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Chris T. Maier outside beetle containment structure

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Trials help determine best grape cultivars for developing Connecticut vineyards

By Richard K. Kiyomoto

A DEMAND FOR LOCALLY-GROWN WINE GRAPES, which exceeds the supply, and renewed interest in establishing wine grape plantings among hobbyists and individuals interested in starting commercial wineries, has created a need to learn more about wine grape cultivars and how they grow in Connecticut

Because of these two factors, I have been developing and identifying clones of desirable wine grape cultivars that will have the hardiness to yield sufficiently to meet winery demands in wine grape trials at the Lockwood Farm in Hamden and at the Valley Laboratory in Windsor.

The Lockwood Farm replicated trial was established in 1992 and focused on four cultivars which had been screened in unreplicated trials for hardiness and productivity. The Valley Laboratory replicated trial was established in 1995 to test the hardiness of five French and American hybrid cultivars and four *Vitis vinifera* cultivars under conditions which I thought were harsher than trials conducted along coastal Connecticut.

The cultivars tested at Lockwood Farm were the white hybrids Seyval and Villard Blanc and the red hybrids Villard Noir and Chambourcin. The cultivars tested at the Valley Laboratory were the white hybrids Seyval, Cayuga White, and Villard Blanc; the red hybrids Villard Noir and Marechal Foch; the white *V. vinifera* types Riesling White and Chardonnay; and the red *V. vinifera* types Cabernet Sauvignon and Cabernet Franc.

Seyval, Cayuga White, Foch, and Chardonnay are commonly grown in Connecticut vineyards. Generally, Vinifera cultivars are grown successfully only in the most favorable sites buffered against the cold of winter and spring.

Low sugar and high acid indicates harvest earlier than optimum; whereas, high sugar and very low acid indicates fruit overripe

I collected information on fruit yield, acidity, and sugar (Brix). Grapes should be harvested when they reach an optimal balance of sugar and acid for winemaking. As starting material for making wine, fruit sugar is optimum around 22% (or 22 Brix) and acid is optimum around 0.60-0.85 g per 100 ml as tartaric acid. As grapes ripen, sugar levels increase to a peak for that cultivar under the conditions of the environment in a particular year and acid content of the fruit declines. Thus, low sugar and high acid indicates a harvest earlier than optimum; whereas, high sugar and very low acid indicates fruit overripe. However, there are years in which fruit quality never reaches the optimum.

Hybrid grapes of high quality can be productive in the Connecticut River Valley as well as along coastal Connecticut

Harvests were made in Windsor on September 30, 1997 and on September 11-October 7, 1998 and in Hamden on October 4, 1997 and October 2-15, 1998. In 1998 juice sugar was monitored during ripening, and harvest of each cultivar was made when maximum sugar was attained. Average yields for cultivars over 2 years at the two sites are summarized in Table 1.

Overall, the yields at Hamden were higher than at Windsor; however, this was expected since 1997 was the first year of harvest in the Windsor planting. The striking difference between the two plantings is the earlier maturity observed at Windsor. This observation was supported by data collected in 1998 when regular sampling of juice sugar was used as an indicator of optimum for harvest.

My data indicate that hybrid grapes of high quality can be productive in the Connecticut River Valley as well as along coastal Connecticut. The results with *V. vinifera* cultivars, however, reinforce the idea that an extremely favorable site is needed to grow these cultivars productively.

A final point, which will be confirmed or discarded in succeeding years, is the earlier maturity and high quality juice obtained from grapes grown in Windsor. If this is true, it will result in a high quality (high sugar, medium acidity) raw product as well as allow a wider flexibility in using some cultivars which are known for high quality, but are too late to mature in current wine growing regions in Connecticut.

Table 1. Yield and quality of selected wine grape cultivars in Hamden and Windsor replicated wine grape trials.

Cultivar	Yield (lbs/A)	Brix*	Acid
Villard Blanc	10,070 a	19.7 a	1.343 b
Seyval	8,116 a	20.7 a	1.172 b
Villard Noir	5.634 b	19.8 a	1.542 a

***Brix = approximate % sugar.**

****Numbers in a column followed by the same letter are not significantly different by Duncan's Multiple Range Test (=0.05).**

Pesticides applied to lawn and garden are found in ground water

By Brian D. Eitzer

LARGE QUANTITIES OF PESTICIDES ARE APPLIED to residential landscapes to control weeds and insects. In fact, for some pesticides the amount applied in residential settings, either by homeowners or landscape care companies, can rival the amount applied in commercial agricultural operations. It is therefore logical to study the impact of residential use of landscape pesticides on groundwater.

To study this impact we chose a town largely residential in nature, Woodbridge. There is no public water supply, so residents must rely on groundwater wells for their domestic water. During summer 1998 we conducted a study of pesticide residues in groundwater wells within the town. Homeowners were solicited to participate by one of our partners in this research, Environment and Human Health Inc. (EHHI), a local environmental advocate.

Homeowners completed a questionnaire regarding their pesticide use and allowed their drinking water wells to be sampled for pesticide residues by our other partner, the Quinnipiack Valley Health District (QVHD). QVHD sent the samples to EHHI, who submitted them to The Connecticut Agricultural Experiment Station for analysis. The coding allowed homeowners results to be kept confidential while allowing us to study pesticide residues in groundwater of a town. A total of 53 homeowners participated in the survey.

The questions included: location of the home relative to past or present farms; pesticide usage by the homeowner, use of lawn and/or tree care companies; and age, depth, and type of well.

Although the exact usage of pesticides in the town is unknown, 66% of the homeowners surveyed reported some application of pesticides on their property, either by themselves or landscape care companies. This level of pesticide usage is consistent with levels found in national surveys.

An unfiltered one liter sample of water was collected from each residential well as close to the wellhead as possible, prior to any treatment system. The sample was analyzed for 19 different pesticides, including some of those most commonly used on residential landscapes currently as well as some older no longer used pesticides.

The differing physical characteristics of various pesticides required use of multiple procedures to detect all of the targeted pesticide with good sensitivity and selectivity.

The pesticides analyzed and the detection limits in μg per liter were: the herbicides dicamba (5.0), 2,4-D (2.5), MPCA (2.5), 2,4-DP (2.5), MCPP (2.5), trifluralin (0.02), and dacthal (DCPA) (0.02); the insecticides: carbaryl (0.10), diazinon (0.01), lindane (0.02), chlorpyrifos (0.02), malathion (0.12), dicofol (0.13), isofenfos (0.13), DDE (0.07), DDT (0.16), methoxychlor (0.15), and chlordane (0.05); the only fungicide was chlorithalonil (0.07).

All residues found were at concentrations well below regulatory limits

Two subsamples were taken from each sample for separate solid phase extraction (SPE) procedures. These procedures concentrate the pesticides by removing them from a large volume of water, and transferring them into a small volume of solvent, known as the eluant. The eluant of the first subsample was analyzed by gas chromatography/mass spectrometry (GC/MS), and the eluant of the second subsample by liquid chromatography (LC) with ultraviolet (UV) or mass spectrometric (MS) detection. The differing procedures also leads to differing detection limits.

We found pesticide residues in 11 percent of the wells sampled (Table 1). Six of the nineteen pesticides studied were found in at least one well during this initial survey. As many as five different pesticides were found in a single well. All residues found were at concentrations well below regulatory limits.

Five of the six wells were resampled. Residues were still present, although the concentration and mix had changed. In addition, a seventh pesticide, chlorothalonil, not found during the first sampling, was detected. The six wells with pesticide residues were not in any particular area of town.

Although we were unable to correlate information about the wells and pesticide usage with the residue data, the results confirm that pesticides may migrate to groundwater and must be used prudently.

Table 1. Concentrations of pesticides detected and regulatory limits in parts per billion (mg/L).

Pesticide	N[1]	Conc. (μg/L)[2]	MCL[3] (μg/L)	RFD[4] (μg/L)
diazinon	5	0.02	a	2.3
dacthal (DCPA)	4	0.03	a	12500
trifluralin	3	0.04	a	4700
lindane	1	0.06	0.2	7.5
chlorpyrifos	1	0.06	a	75
chlordane	1	0.22	2	1.5

1. Number of wells with the particular pesticide.

2. Average concentration in the N wells.

3. Maximum Concentration Level–Data from the Extension Toxicology Network, Pesticide Information Profiles, Oregon State University. a–data not available

4. Reference Dose–Data from the Extension Toxicology Network. Reference dose assumes a 50 Kg person and a 2 Liter per day water consumption.

Beetle thought to attack only dead wood found in live arborvitae in Connecticut

By Chris T. Maier

EXOTIC, OR NON-NATIVE, PESTS HAVE HAD A COSTLY AND LASTING IMPACT upon agriculture. Today, with international trade on the rise, we face an ever-increasing risk that new species will reach Connecticut to harm plants growing in our farm fields, nurseries, forests, and even yards. The latest unwanted arrival in Connecticut is the smaller Japanese cedar longhorn beetle (*Callidiellum rufipenne*), which was discovered in a branch of arborvitae or northern white cedar (*Thuja occidentalis*) brought to The Connecticut Agricultural Experiment Station on September 22, 1998.

The smaller Japanese cedar longhorn beetle (Fig. 1) is a wood-boring insect known mainly from Japan, Korea, Taiwan, and eastern China. It is not the Asian longhorn beetle, which has gained notoriety during the last 3 years by killing maple and other shade trees in New York and Chicago.

The larvae of the smaller Japanese cedar longhorn beetle normally tunnel into the wood of dead and dying trees in the cedar family (Cupressaceae) in their native Asia.

In Connecticut, however, the beetle was found in live trees, some of which appeared otherwise healthy, in four towns in the southern part of the state in September and October, 1998. The towns are: Greenwich and Stamford in Fairfield County, and Milford and North Haven in New Haven County. The attack of live trees may signal an ominous change in the behavior of this foreign beetle.

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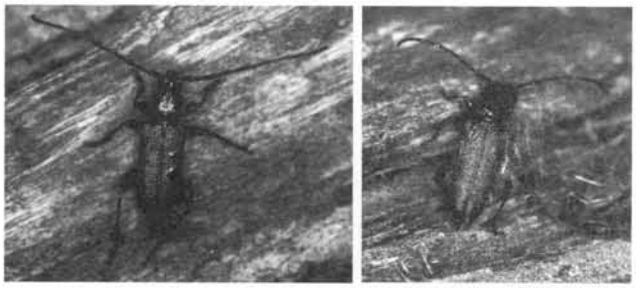
This beetle is a threat to the thriving nursery industry in Connecticut, which produces and exports plants worth millions of dollars annually.

Arborvitae are important to the nursery trade because these popular shrubs are grown widely and sold by nurserymen to be planted especially near homes and commercial buildings. In addition to arborvitae and its normal host, Japanese cedar (*Cryptomeria japonica*), the beetle attacks other plants in the cedar family, including one or more species of cypress (*Cupressus*), false cypress (*Chamaecyparis*), and juniper (*Juniperus*). In Connecticut, this pest also may threaten the health of native trees in the cedar family, such as eastern red cedar (*Juniperus virginiana*) and the highly-prized Atlantic white cedar (*Chamaecyparis thyoides*). The beetle also infests posts of cedar.



Photos by Jeffrey Fengler

Figure 1. Japanese cedar longhorn beetles. Male left, female right.

Adults emerge in April and May and mate on shrubs

Adult beetles vary from one-quarter to three-quarter inch long. The males are iridescent deep blue to black with brownish red to red patches on the upper part of the wing covers and have a reddish-orange abdomen. The antennae of the male are slightly longer than his body. The female has reddish brown wing covers and a reddish-orange abdomen. The antennae are about three-fourths the length of her body.

The smaller Japanese cedar longhorn beetle has one generation per year. Adults emerge in April and May and mate on shrubs. Females lay eggs in the cracks and crevices on stems and under bark. After hatching, the larvae bore first into the cambium and the phloem and later into the xylem, disrupting the transport of nutrients and water. In late summer or early autumn, the larvae burrow into the sapwood to make oval pupal chambers. The larvae pupate in the chambers and transform to adults in the fall. Adults remain in their individual pupal cells until they emerge in spring.

New infestations are detected most easily between late summer and spring when the bark on branches splits to reveal the winding larval tunnels, which are filled with chewed wood fragments and excrement (Fig. 2). In some cases, larvae may girdle branches. In other instances, there is little external evidence of a larval infestation.

How this beetle reached Connecticut is a mystery. Most infested arborvitae were shipped to garden centers in southern Connecticut from the Pacific Northwest during the spring of 1997 or 1998. To date, no infestations have been found at the western localities where the plants were grown. Interestingly, the smaller Japanese cedar longhorn beetle has been intercepted in wood material hundreds of times by USDA inspectors at ports-of-entry in the United States.

With Carol Lemmon, deputy state entomologist, who handles regulatory aspects, I plan to determine where this beetle is established in Connecticut. The principal method of detection is to capture beetles on sticky bands wrapped

For the latest information on the smaller Japanese cedar longhorn beetle, visit the Experiment Station's website at: www.state.ct.us/caes/longhorn.htm

around cut two-foot sections of trunks of arborvitae or eastern red cedar. Adult beetles become trapped on the sticky bands after they arrive to mate or lay eggs. Most of these trap-logs are near potential host plants in garden centers and elsewhere within a one-mile radius of areas with previous infestations. Others are in wild stands of eastern red cedar, plantings of northern white cedar, or forests of Atlantic white cedar throughout the state. Before I use each log in garden centers or yards, I freeze it at –60C to prevent the accidental introduction of wood-inhabiting insects into the areas to be surveyed. I will also try to capture beetles in traps baited with cedar oil.

The period of adult emergence, the preferred plants for egg-laying, and potential larval host plants will also be investigated. These experiments will be performed in two USDA-approved, screened quarantine buildings that recently were constructed at Lockwood Farm in Hamden. The results of these studies will help in devising control methods for the beetles.

Figure 2. A branch of arborvitae showing the larval damage of the smaller Japanese cedar longhorn beetle. The winding larval tunnel is filled with chewed wood fragments and excrement.

Forest management practices may reduce damage caused by canker of black birch

By Francis J. Ferrandino, Jeffrey S. Ward, and Sandra L. Anagnostakis

Black birch (*Betula lenta*) is an increasingly important component of the hardwood forests in Connecticut because it resists damage due to deer and insects.

Long straight black birch logs are shaved to produce sheets of veneer for cabinet makers. A common canker disease, however, can cause defects along the trunk, rendering the tree valueless for anything but firewood. The canker is caused by the fungus, *Nectria galligena.* The spores of this fungus are washed into open wounds in the bark during or immediately following rain. Wounds may be caused by burrowing insects, frost cracks, damage due to crossed branches or climbing vines, cracking, or the death of a side branch.

Once inside the tree, the fungus spreads in the cambium and kills the living tissue underneath the bark. The outer covering of bark remains intact for several years while the only outward sign of infection is flattening on the canker side where little or no new wood or bark is produced. The dead bark eventually sloughs off leaving an open-faced canker (Fig. 1). The tree responds by producing profuse amounts of callus tissue (cross-section, inset Fig. 1) in an attempt to wall off the fungus. Healthy fast-growing trees can often wall off the invader and close over the canker. However, if the tree grows slowly or is weak, it is quickly girdled and dies. Our dual goals in studying this forest disease are to estimate its present impact on Connecticut forests and learn how to avoid future problems.

The tree responds by producing profuse amounts of callus tissue in an attempt to wall off the fungus.

The first person in the United States to report Nectria canker on black birch (*Betula lenta*) was G.P. Clinton of The Connecticut Agricultural Experiment Station. He found cankered birch trees in New Haven in 1906. He called the disease "European canker", because it had only been reported in Europe. Nectria canker had been a well-known problem on European apples since the 17th Century. It is probable that early settlers brought the fungus to the New World with apple trees. Although the disease is now widespread throughout Connecticut, its severity varies with location.

We are fortunate that Henry W. Hicock and others from The Connecticut Agricultural Experiment Station established some forest research plots in 1926. Three, in the Meshomasic State Forest near Portland, were protected and unmanaged since then. The tracts were first inventoried in 1926-27 and every decade thereafter (with the exception of 1947).

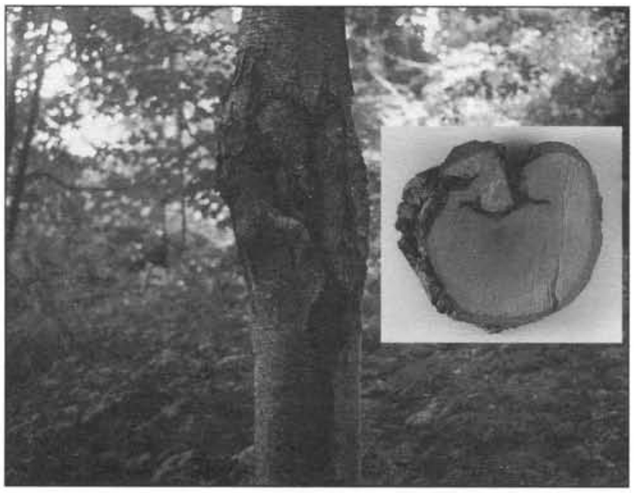


Figure 1. Black birch in forest showing callus tissue created in response to infection by Nectria canker. Inset is a cross-section of a callused tree showing how growth is occuring and walling off the infected tissue.

During the 1997 assay, the incidence and severity of Nectria canker on black birch were recorded. About 8% of 1560 black birch were cankered. Nectria canker was not evaluated when the plots were established; however, in a 1934 survey of tree diseases Station scientists R. Kienholz and C.B. Bidwell found that more than 21% of the 2400 black birch trees assayed in Meshomasic State Forest were cankered.

In the 1930's, the forests in Connecticut were young (<50 years old) because most forested land had been cut by 1900. When the age distribution of trees for the unmanaged plots is compared to the 1934 survey, we see a five-fold increase in trees older than 50 years. For this reason we examined the age distribution of the cankered trees in these two assays.

Figure 2 shows the relationship between the distributions observed in 1934 (black bars) and unmanaged (white bars). In the earlier survey, trees between 20 and 40 years of age had the highest infection rate (17%-29%). This contrasts with the much lower infection rates for all but the oldest trees in the 1997 survey in the unmanaged plots.

Studies in Pennsylvania have shown that most Nectria cankers on black birch (>50%) are initiated when the host tree is between 7 and 14 years of age, and fully 95% of the cankers began on wood less than 20 years old. Therefore, cankers on old trees (>60 years) probably were initiated at least 40 years ago.

A tree, once cankered, is highly likely to be re-infected

One might hypothesize a reduction in inoculum or some long term climatic change to explain the low levels of canker in the last few decades. To test this possibility, Nectria canker was also sampled at four young sites within Meshomasic State Forest which were clear-cut between 25 and 30 years ago. Within these clearcuts, 64 Nectria cankers were found on 22 black birch trees out of a sample of 374 (6%). This is over three times the 2% in the unmanaged

Birch Lore

Black birch, also called "sweet birch" or "cherry birch", is a major constituent of Connecticut forests. The tree readily reseeds and dominates recently cleared forest sites. The leaves and bark of the tree contain an aromatic oil (methyl salicylate) which makes them unpalatable to deer. This protects young birch saplings from damage due to deer browse in the winter months. The foliage of this tree is also less favored by gypsy moth caterpillars which would much rather eat oak leaves. Chemically, this oil is indistinguishable from Oil of Wintergreen (a small old world shrub).

Classic New England "birch beer" is made from the bark of black birch. The following is an old English recipe for the beer:

"To every Gallon of Birch-water put a quart of Honey, well stirr'd together; then boil it almost an hour with a few Cloves, and a little Limon-peel, keeping it well scumm'd. When it is sufficiently boil'd, and become cold, add to it three or four Spoonfuls of good Ale to make it work...and when the Test begins to settle, bottle it up . . . it is gentle, and very harmless in operation within the body, and exceedingly sharpens the Appetite, being drunk ante pastum."

Native Americans also drank the sap without previous fermentation, mostly as a form of traditional medicine. The Cherokee chewed the leaves to treat dysentery and used tea made from the bark to treat colds and stomach ailments. The Delaware used the bark decoction as a cathartic or emetic. The Iroquois used it for colds, fever and soreness. The Ojibwa used the bark as a diuretic. The major ingredient in Sweet Birch oil is closely related to aspirin. The oil remains in use as a counter irritant for arthralgia and neuralgia, usually in balms, liniments, and ointments (active ingredient of Ben-Gay).

Like maple sap, the sap can be made into a syrup or a sugar after boiling down. The oil distilled from the wood is insecticidal and can be used to preserve furs. It is used in very small quantities to impart a wintergreen flavor in such things as baked goods, candies, chewing gums, dairy desserts, gelatins, puddings, and root beer.

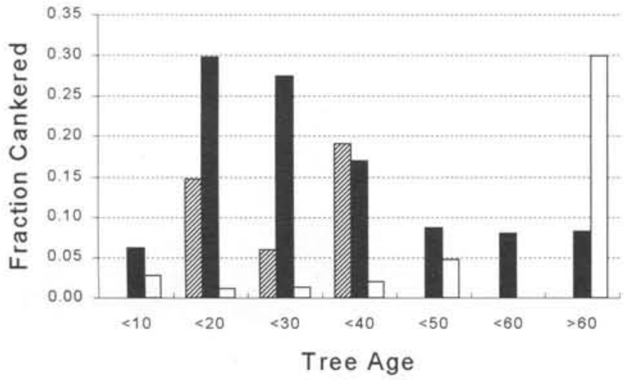


Figure 2. Necria canker incidence among tree age categories from Keinholz and Bidwell's 1934 survey, (black), unmanaged plots (white) and clearcut measurement (striped), both from the 1997 survey.

plots for trees between 20 and 30 years of age (Fig. 2: Unmanaged). Two additional young forest plots (one 20 years and one 31 years of age) in Naugatuck State Forest outside Naugatuck, were also assayed. In these plots, 70 cankers were found on 20 of the 130 (15%) black birch trees examined. The findings indicate that inoculum was present and climate was favorable for infection during the past 40 years.The disease, however, seems to favor sites which have been previously cut.

After spring rains, the fungus produces small red fruiting bodies, called perithecia, which form around the perimeter of the canker (Fig. 3, top). Inside these perithecia are hundreds of spore-containing tubes called asci (Fig. 3, bottom). When mature, the tubes shoot spores into the air. Carried by wind, rain or insects to a wound in the tree bark, these spores start a new canker.

New cankers tend to be clumped in space around the infected tree. In particular, a tree, once cankered, is highly likely to be re-infected. For younger trees (< 60 years) in the unmanaged plots there are less than 1.5 cankers per infected tree. The older trees (>60 years) in this plot, however, have an average of 3.9 cankers per infected tree, the clearcut plots range from 2.5 to 3.8 cankers per infected tree, and the trees in the 1934 assay average 4.6 cankers per infected tree. Since we know the location of every tree in the assay we can also calculate the tendency for cankered trees to be near each other. The result of our analysis implies that trees within 100 feet of a cankered tree are more likely to be cankered. This result tells us something about how far a Nectria spore can travel and still infect.

Early workers found it difficult to isolate the pathogen from canker tissue due to the many decay organisms found in cankers. We have developed a method for isolating the fungus from canker tissue using "Granny Smith" apples. Apples are carried to the forest during survey trips, and small pieces of cankered bark are cut with a sterile pocket knife and stabbed into the apple flesh.

The fungus is in a dark discoloration of the apple tissue expanding very slowly from the bark chip. Pure cultures are recovered by removing a bit of the discolored tissue and placing it on a petri plate containing potato dextrose agar. Exposure to ultraviolet light and repeated transfers of cultures has produced three creamy-white "marked" strains that differ in color from the darker "wild" strains. We have reintroduced marked strains into tree wounds and have shown they will cause cankers. We will follow the spread of these marked strains in the forest.

Although the impact of Nectria canker on Connecticut forests is highly variable, it is strongly tied to the way the forest has been managed in the past. Our preliminary studies show that if all older trees in a stand are cut, Nectria canker incidence may increase in the next generation. However, if some old trees remain, there is less disease. This suggests that if certain healthy larger trees are left standing at some optimal density, the seedlings that emerge may be protected from Nectria canker.

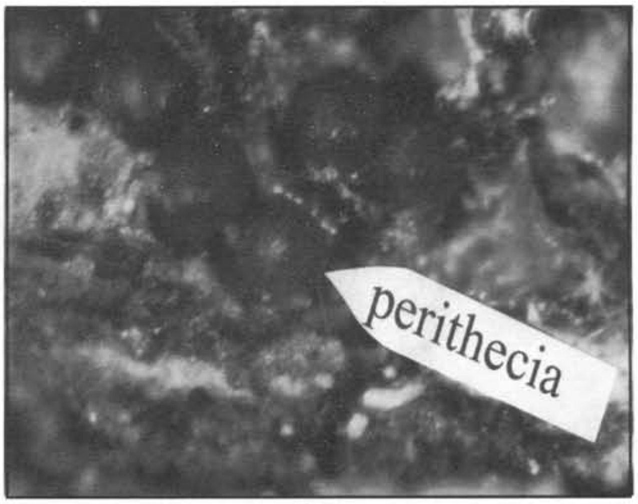
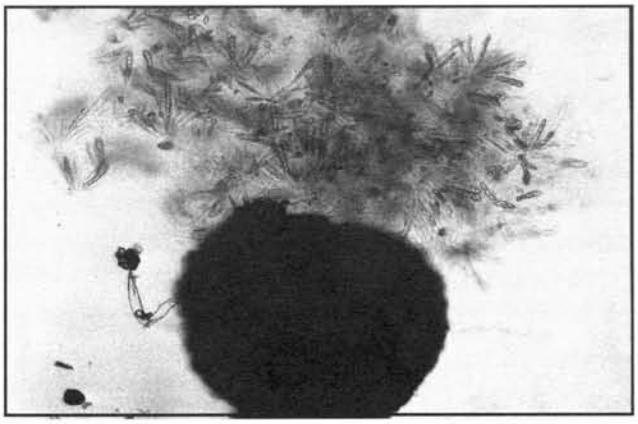


Figure 3. Top. Round fruiting bodies of *Nectria galligena* form around the perimeter of a canker in early spring rains. Bottom. Microscopic view of perithecia showing the enclosed tubes (asci) which contain ascospores. These spores are forcibly ejected when the tubes are mature.



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Jeffrey S. Ward is studying natural changes in forests

Sandra L. Anagnostakis propagates chestnuts and studies control of chestnut blight through hypovirulent strains

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