Tree and Shrub Pathogens New or Noteworthy in New York State

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ABSTRACT

SINCLAIR, W. A., and G. W. HUDLER. 1980. Tree and shrub pathogens new or noteworthy in New York State. Plant Disease 64:590-592.

For New York State, *Bursaphelenchus lignicolus* associated with mortality of *Pinus sylvestris* and *P. thunbergii, Phomopsis eleagni* causing cankers and death of *Eleagnus angustifolia*, and *Scirrhia acicola* causing brown spot needle blight of *Pinus mugo* are first records of these pathogens. *Monostichella robergei* causing bud mortality and twig cankers on *Ostrya virginiana* and *Endothia gyrosa* causing perennial cankers on branches of *Fagus sylvatica* are newly reported aspects of these suscept-pathogen relationships. Canker formation by *Cenangium ferruginosum* on cold-injured *Pinus* spp., association of *Fusarium oxysporum* with root rot and mortality of 2-yr-old seedlings of three coniferous species, *Verticicladiella procera* causing root necrosis and death of *Pinus strobus*, and the association of *V. procera* with lesions on roots of *P. resinosa* in poorly drained soils are described.

Published records of plant diseases that are new or unusual in a geographic region are useful to diagnosticians and to plant pathologists with commodity-oriented responsibilities. Here we present observations of first occurrence or new aspects of diseases of trees or shrubs caused by eight pathogens in New York State.

***Bursaphelenchus lignicolus* Mamiya & Kiyokara, 1972, on *Pinus sylvestris* L. and *P. thunbergii* Parl.** In August 1979, after learning of the discovery of *B. lignicolus*, the pine wood nematode, in Missouri (9), we examined nematodes associated with previously unexplained mortality of Scots and Japanese black pines in Suffolk County, Long Island. Nematodes that matched the description of *B. lignicolus* (15) were readily extracted by a modified Baermann funnel procedure from xylem of trunks and branches of dying and recently killed *P. thunbergii* at three locations and *P. sylvestris* at one of these. Identification of the nematode was confirmed by A. M. Golden and W. F. Friedman of USDA-SEA and APHIS, respectively. Affected trees displayed abrupt cessation of growth followed by fading and browning of foliage at any time during the growing season. Needles adhered tightly to the dead twigs of most branches but were cast from some. Symptoms on the branches of a given tree often developed asynchronously. Insects, wood-staining fungi, and additional types of nematodes, both aphelenchoid and saprophytic, were found in xylem of trees with brown foliage. Before symptomatic branches or stems were attacked by insects, however, the wood appeared normal in color and the only species of nematode found was *B. lignicolus*.

0191-2917/80/06059003/$03.00/0

***Scirrhia acicola* (Dearn.) Siggers on *Pinus mugo* Turra.** *Lecanosticta acicola* (Thüm.) Syd., the asexual state of *S. acicola*, was found associated with typical brown spot needle blight (17,18) on mugo pine in a long-established, sheared hedge at Penn Yan, Yates County, in September 1976. The disease came to our attention via the Cornell Insect and Plant Disease Diagnostic Laboratory, where the diagnosis was made by D. Pinnow. We visited the site, corroborated the diagnosis, and searched unsuccessfully for additional cases of brown spot. Specimens were deposited in the Cornell University Plant Pathology Herbarium (CUP, No. 55039). To date this is the only report of *S. acicola* in New York.

***Phomopsis eleagni* (Carter & Sacamano) R. H. Arnold & Carter on *Eleagnus angustifolia* L.** A landscape planting of *E. angustifolia* (Russian olive) at Corning, Steuben County, badly damaged by *P. eleagni*, came to our attention in September 1978. The trees were of 4–6 cm caliper and had been in place 1 yr. Cankers on branches and trunks and characters of the fungus in culture were typical of those described from midwestern locations (1,4). Dissections showed that some cankers on trunks had developed before the stock was planted and that additional cankers formed in 1978. The trees, from a source in Iowa, had not previously been planted in New York, although they had passed through the storage and shipping facilities of two New York nurseries. Records at the Cornell Insect and Plant Disease Diagnostic Laboratory showed five diagnoses of Phomopsis or Fusicoccum cankers on Russian olive, all during 1976–1978. In the single case for which a specimen was available, we could not confirm the diagnosis. To date the specimens from Corning, deposited in CUP (No. 58374), constitute the only authenticated record of *P. eleagni* in New York.

***Monostichella robergei* (Desm.) Höhnel on eastern hophornbeam.** *M. robergei*, the asexual state of *Spaerognomonia carpinea* (Fr.) Poteb. (20), is a common and widespread cause of necrotic blotches on leaves and premature defoliation of *Ostrya virginiana* (Mill.) K. Koch (eastern hophornbeam) and *Carpinus caroliniana* Walt. (American hornbeam or blue beech) in the United States and Canada (5,6). The fungus produces subcuticular acervuli on blighted leaves. In Europe, *M. robergei* has been associated with leaf blight (16,20) and dieback (20) of *Carpinus betulus* L., the European hornbeam. Pathogenicity of *M. robergei* on foliage of *C. betulus* was shown by Schneider and Sauthoff (20), who apparently regarded twig mortality as a secondary phenomenon caused only indirectly by the defoliating influence of the fungus.

In July 1978, *M. robergei* was found associated with a twig blight epidemic on drought-stressed *O. virginiana* in western New York. Cankers (Fig. 1) on 1-yr-old twigs, and occasionally on older twigs up to 1 cm in diameter, caused bud mortality and dieback. The reddish brown surface of bark in the cankers contrasted with the greenish brown of healthy bark. Cracking and swelling in bark associated with callus formation at canker margins allowed distinction between cankers and dead distal parts of twigs encircled by cankers. The foliage on girdled twigs dried to a tan color and was retained during the remainder of the growing season, creating hundreds of small "flags" on otherwise green trees. Cankers on 1-yr-old twigs originated at buds, thus in leaf axils of the previous season, suggesting that the pathogen had reached twigs via petioles. Acervuli of *M. robergei* were found on killed twigs and in both new and 1-yr-old cankers. These acervuli developed subcortically, rupturing the surface of the bark as they matured. Specimens were deposited in CUP (No. 58342). *C. caroliniana*, growing close to twig-blighted *O. virginiana*, showed no such symptoms or signs.

M. robergi was readily isolated from lesions on leaves or twigs of *O. virginiana*. On malt extract agar or potato-dextrose agar, the fungus formed conidia but no fruit bodies in cultures several days old. Acervuli formed after several weeks and were noted first on the pieces of host tissue from which colonies arose. The fungus consistently caused the formation

of brown crystals of unknown composition in each of several media. This characteristic was useful for diagnosis.

One isolate (T1049A) was used for pathogenicity tests on twigs. The fungus was grown 5 wk on a 1.5% agar medium containing 10 g of glucose and 10 g of ground hophornbeam twigs per liter. Small pieces (about 2–3 mm^3) of agar with mycelium plus conidia were applied beneath flaps of bark or bark plus wood 1–2 cm long on internodes 1–4 yr old. Ten twigs on each of four trees were thus inoculated. Control wounds (10 twigs on each of two trees) received only the agar medium. Each wound was wrapped with Parafilm. The inoculations were made 23 April 1979 as buds were opening and after sap began to run but before the bark could be easily separated from the wood.

Ten inoculated twigs were collected for examination after 3 wk, and, other than slight brownish discoloration of some wound flaps and edges, no abnormalities were noted. After 7 wk, however, 27 of the remaining 30 inoculated twigs, but none of the controls, had cankers. These encircled and killed some twigs of all sizes. Acervuli of *M. robergei* had formed in one canker on a twig of 1 cm diameter. The fungus was reisolated in each of five attempts.

Observations in central and western New York in 1979 suggested that inconspicuous twig mortality caused by *M. robergei*, followed or accompanied by leaf blight, occurs each year. The conspicuous flagging in western New York in 1978 was exceptional.

***Endothia gyrosa* (Schw. ex Fr.) Fr. on branch cankers on *Fagus sylvatica* L.** *E. gyrosa*, recognized in recent years as a significant pathogen of oaks and Formosan sweetgum (*Liquidambar formosana* Hance) (19,21), is reputed to be only a weak parasite of American (*F. grandifolia* Ehrh.) and European (*F. sylvatica*) beech trees (11), causing cankers on the exposed roots. Weir (26) showed its pathogenicity on exposed roots of *F. grandifolia*. Here we record the association of *E. gyrosa* with perennial cankers on major branches of European beech. The disease was found at Mineola, Nassau County, in 1977. Each canker was centered on the stub of a smaller branch. The single tree bearing cankers was in a group under study for diagnosis of a disorder characterized by poor vigor and dieback. Thus, the suggestion of pathogenicity only on previously weakened tissues of beech must be carried forward.

Twig and branch death on introduced *Pinus* spp. caused by *Cenangium ferruginosum* Fr. ex Fr. In June 1977, conspicuous branch and twig mortality developed on Japanese black pine (*Pinus thunbergii* Parl.) in many landscape plantings on Long Island. Branches and twigs with brown foliage occurred throughout the crowns of trees of all ages and sizes, but in no case was an entire tree killed. Immature fructifications were evident in bark immediately distal to the sharply demarcated interface of necrotic and healthy tissues. By mid-July, apothecia that matched the description of *C. ferruginosum* (10,25) were present. Cultures from necrotic bark on nutrient agar were similar to those described for *C. ferruginosum* (14). This outbreak was notable because Japanese black pines on Long Island had not previously sustained disfiguring branch dieback from any cause. The disease caused alarm among nurserymen, landscapers, and property owners because only Japanese black pine among coniferous ornamentals on Long Island has tolerated salt spray and remained relatively undamaged by insects and diseases. *C. ferruginosum* also caused branch mortality on *P. densiflora* Sieb. & Zucc. and *P. nigra* Arnold in New York City in 1977. No damage was observed after that year. *C. ferruginosum* is reputed to be a weak parasite that attacks trees stressed by environmental factors. The 1976–77 winter was one of the coldest on record. We suspect that freezing injury predisposed the pines to attack.

Root rot of coniferous seedlings by *Fusarium oxysporum* Schlecht. Seedlings of *Abies balsamea* (L.) Mill., *Pinus resinosa* Ait., and *Pseudotsuga menziesii* (Mirb.) Franco (balsam fir, red pine, and Douglas-fir, respectively) in their second season of growth in a forest nursery showed stunting, chlorosis, cortical decay of roots, and death. *F. oxysporum* isolated from diseased roots quickly killed newly germinated pine and Douglas-fir seedlings and caused lesions on roots of older seedlings of Douglas-fir grown in a soil-vermiculite (1:1) mixture in pathogenicity trials. Damping-off and root rot of coniferous seedlings by *F. oxysporum* during the first growing season are common in the Pacific Northwest (2,3). This occurrence was unusual for its northeastern location and for the continuation of mortality beyond the first growing season.

Root lesion disease of pines caused by *Verticicladiella procera* Kendrick. The fungus is widespread in New York, causing girdling cankers on roots and stem bases leading to death of *Pinus strobus* L. (eastern white pine) and cankers on roots of *P. resinosa* Ait. (red pine). In 1978, we isolated *V. procera* from the bark of cankers on large roots of dead and dying white pines in Tompkins County. Resin-infiltrated wood beneath the cankers did not yield the fungus. Observations and isolations indicated that *V. procera* spreads proximally along roots, apparently during several years, causing large cankers that eventually coalesce at the butt and kill the tree. Growth reduction is apparent one to two seasons before death. Symptoms typical of those caused by *V. procera* (8,24) were observed on white pines in Allegheny, Clinton, Nassau, Steuben, Tompkins, and Wayne counties. Planted and naturally seeded trees up to 20 yr old in landscapes and forests were affected, always on soils with poor internal drainage. The symptoms and conditions of occurrence are like those of an undiagnosed lethal disease of eastern white pine called "resinosis" (27) that received attention from forest pathologists in the 1930s. Houston (12) found *V. procera* to be an infrequent inhabitant of basal cankers on stems of eastern white pine on the Tug Hill Plateau in northern New York and proved its ability to cause cankers. This is the first confirmation of its activity as a tree-killing root pathogen of white pine in New York State.

On red pine, *V. procera* is associated with lesions on roots of slowly growing or declining trees on poorly drained sites. Site conditions and root necrosis associated with the decline were described by Stone et al (22,23). They and Dement and Stone (7) showed that discrete lesions were part of the syndrome and that their frequency was related to the quality of soil drainage. From such lesions in roots from Chautauqua, Columbia, Montgomery, and Tompkins counties, D. S. Welch isolated a fungus identified by Kendrick (13) as *V. procera*. Here we report further documentation of the

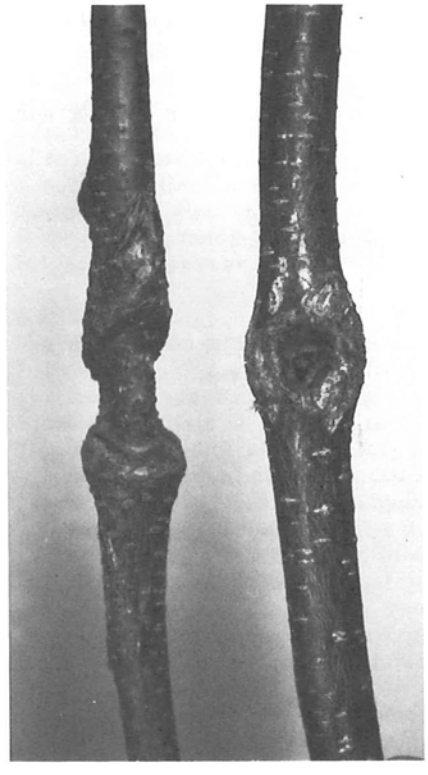

Fig. 1. Inactive 1-yr-old cankers caused by *Monostichella robergei* on 2-yr-old twigs of *Ostrya virginiana*. The cankers originated at nodes. These cankers were unusual in failing to encircle and kill the twigs. Swelling around margins became apparent 1 yr after canker formation.

association among site conditions, lesions, and fungus. In a 29-yr-old red pine plantation where trees in a poorly drained area had either died or grown very slowly, root segments 6–35 mm in diameter were dug from a transect running from well-drained to poorly drained soil. Segments from well-, intermediately, and poorly drained soil were collected separately, each group having an aggregate length of 32–38 m. After the segments were washed, the total length of roots in each sample, the number of lesions, and the proportion of total length dead were recorded. These proportions were 29.6, 7.1, and 0% for poorly, intermediately and well-drained soil, respectively. Counting dead distal portions as single lesions, the numbers of lesions per meter of sample were 8.2, 5.2, and 1.0, respectively. Lesions were classed as inactive or, if noncrystalized resin occurred on or in them, as active. Isolations on acidified malt extract agar were made from 79 active and 60 inactive lesions and 25 segments of apparently healthy root. Fungi were tallied in eight groups. *V. procera*, isolated from 13 lesions, was the only organism associated exclusively with active lesions. All other fungi grew with comparable frequency from active and inactive lesions and, less frequently, from bark of healthy segments.

Lesions caused by *V. procera* are much smaller in red pine than in white pine, and there is no evidence that mortality of the former species on poorly drained sites is caused directly by this fungus.

LITERATURE CITED

1. ARNOLD, R. H., and J. C. CARTER. 1974. *Fusicoccum eleagni*, the cause of a canker and dieback of Russian olive, redescribed and redisposed to the genus *Phomopsis*. Mycologia 66:191-197.
2. BLOOMBERG, W. J. 1971. Diseases of Douglas-fir seedlings caused by *Fusarium oxysporum*. Phytopathology 61:467-470.
3. BLOOMBERG, W. J., and W. LOCK. 1972. Strain differences in *Fusarium oxysporum* causing diseases of Douglas-fir seedlings. Phytopathology 62:481-485.
4. CARTER, J. C., and C. M. SACAMANO. 1967. Fusicoccum canker, a new disease of Russian olive. Mycologia 59:535-537.
5. CONNERS, I. L. 1967. An annotated index of plant diseases in Canada. Can. Dep. Agric. Publ. 1251. 381 pp.
6. CROPS RESEARCH DIVISION, Agricultural Research Service, U.S. Department of Agriculture. 1960. Index of plant diseases in the United States. U.S. Dep. Agric. Handb. 165. 531 pp.
7. DEMENT, J. A., and E. L. STONE. 1968. Influence of soil and site on red pine plantations in New York II. Soil type and physical properties. Cornell Univ. Agric. Exp. Stn. Bull. 1020. 25 pp.
8. DOCHINGER, L. S. 1967. Leptographium root decline of eastern white pine. (Abstr.) Phytopathology 57:809.
9. DROPKIN, V. H., and A. S. FOUDIN. 1979. Report of the occurrence of *Bursaphelenchus lignicolus*-induced pine wilt disease in Missouri. Plant Dis. Rep. 63:904-905.
10. FERCHAU, H. A., and T. W. JOHNSON. 1956. Taxonomy of the Cenangium dieback fungus. For. Sci. 2:281-285.
11. HEPTING, G. H. 1971. Diseases of forest and shade trees of the United States. U.S. Dep. Agric. Handb. 386. 658 pp.
12. HOUSTON, D. R. 1969. Basal canker of white pine. For. Sci. 15:66-83.
13. KENDRICK, W. B. 1962. The *Leptographium* complex. *Verticicladiella* Hughes. Can. J. Bot. 40:771-797.
14. KOBAYASHI, T., and Y. MAMIYA. 1963. A Cenangium causing dieback of Japanese pines. Gov. For. Exp. Stn. Bull. 161:123-150.
15. MAMIYA, Y., and T. KIYOHARA. 1972. Description of *Bursaphelenchus lignicolus* n. sp. (Nematoda: Aphelenchoididae) from pine wood and histopathology of nematode-infested trees. Nematologica 18:120-124.
16. MELIK-KHACHATRYAN, D. G. 1955. On some imperfect parasitic fungi in the Armenian S.S.R. Nauchn. Tr. Erevan. Univ. Ser. Biol. 49:119-145 (In Russian) [Abstr. in: Rev. Appl. Mycol. 37:709, 1958.]
17. PHELPS, W. R., A. G. KAIS, and T. H. NICHOLLS. 1978. Brown-spot needle blight of pines. U.S. Dep. Agric. For. Serv. For. Insect Dis. Leafl. 44. 8 pp.
18. PUNITHALINGAM, E., and I. A. S. GIBSON. 1973. *Scirrhia acicola*. CMI Descr. Pathogenic Fungi Bact. 367. 2 pp.
19. ROANE, M. K., R. J. STIPES, P. M. PHIPPS, and O. K. MILLER, JR. 1974. *Endothia gyrosa*, causal pathogen of pin oak blight. Mycologia 66:1042-1046.
20. SCHNEIDER, R., and W. SAUTHOFF. 1972. Absterbeerscheinungen an *Carpinus betulus* L. (Erreger: *Monostichella robergei* [Desm.] v. Hohn.). Nachrichtenbl. Deutsch. Pflanzenschutzd. 24:117-119.
21. SNOW, G. A., J. W. BELAND, and F. J. CZABATOR. 1974. Formosan sweetgum susceptible to North American *Endothia gyrosa*. Phytopathology 64:602-605.
22. STONE, E. L., R. R. MORROW, and D. S. WELCH. 1954. A malady of red pine on poorly drained sites. J. For. 52:104-114.
23. STONE, E. L., G. TAYLOR, N. RICHARDS, and J. DEMENT. 1958. Soil and species adaptation: red pine plantations in New York. Proc. North Am. For. Soils. Conf. lst, pp. 181-184.
24. TOWERS, B. 1977. The occurrence of *Verticicladiella procera* in Pennsylvania. Plant Dis. Rep. 61:477.
25. VAN VLOTEN, H., and J. GREMMEN. 1953. Studies in the discomycete genera *Crumenula* de Not. and *Cenangium* Fr. Acta Bot. Nederl. 2:226-241.
26. WEIR, J. R. 1926. Notes on the parasitism of *Endothia gyrosa* (Schw.) Fr. Phytopathology 15:489-491.
27. YORK, H. H., R. E. WEAN, and T. W. CHILDS. 1936. Some results of investigations on *Polyporus schweinitzii* Fr. Science 84:160-161.