AN ENEMY OF POPLARS AND WILLOWS.

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In the never-ending contest against insect foes the nurseryman and landscape gardener are no more exempt than men in other branches of agriculture and horticulture. They suffer from many of the enemies of the fruit-grower and of the florist and have, beside, a few troublesome pests of their own. Among the latest of these to attract attention in this State is a borer, the larva of a curculio, Cryptorrhynchus lapathi, that injures poplars and willows both in the nursery and as mature trees.

This is not really a new pest, since it was described by Linnaeus nearly a century and a half ago and has been noted in Europe as a foe to the forests for seventy-five years. It is, though, of comparatively recent occurrence in America, being first discovered near New York City in 1882. It later became quite destructive in some parts of New Jersey and Massachusetts, but did little damage in western New York until about five years ago. In 1902 some blocks of poplars and willows in nurseries near Rochester were so badly injured by the insect that some of the growers thought of abandoning the culture of these trees. Since that time the annual loss in many nurseries has been not less than 10 per ct. of the trees, and occasionally the entire planting has been ruined.

The insect has spread quite rapidly in this section of the State because of the great number of lakes, canals and small streams that are everywhere bordered with willows. These native willows have often become so badly affected that many of them will ultimately die as a result of the injury. From these trees the

*This is a brief review of Bulletin No. 281 of this Station, on the Poplar and Willow Borer, by W. J. Schoene. Any one interested in the detailed account of the investigations will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed on the mailing list to receive future bulletins of the Station, popular or complete as desired. Bulletins are issued at irregular intervals, as investigations are completed, not monthly.
insect has reached the ornamental willows in the cities and cultivated willows and poplars in near-by nurseries; so that it is now well established in many localities. The industry of growing poplars and willows is seriously threatened, as well as the usefulness and beauty of trees already mature.

While willows and poplars are not among the most prized of our trees, they serve useful purposes and are well worthy of preservation. The willows add much to the beauty of our lakes and streams, they make the best soil binders for such situations, and the ornamental species are almost indispensable in cemeteries and parks. They have, as well, no inconsiderable commercial value in some sections, where their growth for basket making is an important industry.

The poplars, on account of their hardiness and rapid growth, are invaluable as shade trees in newly planted suburbs; and some kinds, like the Lombardy poplar and "quaking aspen" fill places in landscape gardening for which there are no satisfactory substitutes.

The poplar and willow borer attacks practically all the species of poplars, willows and alders; and has also been found in red birch and dwarf birch. The importance of these trees and the rapid spread of the insect made a study of it necessary, in order, if possible, to develop methods for its control. From this study the life history of the beetle has been worked out and is substantially as follows:

While engaged in its most destructive work the pest is in its immature, or larval, stage; and is a soft, plump, fleshy, footless grub about a quarter of an inch in length when full grown. It is pale yellow in color, with head light brown and mouth parts dark brown tipped with black. This grub hatches late in August or in September from a small, yellowish-white egg that has been deposited about 15 or 20 days before, in some corky portion of the wood near a bud or branch, in the over-growths caused by pruning, or in any cut or break in the bark.

The tiny grub bores into the stems or branches and feeds upon the tender, succulent tissue just beneath the bark, the cambium
layer. It may remain in one place, making a flat, irregular-shaped chamber or channel; but more often the tunnel extends around the branch or stem nearly or quite girdling it. Frequently stems are so well inhabited that they are fairly honeycombed by tunnels. The larva works in the tunnels just beneath the bark until nearly ready to pupate, when it bores at an angle into the wood until the heart is reached. Here the little larva turns head downward and changes to a pupa. While the grub is tunneling, the chips, splinters, excrement of the larva and the exuded sap of the tree are forced out of the mouth of the tunnel; and these exudations enable the observer to tell in which part of the stem the insect is working. When the larva is busy in the cambium layer, these castings are brown or black and the splinters they contain are very fine; but the matter thrown out when the heart wood is reached is clean, usually white, and contains longer, thicker splinters than that from the sap wood. The pupa at first differs little from the larva, but wings and legs gradually develop, and in about two weeks the adult insect emerges, a beetle very similar in appearance to the ordinary plum curculio.

The beetle is dull black in color but marked with whitish scales on the rear third of the wing covers, on part of the thighs and beneath the front part of the body. These collections of scales give the appearance of whitish spots or bands on these parts of the insect. The beetles are sluggish, walking rather than running, and depending for safety on the curculio habit of dropping to the ground when disturbed, where they remain motionless and with legs curled up close to the body.

Practically all the beetles will have emerged by Feeding the last of July, so they are most numerous during habits of this month and August; but all do not die until beetle. well along in the fall. They are voracious feeders, puncturing the bark in numerous places and eating the tender tissue beneath. For the first ten days they feed on the one-year-old branches; and one observation seems to show that such wood is a necessity for them at this time. Beetles developed in a breeding cage, in which there was only the old wood from which they had emerged, appeared dead after two or three days, but revived when put on a diet of young twigs. This is probably the ripening period for egg laying and this new
wood may be a necessity for egg formation. No eggs are laid at this time, nor are the eggs ever laid in new wood. After feeding for ten days or two weeks on the new wood, the beetles mate and the females go to the old wood to deposit their eggs. If confined on young twigs when it is time to lay eggs, the beetles riddle the bark with punctures, but will not place the eggs in the holes. This peculiarity of the insect in laying eggs only in old wood is brought out clearly by a common nursery practice. A cutting of one year wood is rooted and allowed to grow from one bud. The following year this shoot and the tap root are pruned and the stock replanted. At the end of another year this is called a one-year-old tree, though it may have six or eight inches of two-year-old wood above ground. If such trees are infested, as they frequently are, the eggs are invariably inserted in this short section of old wood.

Since the larvae spend their entire lives beneath the bark and eat parts of the plant that we can not reach with poison, there is but little hope of control through the use of such materials. It was thought possible that something might be accomplished by the use of contact sprays; so several applications of such sprays were made, mostly of lime, kerosene and arsenic in combination. These were applied in the winter in the hope of suffocating the hibernating larvae, but in no case was there any appreciable effect.

Failure of these remedies leaves but one thing to be done against the larvae; that is to cut out and burn the infested parts in June, before the beetles emerge but while they are actively at work and reveal their presence by the collections at the mouths of the tunnels. When only a few trees are infested this method is not difficult to apply and gives quite effective control.

The vulnerable point in the life history of the insect is the feeding of the beetles. Since, to get at their favorite food, the cambium, they must eat holes in the bark, the use of a coating of poison upon the young twigs promised some relief. To test this quite extensive “laboratory” tests were made, with excellent results; but opportunity has not yet been given to apply the same method in actual field work. However, it seems probable that the spraying of nursery blocks with poison will be both effectual and inexpensive.
Tests with poison.

The tests made in 1905 and their results were as follows: (1) Of three pairs of beetles confined by mosquito netting on the branch of a poplar tree that had been sprayed with paris green, all died within 6 days. (2) Eight pairs of beetles were confined on each of two poplar trees in a nursery row, the tops of the trees having been headed in and sprayed with arsenate of lead. In 6 days, twenty of the thirty-two beetles were dead, and there was only a little puncturing of the bark. (3) Forty beetles were similarly confined on two trees that had been sprayed twenty days before with arsenate of lead. Though much of the poison had apparently washed off, all but one of the 40 beetles died within three weeks. (4) As a check upon these experiments, 26 beetles were confined on several unsprayed trees, as it was thought that possibly confinement might destroy the beetles. All but three of these insects were alive at the end of four weeks and the bark of each tree was badly punctured.

Similar tests made in 1906 resulted in the death, within two weeks, of forty beetles confined on trees sprayed some time previously; while only four beetles out of twenty confined on an unsprayed tree died in that time.

It was unmistakably the poison and not the confinement that killed the beetles. But it was barely possible that if not confined the beetles would avoid the poison and seek unsprayed trees; so a test was made to cover this point also. Fifteen beetles were placed in each of three glass jars, with an abundance of food in each. In the first jar all the twigs were sprayed with poison, in the second only half were sprayed and in the third none were sprayed. The beetles in the second jar evidently did not avoid the poison; for all but one died within a week, as was the case with those in the first jar. In the jar containing unsprayed twigs thirteen of the fifteen beetles were alive at the end of the week.

From these tests it seems quite conclusively proven (1) that a poison spray mixture remains for some considerable time on nursery poplar trees, (2) that the beetles feed readily on such poisoned trees and (3) that the poison is quite effective against the insects.

Other tests and observations show that the beetles do not travel far nor leave an abundant supply of food. None have ever
been seen to fly, nor were any of them caught at trap lanterns set
in nursery blocks where they were numerous. Many marked
beetles were liberated within fifty yards of a block of poplar trees
but none of them were ever found on the trees.

It seems convincingly proven that any successful treatment of
a nursery block of trees need not be repeated because of the
migration of beetles from neighboring blocks that are one hundred
yards or more distant.

The Station would accordingly recommend, ex-

Summarized perimentally, the treatment of poplar and willow
directions for trees, in nurseries in localities where the beetles
treatment. are abundant, with a poison spray. The poison
should be combined with bordeaux mixture, as
such a combination will protect the trees against many fungus
diseases and various other insects. An application of such
a mixture of bordeaux with 3 pounds of arsenate of lead to
each 50 gallons can be made on nursery blocks of two-year-
old poplars at an expense of one-fourth of a cent a tree.
The application should be made about July 15, since the
beetles are most numerous after that time. As further remedial
measures, new blocks of poplar and willow should be set at some
considerable distance, say one hundred yards, away from blocks
of older trees. Nurserymen should, as far as practicable, dispose
of stock before it is three years old, as the infestation is liable to
gain very rapidly in the second and third years. Badly injured
or unsalable trees and brush left from pruning should be removed
and burned, as should also any infested willows along creeks,
ditches or swampy places near the nurseries, as these make excel-

When a few trees or a plantation is slightly infested, the infested
trees or branches should be removed and burned in June, before
the beetles emerge.

If willows or poplars planted for windbreaks, or screens, or
holders of the soil, should become so badly injured as to impair
their beauty, it is advisable to dig out and burn the infested trees
during the winter or spring, and to replant with some other kind
of a tree. The silver maple and Weir’s cut-leaved maple are
recommended for this purpose, as they are said to grow well in
damp localities.