Pest & Crop

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Insects, Mites, and Nematodes

Winter Temperatures, Corn Flea Beetle Survival, and Potential for Stewart's Wilt - *(John Obermeyer, Larry Bledsoe, and Greg Shaner)* -

- Corn flea beetle winter survival is expected to be *low* in most of Indiana
- *Moderate* survival is expected for extreme southern Indiana
- Significant snow cover early may have benefited some overwintering beetles
- Corn flea beetle is a vector of Stewart's wilt, which has two disease phases
- Management guidelines for low and high susceptible corn is given below

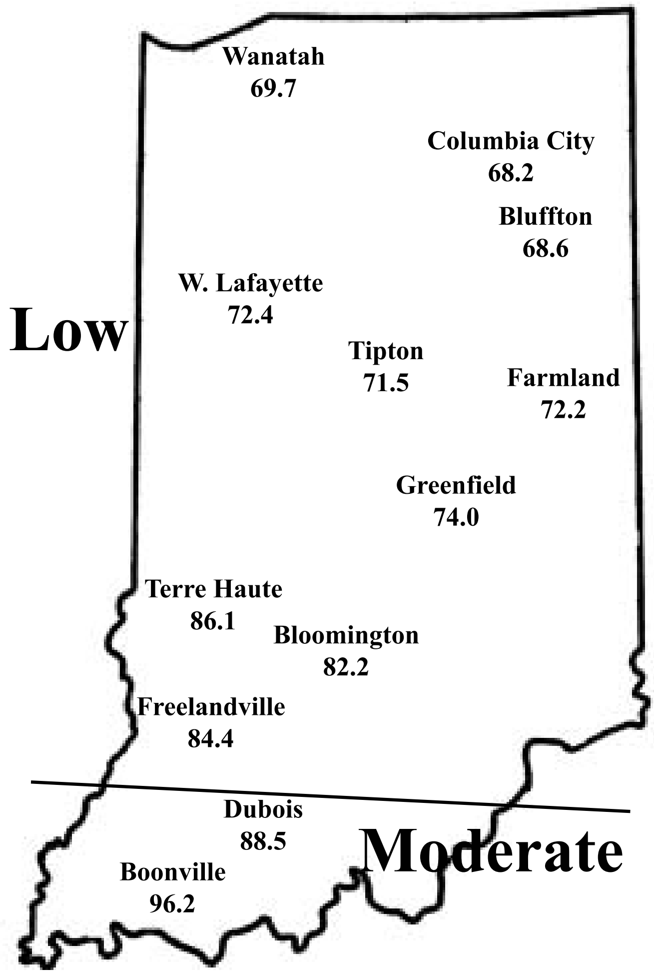
Corn flea beetle is a sporadic pest in Indiana. Where beetles were abundant last season, winter temperatures have a direct impact on how well they have overwintered. This is especially important since this insect can vector and transmit the bacterial disease, Stewart's wilt. The severity of the disease correlates well with winter temperatures, because the bacterium survives in the gut of the overwintering beetle. Warmer temperatures result in higher beetle survival, and greater potential for disease problems to develop. To determine the potential severity of Stewart's disease, add the average daily temperatures for the months of December, January, and February. If the sum is below 90, the potential for disease problems to develop is low. If between 90 and 100, moderate disease activity is a possibility. Sums above 100 indicate that there is a high probability that severe problems will develop for susceptible corn. To help you better gauge the potential for corn flea beetle activity in your area, and thus the potential severity of the threat of the disease, we have created the following state map. Thus, according to the temperature model, there is a low probability of corn flea beetle activity and subsequent disease throughout most of Indiana; areas south of approximately US 50 have a moderate chance.

This temperature model for corn flea beetle has been around many years and has been fairly accurate in predicting the activity of this pest the following spring. However one inherent flaw is that the model is based on ambient air temperatures, not temperatures under leaf litter and grass clumps where this pest overwinters. As well, snow cover, which can provide an excellent insulating blanket for the insect, may protect some beetles from winterkill. Even with this "disclaimer" statement, we think the 2002/2003 winter was cold enough to have negatively impacted overwintering beetles.

There are two phases of this disease: a wilt phase and a leaf blight phase. In the wilt phase, plants wilt rapidly, usually at an early stage of growth. Sweet corn hybrids are especially susceptible. Some dent corn inbreds, and occasional dent corn hybrids, and some popcorn lines are susceptible as well. Dent corn hybrids rarely wilt after growth stage V5. Leaves emerging from the whorl of infected plants are often the first to wilt. Internal tissues at the growing point are discolored or hollowed out. Faint green to yellow streaks containing corn flea beetle feeding marks are visible on one or more leaves. If stalks of wilted plants are cut, it may be possible to see yellow, moist beads of bacterial ooze. The leaf blight phase can occur at any time during the growing season, but often does not appear until after tasseling. Lesions are long and narrow, with pale green to yellow streaks and irregular or wavy-margins. Streaked areas die and become straw-colored. Severely infected leaves may die prematurely.

Management decisions made now, should be based on the corn's susceptibility to the disease and the risk anticipated. *Low susceptibility* - pest managers should scout fields and apply a foliar rescue treatment if beetle damage is severe, there are 5 or more beetles per plant, and the seedling is growing slowly (e.g., cool temperatures). *High susceptibility* - sample field edges (i.e., overwintering sites) before or immediately following planting to assess the potential beetle movement into the field. A sweep net is an ideal sampling tool for this pest. If any beetles are discovered, an insecticide application is warranted. Three systemic soil insecticides that should give good control of flea beetle are available at planting, Counter CR, Furadan 4F, and Prescribe treated seed. Counter may cause inbred damage where post-grass sulfonylurea herbicides are used. Furadan may require re-tooling the planter for liquid application. Prescribe (and Gaucho Extra for inbred seed) must be applied to seed by commercial seed treaters. Prescribe is labeled for fleas beetle control through the 5th leaf stage. If a systemic soil insecticide is not an option, foliar insecticides broadcasted at the time when corn spikes should provide 7 to 10 days of residual protection from beetle feeding. CAUTION: treating of field edges and waterways for beetle control may be an off label application. Avoid movement of insecticides, including soil-bound materials into aquatic environments.

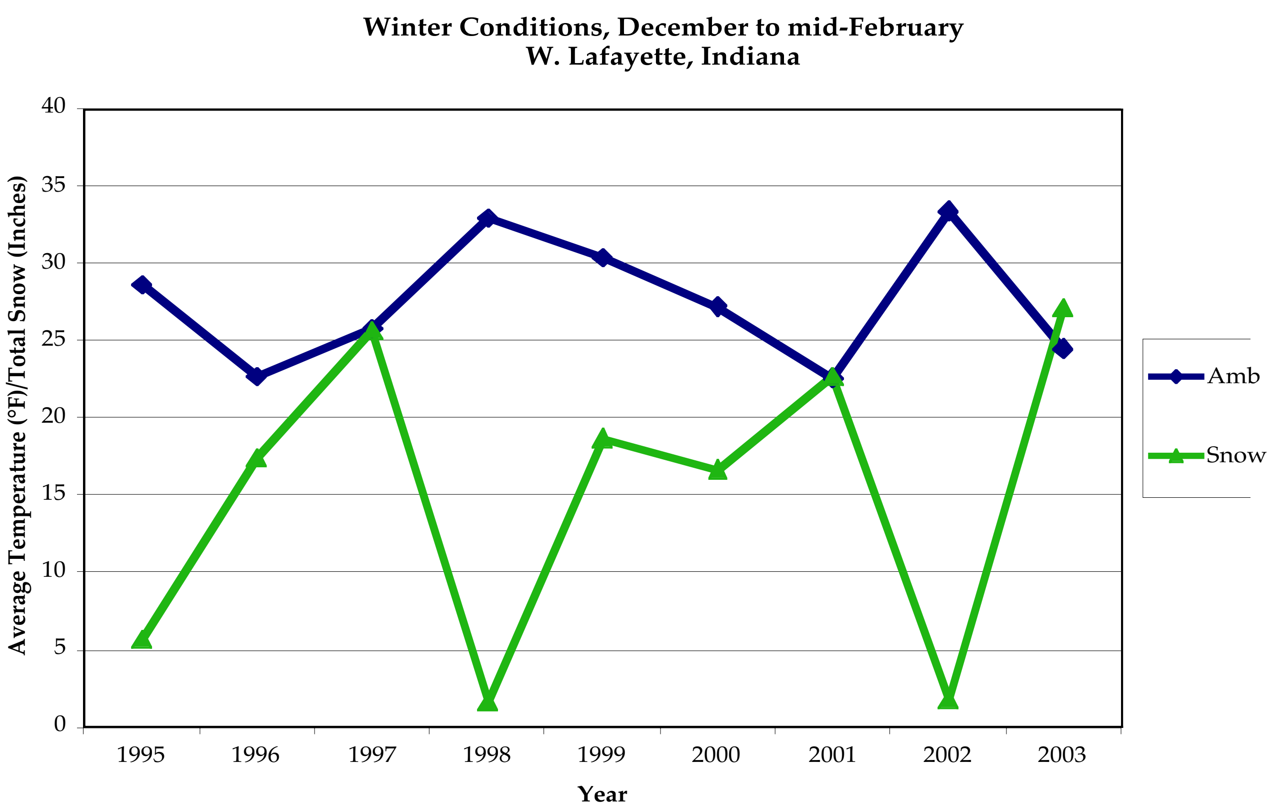
Expected Flea Beetle Winter Survival



Close-up of corn flea beetle and leaf feeding scars

Stewart's wilt in seed corn

Dead growing point of Stewart's infected plant



Though this has been a cold winter, snow cover will protect some insects from lethal temperatures.

Weeds

Broadleaf Weed Control in Winter Wheat - (*Bill Johnson and Glenn Nice*) -

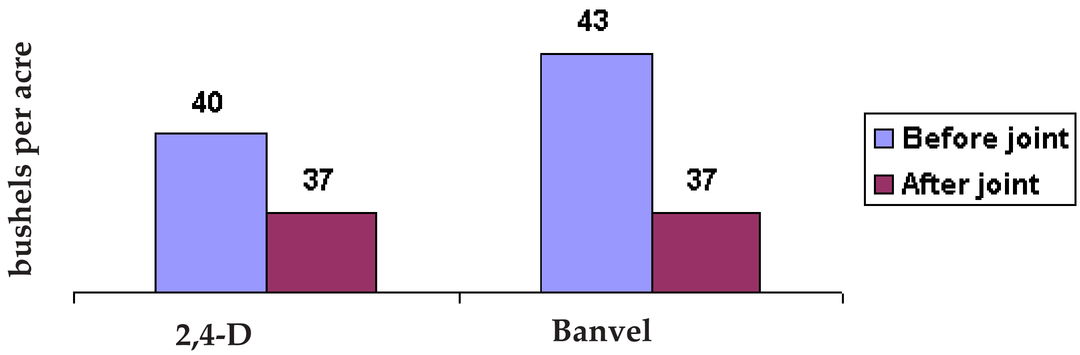
Unlike corn and soybean, only a handful of herbicides are registered for the control of broadleaf weeds in winter wheat grown in Indiana. Herbicides, rates and their application timings are listed in the table below.

It is also important to be aware that restrictions exist concerning application timing of these herbicides to avoid crop injury. Phenoxy herbicides, such as 2,4-D and MCPA, control a number of annual broadleaf weeds and are the least expensive of these herbicides to use. However, proper application timing of the growth-regulating herbicides 2,4-D, MCPA and Banvel is critical to avoid crop injury and possible yield losses. These herbicides can cause substantial crop injury and yield loss in small grains if applied before tillering begins or after development of the grain heads has been initiated.

Table 1. Herbicides to control broadleaf weeds in winter wheat.

Active Ingredient	Trade Names(s)	Rate per Acre	Application Timing	Weeds Controlled
Bromoxynil	Buctril, Moxy	1.5 to 2 pts.	Emergence to boot stage	Wild buckwheat, common ragweed, lambsquarter, field pennycress, henbit, shepherdspurse, wild mustard
2,4-D	Weedar, Weedone, Formula 40, others	1 to 2 pts.	Tillering to before jointing	Field pennycress, shepherdspurse, wild mustard, ragweeds, lambsquarter, horseweed (marestail), prickly lettuce, wild onion
dicamba	Banvel	0.125 to 0.25 pt.	Emergence to before jointing	field pennycress, wild buckwheat, ragweeds, kochia, lambsquarter, horseweed (marestail), prickly lettuce, shepherdspurse
Thifensulfuron	Harmony GT	0.3 to 0.6 oz.	After 2-leaf stage but before flag leaf becomes visible	Wild garlic, field pennycress, wild mustard, chickweed, henbit, shepherdspurse, wild mustard, lambsquarter
Thifensulfuron + tribenuron	Harmony Extra	0.3 to 0.6 oz.	After 2-leaf stage but before flag leaf becomes visible	Wild garlic, field pennycress, wild mustard, chickweed, henbit prickly lettuce, shepherdspurse, wild mustard, lambsquarter
MCPA	Chiptox, Rhomene, Rhonox	1 to 4 pts.	Tillering to before jointing	Field pennycress, shepherdspurse, wild mustard, ragweeds, lambsquarter, horseweed (marestail), prickly lettuce, wild buckwheat
Bromoxynil + MCPA	Bronate, Bison	1 to 2 pts.	After 3-leaf stage but before wheat reaches boot stage	Same as bromoxynil and MCPA
Carfentrazone	Aim	0.33 to 0.66 oz.	Before jointing	Catchweed bedstraw, lambsquarter, field pennycress, tansy mustard, flixweed

Wheat yield following 2,4-D and Banvel applications at Columbia, MO (pooled over 1998 and 1999).



The exact time at which grain heads have been initiated is not easy to determine, but this event always just precedes stem elongation. The occurrence of stem elongation can be easily detected by the appearance of the first node or "joint" above the soil surface, commonly referred to as the "jointing stage." Pinch a wheat plant stem at the base between the thumb and forefinger and slide your fingers up the stem. The presence of a node or joint will be felt as a hard bump about an inch above the soil surface. Slicing the stem lengthwise with a sharp knife will reveal a cross section of the hollow stem and solid node. If jointing has occurred, applications of 2,4-D, MCPA and Banvel should be avoided because crop injury and yield loss are likely. Research from the University of Missouri Weed Science program has shown a 3- to 6-bushel per acre yield loss from 2,4-D and Banvel applications to wheat after the jointing stage.

MCPA alone at labeled rates should be applied before jointing. However, the amount of MCPA applied in Bronate, a combination of bromoxynil and MCPA, is low enough to permit later applications.

As a final note, many wheat fields in Indiana contain wild garlic and wild onion. Although not considered as strong competitors with a wheat crop, wild garlic (*Allium vineale*) and wild onion (*Allium canadense*) are both responsible for imparting a strong odor to beef and dairy products. Wheat producers and grain elevator operators are very familiar with dockages that occur with the presence of wild garlic or onion bulbs in their harvested grain. Found throughout Missouri, wild garlic is a native of Europe, while wild onion is native. Despite the fact that these perennials both occur in similar habitats, wild garlic occupies the majority of small grain settings, including wheat.

Control measures for wild onion and wild garlic will differ. Producers, consultants and industry personnel will want to make certain that they are able to distinguish between these two weed species. The vegetative leaves of wild garlic are linear, smooth, round and hollow (flowering stems are solid). A major difference with wild onion is that its leaves are flat in cross section and not hollow. Another varying feature are the underground bulbs. Wild garlic's bulbs have a thin membranous outer coating while wild onion's bulbs have a fibrous, net-veined coating.

Harmony Extra (thifensulfuron + tribenuron) is the herbicide most commonly used for control of garlic in wheat, plus it controls a relatively wide spectrum of other broadleaf weeds and possesses a fairly wide application window. Harmony GT (thifensulfuron) also has activity on wild garlic, but is considered to be slightly weaker than Harmony Extra. Peak is also labeled and effective on wild garlic in wheat, but it is fairly persistent in soil. The Peak label does not allow one to plant double crop soybean following wheat harvest in Missouri. Wild onion is controlled with 2,4-D. Keep in mind that both of these weeds are perennials and the full labeled rate is needed for adequate control.

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Control of Perennial Broadleaf Weeds with Soil-Applied Residual Herbicides – (*Bill Johnson, Glenn Nice, and Tom Bauman*) -

Perennial weed problems appear to be on the rise in many corn and soybean growing areas in the Midwest. Over the past couple of years, we have seen increases in the number of calls and emails asking for information on managing dandelion, common pokeweed, and many other perennial weed infestations. Reasons for this include a number of factors including a reduction in the utilization of deep tillage operations, warmer winters, and reduced utilization of soil-applied residual herbicides in soybean. Perennial weeds are difficult to manage in agronomic crops because they can reproduce vegetatively and by seed production. Reducing infestation levels of established populations requires aggressive and sustained tactics over several years. Preventing establishment of perennials in uninfested areas is the first step to an effective management program.

Perennial weeds such as Canada thistle, hemp dogbane and common milkweed have specialized structures for wind dispersal. Other perennials such as common pokeweed, produce seeds or berries that are often dispersed by wildlife. Seedlings of perennials develop root systems that are capable of vegetative reproduction in a short period. Many species are capable of vegetative reproduction within 3 to 4 weeks after seed germination.

This article is a summary of a recent study conducted by Dr. Mark VanGessel at the University of Delaware that was published in Weed Technology (Volume 13: 425-428). This research was conducted in the greenhouse by planting seeds of johnsongrass, hemp dogbane, common milkweed, Canada thistle, common pokeweed, and horsenettle in a sandy loam soil (1% organic matter and pH of 6.2) in plastic flats. Herbicides were applied with a moving track sprayer in 26 gallons per acre carrier volume. Herbicide rates were the labeled rates for a corn and soybean on a coarse soil. Immediately after herbicide application, 2 inches of precipitation was applied with the moving track sprayer to incorporate the herbicides. At five weeks after application visual estimates of percent control of each specie were recorded and analyzed with appropriate statistical procedures. The experiment was repeated and data were pooled over experimental runs.

In the original table in Weed Technology, the herbicides were listed by their active ingredients (e.g., metolachlor = Dual) and rates in kilograms of active ingredient per hectare. I converted the active ingredients to product names and rates for clarity in this article.

Summary. A broad range of herbicide families control a number of common perennial weeds found in Indiana. Command provided control of all weeds except for horsenettle. Atrazine provided control of all weeds except johnsongrass, which is intuitive since atrazine is labeled for use on sorghum species, which are

Table 1. Control of seedling perennial weeds with soil applied herbicides[a].

Herbicide	Rate/A	Johnsongrass	Hemp dogbane	Common milkweed	Canada thistle	Common pokeweed	Horsenettle
		-----------------------------------% control---					
Dual 8 E	1.25 pt.	33	69	75	30	16	28
Prowl 3.3 E	1.2 pt.	38	44	56	34	28	26
Command 3 ME	2 pt.	97	98	81	99	86	38
Authority/Spartan 75 DF	4.3 oz.	41	100	64	73	90	65
Lorox 50 DF	11 oz.	27	58	32	88	36	48
Sencor 75 DF	6 oz.	76	100	99	100	88	96
Atrazine 9.0	13 oz.	22	100	85	99	84	96
Python 80 WDG	0.8 oz.	76	81	80	98	95	91
FirstRate 84 DG	0.6 oz.	85	92	86	988	95	91
Scepter 70 DG	2.8 oz.	86	81	77	91	86	80
Canopy 75 DF	4 oz.	80	100	97	99	96	89
LSD (0.05)		18	10	10	15	17	13

[a]Reproduced from VanGessel, M.J. 1999. control of perennial weed species with soil-applied herbicides. Weed Technology 13:425-428.

the same genus as johnsongrass. Sencor, Python, FirstRate, Scepter, and Canopy provided control of all six species. Dual was effective on milkweed, but marginal on other perennial species. Lorox provided control of Canada thistle, but was weak on the other species.

Utilization of soil-applied, residual herbicides should be considered when planning a weed management program, particularly in fields with established perennial weed infestations where Roundup Ready soybean will be grown. Products containing Sencor, Python, FirstRate, and Scepter provide control of perennial weed seedlings and also will control many summer annual weeds common to Indiana soybean fields. For more information on the summer annual weeds controlled by these herbicides consult 2003 Weed Control Guidelines for Indiana, which can be found on the web at <http://www.btny.purdue.edu/Pubs/WS/WS-16/>.

Hemp dogbane was controlled with Command (98%), Authority (100%), Sencor (100%), atrazine (100%), Python (81%), FirstRate (92%), Scepter (81%) and Canopy (100%).

Common milkweed was controlled with Dual (75%), Command (81%), Sencor (99%), atrazine (85%), Python (80%), FirstRate (86%), Scepter (77%) and Canopy (97%).

Seedling johnsongrass was controlled with Command (97%) and Sencor (76%), Python (76%), FirstRate (85%), Scepter (86%) and Canopy (88%).

Canada thistle was controlled with Command (99%), Authority (73%), Lorox (88%), Sencor (100%), atrazine (99%), Python (98%), FirstRate (98%), Scepter (91%) and Canopy (99%).

Common pokeweed was controlled with Command (86%), Authority (90%), Sencor (88%), atrazine (84%), Python (92%), FirstRate (95%), Scepter (86%) and Canopy (96%).

Horsenettle appeared to be the most difficult weed to control in this study.. It was controlled with Sencor (96%), Atrazine (96%), Python (81%), FirstRate (91%), Scepter (80%), and Canopy (89%).

Plant Diseases

Corn Diseases – (*Greg Shaner and Andreas Westphal*)-

- Continuous corn increases the risk of some corn diseases

In the March 10 issue of *Kentucky Pest News*, plant pathologist Paul Vincelli reported that many farmers in Kentucky were planning to shift from an equal acreage of corn and soybeans to a higher percentage of corn. The Indiana agricultural statisticians won't be ready to release spring planting intentions until the end of this month, but I have heard rumblings that Indiana farmers may also switch to a greater percentage of corn production this spring. As in Kentucky, this will mean that some corn will be planted into fields that had corn in 2002. This has implications for diseases on corn.

Many of our major corn pathogens survive in corn residue over the winter. When temperatures rise in spring, they resume growth and produce a new set of propagules that can infect the new corn crop. Planting corn after corn means that the new crop is planted directly into a potential source of inoculum. This does not invariably result in disease, because weather has a strong influence on disease outbreaks. But, for any given weather conditions (other than it being so dry no disease develops), corn planted in a field where last year's corn residue is present will be at greater risk than corn following soybeans or some other crop.

Genetic resistance of a hybrid also has a big effect on disease development. Modern hybrids are resistant to a number of pathogens that have the potential to cause destructive epidemics in the Corn Belt. However, there are a few diseases for which resistance is not adequate in all hybrids. These include gray leaf spot, *Stenocarpella* (*Diplodia*) ear rot and stalk rot, and anthracnose leaf blight and stalk rot. Some hybrids are very susceptible to these diseases. Others have partial resistance, and a few have a high degree of resistance.

In the early 1990s, gray leaf spot was severe in Indiana and most hybrids were susceptible. Breeders have made progress in developing hybrids with greater resistance, so it should be possible to find a hybrid with good agronomic traits and at least partial resistance to gray leaf spot.

Stenocarpella ear rot and anthracnose have cropped up in areas of the state recently. For many years these diseases were not seen much, but they seem to be making a comeback. I have seen some severe epidemics of ear rot and anthracnose stalk rot, so clearly there are some very susceptible hybrids being sold. Growers should avoid these if planting corn after corn.

Corn pathogens are out there in the field now, lurking in crop residue. If a grower plants corn into a field that had corn last year, especially if corn residue is on the soil surface, and if weather is favorable for any of these diseases this summer, a major problem could develop. The best insurance for planting corn after corn is to choose hybrids that combine a high degree of resistance to these diseases with desired agronomic traits (realizing that there may be some trade-off between these traits and resistance – few hybrids have all the desired goodies).

Growers can get information about a hybrid's disease resistance on seed company Web sites or in catalogs. The seed industry has no standard system for rating resistance, so care needs to be taken in interpreting ratings. Some companies use a 1-9 scale, in which 9 is best, others use a 9-1 scale, in which 1 is best. Other companies use a 1-5 scale. Some companies present ratings for several specific diseases; others give a rating for a broader characteristic, such as "plant health."

It is very difficult to make comparisons across companies. For example, it is about impossible to know how the resistance of a hybrid rated as an 8 (9=best) from one company compares with a hybrid rated 6 by another company. Ratings are more useful in comparing hybrids from a single company. Another good way to get information is to talk to the seed dealer or some other company representative about a hybrid's performance toward anticipated diseases.

Stalk rot lodging

Don Scott

Anthracnose leaf blight

Don Scott

Diplodia ear rot

Don Scott

Gray leaf spot leaf lesions

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