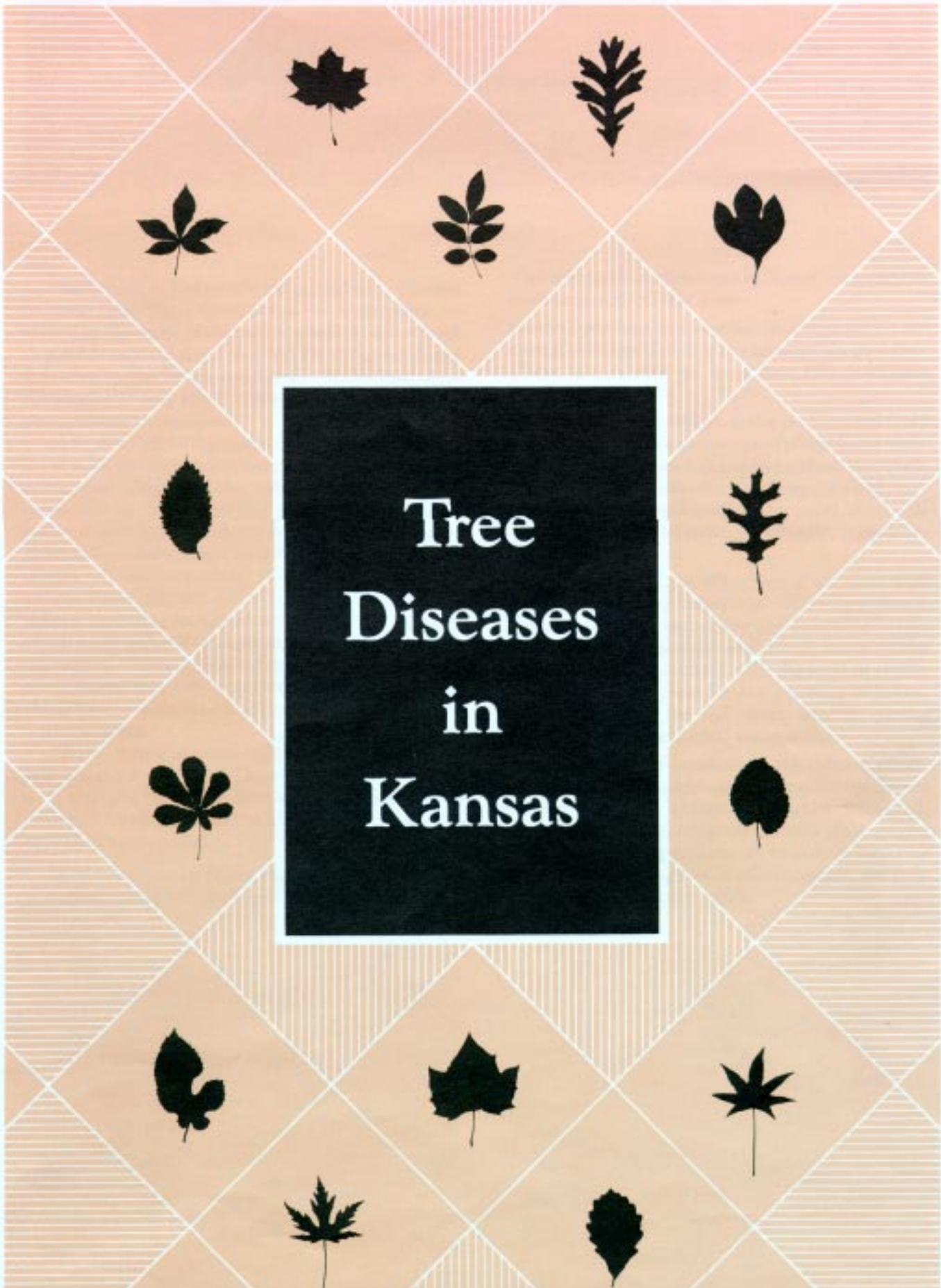

Tree Diseases in Kansas

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

Tree Diseases in Kansas

Shade trees in Kansas are subject to many diseases. In some cases, these diseases can be catastrophic, resulting in the death of the tree or whole groups of trees. A good example of this is the loss of many of our American elms by the Dutch elm disease. In contrast, many diseases cause only minor damage to plants and do not warrant control measures.

The first step in the control of any plant pathogen is the accurate diagnosis of the problem. A wrong diagnosis, and ultimately the wrong control measures, serve only to compound the problem. Diagnosis requires a knowledge of what a normal or healthy plant looks like, and the symptomatology (expressions of the disease on the host plant) of abnormal or diseased plants. Some diseases are relatively easy to identify; others, including root diseases and vascular wilts, are much more difficult to diagnose without considerable experience. Nevertheless, a few simple questions and observations may help you identify an ornamental or shade tree problem which at first glance appears hopelessly complex.

Try to obtain as much information as possible before making a diagnosis. The extra few minutes taken to analyze the problem is time well spent. Some of the information which should be obtained every time a diagnosis is made includes:

Species and cultivar (if possible) of plant affected. The correct identification of the diseased plant is critical. This information allows one to "focus" on problems most common on that plant.

- *Cultural practices and weather conditions* which occurred before and during the onset of the problem. These factors play an important role in disease development.
- *Distribution of the problem.* Is the problem confined to one plant, and to one species of plant? Is the problem uniform or does it occur in patches? Are there any physical structures or soil differences which may contribute to the problem? At this point, don't rule out the possibility of insect, nutritional, or environmental problems.
- *Specific plant symptoms.* What part of the plant is affected? This is very important. Often diagnosis is based entirely on secondary leaf symptoms when the primary symptom(s) and actual cause of the problem may be associated with the roots or trunk. Check the entire plant for any evidence of injury. Specifically, look for leaf spots, wilting, rotting roots, cankers, mechanical wounds, etc.

Once detailed information on the cultural conditions, pattern of the problem, and specific symptoms have been obtained, a diagnosis may be attempted. Compare the information gathered with photographs and descriptions of problems in extension bulletins and books. If the diagnosis is still uncertain, get help from your local Extension office.

Control

Plant pathologists are sometimes referred to as plant "coroners" because they are advised of plant problems only after considerable damage or even plant death has occurred. At this point, the pathologist can only advise the grower as to the cause of the disease and ways to avoid the problem in the future. In fact, most plant diseases are difficult to control once the pathogen has infected and colonized the host plant. Therefore, plant pathologists stress control measures which will prevent disease development. A few simple cultural practices can help avoid a disease epidemic; these include:

- *Buy healthy plant material.* Plant pathogens may be introduced into areas on contaminated plants or infested soil. Carefully inspect plants for any problems before purchasing them.
- *Maintain plant health through proper irrigation and fertilization.*
- *Plant disease-resistant varieties when available.*
- *Destroy diseased plant refuse.* Many plant pathogens survive on dead plant material; removing plant debris will reduce the amount of inoculum for infection the following season.
- *Control weeds.* Weeds and grass compete with young or recently transplanted trees for nutrients and water. Try to keep the soil beneath the tree crown free of weeds and grass. Mulching to a 2-3 inch depth beneath the tree crown will help control weeds and aid the survival of recently transplanted trees. A heavy weed population in plantations or orchards also tends to increase the relative humidity within the tree canopy and favors the development of certain foliar diseases.

In some cases, chemicals must be applied to the plant for adequate protection against certain diseases. Most fungicides today are preventive in nature and must be applied to the plant surface before infection and colonization by the pathogen occurs. Therefore, proper timing of applications is critical for control.

Figure 1. Browning of leaf margins is called scorch. ***(See description of scorch on page 3.)***

Non-Parasitic Tree Problems

Scorch. Scorch is a general term used to describe a burning or necrosis of leaves or needles. Generally, the symptoms start at the margins or tip of the foliage and progress towards the base of the leaf *(Figure 1).* Scorch often is associated with drought conditions; during hot, dry weather transpiration from leaves occurs more rapidly than the plant is able to take up water from the soil, resulting in a burning of the leaf margins. However, scorch can result from other factors such as a poor root system, root or trunk injuries, girdling roots or toxic materials in soil such as herbicides, high salts, and excessive fertilizer. Avoid mechanical and chemical injuries to roots, which can inhibit water uptake by the tree. Plant trees adapted to Kansas conditions and water them regularly during dry weather.

Winter Kill or Winter Injury. Winter injury or winter kill is a common problem of both coniferous and deciduous trees and shrubs in Kansas. Cold temperatures can be directly blamed for death of some winter-tender shrubs and trees such as mimosa, some magnolias, and Japanese black pines. Sudden drops of temperature after warm weather are more damaging than steady declines. Trees in active growth from warm, wet autumns and late summer fertilization are more easily damaged.

Winter drying or dessication is the most common cause of injury to evergreens. Because evergreens retain their leaves throughout the winter, they continue to transpire some water. If the soil is dry or frozen, the plant cannot replace water lost from the leaves, resulting in scorching of leaf margins.

Trees with thin, smooth bark are susceptible to sunscald damage. This type of injury usually occurs in late winter when tree trunks are exposed to bright sunlight and warm temperatures during the day followed by a sudden drop in temperature after sunset. Large, irregular or elongate patches of the bark on the southwest side of the tree are killed.

Frost cracks are longitudinal splits in the bark and wood of a tree, caused in part by old wounds and by differential contraction rates of the inner and outer wood in the tree trunk upon exposure to temperature extremes.

Several steps can be taken to minimize winter injury. Trees and shrubs should be watered thoroughly in the fall before freezing weather sets in. Additional watering of conifers may be required during winter months if weather conditions are unusually warm and dry. Avoid planting trees or shrubs in poorly drained soils and, if possible, plant sensitive evergreens where they will be protected from direct winter sunlight and drying winds. The trunks of young, thin-barked trees on exposed sites should be wrapped or protected in some manner from direct sunlight during the winter months. Mulching prevents frost from penetrating deep into the ground and can help reduce winter injury. Do not fertilize trees in late summer or early fall. This could result in succulent growth which is susceptible to winter injury.

Transplant Shock. Newly transplanted trees are severely stressed and often show leaf scorch, leaf drop, and retarded growth. Extensive root damage occurs during transplanting even with ideal care. Tree stress can be reduced during and after transplanting by reducing the amount of foliage through selective pruning of branches and by adequate watering. Small trees suffer less root damage and shock than large trees. Avoid seeding grass or planting sod under the drip line of newly transplanted trees. Transplanting in fall or early spring allows roots to become established before hot, dry summer weather.

Iron Chlorosis. Iron deficiency results in stunted, yellow leaves with the leaf veins remaining green. With severe iron chlorosis, the leaves develop brown irregular spots and are killed.

Iron chlorosis is more severe in western Kansas because iron becomes less available as soil pH increases. Pin oaks, sweetgums and soft maples are the most severely affected trees, although many other trees and shrubs also show symptoms.

Avoid planting trees and shrubs sensitive to iron deficiency in alkaline soils. Iron deficiency can be corrected in some cases with foliar sprays or trunk injections of iron-containing compounds, or by soil amendments containing iron sulfate; however, these procedures are laborious.

Herbicide Injury. Many tree problems result from careless use of herbicides. Symptoms of herbicide injury include yellowing or distortion of leaves, scorching of leaves, branch dieback, and even death of the tree or shrub. Many people forget that herbicides applied to lawns for the control of broadleaf weeds will cause damage to ornamentals if improperly used. Soil sterilants, used along driveways, fence rows and ditches, can be absorbed by tree roots tens of feet away from the tree trunk, resulting in extensive damage to the tree. There are reports of tree damage caused by soil sterilants applied over 100 feet from a tree.

Most herbicide injuries can be avoided by simply following directions on the pesticide label. Avoid excessive use of herbicides near trees. Non-persistent chemicals such as phenoxy herbicides typically do not result in rapid death of the tree; however, chronic exposure can result in a gradual decline in tree vigor. Persistent, soil-applied chemicals such as soil sterilants will kill trees. Most organic herbicides can be detoxified with activated charcoal applied over the tree roots and worked into the soil. Activated charcoal will not work on salt-based soil sterilants.

Diseases

Many shade tree problems are caused by living organisms (pathogens) which penetrate and colonize plant tissue. The most common plant pathogens are fungi; these are filamentous organisms which lack chlorophyll. In addition, other types of organisms, including bacteria, nematodes, viruses, viroids, and fastidious prokaryotes (elm yellows disease) are capable of inciting plant diseases.

Many diseases cause little injury to the host plant and therefore are of interest only from a scientific viewpoint. It is neither feasible nor necessary to control all diseases on plants. Nevertheless, certain diseases may cause temporary or permanent damage to the aesthetic quality, utility, or vigor of the plant. Still fewer diseases are actually capable of killing trees or shrubs.

Leafspots. Leafspots are localized infections on leaves caused primarily by fungi or bacteria *(Figure 2).* Leafspots can be a significant problem on conifers but seldom cause extensive damage to deciduous trees. Most leafspot organisms survive on infected plant debris and require free water on the leaf surface for penetration of the host. Therefore, cultural practices such as sanitation and providing good air movement will reduce the incidence of these diseases. Occasionally, fungicide sprays may be required to protect trees from severe infection by leafspotting organisms. The selection of an effective fungicide and the proper timing of application are critical for obtaining control.

Figure 2. Leafspots are localized infections on leaves caused primarily by fungi or bacteria.

Anthracnose. Anthracnose is a general term used to describe a group of plant diseases whose symptoms include foliar and / or twig blighting *(Figure 3).* The symptoms of anthracnose can vary markedly depending on the species of plant affected. In Kansas, anthracnose is most common on deciduous trees such as sycamore, ash, maple, and walnut. On sycamore, anthracnose causes a blighting of twigs and new shoots in the spring. Repeated killing of young twigs results in abnormal branching and gives the tree a ragged appearance. After bud break, affected sycamores show a scorching and wilting of new shoots. This is referred to as the shoot blight phase. In June, fully expanded leaves will develop elongated tan to brown lesions parallel with the midrib and veins. This should not be confused with summer scorch which develops along the leaf margin.

Although anthracnose diseases on sycamore, maple, and ash are unsightly, they are unlikely to kill the trees. Large trees tend to recover rapidly if properly maintained. Several fungicides can be used to control anthracnose, but they must be applied during the critical infection period of bud swell in the spring. Later fungicide sprays have little effect in controlling the shoot and bud blight phase of these diseases on sycamore and maple. Information on the timing of fungicide sprays may be found in the specific tree disease section of this bulletin. Also consult publication L-763 for more detailed information on anthracnose diseases.

Powdery Mildew. Powdery mildew is a common foliage disease on many woody ornamentals and shade trees. The fungal disease appears as a white, powdery growth on the surface of leaves *(Figure 4).* This growth absorbs nutrients from the leaf, resulting in a weakened plant and one susceptible to winter injury. The unsightly fungus lesions also greatly reduce the aesthetic quality of the plant.

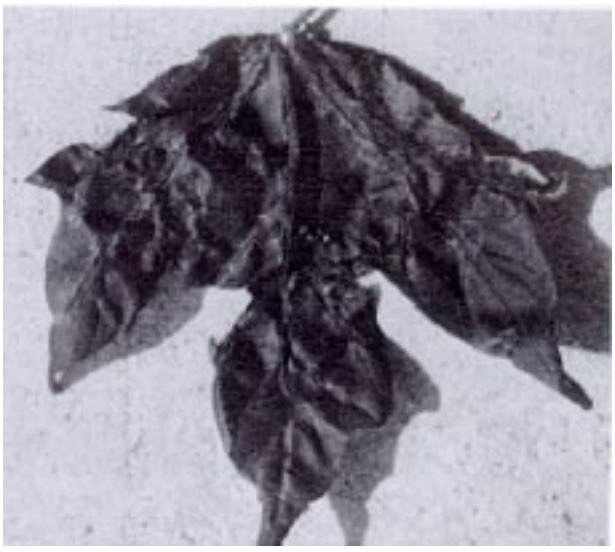

Figure 3. Leaf symptoms of anthracnose on maple. Twig and shoot dieback also may occur with some anthracnose diseases.

The fungi which cause powdery mildew are host specific; the powdery mildew fungus which infects one type of plant will not infect another type. Powdery mildews are more important on flowers and shrubs; they seldom cause significant damage to trees.

Wilt Diseases. Several fungal and a few bacterial and fastidious prokaryote (mycoplasma-like) pathogens can cause wilting of trees. The two most serious wilt diseases of shade trees in Kansas are Dutch elm disease and Verticillium wilt. *Dutch elm disease* continues to kill many American elms in Kansas each year. Symptoms of the disease include yellowing or browning and wilting of leaves on a branch or several branches in a tree. Infected trees may die within a few weeks or survive for a period of a year or more. Affected branches develop a brown discoloration of the sapwood just beneath the bark layer *(Figure 5).* The causal fungus of Dutch elm disease is spread from tree to tree by bark beetles. The fungus also may move between trees through root grafts.

The emphasis of any Dutch elm disease program should always be placed on prevention and sanitation. Early detection of the disease is critical for control. Those trees showing more than 5-10% crown symptoms seldom can be saved and should be removed immediately. Root grafts between healthy and diseased elms should be disrupted by mechanical trenching or by fumigation before the diseased tree is removed. All diseased elm wood should be burned or buried; it should not be stored for firewood use unless the bark is removed. Systemic fungicides may be used to prevent infection or to treat high value trees already infected, but only after the other control measures have been followed. Fungicides are not a substitute for sanitation.

Another wilt disease that occurs in late spring is *Verticillium wilt.* This disease is serious on catalpa, redbud, maples, and Russian olive. Affected trees show a rapid wilting and drying of leaves in a portion of the tree crown or in some cases, throughout the entire crown. Vascular discoloration can sometimes be seen on the cut ends of wilted branches.

Immediately water any trees showing symptoms of Verticillium wilt unless there is sufficient soil moisture. Application of ammonium sulfate to the soil may help trees recover to some extent. Dead branches should be pruned out of trees. Be sure to disinfect pruning tools between cuts. Avoid wounding the roots or root collars of susceptible trees.

Blight and Canker Diseases. Certain fungi and bacteria cause a rapid dieback of new shoot growth (blight) or incite distinct lesions called cankers on the bark of woody plants *(Figure 6).* Some of the more common blight and canker diseases in Kansas are *Diplodia tip blight* of pines, *fireblight* of rosaceous plants, *Thyronectria canker* of honeylocust, *Cytospora canker* of poplars, and *Phomopsis canker* of Russian olive.

Most fungicides and bactericides do not effectively control these types of diseases. Control practices should be directed at maintaining plant vigor through proper fertilization and irrigation, protecting plants from winter injury, pruning out diseased plant parts, and growing resistant cultivars when available.

Crown Gall. Crown galls are bacterially-induced, localized plant tumors. In Kansas, euonymus, rose, cottonwood, willow, apple, peach, and cherry are commonly affected. Galls normally develop near the soil line, although

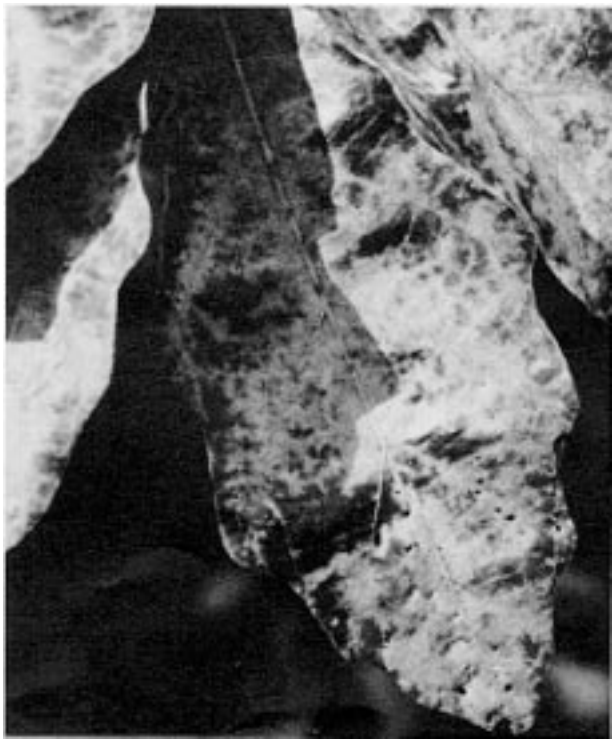

Figure 4. White growth on oak leaf surface caused by powdery mildew.

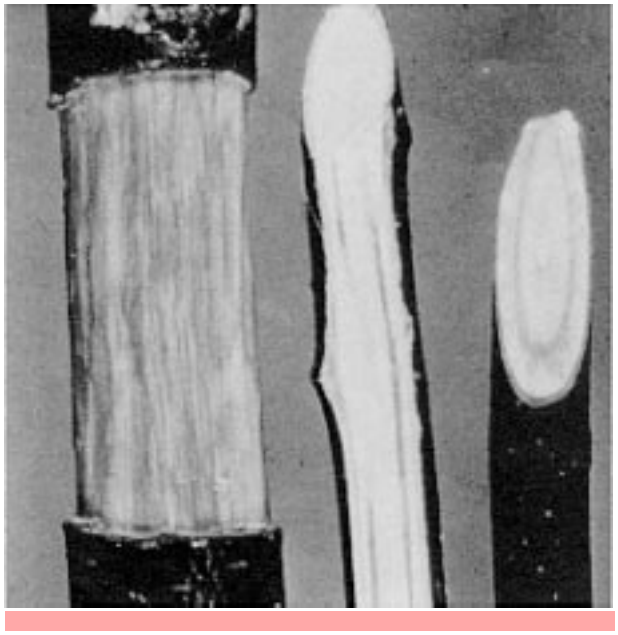

Figure 5. Discoloration or streaking of sapwood often is present in trees affected with wilt diseases.

occasionally the tumor-like swellings may develop on branches *(Figure 7)*. The galls first appear fleshy colored, but later turn dark. The centers of the galls are hard and woody. Numerous galls on the roots can disrupt the normal flow of nutrients and water such that growth is greatly reduced.

The best means of preventing crown gall is avoiding the introduction of the pathogen into the soil. Carefully inspect all woody plants for galls before planting. Any plants showing galls on the roots should be discarded. Because access by the crown gall bacterium to susceptible tissues is through wounds, avoid unnecessary injury to tree roots during planting or cultivation. In areas where crown gall has been a problem, avoid planting susceptible plants. For more information concerning this disease, refer to KSU extension publication L-560, entitled *Crown Gall.*

Wood Decay. Wood decay is the progressive deterioration of the cell wall substances of wood. Decay is caused primarily by fungi which possess the enzymes capable of degrading wood cells. These wood decay fungi gain entrance into trees through wounds, branch stubs, and other openings. The action of these wood decay fungi inside the tree can result in a structural weakening of the tree. The tree has natural defense mechanisms which may "wall-off "the decay process to a certain portion of the tree, but this barrier may be breached with additional wounding or injury to the tree. Once the decay process has been initiated, it is very difficult to control by cultural or chemical means.

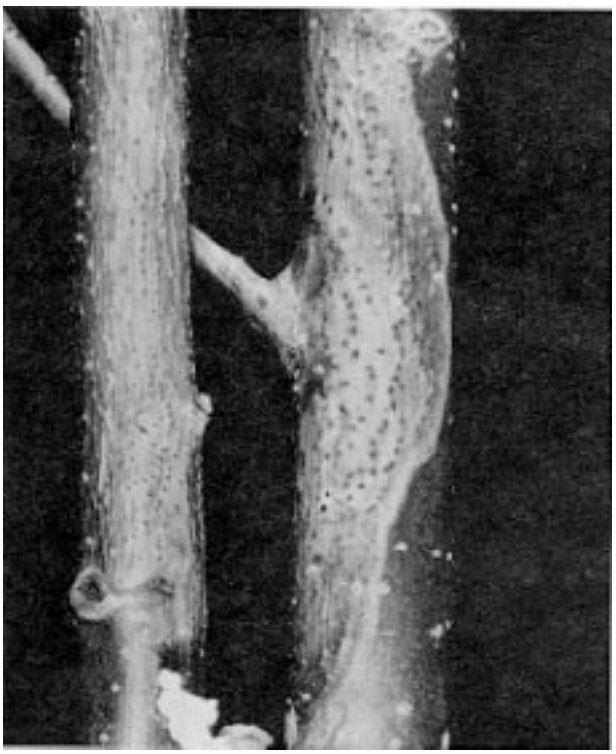

Figure 6. Cankers are distinct, dead areas of the bark resulting from infection by a bacterium or fungus.

Wood decay can be avoided by preventing unnecessary wounds to the tree. Pruning cuts should be made when branches are small. Proper pruning (do not leave branch stubs or cut into the branch collar) is essential for the control of decay. Inspect trees routinely for symptoms or signs of decay, such as conks or mushrooms growing on wood *(Figure 8),* and remove those trees which may be a structural hazard.

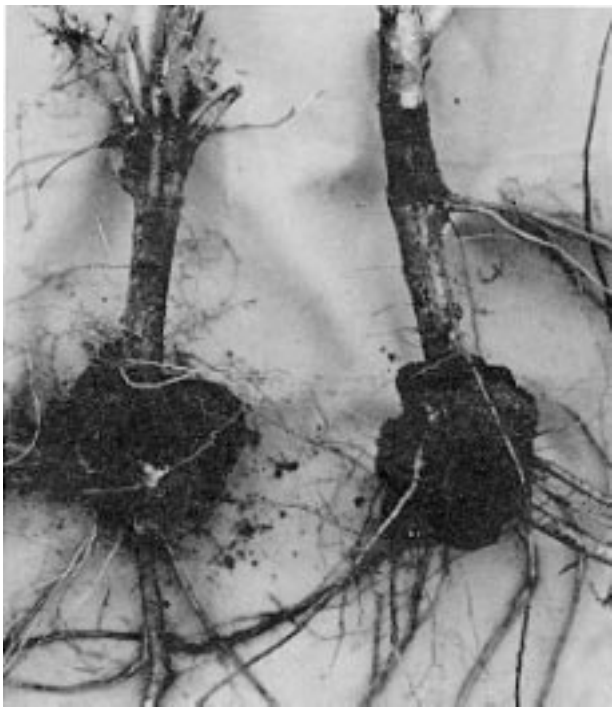

Figure 7. Crown gall results in tumor-like swellings on roots and occasionally branches.

Figure 8. Fungal fruiting structures called conks indicate the presence of wood decay.

Common and Trade Names of Fungicides

Common or generic name	Examples of trade name	Uses
Bordeaux mixture	Bordeaux, Bordo	Copper fungicide for broad spectrum control of many leaf and pine needle diseases
captan	Orthicide, Captan	Broad spectrum, foliage diseases, root diseases, seed protectant
chlorothalonil	Daconil 2787, Bravo 720	Foliage diseases, Anthracnose, needle diseases
coppers	Basic Copper Sulfate, Kocide, Tenn-Cop, and others	Broad spectrum, needle and foliage diseases
etridiazol (ethazole)	Truban, Koban, Terrazole Banrot (ethazole + thiophanate-methyl)	Pythium and Phytophthora root rots, soil drench
fenarimol	Rubigan	Foliage diseases
ferbam	Ferbam, Carbamate	Foliage diseases (general protectant)
fosetyl-A1	Aliette	Phytophthora and Pythium root rots
iprodione	Rovral, Chipco 26019	Botrytis Blight and certain other foliage diseases
lime-sulfur	various names	delayed dormant sprays for foliage and cane diseases
mancozeb	Fore, Foremec, Dithane M-45, Manzate, Zyban (Mancozeb + thiophanate methyl)	Broad spectrum, foliage diseases, soil drench
metalaxyl	Ridomil, Subdue	Phytophthora and Pythium root rots
metam-sodium	Vapam	Soil fumigant
PCNB (pentachloroni-trobenzene)	Terraclor	Rhizoctonia and other root diseases
propamocarb	Banol	Pythium and Phytophthora root rots
propiconazole	Banner, Alamo	Foliage diseases, wilts (experimental systemic injection)
streptomycin	Agrimycin, Agri-Strep, Phytomycin	Fireblight
thiophanate-methyl	Cleary's 3336, Domain, Fungo Banrot (with ethazole) Zyban (with mancozeb)	Similar to benomyl
triadimefon	Bayleton	Powdery mildew, rusts
triforine	Funginex, Triforine	Rose diseases, powdery mildew

Host	Disease	Symptoms	Comments
Arborvitae *(Thuja occidentalis)* and *Thuja orientalis*	Winter injury and Seridium Canker *(Seridium unicorne)*	Entire trees or individual branches may turn dull green and finally brown in late spring or early summer. Damage most severe on exposed sites.	See comments under winter injury and Publication C-711 for Seiridium canker.
Ash *(Fraxinus* sp.)	Anthracnose *(Discula* sp.)	Irregular, brown blotches or spots develop on leaves; commonly associated with leaf veins or margins. Twig and shoot blight phases may occur. Disease more prevalent in May and June during wet weather.	Rake and remove fallen leaves in autumn. Promote vigorous tree growth through proper pruning and fertilization. Protective fungicide applications not required except on trees which have been attacked for several years. Fungicides thiophanate-methyl, mancozeb, or chlorothalonil applied when buds begin to swell, at green tip and at the half-leaf stage are required for control. See publication L-763 for more details.
	Rust *(Puccinia sparganiodes)*	Leaves and petioles become twisted and distorted; eventually bright orange powdery cups form on leaves.	No control necessary.
	Leaf spots *(Mycosphaerella)*	Several fungi can cause lesions or spotting on leaves. Typically, these diseases are more prevalent during wet summers.	Leaf spots seldom damage the tree and no control measures are required.
	Heart rot and decay *Perenniporia fraxinophila* and others	Symptoms of decay may not be visible until extensive structural damage to the tree has resulted. Conks (fruiting bodies) indicate the presence of decay.	Avoid mechanical wounds to the trunk and prune properly. Remove trees with extensive decay.
	Scorch	Browning of leaf margins during hot, dry weather.	See general discussion of scorch.
Basswood (Linden) *(Tilia* spp.)	Leaf Spots	Several fungi can cause leaf lesions. Typically, these diseases are more prevalent during wet summers.	Early applications of thiophanate-methyl or mancozeb will help suppress disease, but these fungicides are generally not needed.
	Scorch	Browning of leaf margins during hot, dry weather.	See general discussion of scorch.
	Herbicide injury	Cupping or distortion of leaves, branch dieback.	Avoid the use of lawn herbicides (2,4-D, dicamba) near lindens.

Host	Disease	Symptoms	Comments
Birch *(Betula* spp.)	Scorch	Browning of leaf margins during hot, dry weather.	See abiotic diseases. Paper birch is not well adapted to Kansas and should be planted only in protected areas.
	Herbicide injury	Rapid defoliation and branch dieback.	Avoid the use of lawn herbicides near birch trees.
	Bronze birch borer	Branch swelling and bleeding, followed by a dieback and decline. This is the most common problem of birch in Kansas.	See publication C-586 for control.
Black Locust *(Robinnia pseudoacacia)*	Heart rot *(Phellinus robiinae)*	The fungus causes a white rot of the heartwood. Large, brown to black conks or shelf-like fruiting structures form on the bark. The disease is often associated with locust borer injury. This disease is very common on old trees.	Prevent wounds to trees and prune properly. There is no control once the fungus has colonized the heartwood.
Catalpa *(Catalpa* spp.)	Verticillium wilt *(Verticillium dahliae)*	Sudden wilting and blackening of leaves on a branch or entire tree. The dried leaves generally remain attached to the tree for several weeks. The disease commonly occurs in May and June.	See Verticillium wilt of Maple.
	Iron chlorosis	Interveinal yellowing of new leaves and stunting of new growth.	See general discussion of iron chlorosis.
	Leaf spots and Powdery mildew	Discrete spots or irregular white blotches develop on leaves.	No control measures required.
Callery Pear including Bradford Pear *(Pyrus calleryana)*	Pseudomonas blight *(Pseudomonas syringae)*	Blighting of new leaves and shoots in May and June; affected leaves turn black at the margins or along the veins. Commonly occurs during cool, wet weather.	Prune out diseased shoots during hot, dry periods. Apply cupric hydroxide (Kocide 101) as dormant spray before bud break in spring.
Cedar—See Juniper			
Cherry & Plum	Crown gall *(Agrobacterium tumefaciens)*	See general discussion	
	Cherry leafspot *(Coccomyces hiemalis)*	Small, dark spots develop on the leaves of cherry, eventually leading to premature defoliation.	Make three applications of benomyl, thiophanate-methyl, captan or ferbam beginning at petal fall and continuing at two-week intervals. See publication C-592.
	Plum pocket *(Taphrina communis)*	This disease causes fruit distortion on plum. See fact sheet AF-120 for more details.	Apply liquid lime-sulfur, ferbam, Bordeaux mixture or chlorothalonil as a dormant spray in late winter before bud swell.
	Brown rot *(Monilinia fructicola)*	This disease may cause a shoot blight, flower blight or fruit rot on cherry and plum.	Prune and destroy infected twigs. Follow spray guidelines in publication C-592.

Cherry & Plum continued on page 10

Host	Disease	Symptoms	Comments
Cherry & Plum *Continued*	*Black knot (Apiosporina morbosa)*	This disease occurs on wild plums, commercial plums, and cherries but not commercial cherries. Elongated black knots or swellings form on branches of affected trees.	Prune out diseased twigs in winter. Spray trees with ferbam or thiophanate-methyl at bud break, full bloom and three weeks later.
Cottonwood—See Poplar			
Crabapple (*Malus* spp.)	Scab *(Venturia inaequalis)*	Olive-green spots develop on upper and lower leaf surfaces in the spring. Fruit lesions are rough or scaly, and appear dark green when wet. Numerous leaf infections will cause premature defoliation and will result in a loss of tree vigor. See publication C-678.	The best means of control is the use of resistant cultivars. The disease may be partially controlled on susceptible varieties by removing leaf debris in the fall. Generally, three fungicide applications of captan, thiophanate-methyl, mancozeb, chlorothalonil, fenarimol, propiconazole or ferbam, starting at blossom and continuing on 7-10 day intervals, is necessary for the control of scab on susceptible cultivars.
	Cedar-apple rust *(Gymnosporangium juniperi-virginianae)*	Bright yellow-orange spots develop on the upper surface of leaves in June. Later, orange cup-like fruiting structures form on the lower portion of the leaves and on fruit. Part of the fungal life cycle is spent on juniper—see juniper diseases for more information.	Avoid planting susceptible varieties adjacent to junipers. Apply ferbam, fenarimol, propiconazole, mancozeb, triadimefon, or chlorothalonil on a 7-10 day interval from early April through May (or when orange gelatinous galls on juniper are present). See publication C-678.
	Fireblight *(Erwinia amylovora)*	Infected blossoms become water-soaked and turn brown. Infected shoots wilt rapidly as if scorched by fire. The terminal end of the shoot becomes hooked (shepherd's crook). Inner bark tissue is water soaked and turns red. Cankers form on branches and the trunk. See publication C-678.	During winter, remove all dead shoots, infected spurs and large holdover cankers. Pruning cuts should be made 6 to 8 inches below the margin of dead tissue. Disinfect pruning tools in 10% solution of household bleach between each cut. Avoid overfertilization. Streptomycin sulfate can be applied during bloom to prevent blossom blight on apples, but this is not strongly recommended for homeowners.
	Powdery mildew *(Podosphaeria leucotricha)*	The disease is most common on the terminal growth, affected leaves are narrow, stunted and tend to cup slightly. A white powdery growth may be observed on the leaf surface. See publication C-678.	Powdery mildew is not a common problem of flowering crab in Kansas. Applications of benomyl, chlorothalonil, or triadimefon at bloom, followed by an additional spray in 7-10 days, should control mildew.
	Cankers *(Botryosphaeria sp.)*	Cankers develop on bark damaged from sunscald, drought or insect injury. Sunken or discolored bark tissue and branch dieback are common symptoms.	Keep trees vigorous by proper irrigation and fertilization. Remove cankered branches.

Host	Disease	Symptoms	Comments
Elm *(Ulmus* spp.)	Dutch Elm Disease *(Ceratocystis ulmi)*	American and red elms are very susceptible to the disease while Siberian and Chinese (lacebark) elms are resistant. Initial symptoms are a yellowing and wilting of leaves on a branch or portion of the tree crown. Eventually the entire tree will wilt and die. Vascular tissue of wilted branches is chocolate brown. Branch samples containing streaks should be submitted to the diagnostic lab for confirmation of the disease.	Consult your local extension agent before any control measures are undertaken. Remove and destroy immediately any trees diagnosed as having Dutch elm disease. Do not use diseased trees for firewood unless the wood has been debarked. Disrupt root grafts between healthy and diseased trees (within 50 feet) by trenching to a 3 foot depth or by soil fumigation. Prune dying wood from elms to reduce beetle (vectors) breeding areas. Systemic fungicides may be used to prevent or treat (therapeutic) high value trees, but only after other control measures have been followed. See your local extension agent or a trained arborist before selecting and injecting fungicides.
	Verticillium wilt *(Verticillium dahliae)*	Sudden wilting of foliage on one or several twigs or a branch. Affected branches may develop light brown discoloration of the sapwood. This disease is easily confused with Dutch elm disease; it can be positively diagnosed only by isolating the fungus. Submit samples to your local extension agent if you suspect Verticillium wilt.	See Verticillium wilt of maple.
	Elm yellows (Mycoplasma-like organism)	Yellowing and drooping of leaves throughout the tree crown in midsummer. Defoliation and mortality can occur within a few weeks. The cambial tissue of the roots and root collar turns yellow-brown and has a distinct wintergreen odor. Symptoms may be confused with those of Verticillium wilt or Dutch elm disease.	The pathogen is believed to be transmitted from tree-to-tree by leaf hoppers and via root grafts. Trees with elm yellows should be removed and root grafts disrupted between healthy and diseased trees.
	Bacterial wetwood (Several bacteria associated with the disease.)	Sour sap oozes from wounds preventing healing and causing gray streaks on the bark. The bacterial infection causes internal discoloration of the wood.	There are no satisfactory controls for wetwood. Damage to trees is often minor.
	Cankers *(Botryodiplodia, Nectria, Dothiorella* and others)	Dark, sunken lesions or depressions form on twigs and branches. Canker diseases can result in branch dieback and overall tree decline. Most canker pathogens are facultative parasites and require a weakened or stressed tree for infection and disease development.	Maintain tree vigor by proper pruning, fertilization and irrigation. Avoid herbicide and mechanical injury to the trees. If cankers develop, prune out and destroy diseased branches. Cankers are common on Siberian and Laceback elms.

Elm continued on page 12

Host	Disease	Symptoms	Comments
Elm *Continued*	Black spot *(Stegophora ulmea)*	Small, black irregular lesions or blotches form on the upper surface of the leaves in June. Heavily infected leaves turn yellow and drop from the tree. Defoliation may be extensive during wet summers.	Rake and destroy diseased leaves in autumn. Chemical control generally is not needed in Kansas; however, 2-3 applications of thiophanate-methyl, mancozeb, ferbam, or copper-based fungicides (Bordeaux), beginning at bud break and 7-10 day intervals thereafter will help control this disease. See publication L-763.
	Leaf curl *(Taphrina ulmi)*	Light-green blisters develop on the upper surface of leaves in early spring. Later, the lesions turn brown. Infection is restricted to the period when new leaves are emerging in the spring.	Control of leaf curl is seldom necessary in Kansas. Bordeaux mixture may be applied just before bud break to suppress disease development.
	Herbicide injury	Newly developing leaves are distorted and discolored. Siberian elm is particularly sensitive to phenoxy herbicides. Herbicide exposure may predispose trees to canker development.	See discussion of herbicide injury.
European Mountain Ash *(Sorbus* sp.)	Fireblight	Rapid blighting of young shoots in the spring.	See control measures for fireblight of flowering crabapple. European Mountain Ash is not well-adapted to Kansas and generally does not grow well.
Golden-Rain Tree *(Koelreuteria* sp.)	Nectria canker *(Nectria cinnabarina)*	Dieback on one or more branches. Dead branches are light tan and dotted with black to red fruiting structures of the fungus. Infection is associated with winter injury.	Maintain trees in a vigorous condition by proper pruning, fertilization and irrigation. Remove cankered branches in late winter.
Hackberry *(Celtis occidentalis)*	Witches broom (Thought to be caused by an interaction of a powdery mildew fungus and a gall-mite)	Affected branches develop abnormal swelling and a proliferation of lateral shoots.	No controls available.
	Root rot *(Ganoderma lucidum)*	The disease is characterized by a rapid decline and death of the tree. The fungus causes a white, spongy rot of the roots and root collar. In the advanced stages of decay, the fungus produces amber to reddish-brown, hoofed-shaped structures (conks) at the base of the tree.	Avoid mechanical wounds to the base of the tree. No control is available once infection has occurred. Trees which are a structural hazard should be removed.

Host	Disease	Symptoms	Comments
Hawthorn *(Crateagus* spp.)	Leafspot *(Diplocarpon maculatum)*	Red to black angular spots develop on leaves. Extensive leaf spotting will cause early defoliation.	Rake and destroy dead leaves each fall. For plants with a history of the disease apply thiophanate-methyl or mancozeb at leaf bud break and make two additional applications at 14-day intervals. Additional applications may be necessary during wet weather.
	Fireblight *(Erwinia amylovora)*	See flowering crabapple for details.	
	Rusts *(Gymnosporangium* spp.)	See flowering crabapple for details.	
Hickory and Pecan *(Carya* sp.)	Leaf spots (various fungi)	Several leafspot diseases may occur on hickory and pecan. These diseases generally are not a serious problem in Kansas.	No control necessary in most cases.
	Pecan Bunch (Mycoplasma-like organism)	This disease primarily affects pecans. Affected trees develop tight bunching of leafy branches called "witches brooms." Diseased trees are often stunted and leaves are yellow. The disease is spread by leafhoppers.	There is no control once the tree in infected. Remove diseased trees and destroy.
	Pecan Scab *(Cladosporium caryigenum)*	The disease causes rough, green to black spots on leaves and nuts of pecan. The disease is not common in Kansas.	Properly timed fungicide sprays will control this disease. Check with the Extension office for fungicide control.
	Crown gall *(Agrobacterium tumefa)*	See general discussion of crown gall.	
Honeylocust *(Gleditsia triacanthos)*	Thyronectria canker *(Thyronectria austro-americana)* Nectria canker *(Nectria cinnabarina)*	Symptoms include branch dieback, reduced foliage and premature defoliation. Sunken, dark-red cankers form in branch crotches or at pruning wounds. Trees may die rapidly or remain in a weakened state for many years.	Maintain trees in a vigorous condition by proper pruning, fertilization and irrigation. Avoid mechanical wounds to the trunk. Prune out all cankered branches. All tools used in pruning should be disinfected by wiping with a 10% solution of household bleach.
	Herbicide injury	Distortion, scorching or premature leaf drop.	See discussion on herbicide injury. Avoid the use of lawn herbicides near the drip line of the tree.

Host	Disease	Symptoms	Comments
Juniper Eastern Redcedar *(Juniperus virginiana)* Rocky Mountain Juniper *(Juniperus scopulorum)*	Rust *(Gymnosporangium juniperi-virginianae* *G. globosum* *G. clavipes)*	Both *G. juniperi-virginianae* and *G. globosum* produce reddish-brown galls on the twigs of juniper. During April and May, the galls swell and produce orange gelatinous tendrils. Spores from the tendrils infect apple and flowering crab. The cedar-quince rust produces cigar-shaped galls on the twigs.	The cedar galls generally do not cause enough damage to require control, although trees may be protected from infection by applying Bordeaux, ferbam, or triadimefon at 7-14 day intervals beginning in early July and continuing through August.
	Phomopsis blight *(Phomopsis juniperovora)*	The terminal 4-6 inches of developing shoots turn dull green, then red in spring or early summer. A light ash-gray lesion forms at the base of the blighted shoot. This disease is a serious problem in nurseries, but is not common in Kansas windbreaks.	Proper spacing of trees and weed control will promote good air circulation and decrease the chances of infection. Resistant juniper varieties are available. Susceptible ornamental junipers may be protected with applications of Bordeaux, mancozeb, or thiophanate-methyl every 7-10 days beginning in May and continuing as long as weather conditions are wet and humid.
	Kabatina blight *(Kabatina juniperi)*	Symptoms identical to Phomopsis tip blight except they only occur in early spring.	This disease is common in eastern redcedar windbreaks in Kansas. There currently are no control measures for Kabatina blight. Benomyl has no activity against this fungus.
	Cercospora blight *(Cercospora sequoiae* var. *juniperi)*	This disease is most serious on *J. scopulorum.* Affected branchlets on the lower portion of the tree drop in autumn, while the terminal shoots remain green.	In areas where Cercospora blight has been a problem, plant *J. virginiana.* Two applications of Bordeaux mixture in early June and late July will effectively control this disease.
	Winter injury	Branches turn dull-green, then brown in March and April.	This is one of the most common problems of junipers in the landscape. See general discussion of winter injury.
	Bot Canker *(Botryosphaeria stevensii)*	This disease results in multiple branch dieback and mortality on Rocky Mountain Juniper. Branch cankers are elliptical, flattened and often covered with resin. Cankers are difficult to detect unless the outer bark is removed.	Prune out diseased branches. Remove tree if more than one-half of the crown is affected. Do not replant Rocky Mountain juniper in plantings where the disease is present.
Maple *(Acer* spp.)	Anthracnose *(Discula* sp.)	Reddish to black spots or blotches form on leaves in the spring, particularly during wet, cool weather. Typically, the spots are formed along the veins. Severe infection may cause defoliation. See publication L-763.	This disease seldom causes damage to maples in Kansas. In areas where anthracnose has been a problem, apply thiophanate-methyl, mancozeb, fixed-copper, or Bordeaux mixture at bud break and spray 1-2 additional times at 7-10 day intervals.
	Summer leaf scorch	Marginal browning of leaves during hot, droughty weather. Summer scorch may be confused with anthracnose.	Maintain proper fertilization and irrigation. Do not plant hard maples on sites exposed to high winds and sun.

Maple continued on page 15

Host	Disease	Symptoms	Comments
Maple *continued*	Verticillium wilt *(Verticillium dahliae)*	Rapid wilting of foliage in a portion of the crown during cool weather in the spring. Affected branches die, but the tree may survive only to develop wilting the following spring. Diseased branches develop a dark-green discoloration of the sapwood. Isolation of the fungus is necessary for positive identification of the disease.	Do not plant susceptible trees (elm, Russian olive, redbud, catalpa, maple) where Verticillium wilt has been a problem. The fungus may survive indefinitely in the soil. If susceptible trees are used, fumigate soil before planting. Avoid mechanical injury to the roots and root collar. Trees with symptoms of Verticillium wilt should be watered thoroughly. Fertilizing with ammonium sulfate may help trees recover. Prune out dead branches; disinfect pruning tools in 10% household bleach or rubbing alcohol between each cut.
	Leaf spots	Several leafspots occur on maple, but generally do little damage to the tree.	No control necessary.
	Herbicide injury	Maples (especially boxelder) are very sensitive to phenoxy herbicides. Symptoms may include leaf distortion and branch dieback.	See discussion of herbicide injury.
	Iron chlorosis	Interveinal chlorosis of leaves. Severe cases result in premature defoliation and branch dieback.	See general discussion of iron chlorosis.
	Leaf blister *(Taphrina* spp.)	Light-green blisters develop on the leaves. The blisters eventually turn brown. Hard maples are more seriously attacked in Kansas.	Generally does not require control. Thiophanate-methyl or Bordeaux mixture applied just before bud break and again in 7-10 days normally will control leaf curl.
	Root rot (Many fungi including *Armillaria mellea, Ganoderma lucidum)*	White spongy rot of the roots and root collar. Sporophores (conks or mushrooms) may be evident at the base of the tree.	Avoid wounds to the root or root collar. No controls available once the decay process has begun.
Mulberry *(Morus rubra)*	Leaf spot *(Cercospora* spp.)	Reddish brown spots on leaves. Occurs during wet weather.	This disease is only a problem during wet weather. It does not cause serious damage and control is not necessary.
	Powdery mildew *(Phyllactinia* and *Uncinula* spp.)	White powdery growth on leaves.	Control is generally not needed but thiophanate-methyl applied every 10-14 days when symptoms are present is effective.
	Popcorn Disease *(Ciboria carunculoides)*	The fruit is replaced by hard fungal structures resembling popcorn seeds.	This disease does not cause permanent damage and control is not necessary.
	Twig dieback	This problem is associated with freeze injury although weak pathogens may attack the weakened twigs.	Keep trees vigorous by proper fertilization and watering. Prune out dead twigs in late winter or early spring.

Host	Disease	Symptoms	Comments
Oak (*Quercus* spp.)	Actinopelte leaf spot *(Actinopelte dryina)*	Small dark spots on leaves between the veins. Some spots may have a light brown center. Spots may also coalesce and form large irregular patches.	Actinopelte leaf spot doesn't appear until mid-to-late summer and does not cause significant (permanent) damage. Chemical control is not necessary.
	Anthracnose *(Apiognomonia quercina)*	The most characteristic symptom of anthracnose is the formation of irregular brown dead areas on the leaves along the veins. Affected leaves appear scorched. Defoliation may be light to heavy and some twig dieback may occur. The disease is favored by wet, cool spring weather. Anthracnose is most serious on white oaks.	Raking up and destroying old leaves is helpful in controlling inoculum. Chemical control is seldom necessary in Kansas. If anthracnose has been a recurring problem, Bordeaux or thiophanate-methyl can be applied when the leaves unfurl. One or two additional sprays at 10-14 day intervals are needed for control. See publication L-763.
	Hypoxylon Canker *(Hypoxylon atropunctatum)*	Early symptoms are yellowing and wilting of leaves on upper branches. Branch dieback occurs and eventually outer bark is sloughed off. When the bark is gone, a crust of fungal material (stroma) is exposed. The color of this mass changes from brown to silver to black.	There is no control for this disease once it becomes established in the tree. However, the fungus attacks stressed or weakened trees so maintaining the health of the tree by proper watering and fertilization should reduce the risk of a Hypoxylon infection. The fungus also enters through wounds so avoid injuring the tree. If a dead tree is going to be used for fuel it should be burned as soon as possible and the stump should be removed.
	Iron chlorosis	Symptoms are first evident and most severe on the youngest leaves on branch tips. Leaves turn yellow but veins remain green. If severe, leaves become necrotic between veins. The condition is common in soils with a pH greater than 7.0.	Pin oaks are most severely affected. See controls under Chlorosis section.
	Leaf blister *(Taphrina caerulescens)*	The disease first appears as light green blisters on the leaves. Blisters may enlarge and affected leaf tissue turns brown.	Leaf blister only occurs during wet, cool springs. The disease does not cause permanent damage to the tree and chemical control is not necessary.
	Oak wilt *(Ceratocystis fagacearum)*	Early symptoms are wilting leaves on individual branches in the upper portion of the tree in late May or June. Individual leaves bronze from the margins in to the midrib. Wilting progresses down the tree. If the bark on affected branches is pulled back, brown streaks are evident in the sapwood. Branch samples containing streaks should be submitted to the diagnostic lab for confirmation of the disease.	Red oaks are much more susceptible than white oaks. Infected trees die in 1-2 years. Disrupt root grafts between healthy and diseased trees (within 50 feet) by trenching to a 3-foot depth or by soil fumigation with metam sodium. Diseased trees should be removed and destroyed. See Dutch Elm Disease. This disease has only been found in Eastern Kansas. Some experimental injection chemicals (Alamo) appear promising.

Oak continued on page 17

Host	Disease	Symptoms	Comments
Oak *continued*	Powdery mildew *(Phyllactinia corylea)*	The most obvious symptom is a white powdery growth on the underside of the leaves. If leaves are infected when young they may be distorted.	Powdery mildew is only a serious problem on shaded shoot growth. Control is usually not warranted. In areas where powdery mildew has been a continual problem, apply thiophanate-methyl on a 10-14 day schedule beginning at the first signs of the disease.
	Shoestring rot *(Armillaria mellea)*	Oaks show a general decline. The wood decays at the base of the tree. If the bark is pulled back, black strings (rhizomorphs) can be observed. In the fall yellow to tan (orange) mushrooms are seen at the base of the tree.	Maintain tree health. When removing an infected tree, be sure to remove the butt and larger roots and do not plant another tree at the same site.
	Sooty mold fungi	Black moldy growth on the leaf surface.	The fungi growing on the leaves are not parasitic, they are saprophytes living on insect honeydew. Sooty mold does not cause serious injury and control is not usually necessary. Some amount of control can be gained by frequently hosing down the foliage and by controlling aphid populations.
Pagoda-tree Japanese *(Sophora japonica)*	Nectria canker *(Nectria cinnabarina)*	Dieback of one or more branches. Dead branches are light tan and dotted with black to red fruiting structures of the fungus. Infection is associated with winter injury.	Maintain trees in a vigorous condition by proper pruning, fertilization and irrigation. Remove cankered branches in late winter.
Pine *(Pinus* spp.)	Brown spot *(Scirrhia acicola)*	Brown spot on current year's foliage results in premature needle drop. Spots are most prevalent on lower limbs on the north side of trees. The spots first appear in September and the disease continues to develop through November. Disease development is favored by wet weather. Brown spot is most common on Scots Pine, especially when grown in Christmas tree plantations. Ponderosa pine is also susceptible but Austrian pine is resistant.	Cultural practices for disease control include: providing adequate space between trees to allow good air circulation, pruning off lower limbs and mowing weeds around the trees, especially in plantations. Susceptible foliage can be protected from infection by one or two applications of a fungicide. Apply Bordeaux (8-8-100), fixed coppers, mancozeb or chlorothalonil in early to mid-June. If unusually wet weather persists a second application should be made 3-4 weeks later. Refer to publication L-722.
	Naemacyclus Needlecast *(Cyclaneusma minus)*	The first symptoms of needlecast are light green spots on 2 and 3 year old needles in early fall. Infected needles eventually turn yellow with dark brown horizontal bands. Yellow needles may be anywhere on the tree. Off-white, waxy fruiting bodies develop on brown bands and are evident during wet weather. Needles are shed October through November. Scots Pine is highly susceptible.	Three applications of thiophanate-methyl, chlorothalonil or mancozeb between mid-April and late June may be effective. Applications should be made every 2 to 3 weeks. This treatment may have to be continued into late fall for total control. Avoid planting next to old Scots Pine windbreaks. This disease has not been a major problem in Kansas.

Pine continued on page 18

Host	Disease	Symptoms	Comments
Pine *continued*	Needle blight *(Dothistroma pini)*	Early symptoms, seen in late summer or early fall include green bands or yellow tan spots scattered on one-year old needles. Spots often enlarge into red bands that encircle the needles. Needles then turn yellow from the band to the tip. Black fruiting bodies are formed in the band during late winter or early spring and summer. Needle blight is a serious disease on Austrian and Ponderosa pine. Mugo pine is also susceptible but Scots pine is considered resistant.	Sanitation of fallen needles may be helpful but chemical treatment is necessary for good control. A single application of a copper-containing fungicide in early June will normally protect the tree but two applications, one in mid-May and one in mid to late June may be more effective. Refer to KSU Extension publication L-722 for more information.
	Tip blight *(Sphaeropsis sapinea)*	Symptoms first appear in late May or early June. New candles fail to elongate and turn yellow or tan. Small droplets of resin often form on stunted needles. Needles normally remain attached to the branch. In late summer, small black fruiting bodies develop at the base of infected needles and cones. Austrian, ponderosa, Scots and Mugo pine are all susceptible.	Tip blight can only be controlled on diseased trees by protective fungicide applications. Two applications of thiophanate-methyl, Bordeaux, or other copper fungicides, one applied approximately the third week of April and one 10-14 days later will help control tip blight. In certain years, a third application may be necessary. Refer to KSU Extension publication L-722 for more information.
	Scorch	Needles die from the tip back while the base remains green. Occurs during periods of hot, dry weather.	See general discussion of scorch.
	Natural needle drop	Two- to four-year needles on the inside of the tree turn yellow then brown and fall off. Needle shed is more prevalent with stress caused by heat and drought.	This phenomenon is a natural occurrence rather than a disease problem. Occurs every fall.
	Pinewood nematode *(Bursaphelenchus xylophilus)*	Sudden death of trees. There is also a lack of resin flow from infected trees. The infection may begin in the spring and kill the tree by fall. Scots pine is more susceptible than Austrian.	Remove and destroy infected trees. This eliminates breeding wood for the insect vector. No chemical controls are labeled.
	Western gall rust *(Endocronartium harknessii)*	Disease may be found on Scots and Ponderosa pine. Large galls develop on the branches and trunks of trees. In the spring, galls break open and expose bright orange, dusty spores.	Inspect and discard all nursery stock with galls. On larger trees, prune off branches with galls. Trees with galls on the main stem should be removed.

Host	Disease	Symptoms	Comments
Populus spp. & related trees including: Cottonwood *(Populus deltoides)* Lombardy Poplar *(Populus nigra* var. *italica)* Willows *(Salix* spp.)	Crown gall *(Agrobacterium tumefaciens)*	Formation of large galls usually at the base of the tree. In some cases, galls may also be formed on branches. Decreased vigor of the tree and yellowing of leaves. Some root damage may also be observed. Crown gall can kill young trees that are infected but may not cause noticeable damage to older trees.	Remove and destroy young infected trees and branches on older trees. Discard infected nursery stock. The bacterium that causes this disease survives in the soil so susceptible trees should not be replanted in the same site.
	Cytospora canker *(Cytospora chrysosperma)*	Brown sunken cankers on twigs and branches. Cankers may enlarge and girdle the branch. Fungal spores ooze out of pustules in red, thread-like masses.	Trees with low vigor are more susceptible than healthy trees so adequate watering and fertilization should be maintained. It is also necessary to remove dead or diseased branches.
	Leaf spots *(Marsonnina* sp. and *Septoria* sp.)	Small dark spots on leaves. Septoria spots often develop a gray center. These leaf spots occur during wet weather and generally do not cause serious damage.	Rake and destroy leaves in the fall. Chemical control is not necessary unless this has been a repeated problem. Thiophanate sprayed every 10-14 days when symptoms appear will control these leaf spots as will chlorothalonil applied at bud break.
	Rust *(Melampsora medusae)*	Yellow-orange powdery spots on the underside of leaves. The symptoms are seen from June through September.	Chemical control is not necessary in Kansas.
	Shoot blight *(Venturia populina)*	Initial symptoms are angular black spots on the leaves. These spots enlarge and eventually the entire leaf and shoot shrivels and appears hooked. The disease occurs during periods of wet weather and is more severe in shaded areas.	Shoot blight seldom causes permanent damage on established trees, so chemical control is usually not necessary. The disease can often be controlled by pruning out infected shoots. If this disease has been a continued problem, apply mancozeb at 10-day intervals starting at bud break.
	Bacterial wetwood	The main symptom of wetwood is the oozing of sap from wounds (slime flux) in the bark. Internal pressure caused by growth of the bacteria prevents healing of the wounds. If the wood is cut, a foul odor is evident. Toxic compounds in the flux also causes gray streaks in the bark where it comes in contact with flux. Infected trees may show lack of vigor and branch dieback.	See wetwood of Elm.

Host	Disease	Symptoms	Comments
Redbud *(Cercis canadensis)*	Verticillium wilt *(Verticillium dahliae)*	Sudden wilting and blackening of leaves on a branch or entire tree. The dried leaves generally remain attached to the tree for several weeks. The disease commonly occurs in May and June.	See Verticillium wilt of Maple.
	Leaf spot *(Cercospora* sp.)	Small reddish brown leaf spots with irregular margins.	This disease only occurs during wet seasons and is not a serious problem so active control measures are not necessary.
	Herbicide injury	Cupping or distortion of leaves, branch dieback. Redbud is very sensitive to phenoxy herbicides.	See general discussion of herbicide injury.
Russian Olive *(Elaeagnus angustifolia)*	Verticillium wilt *(Verticillium dahliae)*	Sudden wilting and blackening of leaves on a branch or entire tree. The dried leaves generally remain attached to the tree for several weeks. The disease commonly occurs in May and June.	See Verticillium wilt of Maple.
	Stem canker *(Phomopsis elaeagni)* *(Tubercularia* sp.)	Oval to elongate dark sunken cankers on branches. Infected bark remains smooth but cracks may form at the margin of the canker. Fruiting bodies develop in the dead bark and appear as raised pustules.	Remove and burn diseased branches. Cut branches at least 6 inches below any cankers when the wood is dry.
	Leaf spot *(Septoria argyraea)*	Round to oval leaf spots with a gray center and dark margin. Fungal fruiting bodies (pycnidia) appear as small black dots in the center of the spot.	This is not a serious disease of Russian olive so active control measures are not necessary.
Spruce *(Picea* spp.)	Rhizosphaera Needlecast *(Rhizosphaera kalkoffii)*	Fuzzy black growth on needles in late fall or early spring. One- and 2-year-old needles on lower branches turn purplish-brown in summer and are usually shed by late fall.	Apply chlorothalonil when needles are half-elongated and again when needles are fully elongated.
	Cytospora canker *(Cytospora kunzei)*	Cankers on branches are covered with white patches of pitch. Small black fruiting bodies form in diseased bark. Brown needles present on lower branches first then spreads to higher branches.	This disease is not common in Kansas. It usually is found on drought-stressed or winter-injured trees that are greater than 15 years old. Remove infected branches but do not prune during wet weather. Fertilize adequately.
	Shoot blight *(Sirococcus strobilinus)*	Shoot dieback. Needles turn brownish red and drop off.	Apply chlorothalonil in spring when shoot growth is 1.5 to 2 inches in length. Make 1 or 2 additional applications at 2- to 3-week intervals.
	Needle death	Needles turn brown to purple, sometimes including current year's growth to twig.	Caused by stress from growing in conditions less than ideal. Spruce are not well adapted to Kansas growing conditions. Provide tree with good care including adequate watering and fertilization.

Host	Disease	Symptoms	Comments
Sweetgum *(Liquidambar styraciflua)*	Iron chlorosis	Interveinal yellowing of new leaves and stunting of new growth.	See general discussion of iron chlorosis.
	Scorch	Browning of leaf margins during hot, dry weather.	See general discussion of scorch.
	Leaf spots (Various fungi)	Spotting of leaf tissue.	Control not necessary.
Sycamore and London Plane *(Plantanus* spp.)	Anthracnose *(Gnomonia plantani)*	Brown irregular areas along veins. Young leaves appear frosted and fall off. Twigs may be killed. Infection occurs in cool weather just as buds open. London Plane is more resistant than Sycamore.	Fungicides are effective only if applied when buds begin to swell. Use thiophanate, Bordeaux, or other coppers and repeat application in 7-10 days. Systemic injections of Arbotect and Fungisol PV in autumn are labeled for anthracnose. See publication L-763 for more details.
	Powdery mildew *(Microsphaera alni)*	Leaves and young twigs are covered with a white, powdery mold.	London Plane is susceptible, but it is seldom a serious problem in Kansas. If the disease is a continual problem, treat with benomyl as soon as symptoms appear. Repeat at 10-14 day intervals.
	Scorch	Browning of leaf margins during hot, dry weather.	See general discussion of scorch.
Walnut *(Juglana nigra)*	Anthracnose *(Gnomonia leptostyla* also known as *Marsonina juglandis)*	Irregular brown or black spots on leaflets, sometimes with yellow margins. Premature defoliation. Brown to black sunken spots on nut hulls. Refer to publication L-763.	Anthracnose is only a serious disease problem in a cool, wet season. The disease can normally be controlled by raking, burning or composting fallen leaves and removing twiggy growth for increased air movement. Fertilize trees in the spring. If trees are attacked repeatedly, fungicides can be used for control. Bordeaux, thiophanate-methyl and chlorothalonil are effective. Apply when leaves are ½ to fully expanded and make 1- to 2-additional applications at 3- to 4-week intervals.
	Scorch	Browning of leaf margins during hot, dry weather.	See general discussion of scorch.
Willow *(Salix* spp.)—See Populus spp.			

Reference to products in this publication is not intended as an endorsement to the exclusion of others which may be similar. Persons using such products assume responsibility for their use in accordance with current label directions of the manufacturer.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

C-674 April 1999

File code: Plant Pathology–7