple of years to control newly emerging plants.

Kristine Schaefer is an extension program specialist with the Pest Management and the Environment Program.

Crop Production

Time is running out for planting an "emergency" forage crop

by Stephen K. Barnhart, Department of Agronomy

Weather events or unusual circumstances will sometimes lead to the decision to produce an "emergency" forage crop. The forage crop chosen often is a warm-season annual grass harvested one to three times during the growing season. The choice of crop species depends primarily on how the crop will be stored or used (hay, silage, or grazed), the type of animal being fed, and the yield expectations.

Harvest as silage provides the widest range of species choices. Foxtail, Japanese, and hybrid pearl millets and sudangrass and sorghum-sudangrass hybrids can all be planted as late as mid-July and still produce a harvestable crop. All of these also could be considered as grazed forage too. Foxtail millet, sudangrass, and the sorghums should not be used for horse pasture. It is probably too late in the season to plant forage sorghum and expect a normal forage sorghum yield silage crop, and forage sorghum is not generally recommended as a grazing crop.

Choices for an emergency crop for harvest as dry hay are more limited. The best choice is probably foxtail millet. It is the most "grassy" of the millets and the best suited for drying and safe storage as dry hay. Sudangrass and Japanese millet also are possible choices for a hay crop but somewhat less desirable because of coarse stems and less uniform field curing.

Planning for and choosing an emergency forage crop may not be sufficient. For a successful midsummer planting, there needs to be adequate soil moisture to germinate the seed and a regular rainfall pattern for the remainder of the growing season to keep the crop growing.

Though often not considered, you may already have an emergency forage crop growing. Corn silage or soybeans harvested during early pod fill also are possible and viable forage choices; however, their value as grain must be weighed against their value and need for forage.

Livestock producers need to be aware of late summer nitrate toxicity risk with many grass forages growing during dry summer months. They also should be aware that hydrocyanic acid (Prussic acid) needs to be considered when managing sudangrass and the sorghums as pasture.

Stephen K. Barnhart is a professor of agronomy with extension, teaching, and research responsibilities in forage production and management.

Indicators point to hay supply deficits in Iowa

by Stephen K. Barnhart, Department of Agronomy

Livestock producers are encouraged to regularly assess their forage inventories. This year there are several indicators that point to localized or even statewide hay deficits.

The early summer USDA crop acreage estimates indicate that 2007 alfalfa, mixed alfalfa and grass, and "other hay" acreage is down 8 to 9 percent from that of a year ago. Higher grain prices and the early-season freeze have contributed to this decreased acreage. In addition, the early April freeze led to 20 to 50 percent lower first-cutting yields across much of the state. Potato leafhopper populations are high already and may contribute further to reduced summer production in alfalfa-based hay fields.

Some ways to possibly make up some of the deficits could be considered:

- Some producers will be harvesting oat or other cereal grain crops for hay and silage to make up some of their deficits.
- Producers with alfalfa-based hay fields are encouraged to scout for and manage potato leafhopper populations for the remainder of the summer, to maximize the yield potential of their summer harvests.
- There are still a couple weeks to consider planting a warm-season, annual grass crop for "emergency forage." While there is still time to produce a productive crop before fall frost, there is a risk that there will be insufficient soil moisture and timely rainfall to establish and produce a productive crop over the next few months.

Higher grain prices and the early-season freeze have contributed to decreased alfalfa, mixed alfalfa and grass, and other "hay" acreage. *(Natural Resources Conservation Service)*

- There may be an opportunity to harvest hay from CRP acres.
- Corn silage or soybeans harvested during early pod fill also are possible but often less viable forage choices.

Stephen K. Barnhart is a professor of agronomy with extension, teaching, and research responsibilities in forage production and management.

Weed Management

Dicamba, stress, and distorted soybean leaves

by Bob Hartzler, Department of Agronomy

A fairly common occurrence in late June and July is the appearance of distorted leaves on soybean plants. The most common cause of this response is exposure to a growth regulator herbicide (2,4-D; dicamba; etc.). Dicamba is the most commonly used growth regulator herbicide in Iowa crop production, and is present in numerous products (Banvel®, Clarity®, Marksman®, Distinct®, Status®, and many others).

Soybeans may be exposed to dicamba in three ways: spray particle drift, vapor drift (volatilization), and sprayer contamination. Injury from spray drift or sprayer contamination usually is fairly straightforward in diagnosing, but questions often arise regarding volatilization.

Volatilization occurs when dicamba is sprayed, lands on the target site, but later evaporates and moves from the treated field. The potential for volatilization is affected by many factors. As temperatures exceed 85 °F, the threat of volatilization increases. Dicamba is more likely to evaporate off corn leaves than soil, so the risk increases with late applications of dicamba to corn since more product will be intercepted by corn leaves. Risk of volatilization varies among dicamba formulations, with the dimethlyamine salt (Banvel) greater than the diglycolamine salt (Clarity) or sodium salt (Distinct, Status). Studies have shown that the majority of volatilization occurs within 2–3 days of application.

Distorted leaves on soybean are commonly caused by exposure to dicamba. ***(Bob Hartzler)***

Determining the potential for yield impact from growth regulator herbicides shortly after exposure is difficult, but if only two or three leaves show slight distortion, it is likely yields will not be affected. Studies found that if soybean height at the end of the season was not affected, then yields usually were not affected by dicamba exposure.

It generally is accepted that occasionally soybeans will develop symptoms similar to that of growth regulator herbicides in the absence of the herbicide. These symptoms typically occur during stress or periods of rapid fluctuating weather. Under these conditions, the symptoms typically appear uniformly across a field, rather than displaying a spray or drift pattern. With this type of response, the cupping is relatively minor and limited to one or two leaves.

Bob Hartzler is a professor of agronomy with research and extension responsibilities in weed management.

A spray plane applies pesticides to a corn field in north-central Iowa during early July. ***(Marlin E. Rice)***

Plant Diseases

July soybean disease scouting

by X. B. Yang, Department of Plant Pathology

Each season in Iowa is different and different seasons have different diseases. After soybean passed the flowering stages, soybean root and foliar diseases began showing up. First, came the report of viral disease being found in the last week of June, which was much earlier than in the past. Then, Fusarium wilt showed up. With weather like we're experiencing, this season appears to be a mixed bag of soybean diseases. This article discusses some soybean diseases that occur in Iowa and that you may see while scouting in July.

Fusarium wilt. Last week, the ISU Plant and Insect Diagnostic Clinic received a sample of one-foot-high soybean plants and diagnosed Fusarium wilt. Patches of soybean plants infected with this disease also were observed in fields in central Iowa. Previously, this disease was reported in 1999 and 2003 (when early summer was cool and wet), with sporadic and isolated occurrences. The disease could be misidentified with several diseases, although the importance of this disease in Iowa currently is minor.

Fusarium wilt, also called Fusarium blight, is caused by *Fusarium oxysporum,* a very common soil-borne fungus. In July, wilting patches of affected plants can be seen in the distance (see photo). Plants killed by this disease appear to have Phytophthora root rot and may be scattered or appear in small patches in the field. Upper leaves are wilted and seem to be scorched. The middle or lower leaves turn yellow or have pale yellow spots, then wither or drop prematurely upon splitting the stems of these plants from base up, like brown stem rot. In the root system, fine roots are rotten with purple discoloration evident on the lateral roots.

Fungal root rot has been found in many soybean fields. Early in the spring, *Rhizoctonia* was prevalent and now Rhizoctonia root rot. Fusarium root, which is different from Fusarium wilt, also is part of fungal root rot. Patches of diseased plants in lower areas are yellowing. Affected plants lack lateral roots with discoloration (dark to red-brown) on taproots. Generally, the disease samples come from fields that also have other problems, such as soybean cyst nematode or iron chlorosis in high-pH fields. Consider cultivation to promote root growth if affected areas are large; cultivation generally helps soybean overcome such problems.

Bacterial blight. A week ago, many ISU field agronomists reported bacterial blight because there was plenty of rain in June and temperatures were relatively cool in many areas. This disease occurs in Iowa every year without causing significant yield losses. It is caused by the bacterium *Pseudomonas syringae.* Lesions (small, angular, water-soaked, yellow-to-brown spots) of bacterial blight are normally first observed on top leaves. The lesions enlarge in rainy weather and merge to produce irregular dead areas. Sometimes, brown spot can be mistaken for bacterial blight, but the two diseases are easy to separate: bacterial blight occurs on upper, new leaves, and brown spot infects lower, aged leaves.

Fusarium wilt symptoms were evident in 2003. ***(Steve Barnhart)***

Brown spot. Another foliar disease commonly seen in July is brown spot, caused by the fungus *Septoria glycines.* Like bacterial blight, this disease occurs every year. Disease symptoms occur on the lower leaves of soybean plants. The fungus spreads by splashing rain, thus, current warm weather conditions may arrest the development of this disease. Symptoms include many irregular, dark brown spots on both upper and lower leaf surfaces. Adjacent lesions frequently merge to form irregularly shaped blotches. Brown spot usually does not cause damage unless the disease progresses due to frequent rains later in the season.

If you are considering applying fungicides for plant health treatment, a practice recently promoted and interesting to some growers, watch the two foliar diseases together with **frogeye leaf spot**, which also has been found in central Iowa. Development of these diseases is associated with rainfall later in the summer, and these diseases, when severe, could affect yield by causing premature defoliation late in the season.

X. B. Yang is a professor of plant pathology with research and extension responsibilities in crop diseases.

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Degree Days

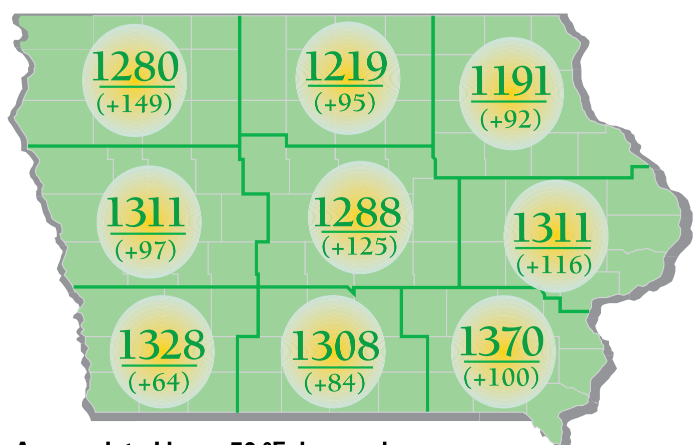
July starts warm and dry

by Rich Pope, Department of Plant Pathology

The first week of July brought temperatures slightly above long-term averages, particularly in northwest and west-central Iowa. Unfortunately, these are exactly the parts of the state where moisture shortages are becoming a bit of a concern. As always, conditions can vary greatly within a local area, depending on soils and where and when the rain falls.

Thankfully, Iowa farmers in most places started the growing season with ample soil moisture reserves. As the month progresses, rain stress, especially if it is exacerbated by above-average temperatures, will be a continuing concern.

Rich Pope is an extension program specialist working with the Iowa State University Corn and Soybean Initiative.



Accumulated base: 50 °F degree days and departure from normal—May 1 through July 8, 2007

Integrated Crop Management is published by Iowa State University Extension, with funding support from the Integrated Pest Management program. Subscriptions are available for $55 a year from the Extension Distribution Center at ISU. To subscribe or change the address of a current subscription, write to 119 Printing and Publications Building, Iowa State University, Ames, Iowa 50011 or call 515-294-5247. Please indicate that you are inquiring about *Integrated Crop Management*. Marlin E. Rice, Department of Entomology, is executive editor of *ICM* newsletter; Keven Arrowsmith, Extension Communications and Marketing, is managing editor; and Donna Halloum, Information Technology Services, is production designer.