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No degree day information is available on these pests:

- Inkberry leafminer
- Magnolia weevil
- Lesser peach tree borer
- American plum borer

Left: Purple trap that will be used for surveying for emerald ash borer. Above: Fletcher scale (photo credit: www.bugwood.org)

2008 marks the return of the XIV brood of periodical cicadas. This brood covers most of KY, the only exception possibly being the Purchase Area. In 1991 at Robinson Forest in eastern KY, Dr. Paul Kaliz of the UK Forestry Dept. noted that emergence began on May 4 with widespread activity by May 10 with a 9 day difference between dates of peak emergence from upper south slopes and lower slopes. Image credit: www.bugwood.org

Left: A hemlock branch infested with hemlock woolly adelgid (photo credit: Tom Coleman, US Forest Service. Now is an ideal time to scout for this pest. Right: Map showing where surveys have been conducted for hemlock woolly adelgid. Green dots are negative, yellow dots are positive sites.
New Inspector for Western Kentucky

Katie Kittrell was hired in November as an inspector for Western Kentucky. She has been in the Lexington office receiving training and will be moving to the Princeton area in May. Katie received her BS in Horticulture from UK in 2006. She has worked mostly in greenhouses in Kentucky and British Columbia, Canada.

Katie’s hobbies include gardening, hiking and traveling.

Please join us in welcoming Katie.

Cooperative Agricultural Pest Surveys (CAPS) in Kentucky

Janet Lensing, State Survey Coordinator

CAPS is a national program established by the U.S. Department of Agriculture. This program is designed to detect exotic pests and facilitate the export of U.S. agricultural products. CAPS is one of the most effective tools available to prevent exotic pests from making a permanent home in the U.S.

Kentucky has been actively involved in the CAPS program for many years and has conducted surveys for exotic insects, diseases, and weeds. The surveys are carried out by nursery inspectors from the University of Kentucky, USDA officers, and temporary surveyors that live throughout the state. The 2008 CAPS surveys in Kentucky include 1 disease and 6 insect pests.

The disease of concern is sudden oak death. Large numbers of oaks in the western US have been killed by this pathogen. It is easily spread on nursery stock including viburnum, camellia, Pieris, mountain laurel, and rhododendron. Nursery inspectors take samples from these plants to analyze in the lab for the sudden oak death survey. This disease has not yet been detected in Kentucky.

The first insect pest of concern is a group of wood-boring and bark beetles that can be very destructive to trees in the landscape. These beetles could be accidentally introduced at barge ports along the Ohio River or airports so we place traps in these locations each year. We have not found any exotic beetles in these traps so far.

Sirex woodwasp can cause significant mortality to pines. In the Southern Hemisphere it has caused up to 80% mortality in pine plantations. Sirex is established in New York and has been found in Vermont and Michigan. As part of the CAPS survey we place traps in barge ports and pine stands. We have not found Sirex in the state.

Another pine pest, pine shoot beetle, is established in Ohio and Indiana; therefore, we place traps in counties along the Ohio River. We have not found this beetle in Kentucky.

Gypsy moth is a serious forest pest endemic to the northeastern United States. The populations are slowly approaching Kentucky by natural dispersal but egg masses and pupae can be transported by humans. Each year we conduct an extensive survey by placing about 8000 gypsy moth traps throughout the state. Each year we capture moths (in 2007 we captured 212) but we still do not have any populations established in Kentucky.

Hemlock woolly adelgid was first found in eastern Kentucky in April 2006. This pest has killed 90% of the hemlocks in Shenandoah National Park in Virginia. We are conducting surveys to determine the extent of infestations in this state.
Emerald Ash Borer Trapping Program in Kentucky
Janet Lensing, State Survey Coordinator, University of Kentucky

Emerald ash borer (EAB) is an exotic beetle native to Asia that was first discovered in the United States near Detroit, Michigan in 2002 (Figure 1). Since then this beetle has been found in Illinois, Indiana, Ohio, Maryland, Ontario, and Pennsylvania. The most recent find was in West Virginia in the fall of 2007. EAB has not been found in Kentucky but there are at least 5 EAB positive sites in Cincinnati. The larvae girdle ash trees with their feeding in the vascular tissue and it is likely that all North American ash species are susceptible. Ash trees are typically dead within 1-3 years of initial attack by EAB. The primary dispersal method of these beetles is believed to be human-assisted in ash products, particularly firewood. Beginning in 2005, girdled trap trees were widely used to detect EAB; however, these are expensive and logistically difficult to use. Recent developments in trap and artificial lure design will allow the USDA to implement the first large-scale EAB trapping program this year. This spring the USDA is initiating 1) a delimiting survey within a 100-mile radius of the current known infested area and 2) a national survey aimed at detecting EAB in an additional 37 non-infested states. Kentucky will be participating in the delimiting survey with the primary trapping region shaded in yellow and blue on Figure 2. Purple prism traps will be used in this survey since these beetles are very attracted to the color purple. Three large (2 ft. high and ~1 ft. wide) panels are folded to form a triangular trap with the outer surfaces covered in a sticky substance. A Manuka oil lure, which contains volatile compounds similar to those in ash bark, hangs inside each trap to lure the beetles. Trapping protocol states that these traps will either be hung from a tree branch or from a metal rod that will be attached to the tree trunk. The traps will hang at least 5 feet above the ground.

Controls for Greenhouse Ornamental Insects
Ric Bessin, Dept of Entomology, University of Kentucky

The warm humid conditions and abundant food in the greenhouse are ideal for pest build up. Problems can be chronic unless recognized and corrected. While insecticides are important tools, successful control of greenhouse ornamental pests relies primarily on cultural factors. Proper cultural practices can minimize the chance for initiation and build up of infestations. Early detection and diagnosis are key to greenhouse pest management, as well as, the proper choice and application of pesticides when pest outbreaks occur.

Cultural Controls
Pests may enter the greenhouse in the summer when the ventilators are open. Others may be brought into the greenhouse on new plant material or in soil. Many are able to survive short periods of time between harvest or plant removal and production of the next crop. Cultural controls are the primary defense against infestation.

Proper cultural practices which will help prevent pest infestations include:
- Maintain a clean, closely mowed area around the greenhouse.
- Properly maintain ventilators and rotate crops as necessary when a pest population becomes too large.
- Maintain a clean, healthy greenhouse environment to discourage pest development.
- Rotate crops and maintain a diverse plant community to minimize pest build-up.
- Properly manage pest populations with pesticide use.

This extensive trapping program will allow us to determine if the emerald ash borer is present in Kentucky and, if so, which areas of the state are infested with this destructive beetle.
greenhouse to reduce pests that develop in rank growth.

- Remove all plants and any plant debris, clean the greenhouse thoroughly after each production cycle.
- Keep doors, screens and ventilators in good repair.
- Use clean or sterile soils or ground media, tools, flats and other equipment.
- At the conclusion of the season remove all plants and any plant debris, clean greenhouse thoroughly and fumigate.
- Inspect new plants thoroughly to prevent introduction insect or disease infested material into the greenhouse.
- Watch for leaks or pooled water that can lead to fungal growth.
- Avoid wearing yellow clothing which is attractive to many insect pests which can be carried into the greenhouse from outside.
- Eliminate infestations by discarding or removing heavily infested material.

Pest Monitoring

Early detection and diagnosis of pest infestations will allow you to make pest control decisions before the problem gets out of hand. It is good practice, therefore, to make weekly inspections of plants in all sections of the greenhouse.

Insect monitoring devices are also available. Yellow sticky cards (PT Insect Monitoring & Trapping System, Whitmire) are highly attractive to winged aphids, leafminer adults, whiteflies, leafhoppers, thrips (blue cards can also be used with thrips), various flies and other insects. These can be used to alert you to the presence of a pest and identify hot spots in the greenhouse. One to three cards per 1000 sq. ft. in the greenhouse is recommended and should be changed weekly. If you cannot identify a trapped insect, contact your county extension agent for assistance. Mass trapping products such as sticky tapes are also available for thrips, whitefly, leafminer and fungus gnat detection and management.

Insecticide Resistance Management

Many of the most serious greenhouse pests tend to be small insects (or mites) with short life cycles and high birth rates. This includes spider mites, aphids, whiteflies and thrips. Development of insecticide resistance is a potential problem with these pests. Susceptible individuals in a pest population are wiped out when chemicals with the same mode of action are applied repeatedly. The proportion of resistant individuals in a population increases and they become more difficult to control. Unfortunately, a grower may increase usage of the pesticide in response to this until it no longer provides control.

As a greenhouse manager, there are several tactics to prevent, delay or reduce insecticide resistance. Countermeasures include reducing the frequency or extent of insecticide treatments, reducing the use of insecticides with long residual action, avoiding treatments which act upon both larva and adults, and including nonchemical methods of biological and cultural control into an integrated pest management program.

Phytotoxicity to Pesticides

Not all varieties of each plant species has been tested with these registered pesticides. Plant response to these pesticides may vary in your greenhouse. Specific environmental factors in your greenhouse greatly affect phytotoxicity. All pesticides should be tested on a small group of plants to be treated at the recommended rate under anticipated growing conditions for phytotoxic symptoms. Signs of phytotoxicity may take 1 to 14 days to develop.

Alphabetical listing of common insecticides (trade names), the pests they control, and a listing of safe and sensitive plants, comments also.

Using the format below:

Common Name (Trade Names) abbreviated CN/TN

Pests controlled
Safe plants
Sensitive plants
Comments

A

CN/TN: Avermectin (Avid 0.15EC)
Pests controlled: Spider mites (all motile forms), leafminers
Safe plants: Various ornamentals
Sensitive plants: Do not use on ferms or conifers.
Comments: Insecticide/miticide: May require 3 to 4 days to achieve maximum effectiveness.

CN/TN : Acephate (Orthene Turf, Tree and Ornamental Spray, PT 1300 TR, Orthene, PT 1300 DS Orthene)
Pests controlled: Aphids, cabbage loopers, lacebugs, leafminers, leafrollers, mealbugs, plant bugs, scale crawlers, sweet potato whitefly, thrips, whiteflies
Safe plants: Roses, orchids, anthuriums, cacti, poinsettia, carnations, chrysanthemums, impatients, marigolds, petunias, geraniums, snapdragons, fuchia, lantana, New Guinea impatiens, ivy, geraniums, boston fern, dracaena, ficus, schefflera, philodendron, lilies, african violets, hibiscus, begonia, azalea, viburnum, yew
Sensitive plants: Do not apply to american elm, flowering crabapple, sugar maple, and cottonwood.
Comments: An organophosphate insecticide. Do not apply to roses or chrysanthemums with open flowers.

CN/TN Bacillus thuringiensis var azawai(XenTari)
Pests Controlled: Armyworm, looper, Heliothis
Safe plants: Flowers, bedding plants, herbs, and ornamentals.
Comments: A biological insecticide that attacks the gut and must be ingested. Does not kill adults. Toxic to the predatory mite Metaseiulus occidentalis and green lacewing.

CN/TN : Bacillus thuringiensis kurstaki(Dipel 2X, Javelin WG, Steward)
Pests Controlled: Armyworm, loopsers, Heliothis
Safe plants: Flowers, bedding plants, herbs, and ornamentals.
Comments: A biological insecticide that attacks the gut and must be ingested. Does not kill adults. Toxic to the predatory mite Metaseiulus occidentalis and green lacewing.

CN/TN : Bacillus thuringiensis Serotype H-14 (Gnatrol)
Pest controlled: Fungus gnat larvae
Safe Plants: Ornamentals
Comments: A biological insecticide that attacks the gut and must be ingested. Apply as a soil drench. Does not kill adults.

CN/TN: Bendiocarb (Dicarb, Turcan)
Pests Controlled: Aphids, thrips, mealybugs, greenhouse whitefly, black vine weevil, scales, collembola

Safe Plants: Ornamental plants including: african violet, ageratum, aglaonema, aralia, asarina, asparagus sprengerii, begonia, calathea, calendula, camellia, carnation, celosia, chrysanthemum, coleus, cotoneaster, Croton, daffodil, dahliia, dianthus, dieffenbachia, dracaena, epipremnum, episica, fatsia, ferns, ficus, fountain grass, fuchsia, gaulnia, geranium, gladiolus, gloxinia, hydrangea, hypoestes, impatiens, iris, ivy, ixa, leucothoe, lily of the valley, maranta, marigold, mondo grass, nandina, nasturtium, nicotiana, pansy, peperomia, petunia, philodendron, photinia, pieris, poinsettia, portulaca, pothos, primrose, rose, saigo palm, salvia, sansevieria, schemerha, shasta daisy, sinningia, snapdragon, spathiphyllum, spirea, sycamore, verbena, viburnum, vinca, wandering jew, and zinnia.

Comments: A carbamate insecticide.

CN/TN: Bifenthrin (PT 1800 Attain, Talstar T&O 10 WP, Talstar T&O Flowable)
Pests Controlled: Aphids, armyleworms, brown soft scale, caterpillars, fungus gnats, cutworms, loopers, mealybugs, plant bugs, scale, whiteflies, spider mites, thrips, leafminers

Safe Plants: Ornamental and flowering plants
Comments: A synthetic pyrethroid insecticide. Apply during early evening when foliage is dry and temperature is between 60 - 80 F. Use an alternate class of chemistry in a treatment program to delay or prevent resistance.

G

CN/TN: Chlorpyrifos (Dursban 50 WP, PT 1325 ME Duraguard, Pageant DF)
Pests Controlled: Ants, aphids, beetles, caterpillars, centipedes, crickets, leafhoppers, mealybugs, plant bugs, scale, sowbugs, thrips (exposed), whiteflies

Safe Plants: Ornamental and flowering plants

Pests Controlled: Do not use on croton, schefflera, zebra plant, copperleaf, black olive, papayas, cissus, ficus, weeping fig, Cuban laurel, yellow hibiscus, red/chinese hibiscus, impatients, Boston fern, petunia, and some roses.

Comments: An organophosphate insecticide. Direct spray to some open blooms may cause petal drop. Do not use additional wetting agents, spreaders or stickers.

CN/TN: Cyfluthrin (Tempo 2, Tempo 20 WP, Decathlon)
Pests Controlled: Armyworms, cutworms, flies, crickets, fungus gnats, sowbugs, ants, aphids, flea beetles, leafhoppers, plants bugs, mealybugs, thrips, scales, whiteflies

Safe plants: Ornamentals
Comments: A synthetic pyrethroid insecticide.

CN/TN: Cyromazine (Citation 75 WP)
Pests Controlled: Leafminers
Safe plants: Container grown chrysanthemums
Comments: An insect growth regulator. It has some systemic effects, but should be applied as a high volume spray.

D

CN/TN: Diazinon (Knox-Out 2FM PT 285, Knox-Out PT 1500R)
Pests Controlled: Ants, aphids, caterpillars, crickets, fungus gnat larvae, leafminers, loopers, mealybugs, millipedes, mites, scales, thrips

Safe plants: Various ornamentals

Do not use on bella palm, dracaena, hoya, maidenhair fern, neath, poinsettia, and prayer plant.

Comments: An organophosphate insecticide.

CN/TN: Dinobrom (Naled 8 E)
Pests Controlled: Spider mites, adult whiteflies, aphids, leafrollers, mealybugs

Safe plants: Roses and other ornamental plants. Often used as a vapor treatment when applied on heat pipes.

Comments: An organophosphate insecticide.

CN/TN: Fenpropatrin (Tame 2.4 EC)
Pests Controlled: Aphids, beet armyworm, mealybugs, greenhouse whitefly, lace bugs, leafhoppers, two-spotted spider mite, sweet potato whitefly

Safe plants: Ornamental plants including: Anthurium, bedding plants, chamomile, chrysanthemum, crossandra, columbine, foliage plants, geranium, gladiolus, impatiens, liriope, lily, miritold, poisetitia, snapdragon, azalea, croton, camellia, coleonaste, gardenia, hibiscus, rose, viburnum.

Comments: A synthetic pyrethroid insecticide.

CN/TN: Fluvinate (Mavrik Aquaflo)
Pests Controlled: Aphids, thrips, mites, whiteflies, flea beetles, leafhoppers, plant bugs, leaf-feeding caterpillars

Safe plants: Ornamentals
Comments: A synthetic pyrethroid insecticide. May work slowly on some species. Allow 3 to 4 days to evaluate performance. Piperonyl butoxide will aid in the control of some pest species such as whiteflies, aphids, thrips, and mealybugs.

H

CN/TN: Horticultural oil (SunSpray Ultra Fine Spray oil)
Pests controlled: Aphids, fungus gnat, leafminers, mealybugs, scales, spider mites, whiteflies

Safe plants: Azaleas, begonias, camellias, chrysanthemums, Easter lilies, ferns, gardenias, hibiscus, jade plant, New Guinea impatients, palms, philodendron, portulaca, reigor begonias, zinnias, poinsettia, dieffenbachia

Sensitive plants: Do not use on coconut palms or maiden hair ferns. Blooms of chrysanthemums and geranium may show injury at higher rates. Do not use on poinsettia bracts. Some bleaching and spotting has been observed on open blooms.

Comments: Most effective on whitefly during immature stages. Kills insect by suffocation. Complete coverage is necessary. Is incompatible with pesticides containing sulfur.
Win Dunwell, Dept of Horticulture & Landscape Architecture, Don Hershman

Soybean Cyst Nematode: A Potential Problem for Nurseries

Win Dunwell, Dept of Horticulture & Landscape Architecture, Don Hershman

Editors Note:
This is particularly important to nurseries & daylily growers.

For samples to be official, they MUST be collected by someone from our office. Samples submitted by individuals will NOT be permitted for phytosanitary use.

Situation
Soybean cyst nematode (SCN) is a microscopic roundworm that feeds on root systems of soybean plants and reduces their capacity to absorb water and nutrients. Soybean cyst nematode (Heterodera glycines) was first discovered in Kentucky in 1957 in Fulton County. It has been confirmed in 36 west and central counties and probably exists to some extent in every county where soybeans are grown. Soybean cyst nematode causes a problem for field production nurseries because Canada and states such as California do not allow soils (ball-and-burlapped materials) to be imported into their areas without proof that the nursery stock comes from counties free from SCN. Other states, such as Pennsyl-
Among other factors, this rapid spread is attributed to the movement of soil. The quarantine activity is an attempt to limit the spread of the nematode. 

Soybean growers have learned to deal with SCN by tailoring their production practices to minimize the effect of existing populations of SCN. Nurserymen will not be able to follow similar production practices because they will have to deal with a zero tolerance level when shipping into quarantined and currently uninfested areas. The following states are currently free of SCN: Pennsylvania, New York, and all New England states; all states west of and including North Dakota, South Dakota, Wyoming, Colorado, and New Mexico.

**Nursery Program**

We recommend that nursery operators plan a proactive program to deal with potential problems relating to the shipment of ball-and-burlapped plants out of Kentucky. The program includes:

- **Preplant sampling of fields.**
- **Host control:** avoid planting host plants of SCN, and rigorously control weeds that may also serve as hosts of the pest.
- **Rigorous sanitation.**
  1. Do not bring equipment into other farms and fields that could be contaminated with soil-carrying SCN.
  2. Always clean equipment when moving from one field or farm to another.
  3. When borrowing or purchasing used equipment, always be sure it is clean before bringing it to your nursery.
- **Quarantine your nursery.** Do not bring in any plants from surrounding areas without some assurance that soil coming with the plant material is free of SCN.

One year in a nonhost crop can reduce the SCN population by as much as 90 percent. After two years only five percent of the original population will remain. However, some cysts remain viable in the soil for years; thus, it is virtually impossible to eliminate SCN from a field using nonhost crops. In fact, there is no known way to totally eradicate SCN from a field once it is established. Therefore, avoiding the problem is the only way to ensure your ability to ship into areas not currently infested with SCN.

### Soil Sampling

The Department of Plant Pathology provides a SCN Soil Analysis Service at the UK Research and Extension Center in Princeton.

When cysts are detected (at any level), a bioassay using soybean plants will be conducted to verify that the cysts are in fact SCN and not some other less important cyst nematode species. If SCN is determined to be absent from a field after analysis and testing, the Kentucky State Entomologist will use the test results to certify shipments of nursery stock from that field. Ideally samples should be taken when nematode populations are the highest in the early fall. However, it may be necessary to collect samples in the spring to avoid planting into a contaminated field. A two-month lead time is required for the SCN laboratory to do a bioassay for SCN. Consequently, you must plan in advance to obtain results relative to planting or leasing land for field-grown plant material.

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It is always best to take samples when soil moisture is adequate, but not excessive. One sample (pooled from multiple collection sites) should represent no more than five acres. Samples representing larger areas may yield misleading results. Sampling areas should have a uniform soil type and cropping history.

Collect soil from a depth of 6 to 8 inches using a soil probe or spade from at least 20 locations in each field sampled. Follow a zigzag pattern (see figure). In cropped fields collect soil from the root zones of plants within the rows.

Mix soil in a bucket and immediately place one to two pints of soil in a plastic bag. Label bags with a field number or name and location.

Protect the sample from heat and from drying conditions which could reduce detection of nematode numbers in the sample.

Take the sample to your local county Extension office for mailing to the lab at the UK Research and Extension Center in Princeton. If this cannot be done immediately, store samples in the shade or in an insulated cooler. Any prolonged storage should be done at refrigerator temperatures (approx. 40°F).

### Host Plants

The following is a list of plants known to be hosts to SCN:

#### Crops and Ornamental Plants:

- Soybeans, cultivated and wild (*Glycine* spp.)
- Beans, green (snap), bush, or kidney (*Phaseolus* spp.)
- Lespedezas (*Lespedeza* spp.)
- Vetch, common, hairy, or winter (*Vicia* spp.)
- Lupines, white (ornamental species) (*Lupinus* spp.)
- Clovers, crimson, scarlet, or alsike (*Trifolium* spp.)
- Sweetclover (*Melilotus* spp.)
- Birdsfoot-trefoil (*Lotus* spp.)
- Crownvetch (*Coronilla* spp.)
- Pea, garden (*Pisum* spp.)
Cowpea or black-eyed pea (Vigna spp.)
Locust, black (Robinia spp.)
Bells of Ireland (Molucella laevis)
Borage (Borago spp.)
Canarybird flower (Tropaeolum spps.)
Caraway (Carum spp.)
Chinese Lanetplant (Physalis spps.)
Coralbells (Heuchera spp.)
Cup-flower (Nierembergia spps.)
Delphinium (Delphinium spps.)
Foxglove (Digitalis spps.)
Geranium (Geranium spps.)
Geum (Geum spps.)
Horehound, common (Marrubium vulgare)
Poppy (Papaver spps.)
Sage (Salvia spps.)
Snapdragon (Antirrhinum spps.)
Sweet basil (Ocimum spps.)
Sweet pea (Lathyrus spps.)
Verbena (Verbena spps.)
Weeds
Henbit (Lamium amplexicaule)
Hop clovers (Trifolium spps.)
Chickweed, common (Stellaria media)
Mullein, common (Verbascum thapsus)
Sicklepod (Cassia obtusifolia)
Digitalis penstemon (Penstemon digitalis)
Pokeweed (Phytolacca americana)
Purslane (Polutula aceracea)
Bittercress (Cardamine spps.)
Rocky Mountain beeplant (Cleome serrulata)
Spotted geranium (Geranium maculatum)
Toadflax, old-field (Linaria canadensis)
Pigweed, winged (Cycloloma atriplicifolium)
Vetch, American, Carolina, or wood (Vicia micrantha)
Burclover or toothed medic (Medicago sp.)
Dalea (Dalea alopocur-oides)
Milkvetch, canadia (Astragalus canadensis)
Beggarweed or tick clover (Desmodium nudorum, D. marilandicum, D. viridiflorum)
Corn cockle (Agrostemma githago)
Hogpeanut (Amphicarpa bracteata)
Milkpea (Galactia volubilis)
Wildbean (Strophostyles helvolala)
Hemp sesbania (Sesbania exaltata)

### Anthracnose Diseases of Shade Trees

**John Hartman, Extension Plant Pathologist, University of Kentucky**

Anthracnose diseases occur on many landscape trees; though, in Kentucky, they tend to be more severe on ash, dogwood, maple, oak, and sycamore. They are typically foliar diseases but twigs, branches, and buds may also be affected. Twigs and branches may develop cankers or dead areas that girdle the stem, causing death of distal parts of the stem. Premature leaf drop commonly occurs on infected trees. Anthracnose is not fatal (except for dogwoods in some circumstances); however, severe defoliation from anthracnose year after year can seriously weaken trees. Weakened trees become more susceptible to environmental stresses and secondary pathogens.

Dogwood anthracnose or lower branch dieback caused by the fungus *Discula destructiva*, because of its greater impact, is discussed in U.K. Extension publications ID-67 and PPFS-OR-W-6.

#### Symptoms

The symptoms of anthracnose vary somewhat from host to host.

**Ash**

Buds, leaves, and sometimes twigs can become infected. In early spring, infection of buds or expanding leaves results in irregular brown blotches and distortion of leaflets. These blotches are often associated with leaf margins. Infections that occur once leaves have already expanded result in small brown circular lesions. As these lesions enlarge, they may coalesce. Infected leaflets frequently drop from the tree leaving a carpet of leaflets on the landscape below. Although shoots may become stunted, infection on ash does not result in conspicuous twig or branch cankers.

**Maple**

Infection of this host results in irregular necrotic leaf lesions that vary in size and shape. At least two different anthracnose fungi may be involved. On Norway maple, lesions are purple to brown and follow the veins. Leaves of Japanese maple blacken and shrivel up. Brown to reddish brown lesions form along or between veins of sugar maple.

**Oak**

If oaks are infected early, buds may be killed before they begin to open in spring. As a consequence, twigs remain bare and eventually die. Later, new shoots may grow from the lower branch. If this occurs repeatedly, clusters of dead twigs at the ends of branches produce a witch’s broom effect. When infection occurs during leaf expansion, distortion of leaves results. In addition, brown necrotic lesions form at leaf tips and along veins. On fully expanded leaves, infection causes irregular brown spots that eventually enlarge and coalesce. Oak twig infections can cause twig cankers and dieback of developing shoots in spring.

**Sycamore**

The early leaf blight stage of anthracnose in sycamore causes complete death of young leaves and twigs. Twig infection can cause shoot tips to die back as much as 8 to 10 inches. Cankers may also form on major branches and limbs. Later, leaf infections cause brown, irregular dead areas along veins or leaf margins. As is common with anthracnose on other hosts, affected leaves may drop prematurely. However, on sycamore trees, a new healthy crop of leaves may form later in the season.
**Spread**

Anthracnose on these hosts is caused by several species of closely related fungi with names such as *Apiognomonia*, *Discula*, *Gnomonia*, *Gloeosporium*, and *Kabatiella*. These fungi overwinter in margins of twig and branch cankers and twigs on the ground. During cool, wet weather in spring, fungal spores are discharged from overwintering fruiting bodies. Infected buds are killed and previous season’s cankers expand further. Spores are carried by wind or splashing rain to emerging shoots and leaves.

**Control**

1. Prune out infected twigs and branches.
2. Gather and destroy fallen leaves and twigs in autumn.
3. Fungicide sprays are generally not warranted. However, if the tree is a valuable one or if it has been attacked year after year, a fungicide spray program may be justified. Three sprays should be applied in spring: at bud break, when leaves are half-expanded, and when leaves are fully expanded.

These chemicals are protectants and therefore must be applied before infection occurs. Once symptoms develop, it is too late to apply fungicides for controlling anthracnose. Contact your county Extension office for a listing of suggested fungicides.

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**Understanding Degree Days**

University of Tennessee Agricultural Extension Service Publication 1623

On the last page of the newsletter, there will be a box that lists the degree day accumulations for several places throughout Kentucky for this year and also the accumulations from last year. The following article was taken from the University of Tennessee Agricultural Extension Service Publication 1623. This article discusses using degree-days to determine pest activity. The equation for calculating degree-days is simple and can be a very useful tool in insect monitoring. To determine degree-days, add the daily maximum temperature to that day’s minimum temperature. Divide this number by 2. Then subtract 50 from this number (all of the insects in this list have a base temperature of 50°F). If the number is negative, then a 0 is recorded. The procedure is repeated each day and the number of degree-days is tallied. For example: Let’s say for January 1, the maximum temperature was 70°F and the minimum was 40°F. We add those numbers together (70° + 40°=110) and divide by 2 which gives us 55. 55 minus the base of 50° gives us 5 degree days for that day. January 2, the maximum temperature was 55°F and the minimum was 30°F. We add the maximum and minimum temperatures together (55° + 35°=84) then divide by 2: (84 ÷ 2 =42). Then we subtract the base temperature of 50: (42-50= -8) this results in a negative number so there are 0 degree day accumulations for Jan 2. January 3, the maximum temperature was 61° and the minimum was 43°. Again we add the maximum temperature and the minimum: (61° + 43° = 104) then we divide by 2 (104 ÷ 2 = 52). Then we subtract the base temperature of 50 (52-50=2) which gives us 2 degree days for January 3.

For the yearly total, we simply add the degree day totals for each day (in the example above: Jan 1 + Jan 2 + Jan 3) [5 + 0 + 2 = 7 degree days]. Continue this throughout the year to track the degree days. There is a chart included at the end of the list of insects that will help with record-keeping.

**Reason for Using Degree-Days**

Degree-Days (DD) are a method of accounting for heat units. Power companies use cooling degree-days and heating degree-days to calculate how much energy a customer needs to cool or heat a house. Plants and animals that do not regulate internal temperatures (often called (“cold-blooded”) vary in their physiological development, or metabolism according to what temperature they are subjected to. In short, these organisms develop rapidly at warm temperatures and slow at cool temperatures. Therefore, we can treat plants and animals like a house — the more energy (heat) added, the faster things happen. Conversely, the cooler (less energy) the organism, the slower it develops. If this rate of development related to
temperature can be determined, a prediction of insect and/or plant development or activity can be made.

Using DD as a predictor takes into account cool vs. warm weather. Calendar scheduling of controls will usually be too early or too late unless the year is an "average year."

Temperature Thresholds

Fortunately, most plants and animals develop within a specific range of temperatures. If the organism drops below a certain temperature, called the lower threshold, no development occurs. Above this lower threshold, the rate of development increases with temperature in an almost straight-line fashion.

Most organisms also have an upper threshold temperature at which development begins to deteriorate because of heat shock. If the organism's temperature rises too far above this threshold, it will die. In nature, most insects and plants find habitats that have temperatures above the lower threshold for sufficient time to complete a generation of development, but rarely exceed the upper threshold temperature.

Several field crops and ornamental plants are occasionally grown outside their original habitats. Corn plants shut down their development above 86°F and Balsam fir tends to stop development above 90°F. Unfortunately, most state crop-reporting services are based on corn DD models that have the relatively low upper threshold of 86°F. Most insect pests and other trees and shrubs do not stop development until temperatures reach 100-110°F.

In reviewing DD thresholds for many insects and plants, several lower thresholds seem to be common. Most soil-dwelling insects and some cool-season plants (i.e. conifers, maples) seem to have lower thresholds of 40°F (5°C) or 45°F (7°C). Most above ground feeding insects (turfgrass surface feeders and most tree/shrub scales and caterpillars) seem to have a lower threshold of 50°F (10°C).

For all practical purposes, associating insect activity and plant phenology with 50°F degree-days (DD50) is generally satisfactory.