1920

Notes on some diseases of aspen

Carl Hartley

Glenn G. Hahn

NOTES ON SOME DISEASES OF ASPEN

CARL HARTLEY AND GLENN G. HAHN

WITH THREE FIGURES IN THE TEXT

The quaking aspen, *Populus tremuloides* Michx., probably the most widely distributed American forest tree, is in places unusually subject to disease. In the Pike's Peak region in east-central Colorado diseases are so destructive as to suggest that they may be quite as largely responsible there for the short life of aspen stands as the shading by the more tolerant conifers, to which aspen replacement in the East is commonly ascribed. The damage done by disease in the aspen in this district is not equalled in any other native American tree of which the writers have knowledge in any part of the country. Death of isolated trees as well as of those in groups regularly occurs much before maturity. Observations in the Wasatch Mountains of Utah, where aspen seems to be a less temporary forest type, indicate that diseases are decidedly less destructive there. The most prominent of the diseases noted are described in the following:

LEAF TROUBLES

The most prevalent leaf disease in the Pike's Peak region is that caused by *Sclerotium bifrons*. The disease is characterized by the death of the entire leaf. Half of the foliage over considerable forest areas is sometimes killed. The greatest prevalence is near streams. The dead leaves are typically persistent until autumn. In August one to five, or more, definitely outlined areas in each leaf become thicker and darker than the rest of the leaf, and usually drop out before the leaf falls, resulting in a shot-hole effect. The sclerotia vary from brown to black, with nearly white interior tissue. They are circular, ellipsoid, or sometimes irregularly lobed, with diameters usually between 2 and 8 mm., 3.5 mm. being a very common diameter. Attempts were made to develop fruits from these sclerotia. Fresh sclerotia were washed in mercuric chloride solution and planted in six different kinds of nutrient agar (prune, rice-stem, potato, cornmeal, beef and saccharose, and cornmeal and saccharose). The cultures either remained sterile, or yielded only *Cytospora* sp., which fruits commonly on dead aspen bark in the Pike's Peak region. Sclerotia placed on the ground in loose cloth sacks near the point of collection (9000 feet

elevation, Pike National Forest) and at Great Falls, Virginia, in the autumn, showed no change by the following spring. Possibly cultures from these over-wintered sclerotia would have been more successful.

The fungus has been found abundantly by Dr. G. G. Hedgcock and the writers on the Pike, Colorado, Rio Grande, San Isabel, San Juan, Uncompaghre, and Montezuma National Forests, Colorado, and by Dr. Perley Spaulding practically throughout New England and the Adirondack region. In Utah it has been observed, but less commonly. Specimens have been secured from the Hayden National Forest, Wyoming, collected

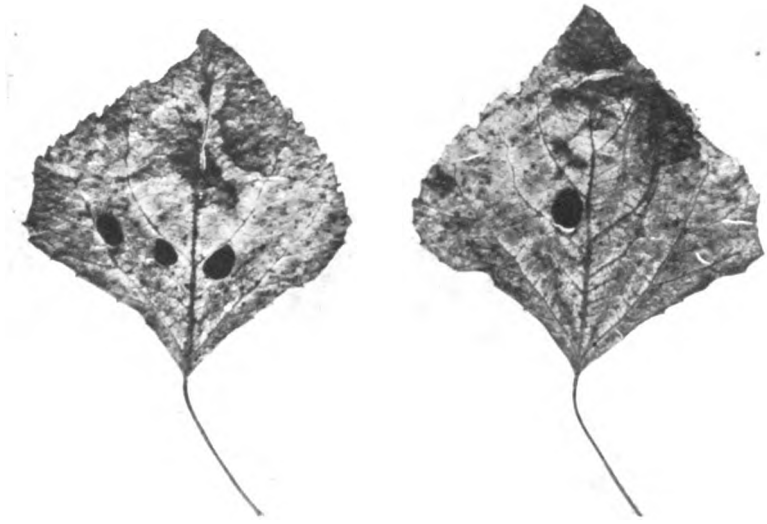

FIG. 1. LEAVES OF LOMBARDY POPLAR KILLED BY SCLEROTIUM BIFRONS

The sclerotium in the right-hand leaf has commenced the process of separation from the leaf which ultimately gives a shot-hole effect.

by Mr. A. M. Cook. In the Adirondacks, Dr. Spaulding's notes state that in mixed stands of *P. tremuloides* and *P. grandidentata* only the former is attacked. The fungus has also been reported from Wisconsin (2). Specimens have been distributed as N. A. F. 2554 (from Ontario) and Fungi Columbiana 155 (Ottawa) and 2276 (Colorado). Specimens are now in the collections of the office of Forest Pathology, collected by Dr. G. G. Hedgcock, Doctor Spaulding, Mr. G. L. Barrus, and the writers, from *P. tremuloides* in Colorado (fifteen collections), New York (three), and Vermont (two). The only collection known to the writers on hosts other than *P. tremuloides* is from Lombardy poplar (*P. nigra italica* Du

Roi), received from Miss Ethel Paine, Heath, Massachusetts (fig. 1), (Specimen F. P. 29306).

In the spring or early summer both the youngest leaves and the tender twig tips are sometimes killed in such a way as to suggest frost injury but at times when there has been little frost While the leaves do not persist and bear sclerotia, there is reason to think that this phenomenon is also due to the Sclerotium.

Cultures made from an angular leaf spot rather prevalent on the Pike National Forest yielded, in additon to hyphomycetes, nothing but *Cytospora* sp.

Leaf rust, *Melampsora albertensis* Arth. (Specimens F. P. 32698), is also quite common in the Pike's Peak region, fruiting conspicuously on the lower surfaces of the leaves, but does apparently little damage, not causing the premature defoliation often observed in young *Populus deltoides* affected with *Melampsora medusae* Thüm., or the blighting of leaves and lateral twigs by *Marsonia populi* (Lib.) Sacc. (5). This blight has been observed by Dr. G. G. Hedgcock to be frequent and injurious upon the Holy Cross National Forest, Colorado, and Targhee National Forest, Idaho.

TWIG TROUBLES

A disease locally prevalent in the Pike Forest, which has been observed in late summer during several different seasons, is a twig blight. The persistent blackened leaves give the trees much the same appearance as pear trees affected by fire blight. Insect tunnels were found in some of the affected twigs.

A trouble which may or may not have been connected with the death of twig terminals was a killing of short lateral twigs and isolated leaves with the same characteristic blackening and persistence. Examination of solitary dead leaves showed in part of the cases an insect larva tunnelling in the twig directly under the point of attachment of the petiole.

TRUNK TROUBLES

The heart rot due to *Fomes igniarius*, which is widely distributed on aspen (7), is common in parts of Colorado, entering relatively small stems and, after establishment in the trunk, spreading outward through both heart and sap wood until the cambium is reached and killed. Ordinarily however only the heart wood and older changing sap wood are affected.

The most serious damage to the aspen in the Pike's Peak region is from bark lesions. Three types are frequent: (1) Elongated dead areas most often formed on the south or west sides of trunks, presumably due to

FIGS. 2 AND 3. POPULUS TREMULOIDES AFFECTED WITH TYPE II CANKER, BROKEN OVER AT THE REGION OF THE LESION
Photographed by Dr. Perley Spaulding, Saranac Inn, N. Y. 1909

winter sunscald. These sometimes serve as starting points for lesions such as described under III, but do not directly cause death. They have not been commonly observed. II. Determinate cankers which may appear on any side of the tree and are not believed to be connected with sun or winter injury, though such a possibility is not excluded. In size this type of canker is usually in the earlier stages small, and may become exceedingly large, lengths of 12 to 15 feet having been observed, at times practically involving the larger part of the tree In appearance these suggest cankers caused by *Bacillus amylovorus* (Burrill) De Toni. Observation indicates that some of these cankers continue to spread, successive zones of wound callus being killed. In certain cases the parasite seemed to be able to extend the lesion the second year only at the upper margin. Lesions on the trunk often originate at branch stubs. Branches as well as main trunks may be affected. The type II canker is the most serious in the Pike's Peak region as well as in the East throughout the New England and Adirondack regions. In the latter region this canker renders the aspen worthless before it reaches available size. Here the canker, according to the observations of Dr. Spaulding, causes the aspen to be readily susceptible to mechanical injury, trees frequently breaking over at the region of the lesion (figs. 2 and 3). III. Lesions on less vigorous trees, which spread more rapidly and are not often determinate or regularly zonate. These frequently cause death by girdling. All three of these types of stem lesions are common in slow-growing stands on unfavorable sites. As these sites are in general dry, it seems probable that it is the lack of vigor of the host more than favorable conditions for parasite development which is responsible for the local variations observed in prevalance of cankers. A *Cytospora* sp. with reddish or orange-colored spore horns and closely resembling *Cytospora chrysosperma* Pers. fruits abundantly on cankers of types I and III, and very promptly on aspen killed back by any agency. On cankers of type II it seems less common than on I and III. *Dothiorella populnea* Thüm. (Specimen F. P. 32699) is frequently found mixed with the Cytospora, the pycnidia crowded on a stroma, erumpent, and fully exposed when the epidermis is entirely loosened and falls away. This fungus is of interest for it is listed by Stevens (8) as being perhaps parasitic on Populus. *Valsa sordida*[1] has also been collected on the cankers.

An interesting phenomenon possibly related to a bark disease of established trees is the bark blackening of cuttings. While *Populus alba* (4) and *P. tremula* (1) cannot be propaged from cuttings, Hedrick (6) states that cuttage is a practicable method for propagating *P. tremuloides* In an effort to test the value of aspen as a nurse tree, Mr. C. G. Bates, of the Forest Service, in 1909 set out at Halsey, Nebraska, 2600 hardwood aspen

[1] Determination by Mrs. H. E. Watkins.

cuttings, part from South Dakota, part from an isolated clump of native aspen near Halsey. Both the cuttings in the nursery and those set out directly in the sandhills callused well, and at the end of a few weeks 74 per cent had started leaves. Before roots started, the bark of all became blackened in definite patches which started at the callused surfaces or at buds, spreading till the entire cutting was involved. The planting was a total loss. Cuttings taken from the Pike Forest and planted in sand in a greenhouse at Washington, D. C., behaved in the same way, though part of them had been washed in mercuric chloride solution and the ends trimmed back with a sterile knife. In this case the cuttings which had started leaf growth blackened much earlier than those which had not. Two of these cuttings commenced to blacken at points remote from buds or visible wounds, an occurrence rarely observed. The cuttings planted at Washington were set in rows, and the living and dead mapped at intervals. No evidence was secured of the spread of the disease from foci. Inner bark cut from recently blackened areas both on diseased cuttings and in cankers found on living trees was planted in nutrient media. Beef agar, cornmeal agar, prune agar, aspen agar, and beef gelatin were employed. No organism appeared consistently and many of the plantings yielded no organism whatever. Rhizoctania hyphae were common on the surface of the diseased cuttings, but inoculation at wounds with artificial cultures of Rhizoctonia, Cytospora, and Macrosporium, the two latter taken from a canker on native aspen at Halsey, failed to give results. Pieces of recently blackened inner bark were fastened in slits in healthy bark without pathogenic results.

The rapid blackening of bark is a common phenomenon in aspen killed from any cause, and therefore is not a diagnostic character for the work of any particular disease. It is entirely possible that no parasitic action was involved in this failure of the aspen cuttings. It does not seem likely that the Cytospora so commonly found was the cause of the death of the cuttings. Another possibility which seems to the writers worthy of consideration is that much of the bark killing, both on cuttings and on trunks and possibly twigs of older trees, may be due to a bacterial organism like the *Micrococcus populi* of Delacroix (3), which he was able to cultivate only in unheated poplar bark trituration. It seems especially likely that the cankers of type II may have been caused by an organism of this type.

SUMMARY

Observations have shown quaking aspen in certain areas to be unusually subject to disease; trunk cankers of unknown origin seem to be especially important factors in shortening the life of the trees. *Fomes igniarius* is

also an important factor in causing premature death of aspen in the Pike's Peak region.

Interesting but less important diseases are (1) a twig blight suggesting in appearance the fire blight of pear; (2) a leaf disease due to *Sclerotium bifrons*, E. & E., distributed from the Rocky Mountains to New England and also attacking Lombardy poplar but not *Populus grandidentata*; and (3) a rapidly spreading bark trouble which kills cuttings.

OFFICE OF INVESTIGATIONS IN FOREST PATHOLOGY
UNITED STATES BUREAU OF PLANT INDUSTRY
WASHINGTON, D. C.

LITERATURE CITED

(1) BRETON-BONNARD, LUCIEN: Une arbre utile. Le peuplier, histoire—variétés—culture—utilité—maladies. . . . p. 25. Paris, [1904.]
(2) DAVIS, J. J.: A provisional list of parasitic fungi of Wisconsin. Trans. Wisconsin Acad. Sci. **17**: 846–984. 1914. (p. 97).
(3) DELACROIX, GEORGES: Le chancre du peuplier. Bul. Mens. Off. Renseig. Agr. [Paris] **5**: 1349–1352. 1906.
(4) GREEN, S. B.: Russian willows and poplars from hard wood cuttings. Minnesota Agr. Expt. Sta. Bul. **5**: 34–35. 1889.
(5) HALSTED, B. D. Forest fungi—anthracnose of poplars. Proc. Amer. Forestry Assoc. **11**: 176–178. 1896.
(6) HEDRICK, U. P.: Tree planting in Utah. Utah Agr. Expt. Sta. Bul. **62**: 229. 1899.
(7) SCHRENK, HERMANN VON, AND SPAULDING, PERLEY: Diseases of deciduous forest trees. U. S. Dept. Agr. Bur. Plant Indus. Bul. **149**: 27. 1909.
(8) STEVENS, F. L.: Fungi which cause plant disease. p. 499. New York, 1913.