

SPRAYING AGAINST CANKER OF CITRUS

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SPRAYING experiments were begun on citrus trees (grapefruit) at the Experiment Station, Peradeniya, on 8 December, 1930. The trees were three to three-and-a-half years old and averaged about ten feet in height. Fifteen trees were selected for the experiment; of these, five were sprayed with a $\frac{1}{2}$ per cent aqueous solution of concentrated lime-sulphur weekly, five with 1 per cent fortnightly while five served as controls. Before the experiment was started each tree was examined primarily to ascertain the severity of citrus canker on the leaves and branches.

Citrus Canker is one of the commonest diseases of citrus plants in Ceylon and is caused by the bacterium *Pseudomonas citri*. The disease is widespread in its distribution and is found in the United States of America (in Florida and some of the Southern States), in Japan, China, Java, India, Malaya, and Ceylon. In Ceylon it is more common at lower elevations, particularly in the wetter zones.

The first symptom of the disease is the appearance of yellow spots on the leaves. Later, small brown coloured, corky, eruptive growths are produced from these yellow spots. The character which distinguishes them from other eruptions of a similar nature is the yellowing of the leaf tissue round the eruption which gives the appearance of a sort of halo. The canker occurs on leaves, fruits, green twigs and young stems and in older stages may completely girdle twigs and young stems to cause the dying back of the parts above.

The presence of fungi and pests on these trees was also noted. Dr. J. C. Hutson, the Government Entomologist, identified the following pests: Fluted scale (*Icerya purchasi*), mussel-shell scale (*Lepidosaphes citricola*) and green bug (*Coccus viridis*) were found on the stems, while *Icerya seychellarum*, *Lepidosaphes gloveri*, *Lepidosaphes gloveri* var *pallida*, probably at least two species of *Chionaspis*, *Lecanium* sp., leaf miner (*Phyllocnistis citrella*) black fly (*Aleurocanthus* sp.) and aphids (*Toxoptera aurantii*) were present on the leaves.

Among the fungi recorded were *Septobasidium* sp. and sooty mould which develop on the secretions of scale insects, *Cephalosporium lecanii*, parasitic on green bug (*Coccus viridis*), *Microcera* sp. parasitic on *Lepidosaphes citriola* and *Chionaspis* sp.

The primary object of the experiment was to ascertain the efficacy of the spray fluid against the spread of the bacterium which caused citrus canker on leaves, branches, and fruits; it also afforded an indication of the effect of the spray on fungi and insects commonly present on citrus.

Fungi like sooty mould and *Septobasidium* sp. which live on the secretions of the scale insects are not very harmful when they are present in small quantity, but when they occur in abundance they may seriously retard growth and render the tree less resistant to drought. The dense, black structure which the sooty mould fungus forms on the leaves reduces the amount of light reaching the chlorophyll and consequently diminishes the activity of the latter in manufacturing food.

Pests like fluted scale, green bug, and aphids reduce the vitality of the tree by sucking its plant juice. All these factors working together may have a detrimental effect on the health of the trees and their subsequent production of fruit.

No attempt was made to cut off affected twigs and leaves as it is realized that this procedure would be impracticable especially in the case of large trees where in severe attacks a large percentage of the leaves are affected.

As stated above five trees were sprayed weekly with a $\frac{1}{2}$ per cent aqueous solution of concentrated lime-sulphur, and five trees fortnightly with a 1 per cent solution. After the former group had received ten applications and the latter five, the trees were individually examined. It was observed that the spray did not arrest the spread of the canker to the young shoots to a marked degree, that some of the scale insects were not killed in the trees which were treated with the $\frac{1}{2}$ per cent solution and that the leaf mining caterpillar was still active carrying the bacterium of the canker to young foliage.

On 16 February, 1931 a change was effected in the strength of the spray fluid. The trees that received a $\frac{1}{2}$ per cent solution of the lime-sulphur were treated with a 1 per cent solution and those that received the 1 per cent were sprayed with a 2 per cent solution. After the former group had received eight applications and the latter four of the increased strengths the trees were again individually examined. The effect of the increased strength of the spray fluid was noticeable. Pests such as green bug and scales were completely wiped out together with the fungi such as sooty mould which lived on their secretions; the *Septobasidium* which enveloped the larger branches were seen to have cracked and dropped off; the spread of the canker to the young foliage was arrested to a considerable extent; the leaf mining caterpillar was present but the damage it did was

negligible. From observations made it appeared that the leaf miner infected the leaves in the interval between the application of the spray fluid. The spray did not appear to be completely effective against ants and aphids though their numbers were reduced considerably. No difference was noticeable in the trees sprayed weekly with the 1 per cent solution compared with the trees sprayed fortnightly with the 2 per cent solution.

From the above experiments and observations made in the field it is recommended that (1) trees should be sprayed weekly with a 1 per cent aqueous solution of concentrated lime-sulphur or fortnightly with a 2 per cent solution, (2) affected twigs and leaves should be cut off and burnt wherever possible. The Entomologist suggests that the application of a spray of tobacco wash between the application of lime-sulphur will be effective against aphids and leaf miner.

Canker infection takes place most readily on young leaves. If new foliage growth can be stimulated during the drier periods of the year in which canker infection is not so common, some infection may be avoided. Young trees should therefore be watered during dry weather to stimulate growth and if manuring is undertaken it should be done so that the maximum effect is felt during dry weather.

Wherever possible infected twigs and foliage should be pruned out to remove sources of infection. Spraying against citrus canker is a preventive and not a curative measure. Once the bacterium is inside the tissues of the host plant spraying will not eradicate it but will, to a great extent, prevent it from spreading to neighbouring leaves and branches.

If citrus is planted 15 feet by 15 feet, 195 trees will cover an acre. In the experiments described above, 2 gallons of solution were used for five trees. This quantity was considered the minimum amount of spray fluid required for the trees of the size experimented upon. Based on these calculations roughly 13 pints of concentrated lime-sulphur solution will be required for spraying an acre of citrus with a 2 per cent solution.

If the citrus plants are young, spraying can be carried out with small hand sprayers; if done on a larger scale or if big trees are to be sprayed, the use of a knapsack sprayer will be most convenient.

If the routine spraying recommended above to control citrus canker is adopted, the spray will help to prevent infection by pink disease (*Corticium salmonicolor*) and mildew (*Oidium tangerinum*) which are responsible for dieback in citrus and when once established on a plantation are troublesome to eradicate.