

Typical blight canker in the bark of a large limb of a Tolman Sweet, which developed at the base of a watersprout that was inoculated by aphids. Many cankers so caused were on the tree, some of them spreading sufficiently to girdle the limb.

proboscis into the flower to get the nectar, they deposit a few germs in the nectaries, and here the germs develop rapidly, kill the flower, and pass down the bark of the flower stem to the fruit spur, kill it and all the other blossoms on it; they continue to work their way in the bark, passing on down the twig to the larger branch, and thus we get a typical case of "twig blight."

When the disease is active in a sappy tree, there is often a gummy exudate from the part affected. This is usually amber-colored and may be seen on the outside of the diseased bark, sometimes in globules and sometimes slowly streaming down the surface. This gummy material is teeming with the disease germs and many insects like to feed on it, and in feeding on it they get their feet and mouth parts covered with the germs, and these when they fly away they take along with them. So when they fly from a diseased tree to a healthy one, they are liable to inoculate the latter with the disease germs from the former. The inoculation is made either through the flower by the honey seekers or else by a puncture of the bark by a biting or boring insect, such as a beetle, or by a sucking insect, such as the various plant bugs and aphids.

We found as the result of our observations made in the college orchard and many orchards in the Niagara, St. Catharines and Whitby districts, that fifty per cent. of the total amount of twig blight on apple trees in 1909 was due to its spread from tree to tree and from orchard to orchard by aphids (*Aphis mali* and *Schizoneura lanigera*), and that practically all the twig inoculations that were made after the blossoming season were made by these same orchard pests.

The aphid's favorite feeding place is

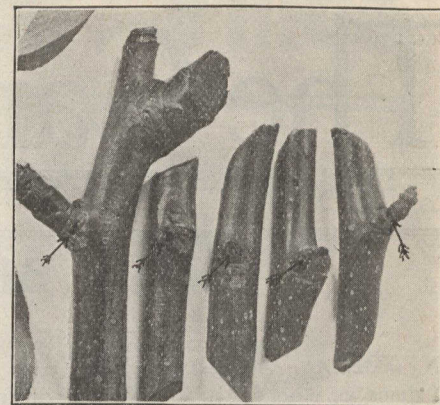
on the water sprouts, suckers, and young twigs of the tree. It is here they find the tender bark which they can easily puncture to obtain the plant juice which is so plentiful there. It is the tender, juicy bark that, as we have before mentioned, supplies the ideal conditions for the blight germ to rapidly develop in. An aphid when feeding punctures the bark from which it draws the sap with its sucking tube. Should the twig which it punctures have the blight, the sucking tube which is inserted in the bark will be contaminated with the blight germ, and large numbers of germs will be drawn into the body of the insect and will cover its mouth parts, and so, when the aphid moves to another twig, it will carry the germs along with it, and on puncturing the fresh twig will inoculate it with these germs. We found this to be happening in practically all the orchards we visited during June, July, and early August. We found many young trees that had not yet borne a blossom and that were absolutely free from blight before the aphids came in June, to have after this date all their young shoots killed out by the gradual



Trunk of young pear tree, near the ground, showing a rapidly spreading canker, which developed as the result of the tree being inoculated with the germs of the shot-hole bark-boring beetle, *Scolytus rugulosus*. The minute borings of the beetle may be seen close to the arrow points. Notice that the borings are usually within a bud scar.

spread of the disease from the tops downward after they had been inoculated by aphids. We also found large numbers of suckers and water sprouts on the older trees develop the disease after the aphids visited them and rapidly die.

In many cases, when the disease reached the base of the water sprout or sucker it entered the limb or trunk on which the shoot grew and there formed a canker, sometimes large and spreading, if the bark was juicy, and sometimes small. The bark immediately surrounding such cankers is liable to harbor the disease germs through the winter, then in the spring, when the sap begins to run once more, the germs rapidly develop, spread



Shot-hole borings in a healthy branch from a young pear tree. In every case they are at the base of a fruit spur or small branch. Around three out of five of the punctures the blight was spreading as a canker.

further through the bark, thus enlarging the canker, and often girdling the limb, which results in its death.

THE DISEASE IN NURSERIES

We found aphids to be the principal means of spreading the blight in apple tree nurseries. Wherever in nurseries the aphids were kept in check there was practically no blight. While in the nurseries in which the aphid was allowed to have its way, there the blight flourished in all directions.

While aphids and "twig blight" are both common on the apple, neither are very prevalent on the pear. Blight, however, kills off many more pear trees than apple trees. How, then, is the blight carried to the pear trees? It is sometimes carried to the blossoms by bees and wasps, and it is such inoculations that are responsible for most cases of "twig blight" in the pear. "Body blight," however, is more common than "twig blight" in the pear. This is the same disease working in the bark of the trunk and larger limbs. The germs sometimes enter it at the base of the twigs which have been inoculated at the blossoms. We found, however, during the last two seasons cases of direct inoculation into the bark of healthy trees made by the fruit-bark-boring beetle (*Scolytus rugulosus*).

This is the same beetle that works in the bark of the peach and cherry, causing them to exude large quantities of gum-like material. The pear tree does not exude this gummy material, and as the hole made by the beetle is very small and is usually underneath a bud or spur, it is not readily seen. This beetle bores in the bark and is more common on weak or diseased trees than on healthy ones. We found the beetles in the bark of blighted trees to be literally covered with blight germs, and we found the disease to be developing around the fresh punctures made by these beetles in the bark of healthy trees. The fruit-bark-boring beetle is one means of spreading the blight among pear trees.

The pruning-knife, saw, chisel, shears,