

Healthy trees produce masses of matted rootlets immediately beneath the surface of the soil; every minute fibril being clothed with root-hairs near the tip. In diseased trees the branches of the root are almost naked, but few fibrils having escaped decay, and they are so much affected as to be almost destitute of root hairs.

Causes.

Foot-rot is chiefly caused by the rootlets penetrating into a cold retentive subsoil; deep planting; earthing-up, whether with wood-ashes, stable-manure, or with earth; excessive manuring, &c.; in some cases by excessive autumn pruning, leading to a late growth, and consequent development of unripened wood. Young plants that have been kept so long in pots as to become "pot-bound" are peculiarly liable to be attacked.

Prevention and Cure.

Excessive autumn pruning, the application of manure late in the season, or any cause tending to stimulate root-action shortly before the approach of winter must be avoided, on account of the risk attending a sudden arrest of growth.*

The degree to which remedial measures may fairly be expected to prove successful must depend to some extent upon the stage of the disease; as a general rule, so long as decay has not encircled the stem, recovery may be hoped for. The soil must be thoroughly drained, and, if of a retentive character, properly worked before replanting. All unsound portions of the root must be cut away, and all traces of decay removed; in cloudy weather the roots may be left partially exposed for a few days; afterwards covered with leaf-mould or with light alluvial soil. The decayed bark must be pared away in such a manner as not to wound the sound portion more than can be avoided. Frequent application of tar-water to the root and stem will be found beneficial in all except extreme cases. A light top-dressing of lime mixed with a little sulphur would probably prove of benefit.

This disease is most frequent among trees growing in cold subsoils; it is rare on open volcanic soils or where the trees have been surface-planted. It attacks the lemon and citron more frequently than the orange, and its effects upon the former are more severe than upon the latter. The shaddock appears to be exempt from its attack, but the lime sometimes suffers severely.

In some cases a gummy secretion is exuded by the affected parts of the stem during the earlier stage of the disease, and ceasing with the decay of the bark; this constitutes the disease termed "lagrima," but I am unable to draw a distinction between the two.

ROOT-FUNGUS.

See *ante*, page 4.

BLACK BLIGHT, OR LEMON SMUT (*Capnodium australe*, n. sp.).

I have no hesitation in referring this fungus to *Capnodium*, but am unable to identify it with any species of which I possess descriptions; it is therefore provisionally distinguished as *Capnodium australe* for convenience of reference.

The fungus forms a black film on the surface of the leaves and twigs, and usually develops short, erect, excessively-branched filaments from one-tenth to one-quarter of an inch in length, sometimes in such abundance as to form a velvety surface, but the general appearance of trees clothed with this sooty-coloured parasite is simply disgusting.

The fungus acts injuriously by closing the orifices of the air-passages, and preventing the direct action of light, so that the leaves are unable to discharge their functions.

By some cultivators it is said to be the excreta of the large white scale (*Icerya purchasi*); it is, however, a true fungus, although frequently found growing on trees infected by scale, aphids, or other homopterous insects. It certainly assumes its most luxuriant growth on twigs or leaves coated with the honey-dew secreted by many of these insects, but, so far as my observation serves, the connection is not invariable.

Trees infested with scale and aphides are not always infested with the fungus, and trees affected by the fungus are not invariably attacked by Homoptera.

That it has no necessary connection with *Icerya* is apparent from the fact that orange- and lemon-trees were observed to be infested with the parasite at least ten or twelve years before the introduction of *Icerya* into the colony.

There is a curious similarity of growth between our plant and its near relative *Antennaria scoriadea*, a fungus also of a velvety, sooty appearance, but of much larger size. Both plants are found on trees infested by Homoptera, and both are found on trees apparently destitute of these insects; the *Antennaria* is however found occasionally on bog mosses (*Sphagnum*), which, so far as I am aware, are never infested by scale or aphides.

It has been suggested that, as the fungus is almost invariably connected with the occurrence of scale or aphids, it is superfluous to treat it as a separate pest; if the insect be destroyed, the fungus will cease to exist. While fully admitting the frequency of the association, I am unable to give full assent to this view. I find instances in which the fungus is not directly associated with insects, and have seen trees sparingly attacked by scale, but having the leaves so excessively infested with

* At the Bay of Islands, in June last, oranges and lemons in active growth were severely cut by frost, while trees which had completed the season's growth were uninjured.