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COCONUT PESTS IN SRI LANKA-THE COCONUT LEAF-MINER

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ABSTRACT

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This is the second of the series on Coconut Pests in Sri Lanka. The different stages of the coconut leaf-miner, *Promecotheca cumingi* are described. The initial occurrence of *P. cumingi* and its subsequent spread in Sri Lanka are outlined. The dispersal of the pest, the nature of damage and its influence on the crop and the control measures are discussed.

INTRODUCTION

Species and Distribution

The coconut leaf-miner *Promecotheca* is a serious pest of coconut on a number of islands in the South Pacific and South East Asia. On most of these islands the pest has been present over a relatively long period of time and has hence gathered its own complement of parasites and hyperparasites (living organisms, such as insects, which destroy the pest and parasites respectively). Four different species of *Promecotheca* have been recorded of which *Promecotheca cumingi* Baly. (Coleoptera; Hispidae) is the species occurring in Sri Lanka. *P. cumingi* is also found in the Philippines, Malay peninsula, Singapore, Borneo and South Celebes while the distribution of the other three species is confined to New Guinea and the Pacific islands. In addition to coconut *P. cumingi* has been recorded as attacking arecanut, the swamp palm, the sago palm, the royal palm and the oil palm but in Sri Lanka it has so far been detected only on coconut, the oil palm and the royal palm.

PEST BIOLOGY AND CONTROL

The importance of an insect as a pest is based on the nature and seriousness of the damage it causes to the crop either directly or indirectly. A pest may be classified as a high density pest if a large number of the pest are required to be present to cause economic damage, or as a low density pest if only a small number of the pest are sufficient to cause economic damage. *P.cumingi* is a high density pest. Very often, the damage caused by an insect is restricted to one of its stages such as either the larval, or adult stage. However, in the case of *P. cumingi* damage to the coconut palm is caused in the adult stage and all the larval stages.

Description

The adult *P. cumingi* is reddish brown in colour about 10–12 mm long and about 4 mm broad. It has a prominent head and the elytra (fore wings) are finely sculptured giving the appearance of parallel longitudinal lines. (Fig. 1). The female beetle is slightly larger than the male, and very careful examination will show that the female abdomen is very slightly broader towards the posterior end than at the anterior end, whereas the male abdomen is uniform throughout its length. When the pest generation is in the adult stage, large numbers of adults may be found on the underside of leaflets of infested coconut trees. The adult period may last for about 2 months, during which eggs are laid.

The eggs are laid in 2–3 mm long oval cavities and are covered over with partly digested leaf matter and resinous secretion. Externally they appear as small oval cyst-like protruberances on the under side of leaflets (Fig. 2). The eggs hatch in about 9–12 days.

P. *cumingi* is a true leaf-miner and when the egg hatches, the tiny worm like larva, from its embedded position in the leaf, begins to feed on the leaf tissue between the 2 epidermal layers causing the formation of a 'blister-like' mine. The mine increases in size as the larva develops and a fully formed mine is about 7 cm long. Externally, 3 areas are fairly easily distinguished in the fully formed mine (Fig. 3) corresponding to the 3 instars of a fully developed larva. If only one area is distinguishable (small mine) then the larva is in the 1st instar of development and if two areas are distinguishable then the larva is in the 2nd instar. The larva is always inside the mine and can be seen only if the mine is opened (Fig. 4). As in most leaf-miners the larva is strongly dorso-ventrally flattened and has no legs (Fig. 5). Its limited movement is by a wriggling action. A full grown 3rd instar larva is about 12 mm long. The larval period lasts for about 30 days.

A fully grown 3rd instar larva turns into a pupa (resting stage) (Fig. 6) The pupa is about 7–8 mm long and is not so heavily dorso-ventrally flattened as the larva. The pupa though relatively immobile is capable of brisk wriggling movements. The pupal period lasts for about 12 days during which they develop into adult beetles. The adult beetle rests for 2–3 days inside the mine after which it cuts a semi-circular hole on the upper side of the mine and emerges.

Occurrence and spread in Sri Lanka

In October 1970 small beetles, resembling fireflies (s. Kalamadiriya) were recorded by the Coconut Research Institute on some coconut trees in the Dehiwela area. These were subsequently identified as P. *cumingi* an insect that was not recorded in Sri Lanka previously. The exact mode of pest entry into Sri Lanka is not known, but was probably carried in the personal baggage of a traveller. When P. *cumingi* first entered Sri Lanka it was not accompanied by any effective parasites or predators; hence the pest multiplied very rapidly and spread, severely infesting an area of approximately 14,000 ha. The main area of infestation was in and around Colombo extending from Panadura to Mutwal along the coast. A few pockets of mild infestation also occurred away from this main area, of which the ones at Katunayake and Galle proved to be more persistent.

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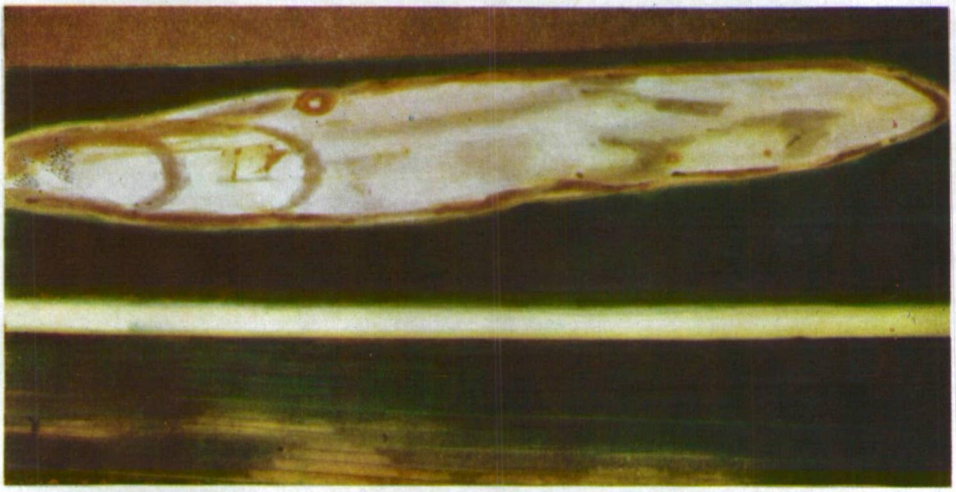

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Fig. 1 — Adult *P. cumingi*

Fig. 2 — *P. cumingi* eggs

Fig. 3 — A fully formed *P. cumingi* mine (third instar)

Fig. 4 — A third instar mine opened to show fully grown larva inside.

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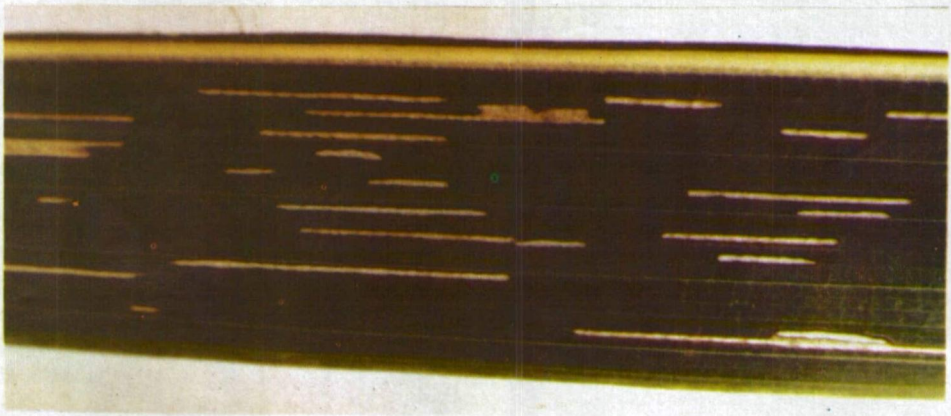

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Fig. 5 — A third instar larva

Fig. 6 — Pupal stage of *P. cumingi*

Fig. 7 — *P. cumingi* adult feeding marks (streaks)

Fig. 8 — A. *P. cumingi* damaged (estate)

P. *cumingi* is not a very active flier and is not easily disturbed from its position on the leaflet. However, on hot humid days with plenty of sunshine adult beetles may be found hovering around or moving from tree to tree at the crown level of infested trees. In areas of very heavy infestation, swarming of adult beetles occur periodically at approximately 2½ month intervals, when large numbers of adults take wing in an apparently uni-directional pattern. When swarming occurs beetles have been observed to be trapped in vehicles, especially public conveyances such as trains and buses, and carried to distant places, where pockets of infestation may develop.

Nature of Damage

Damage caused by P. *cumingi* is of two distinct forms namely damage due to adult feeding and damage due to larval feeding. When the pest is present in small numbers pest damage would not be so apparent and detection of the pest would only be possible through careful examination. However, when pest numbers are high the damage is so extensive that it imparts to a casual observer the impression of damage due to fire, or scorch resulting from 'sea-spray' (Fig. 8)

(*a*) *Adult feeding*

The adult P. *cumingi* starts feeding soon after emergence. The feeding marks of these beetles are very charasteristic and can be observed as longitudinal grooves of 'streaks' on the lower surface of leaves of infested trees. These feeding marks or 'streaks' are about 1 mm broad and up to 5 cm long. (Fig. 7), and are caused by the adult eating up the lower epidermis and all the leaf tissue between 2 longitudinal veins, leaving the upper epidermis and the cross veins undamaged. Records indicate that a single adult eats an average of 17 cm of 1 mm furrows per day under caged conditions, Thus a single adult, if it lasts its entire life of about 2½ months could eat as much as 129 cm^2 of leaf area.

(*b*) *Larval feeding*

The damage due to larval feeding is unmistakable and is in the form of 'blister-like' mines. A single larva could eat an average of 17.1 cm^2 of leaf area. Most of the larval damage is during the 3rd instar when an average of 13.4 cm^2 of leaf area is eaten up. The larvae feed by scooping up all the tissue between the upper and lower epidermis and when the epidermal layers dry up a brown patch demarcating the area of the mine is rendered non-functional.

Influence on Crop

As with most insect damage the coconut tree is able to tolerate damage at low levels without any direct influence on crop. Mild infestations persisting over a long period may not show signs of directly affecting the crops, but may in the long run lower crops through gradual deterioration of the health of the palms. Severe infestations of P. *cumingi* have been recorded to cause approximately 80% loss in crop.

Control

The first step in any pest control program is to detect and establish the identity and importance of the pest. Early detection and identification would facilitate more effective subsequent control action. If detection is made in the very early stages of infestation when only a few mines are present, the pest could be controlled to some extent by selectively cutting and burning the infested leaves. However, this should be followed up with parasite releases. P. *cumingi* is very successfully controlled by the biological method using parasites. Nucleus cultures of the parasites of *Promecotheca* were originally imported from abroad, bred in the laboratories and released in large numbers on infested lands. These parasites include an egg parasite, (which attack pest eggs) called *Achrysocharis promecothecae,* a larval parasite (which attack pest larvae) called *Dimmockia javanica* and a larval/pupal parasite (which attack late stage larvae and pupae) called *Pediobius parvulus.* Some of these parasites are firmly established and are present in most areas where *P. cumingi* is present, keeping the pest under satisfactory control. However, when conditions for pest development are more favourable then for parasite development, the pest breeds faster, and pest outbreaks result. When such outbreaks occur, a scheme of re-distribution of parasites from more abundant to less abundant areas or of laboratory multiplication of parasites under controlled conditions may be resorted to. The pictures and descriptions detailed in this paper should enable planters to detect and identify the pest without much difficulty. Once the pest is detected planters are advised to write to the Director, Coconut Research Institute, Lunuwila giving the following details:

(a) Name and address of land and name of person to be contacted.

(b) Directions to reach the land.

(c) Extent of land.

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