

Notes on Some Mealy-bugs (*Coccidae*) of Economic Importance in Ceylon

WALTER CARTER¹, Entomology Department, Pineapple Research Institute,
Honolulu, Hawaii

THE *Coccidae* or scale insects of Ceylon were the subject of a new classical taxonomic treatise by Green (3). This report covers studies on the economic importance of several species of mealy-bugs, undertaken as part of an FAO project, in the Entomology Section, Department of Agriculture at Peradeniya, in 1953.

Included are the results of experiments on the transmission of cacao virus, the confirmation of a previous diagnosis of mealy-bug wilt of pineapple by experimental mealy-bug infestation and the establishing of a *Pseudococcus* sp. as the cause of a malformation of kapok (*Ceiba pentandra*) seedlings.

Cacao Virus

Cacao virus disease was first noted in 1949 by J. W. L. Pieris of the Ceylon Department of Agriculture, who submitted leaves showing the typical oak-leaf pattern to A. F. Posnette, then of the West African Cacao Research Institute, for diagnosis.² Posnette confirmed

Pieris' opinion that the symptoms were similar to a strain of swollen shoot in West Africa. Although my own experience with the swollen shoot disease complex was limited to a few months spent as a member of the Swollen Shoot Commission, the leaf symptoms as observed in the Peradeniya area were typical of those seen in West Africa, although the rounded fruit was seen only once, and the swelling of the stems not at all. The leaf symptom is a striking oak-leaf pattern.

In view of the diagnoses on the basis of leaf symptoms, the known role of mealy-bugs as vectors, and the frequency of mealy-bug infestation on cacao in Ceylon, the necessity for the testing of these mealy-bugs was clearly indicated.

Three species of mealy-bugs were found on cacao. Of these, *Pseudococcus lilacinus* (Cockerell) was by far the most common. *P. citri* (Risso) and *Ferrisia virgata* (Cockerell) were found only on occasion, the latter being almost invariably associated with the flower pads on the tree trunks.

The technique of transmission was essentially that described by Posnette (4) with a modification that eliminated the dissection of the bean. The latter resulted in too high a percentage of

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² Oral communication.

rotted beans under the local conditions for growing the seedlings. Beans were washed clean and set in large Petri dishes on moist paper. Large numbers of mealy-bugs from diseased trees were then introduced into these dishes and a fair proportion settled on the beans. From two to four days later, the beans were planted in flats and grown in a large screened cage.

Using this technique, positive results were obtained with *Pseudococcus lilacinus* and *P. citri*. Experiments with *Ferrisia virgata* were inconclusive up to the time I left Ceylon. In the positive cases, the first symptom was vein-clearing, which developed in approximately two months. The typical oak-leaf patterns developed on later flushes.

The experimental results made it clear that mealy-bugs are the vectors of cacao virus in Ceylon, and indicate equally clearly that the virus is closely related to the swollen shoot complex of West Africa. In the absence of comparative yield records, no positive estimate can be made of the debilitating effects of the virus disease on the tree but from observation in the field on the vigor of infected trees, it seems likely that the disease is actually a mild one. Sickleaf (a deficiency disease), the activities of *Helopeltis*, and black-pod disease (*Phytophthora palmivora*) are probably of far more economic importance. Even granting this to be true, however, control of cacao virus is desirable. Fortunately most of the cacao plantings in Ceylon are plantation style and except for extremely hilly locations, lend themselves in some degree to mechanical spray control methods. Formicidal sprays could well be combined with sprays against *Helopeltis* and with suitable formulations effective against

black-pod disease. Cutting out of diseased trees would need to be resorted to only in the most extreme cases. This solution, however, will require the accumulation of more basic data than was available at the time, on the one hand, and the informed co-operation of the cacao growers on the other.

Mealy-bug Wilt of Pineapple

This disease of pineapple, induced by the feeding of *Pseudococcus brevipes* Cockrell is found throughout the tropics wherever pineapple is grown. It is definitely a condition which continuous growing of pineapple on the same land encourages but is rarely serious in the one-cycle culture so often practised in these areas.

In Ceylon, the mealy-bug is found attended principally by the fire ants *Solenopsis* and, as is typical in such cases, in rather isolated patches often with a huge nest built around a mealy-bug-infested plant. Even so, however, by the time the plants have fruited and slips and suckers are produced, mealy-bugs can be found on a high percentage of the vegetative planting pieces used for new plantings.

In the area near Colombo where pineapple has been planted on land cleared of old rubber and coconut plantings mealy-bug wilt is a serious matter to many growers.

The purpose of the experiment which was performed was to confirm the diagnosis made on the basis of symptoms. In this experiment, leaves were pulled from large apparently normal plants growing in a field where patches of wilted plants were common. Gravid females of *Pseudococcus brevipes* were

caged on these leaves and after large colonies of first instar larvae had developed, these were used to infest healthy young plants by cutting out the section of leaf on which the cage had been set and dropping this into the heart of the plant, leaving the mealy-bugs to move off as the leaf section dried up.

Two months later typical symptoms of mealy-bug wilt had developed on some of the infested plants and later reports indicated that a high percentage had wilted.

The experiment was adequate to confirm the diagnosis and to demonstrate to the growers the relationship between the insect and the disease.

The fumigation of planting material, already recommended by the Entomology Section, Ceylon Department of Agriculture, would seem to be the most logical control measure for the small grower to adopt with the aid of fumigation facilities provided by the Government.

Mealy-bug Green-spot of Pineapple

This toxic effect, localized at the insect's feeding point, was present in a mild way on pineapple leaves in Ceylon. It is a distinctly different disease from mealy-bug wilt and of no economic significance unless developed to extreme on very small plants.

Of interest from the standpoint of the geographical distribution of mealybug strains, the symbionts of *Pseudococcus brevipes* in Ceylon did not include the rod-shaped form. In this respect they are similar to specimens examined in Tanganyika and Malaya (2) and different from those in Hawaii and Central and South America. There, green-spotting is associated with the presence

of various rod forms in the mycetomes of *P. brevipes* (1, and unpublished data).

Savoy Curl of Kapok

Young kapok seedlings showing a savoy-like curling of both terminal and lateral shoots were received from an estate. The plants were infested with a mealy-bug determined as *Pseudococcus* sp. Because of this incomplete identification it can be noted that the insect produces an egg mass enclosed in an almost parchment-like sac. Its mycetome is orange-red in color and the included symbionts blunt, sausage shaped, some curled, and somewhat similar to those of *P. citri*.

The symptoms on the kapok were diagnosed as probably due to the toxic feeding of the mealy-bug and experimental evidence confirmed this. Mealy-bugs caged on young healthy kapok produced the symptoms very rapidly, and there was a clear relationship between the numbers of mealy-bugs and the severity of the symptom. When the mealy-bugs were killed by spraying with malathion, the symptom development ceased and new growth was normal.

Summary

Cacao virus, similar in symptoms to some of the West African strains, was transmitted from cacao to cacao by *Pseudococcus lilacinus* and *P. citri*.

Mealy-bug wilt of pineapple was diagnosed on the basis of symptoms and the diagnosis confirmed by experimental infestations of healthy plants by *Pseudococcus brevipes*.

Green-spotting of pineapple leaves was found associated with *Pseudococcus brevipes* and the mycetomes of insect do not appear to contain the rod-like form present in other areas.

A savoy curl of kapok was shown to be due to the feeding of a *Pseudococcus* sp.

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