BIOLOGY AND HOST RANGE OF THE COCONUT LEAFFOLDER, *Telicota palmarum* MOORE (Hesperiidae, Lepidoptera)

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Funded by the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD).

ABSTRACT

The biology and host range of the coconut leaffolder, *Telicota palmarum* Moore, was studied in the laboratory. The insect underwent five larval instars with an average total developmental period of 35.0 days for males and 35.2 days for females. The males live longer than females with a longevity of 3.9 and 2.4 days, respectively. Fifteen out of 24 plant species tested were fed on by the coconut leaffolder after 24 hrs. Three among the 15 species were further used as food substrate until the insects completed its developmental period. The insect was able to emerge into adults in only one plant, Bunga de China *(Adonidiam merrillii* Becc).

Ann. Trop. Res. 12:10-17

KEY WORDS: Alternate host. Behavior. Coconut. Coconut leaffolder. Development. Insect pest. Life history. *Telicota palmarum.*

INTRODUCTION

The coconut industry in the Philippines provides livelihood to about one third of the country's population. Coconut production in the country, however, is beset by the occurrence of pests and diseases.

One of the most important insect pests of coconut is the coconut leaffolder, *Telicota palmarum* Moore Syn., *Cephrenes chrysozona* Plotz (Gabriel, 1976). Larvae of the insect feed on coconut leaflets leaving only the midribs. The damage that they cause can be alarming at times because it can result to severe defoliation of coconut plantations (Banzon and Velasco, 1982).

Development of an effective control program against this pest is largely due to lack of knowledge on its biology and host range.

MATERIALS AND METHODS

Mass rearing of insect

Larvae of coconut leaffolder were collected from the field and brought to the laboratory to start a stock culture. They were placed in a rearing cage made of wire screen (38 cm x 31 cm x 31 cm) which was provided with coconut leaflets placed in a glass jar with water. Upon pupation, the pupae were collected and transferred into an uncovered petri dish and placed in an emergence cage (245 cm x 80 cm x 50 cm). Adults were allowed to mate and oviposit in the same cage. A cotton soaked in honey solution was hung at the middle to serve as food for the adults. A coconut seedling was placed inside the cage as an oviposition substrate for the adult moth. Eggs laid by the field-collected insects plus the eggs laid by their offsprings were used to supply test insects for succeeding studies, since the insect was hard to mass rear in the laboratory. The female skippers laid only a few eggs so that continuous collection of insects from the field was undertaken to have enough eggs for the various studies made.

Life history and behavior

The life cycle of the coconut leaffolder was studied for two generations. Eggs laid by the insect were transferred to sterile petri plates lined with moist tissue paper. Dates when eggs were laid and hatched were recorded. The eggs were incubated at room temperature and were observed daily to record any change in appearance until they hatched.

A total of 92 individuals, representing 2 generations, were reared. The newly hatched larvae were placed individually in small jars (10 cm x 2 cm). Pieces of fresh coconut leaflets were placed inside each jar. Wet cotton was placed at one end of the cut leaflets to keep them fresh for a few days. The glass jars were covered with fine meshed nylon tulle secured at the rim with a rubber band to prevent the larvae from escaping. The individual cultures were placed in an aluminum tray.

All larval cultures were inspected daily to observe changes in their appearance, feeding habits, number of larval stadia, total length of larval and pupal stages, total developmental period and other pertinent information.

Host range

Plants belonging to family palmae other than coconut, other selected crops and weeds commonly associated with coconut, were tested in the laboratory as possible alternate hosts of the coconut leaffolder. These plants were collected from the field and offered to the coconut leaffolder larvae being reared in the laboratory to test initially if they will readily feed on them. The plants that were fed on after 24 hrs were further tested by rearing the insects on them. Those that were not fed on were regarded as non-hosts and were not tested further. Insects that fed on other plants during the preliminary testing were reared on them for one generation. Observations on the different developmental stages were also noted.

RESULTS AND DISCUSSION

Life history, behavior and description

Eggs. The coconut leaffolder egg is hemi-spherical and measures about 1.5 mm in diameter. It is smooth and light yellow when fertile and orange when infertile.

Newly laid eggs are translucent yellow. One to two days later, a red ring appears at the central portion of the egg and around the upper margin with a red spot at the center. Subsequently, the red spot darkens and becomes larger until it almost occupies the entire surface of the egg. The dark spot is the head of the developing embryo inside. The presence of dark spot indicates that the egg is about to hatch (Fig. 1).

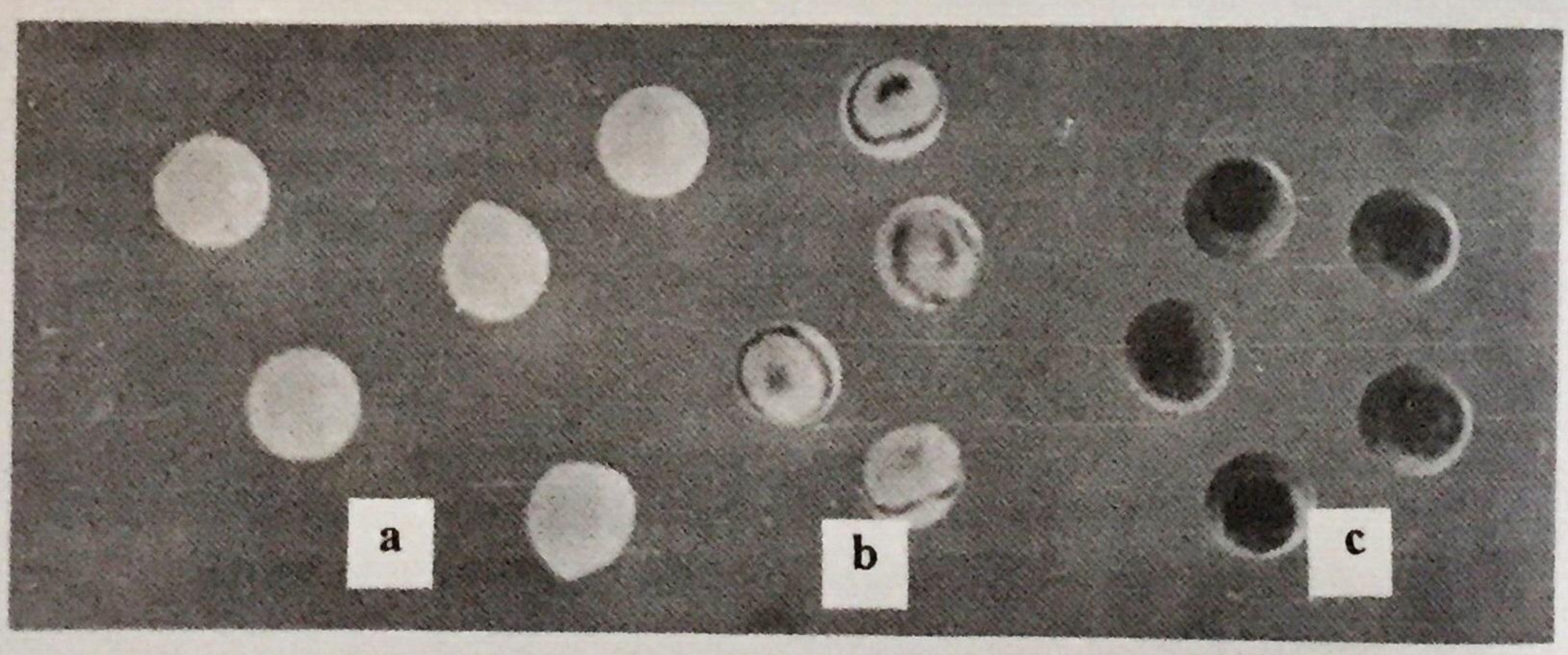

Figure 1. Photomicrograph of the eggs of the coconut leaffolder: (a) newly laid, (b) two days after being laid, and (c) about to hatch (x=10).

During eclosion, the upper portion of the egg is pushed up by the emerging larva which comes out head first. Eclosion lasts for 10-20 min.

The mean incubation period of the egg is 6.5 days for individuals which give rise to male adults and 6.6 days for those which give rise to female adults (Table 1).

Larva. Coconut leaffolder undergoes five larval instars with a 3- to 6-day interval between each molt. The leaffolder larva is eruciform with a cylindrical body. The differences between each larval instar are size, color of the body and head capsule. During the earlier instars (first and second) the insect has black, circular, flattened head capsule with light yellow to light green body. The color of the head becomes lighter brown and the body gets darker in the later instars (third, fourth and fifth).

The first instar larva is pale yellow green and measures 5-6 mm in length and 0.50-0.75 mm in width. Immediately after it hatches from the egg, it becomes active and feeds on the tip of the coconut leaflet. In the field, the

Table 1. Duration (in days) of the developmental stages of the coconut leaffolder, *Telicota palmarum* Moore[1].

DEVELOPMENTAL PERIOD	MALES		FEMALES	
	Range	Mean	Range	Mean
Incubation Period	6-7	6.5	6-7	6.6
Larval Period				
First stadium	3-4	3.2	2-6	3.4
Second stadium	3-6	3.7	3-5	3.8
Third stadium	3-5	4.1	3-5	4.4
Fourth stadium	4-6	4.6	4-6	4.8
Fifth stadium	4-5	5.1	3-6	5.0
Total Larval Period	17-26	20.7	15-28	21.3
Pupal Period	5-11	7.8	6-11	7.4
Egg laying to adult emergence	28-44	35.0	27-46	35.2
Longevity of adults	2-6	3.9	2-5	2.4

[1]Data based on 92 individuals successfully reared on coconut for two generations.

first instar larva soon spins silk and begins folding two leaflets together and feeds inside folded leaflets. They first feed on the tip or younger portion of the leaflets.

The second instar larva is a little bit darker than the first instar and measures 10-11 mm in length and 2.0-2.5 mm in width; the third instar, 15-18 mm in length and 2.0-2.5 mm in width; the fourth instar, 25-29 mm in length and 3-4 mm in width. The fifth instar has the lightest color of the head capsule but with a darker body when compared to other instars. It has a prominent Y mark on the head capsule (Fig. 2).

The mean larval period was 20.7 days for males and 21.3 days for females (Table 1). The highest larval mortality was observed in the fourth instar. The mortality during this stage was mostly due to fungal contaminants. In the field, larval mortality due to parasites and pathogens were also observed in the later instars, *i.e.*, third, fourth and fifth instars. Parasitization or infection of the insect bodies were observed during earlier instars but it was during the later instars that parasites and pathogens fully colonized their bodies.

Pupa. Prior to pupation, the insect underwent an inactive non-feeding pupal stage wherein the larva became shorter and more robust. This lasted for about a day. The prepupa was covered with a white powdery substance secreted by the larva itself.

The pupa was obtect; 25 mm long and 4.5 mm wide. It was soft and light green when newly pupated and turned orange to dark brown when about to emerge. The pupal mortality was 2.23% which was mainly due to fungal attack.

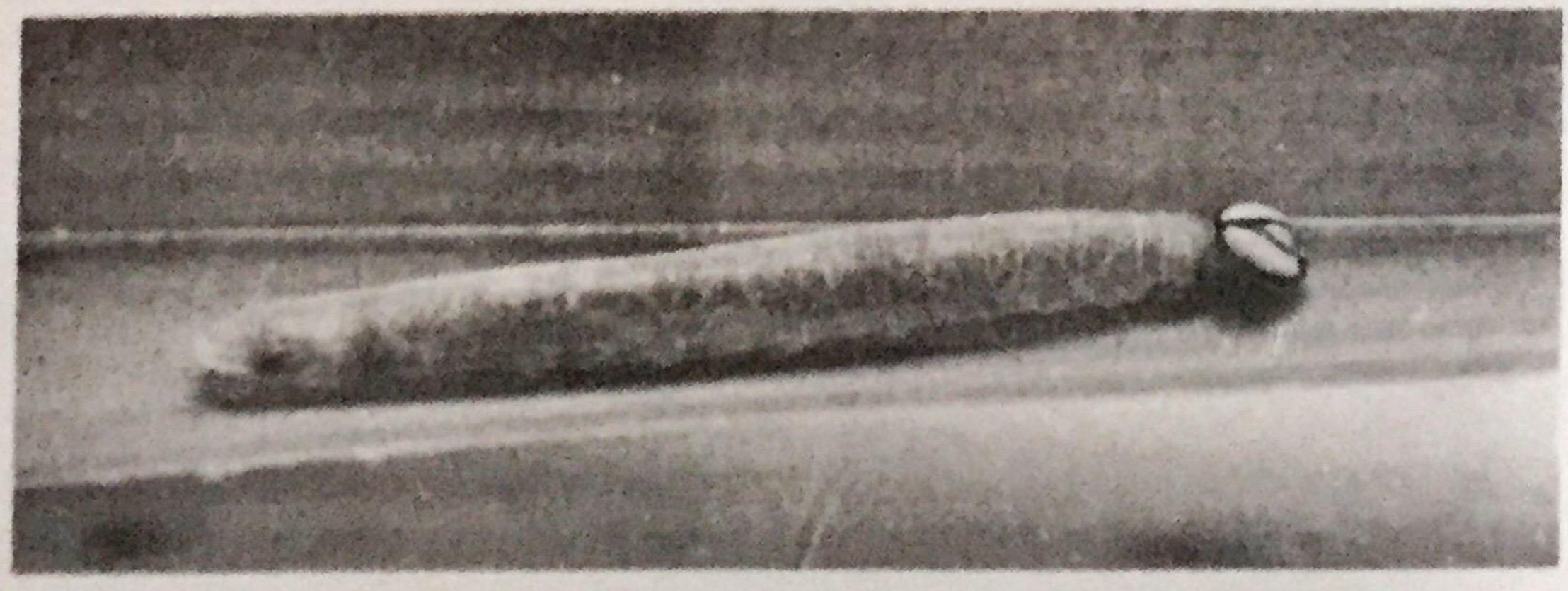

Figure 2. Fifth instar larva of the coconut leaffolder showing a prominent Y mark on the head (x=5).

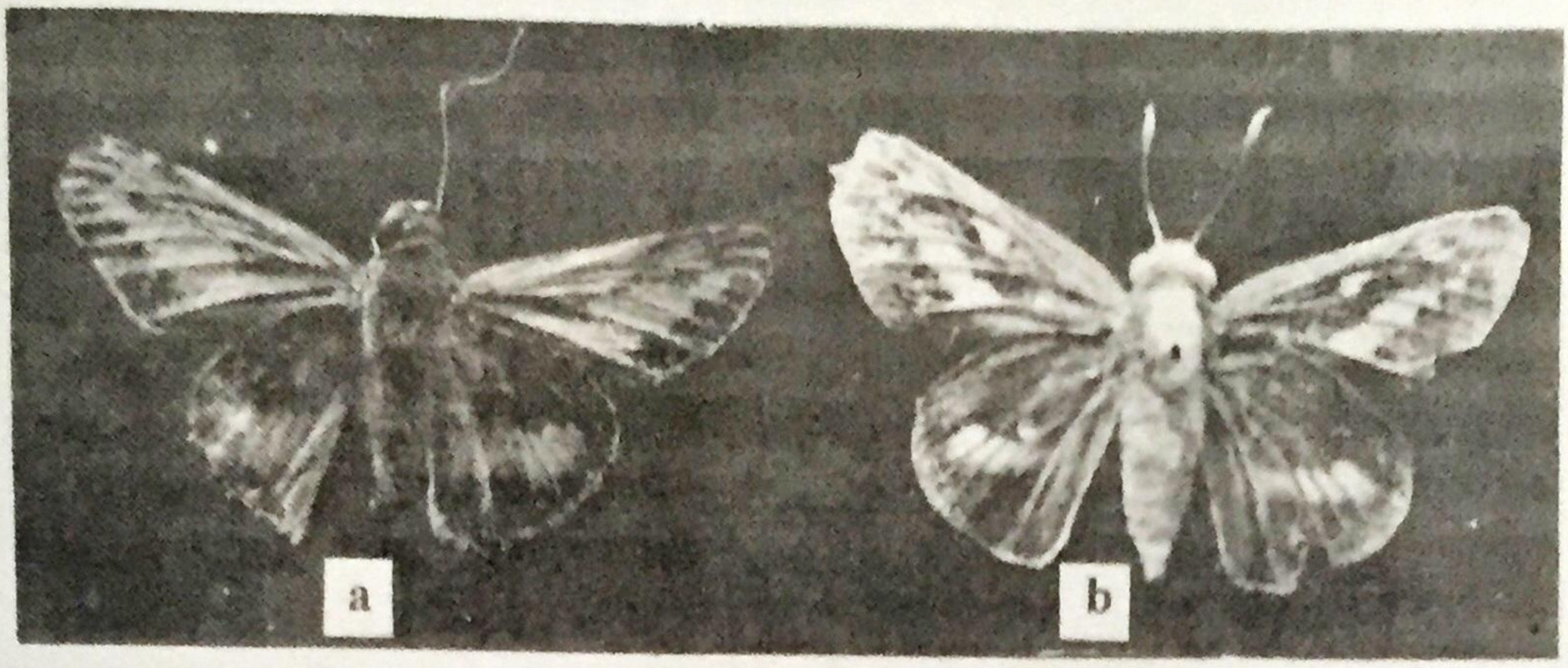

Figure 3. Adults of the coconut leaffolder: (a) male and (b) female (x=3).

Adult. Movement of the adult moth inside the pupa caused the head portion of the pupa to be pushed open allowing it to come out head portion first. A newly emerged skipper had crumpled wings which gradually stretched and expanded. When at rest, the wings are angled at about 45° from the body plane.

The male and female adults are about the same length (19 mm), but the wingspan of males is shorter (22 mm) compared to that of the females (24 mm). The male adult has an orange body with dark brown to black markings and with a dominant orange coloration, while the female is pale black to brown with light yellow markings (Fig. 3).

The female genitalia is composed of a sclerotized plate with tuft of hairs surrounding the median slit (Fig. 4a). The male genitalia is composed of a pair of lateral and one narrow dorsal sclerotized plate forming a hollow at the center (Fig. 4b). The sclerotized plate bore dense long setae projecting inwardly.

There was no great difference between the total developmental period of the male and female leaffolders. The males lived longer than the females with a mean longevity of 3.9 days (Table 1).

Mating of adults was observed at about 1600-1700 hr in the presence of light. Eggs were observed in the oviposition cage a day after mating. A large oviposition cage was needed in order for the adult females to mate and lay fertile eggs. Since several pairs of male and female adults were placed in one large oviposition cage, the number of eggs laid per female was not determined. Females seemed to be indiscriminate in laying their eggs. In the laboratory, eggs were found laid on the wall and roof of the oviposition cage.

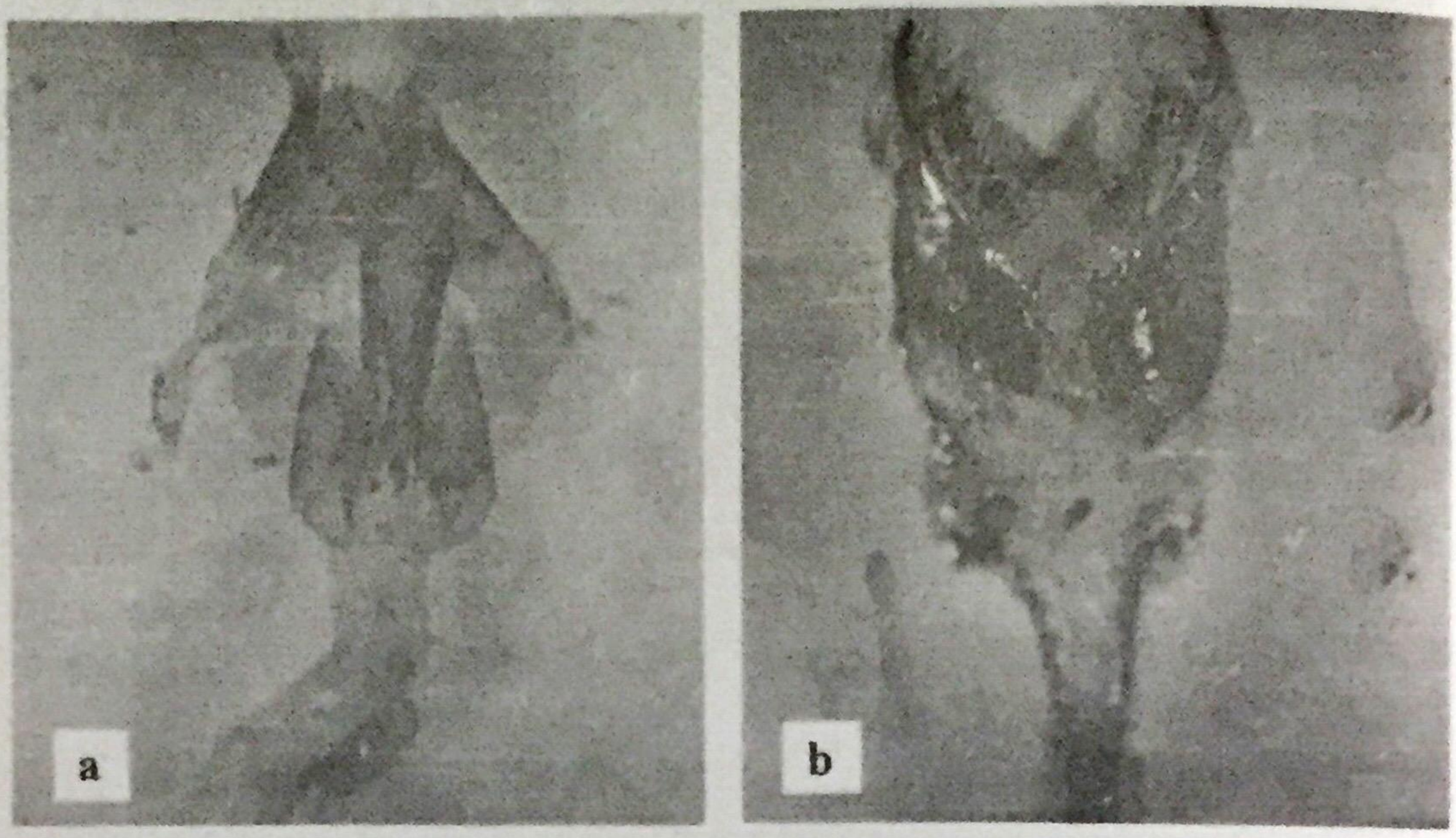

Figure 4. Photomicrographs of the female (a) and male (b) genitalia of the coconut leaffolder (x=40).

Host range. Of the 24 plant species tested as alternate hosts of the coconut leaffolder, 15 species were fed upon after 24 hrs. Nine of them belong to the palm family, namely:*Adonidia merrillii* Becc. (Bunga de China); *Cycas circinalis* (cycad); *Caryota cumingii* Roxb. (pugahan);*Borrasus flabellifera* (palmyra); *Nypa fruticans* Wurmb. (nipa); *Corypha elata* Lodd. (buri); *Arecha catechu* Linn. (betel nut);*Elaeis guineensis* Jcq. (African oil palm); and *Livistona rotundifolia* Mart. (anahaw). The other plant species were: *Musa sapientum* (banana); *Arachis hypogaea* L. (peanut); *Musa textilis* L. (abaca); *Ipomoea batatas* Linn. (sweetpotato); *Manihot esculenta* Crantz. (cassava); and *Penissitum purpureum* (napier grass).

Out of the 15 plant species that were fed on after 24 hrs, only three were further tested due to scarcity of test insects and time limitation. These were Bunga de China, African oil palm and nipa. The insect was able to complete its life cycle only on Bunga de China.

Table 2 shows a comparison of the life cycle of the coconut leaffolder on two host plants. The two data sets were gathered at different times and the number of test insects used were not the same so that they were not statistically analyzed and compared. The data however show that the insects reared on coconut had a shorter developmental period than those reared on Bunga de China. It was also observed that the adults which emerged from larvae fed with Bunga de China were smaller compared to those reared on

Table 2. Comparison of the duration (in days) of the developmental stages of the coconut leaffolder reared on two host plants.

DEVELOPMENTAL PERIOD	COCONUT[1]		BUNGA DE CHINA[2]	
	Range	Mean	Range	Mean
Incubation period	6-7	6.6	6-8	7.0
Larval period				
First stadium	2-6	3.3	3-6	3.4
Second stadium	3-6	3.7	3-4	3.4
Third stadium	3-5	4.2	2-5	3.9
Fourth stadium	4-6	4.7	3-7	4.0
Fifth stadium	3-6	5.1	5-12	8.1
Total larval period	15-28	21.0	19-28	23.1
Pupal period	5-11	7.6	8-10	8.9
Egg laying to adult emergence	27-46	35.1	35-43	39.0

[1]Data based on 92 individuals.
[2]Data based on 20 individuals.

coconut. However, since the two experiments were conducted at different times, environmental factors may have affected the growth of the leaffolders reared on these two host plants. Further study on this aspect and the biology of the insect using the other host plants that were fed on after 24 hrs as hosts are needed.

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