PLANT PATHOLOGY NOTES NO. 40

PSOROSIS COMPLEX OF CITRUS

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ABSTRACT

The psorosis complex contains approximately eight related viruses which infect mainly citrus plants in most of the citrus growing regions of the world. There are signs that this virus complex is already present in Papua New Guinea. This note discusses the psorosis complex in general with reference to psorosis A, the most common form.

INTRODUCTION

There are several economically important virus diseases which infect citrus plants. One that can have a considerable impact on citrus production is the psorosis complex. The psorosis complex is a name assigned to a group of virus diseases including psorosis A, psorosis B, concave gum psorosis, blind pocket psorosis, crinkly leaf, infectious variegation, cristacortis and impietratura induced young leaves. Of these psorosis A is the most common form often found on virus diseased citrus plants. Citrus plants known to be susceptible to the psorosis complex include Carrizo citrange, trifoliate orange, Surprise Naval orange, Minneola tangelo, Eureka lemon and West Indian lime.

Although the psorosis complex is quite common in some of the citrus growing regions of the world, PNG has not had a major outbreak of diseases caused by this complex. During 1985-86 diseased West Indian lime trees at the Laloki Research Station showed symptoms similar to psorosis A. In a 1991 survey for virus diseases of citrus in PNG, diseased Sweet orange and Grapefruit trees on rough lemon rootstocks at Laloki Research Station and Poroma in the Mendi district exhibited field symptoms of the psorosis complex. The symptoms of the psorosis complex in general and methods of control are described for the benefit of citrus growers.

SYMPTOMS

Identifying the type of virus based on leaf pattern and spotting symptoms on infected citrus trees at an early stage of plant growth is difficult. Symptoms other than leaf symptoms usually appear very late in the life of the tree.

Symptoms of the psorosis complex may develop and become visible on infected citrus trees that are well over eight years old and these may appear on leaves, twigs, fruits and trunks. Leaf symptoms caused by all viruses in this complex are generally similar. On young leaves these may consist of minute or small but elongate light-coloured areas or spots often referred to as "flecks" whilst the mature leaves may show a distinct pattern of circular ring spots often known as an "oak-leaf" pattern. These spots

Figure 1. Sweet orange on rough lemon rootstock about eight years old infected by psorosis A. Notice the abundant lesions and scaling on the branch (foreground) and the non-infected (background) of the same tree. Photo taken at a Waigani residence, Port Moresby, material ex-Laloki Research Station nursery.

Figure 2. A closer view of the trunk of the same tree showing the extent of scaling and the lesion. Notice that the scaling is up and down and around the trunk, a typical characteristic of psorosis A.

Figure 3. Main trunk of Marsh grapefruit on rough lemon rootstock at Kuk Research Station showing symptoms of "Blind pocket psorosis". Notice the narrow slit-like holes in the trunk. Gum layers cannot be seen unless bark is removed.

Figure 4. Grapefruit on unknown rootstock growing at Poroma, Southern Highlands Province, suspected of being infected with "blind pocket" psorosis. Note the prominent blind or slit-like holes in the trunk.

may sometimes consist of concentric rings around the inner spot. On fruits the ring spots may become necrotic forming dead tissues and sunken as on Valencia orange. On grapefruit the disease may also show lines consisting of furrows (line cut) and depressions which often result in a rough and bumpy appearance of the fruit surface. On twigs, branches and trunks the symptoms vary but the most prominent and common of psorsis A and B are bark scaling and gumming. The first symptom of infection in the case of psorosis A (Fig. 1, 2) is the development of distinctive lesions on the bark. These lesions are often small and may form a blister-like area on the bark causing the bark to lift its scales (bark skin). The lifting of bark and increasing in scaling around the margins of the infected sites on the trunk cause lesions to enlarge and spread up and around the trunk. Formation of gum in the inner or deeper layers of bark and even the wood often occurs after scaling of bark has taken place. Psorosis B in contrast, the formation of gum appear first followed by bark scaling. The bark scaling is also more rapid and often occurs more in strip or along one side of the trunk, branch and twigs than in psorosis A. Infections of trunks either by psorosis A or B may result in the loss of plant vigour, death of the trunk and in severe cases death of the entire plant.

It must be emphasised that flecking and oak-leaf pattern symptoms of young and mature leaves are common characteristics of psorosis and as such may be seen on citrus trees infected by the psorosis complex. They can not be used to separate virus diseases in the complex and may be visible only during a few days to weeks under favourable conditions, usually during the growth flush and during cool periods. Specific symptom(s) for each virus should be used when inspecting citrus trees suspected of having psorosis infection. Hence, the following virus diseases in the complex with the corresponding specific symptoms are given:

Concave gum psorosis
Inward cavities or holes in the trunk with gum layers formed beneath these cavities.

Blind pocket psorosis (Fig. 3, 4)
Narrow and slit-like holes in the trunk with gum layers formed beneath the pockets.

Infectious variegation
Crinkling with marked irregular discolouration of leaves.

Crinkly leaf psorosis
Twisting and wrapping of leaves.

Cristacortis psorosis
Abnormal swelling of trunks.

Impietratura induced young leaves
Great reduction in size of mature leaves to the size of immature leaves.

SPREAD OF THE DISEASE

The psorosis complex is spread basically through scion or budwood (young buds or shoots taken from one parent tree and budded onto rootstocks of another parent tree) taken from infected trees. Seed transmission is uncommon with the exception of psorosis A in which the disease may spread through seeds harvested from infected trees, especially in Carrizo citrange and trifoliate orange. Besides bud and seed transmission, no other mode of spread has so far been recorded.

CONTROL

Since the disease is known to spread through infected budwood the first approach for control should be through the use of disease-free budwood. This requires identifying

disease-free parent trees to be used as sources for obtaining budwood. A technique known as indexing is used to identify disease-free trees. It is done by visual arbitration of all trees in the orchard through normal inspection and selection processes. Because specific symptoms appear very late the parent trees selected must be of suitable age, about seven or eight years and above, with no visual symptoms on them. Seedlings can also be raised from seeds of the indexed trees.

Infected trees should be uprooted and burned. The psorosis virus is not known to survive in soil or in debris (rubbish) and also has no insect vector to spread it. Therefore the same location or site can be replanted with healthy citrus plants. When introducing new planting material it is advisable to obtain it from indexed tree that have been certified free of psorosis and also other virus diseases such as triteza, exocortis, and xyloporosis.

A second option of indexing for psorosis complex is through use of the indicator citrus plants such as Ruby Blood Sweet orange. Homosassa Sweet orange or Emperor Mandarin. Seedlings of each indicator are budded with candidate (citrus plants) using two pieces of either the buds or grafting pieces of bark or inserting pieces of young leaf tissue under the bark of the indicator seedlings. This indexing technique is more complicated than the visual arbitration in the orchard for virus-free citrus trees. It is complex because apart from the test plants there will always be control e.g seedlings without being budded with any candidate material and marker virus plants (seedlings being inoculated with psorosis virus). The use of both control and marker virus plants is basically to assess disease and symptom development with the virus test plants. Labelling and maintenance including care to bud growth, free of insects and diseases, free of nutrient deficiencies and pruning of test plants is important during the test period. Observations should be made as each new flush appears on all plants and presence or absence of symptoms recorded with the date of the observation. Also at each observation and recording test plants must be compared with the control and marker virus plants for symptom development. If one or more indicator plants show symptoms of psorosis at two subsequent leaf flushes then the test result is positive and testing can stop. However, if all indicator plants remain symptomless then testing must continue for at least 24 months. At the end of the 24 months period if all indicator plants remained symptomless then the result is negative and therefore the candidate plant is deemed free of psorosis virus.

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