Pacific Pests, Pathogens, Weeds & Pesticides - Online edition

Cocoa pod borer (175)

Common Name

Cocoa pod borer

Scientific Name

Conopomorpha cramerella. It was previously known as *Acrocercops cramerella.*

Distribution

South and Southeast Asia, Oceania. It is recorded from Papua New Guinea and Samoa. Note, it was eradicated from Australia in 2014; and it has not yet (2017) been recorded from Solomon Islands, although it is in nearby Bougainville.

Hosts

Cocoa, Pacific lychee (*Pometia pinnata*), rambutan (*Nephelium lappaceum*), and cola (*Cola acuminata*).

Symptoms & Life Cycle

Eggs are laid on the surface of pods that are 2-6 weeks from the first sign of yellowing. The eggs hatch in about 3 days, and then tunneling begins. The larvae go through the husk into the pulp around the beans, and into the placenta that hold the beans together.

After 14-18 days and 3-5 moults, the larvae exit the pod through holes they make in the husk wall. The larvae then crawl to a pod or lower themselves on a silken thread to dried leaves on the ground, or to weeds, spin an oval brown cocoon and pupate (Photo 2). After 6-8 days, the adult moth emerges. It is mosquito-size about 5-7 mm long and brown with bright yellow patches at the tips of the forewings (Photo 3). The moths have long antennae which are swept backwards when they are at rest. They rest horizontally on the underside of branches during the day, and are active at night. The life cycle is from 27-33 days.

Spread of the cocoa pod borer occurs through movement of the pods, leaves and other vegetation to which the pupae are attached. Spread also occurs as larvae within rambutan fruit. Modelling suggests that small boats are the likely way that the moth will transfer from East New Britain to New Ireland in Papua New Guinea, while planes are predominant risk for Bougainville.

Photo 1. Internal damage by larvae of cocoa pod borer, *Conopomorpha cramerella.*

Photo 2. Pupa of cocoa pod borer, *Conopomorpha cramerella*, inside a silk cocoon, on the underside of a leaf.

Photo 3. Adult cocoa pod borer, *Conopomorpha cramerella*, showing wing colouration and very long antennae.

Photo 4. Pods showing premature yellowing due to internal infestation of cocoa pod borer, *Conopomorpha cramerella.*

Impact

The larvae or caterpillars do the damage by boring into the young, green pods and feeding on the tissues that surround the beans. Sometimes the larvae eat the seed coat of the cotyledons, the first leaves. Pods ripen early (Photo 4) and the beans are small, flat and often stuck together in a mass of dried mucilage, and this produces poor quality cocoa beans.

Many people consider the pod borer to be the most important pest of cocoa in many parts of Southeast Asia. With limited control, losses are between 20-50% for smallholders. In severe cases, over half the potential crop is lost. As an example of its impact, between 2008

The economic consequences of its introduction are serious, and managing the pest will depend if growers decide to change to a high labour input system of production, which includes pruning, shade control and regular and frequent harvesting. A feasibility study on using the sterile insect technique will be undertaken.

Detection & inspection

Look for exist holes and/or larval debris on the pods. Look for premature ripening of the pods. Look for the tunneling by the larvae inside the pods, and beans that stick together making it difficult to extract them from the pods.

The fact that the moth is active at night and the wings are dark and blend well with its surroundings means that it is difficult to detect. Sometimes it can be seen on the underside of horizontal branches during the day.

Management

Note that the cultural controls described below, not only reduce the effects of the cocoa pod borer, but also reduce losses caused by black pod, *Phytophthora palmivora*, and also rats.

QUARANTINE
Countries not yet infested by the cocoa pod borer should take special precautions against its introduction via the trade in rambutan, a known host. There are instances of long distance spread of live borer inside rambutan fruit. Presumably, long distance spread in cocoa pods is a possibility too, although only fermented beans are traded internationally.

However, the presence of *Conopomorpha cramerella* in Samoa and Solomon Islands that looks the same as that in Papua New Guinea, but causes only skin mining of pods, suggests that different biotypes exist. The situation is not fully understood, and the view of some that *Conopomorpha* has been present in Papua New Guinea for some time and that previously it was not a pest of cocoa, adds to the complexity.

The FAO/IBPGR *Technical Guidelines for the Safe Movement of Cacao Germplasm* (Revised 2010) should be followed (http://www.bioversityinternational.org/e-library/publications/detail/technical-guidelines-for-the-safe-movement-of-cacao-germplasm/). The shipping of whole pods is not recommended. In general, germplasm should be obtained from an intermediate quarantine station where pathogen testing is possible.

NATURAL ENEMIES
Predation levels of the cocoa pod borer of 40-60% are common due to *Iridomyrmex* ants. Parasitoids have not been successfully employed to give control of the pod borer, although those attacking eggs, larvae and pupae are known.

CULTURAL CONTROL

During growth:

- Prune trees every 6 months to have an open canopy, and trees no more than 3 metres tall so that pods are easy to pick.
- Pick pods frequently, as soon as they turn yellow indicating maturity. Do this at 7-day intervals in order to disrupt the insect's life cycle. The idea is to collect the pods before the adults emerge. This has become known as "Complete, Frequent, Regular Harvest" (CFRH).
- Bury infested pods; do not leave them in the cocoa plantation as a source of moths to infest remaining pods.
- It is important not to miss mature pods, and it is important that this practice is done over large areas, otherwise moths from adjacent infested farms will reduce the effectiveness of the control measure.

CHEMICAL CONTROL
Cultural measures should be used to control the cocoa pod borer rather than pesticides. Pesticides have not been recommended for smallholders due to their potential impact on human health and the environment, and that there is little evidence that they are cost-effective.

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Information from New Agriculturist *on-line*. (http://www.new-ag.info/00-1/develop/dev01.html); and CABI (2015) Conopomorpha cramerella (cocoa pod borer) Crop Protection Compendium. (https://www.cabi.org/cpc/datasheet/7017); and Yen JDL, et al. (2009) Cocoa pod borer *(Comopmorha cramerella* Snellen) in Papua New Guinea: Biosecirity models for New Ireland and the Autonomous Region of Bougainville. Risk Analysis (DOI: 10.1111/j.1539-6924.2009.01297.x); and from (including Photos 1&2) End MJ, *et al.* (Eds.) 2017. Technical guidelines for the safe movement of cacao germplasm. Revised from the FAO/IPGRI Technical Guidelines No. 20 (Third Update, October 2017). Global Cacao Genetic Resources Network (CacaoNet), Bioversity International, Rome, Italy. (https://www.cacaonet.org/fileadmin/templates/CacaoNet/Uploads/publications/Safe_Movement_Guidelines_2017_En.pdf). Photo 3 Smilja Lambert ABC *Rural Foreign aid to fight cocoa bug* (2012). Photo 4 *Cocoa pod borer*. Department of Agriculture, Fisheries and Forestry, Queensland Government.

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