

Diagnosing Thousand Cankers Disease of Walnut

Thousand cankers disease is a newly recognized disease of various species of walnut (*Juglans*). Eastern black walnut (*Juglans nigra*) is particularly susceptible to thousand cankers and during the past decade it has devastated plantings of black walnut in most western states. At present, the known eastern range of the disease is along the Front Range of Colorado.

Visual Symptoms of Affected Trees

Yellowing and flagging of leaves on upper branches is usually the first symptom of the disease. This is followed by a progressive dieback that over time causes death of larger limbs and, ultimately, the entire tree. In Colorado, black walnut usually is killed within 3-4 years after initial leaf yellowing symptoms of thousand cankers disease are noted.



Crown thinning and leaf yellowing associated with Thousand Cankers Disease



Rapid wilting in end stage of Thousand Cankers Disease

The production of leaf yellowing/flagging of black walnut can have many other - and far less serious - causes. However, in areas where the disease is suspected to occur there should be additional examination to determine if thousand cankers disease is the cause.

Symptoms of Cankers

Thousand cankers disease kills trees by the production of numerous small, dark, dead areas (cankers) under the bark. Each of these is associated with tunneling by the walnut twig beetle (*Pityophthorus juglandis*), a minute brown bark beetle that carries the fungus (*Geosmithia*, new species) that produces the canker. The cumulative effect of innumerable cankers produces

limb girdling that cause the visual symptoms and dieback.

The presence of cankers is detected by carefully removing the bark from symptomatic limbs. When peeling the bark to visualize cankers, be sure to not cut too deeply; the beetle galleries and fungus originally are found in the living bark (cork cambium and not the wood cambium).



Large cankers under bark that coalesce to produce limb girdling



Shallow tunnels produced by the walnut twig beetle can usually be seen in the center of cankers.

Individual cankers may originally be only a few millimeters in diameter, but ultimately can be 3 cm or greater and often assume an elongate oval form. Typically the appearance of a shallow tunnel produced by the walnut twig beetle will be present near the center of the canker.

The combination of a dark canker with the beetle tunneling is almost certain confirmation of thousand cankers disease. However, dark cankers occur under the bark following wounding and other injuries. Culturing the *Geosmithia* fungus from the canker will allow positive confirmation of thousand cankers.

Verifying the Disease

It is important to verify the Thousand Cankers disease, particularly in locations where the walnut twig beetle and *Geosmithia* have not previously been reported. Walnut branch samples from trees suspected of having Thousand Cankers may be sent to Colorado State University for verification. Select branches that are still alive but have evidence of beetle galleries and cankers and put 4-5 inch sections of the branch in a Ziploc bag without water or wet paper towels. Place this bag in a second Ziploc bag, seal tightly and mail to the address provided. Phoning ahead of sample shipments is strongly encouraged. Phone calls can either be made to the Plant Disease Clinic (970-491-6950) or to Dr. Tisserat (970-491-6527).

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Geosmithia culture growing on PDA media



Conidiophores and conidia of *Geosmithia* cultured from black walnut

Geosmithia is relatively easy to isolate from cankers of all sizes if you have diagnostic facilities. Place small bark chips on $\frac{1}{4}$ strength potato dextrose agar amended with 100 mg/L streptomycin sulfate and 100 mg/L chloramphenicol ($\frac{1}{4}$ PDA++). It is not necessary to disinfect the bark chips in sodium hypochlorite. The fungus initially grows very rapidly out of the wood chips and colonies commonly exceed 20-40 mm in diameter after 3-5 days at 25 °C. Fungal colonies on half strength PDA are cream-colored to tan, and tan to yellow-tan on the reverse side of the plate. The fungus sporulates profusely in culture producing dry conidia on multi-branched, verticillate, verrucose conidiophores. Conidiophore morphology is similar in appearance to *Penicillium*, although these genera are not closely related. *Geosmithia* conidia are tan en masse, cylindrical to ellipsoid, 2 to 6 x 6 to 14 (mean 2.7 x 6.5) μm , and form in chains. *Geosmithia* can be transferred and maintained on $\frac{1}{2}$ strength PDA or malt agar.

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