BIOLOGY AND HOST RANGE OF THE TARO PLANTHOPPER, *Tarophagus proserpina* Kirk.

Cecile Joy Y. Duatin and Lorenza B. de Pedro

Research Assistant, Farming Systems Development Project-Eastern Visayas, and Instructor, Department of Plant Protection, Visayas State College of Agriculture, Baybay, Leyte, Philippines.

Portion of BS thesis in Entomology conducted by the senior author in ViSCA, Baybay, Leyte.

ABSTRACT

The biology of the taro planthopper was studied in the laboratory using taro as food. The total developmental periods of the male and female planthoppers are ± 30.86 days and ± 31.29 days, respectively. The insect undergoes five nymphal instars with a duration of 1.31 and 1.25 days in males and females for the first stadium to 17.58 and 17.50 days for the fifth stadium. The female hopper lives longer than the male. Both sexes are morphologically similar except in size and genital structures. Low percentage mortality (8%) was observed during the first to the third instar.

Possible alternate hosts of taro planthoppers are ornamental gabi, *Caladium bicolor* (Ait) Vent.; yautia, *Xanthosoma* sp.; sweet potato, *Ipomoea batatas* (L.) Lam; cassava, *Manihot esculenta* Crantz; and weeds such as milkweed, *Euphorbia hirta* L; kangkong, *Ipomoea aquatica* Forsk.; gabi-gabi, *Monochoria vaginalis* (Burm.f.) Presl.; and alikbangon, *Commelina benghalensis* L.

Natural enemies observed on taro planthoppers were ants, a species of predaceous mite belonging to Family Trobidiidae and a minute gastropod.

Ann. Trop. Res. 8: 72-80.

KEY WORDS: *Tarophagus proserpina* Kirk. Homoptera. Taro insect pest. Life cycle. Host range.

INTRODUCTION

The Philippines is one of the many countries now engaged in the extensive cultivation of taro. Taro or gabi, *Colocasia esculenta* (L.) Schott, can be an excellent source of vitamins, calcium and potassium (PCARR, 1976). When boiled, it is a good substitute for rice and corn because of its starch content.

NFAC (1975) reported that the average taro production in the Philippines is only 3.2 tons per

hectare. This is lower than production in other countries as reported by Knott and Deanon (1970). Insect pests which may act as vectors of taro diseases could be one cause of low yields. PCARR (1976) reported that the taro planthopper transmits the feathery mosaic disease which once became prevalent in Eastern and Central Visayas.

The taro planthopper, *Tarophagus proserpina* Kirk, is one of the most important insect pests attacking taro and other economic crops in the Philippines. It feeds on the stalks and leaves of the taro plant, thereby affecting its photosynthetic activity. Its life history and behavior should be known before one can develop a successful control measure against this pest. Similarly, its possible alternate hosts and natural enemies should be determined before formulation of an effective biological control program.

MATERIALS AND METHODS

Mass Rearing of the Test Insects

Taro planthoppers of different developmental stages were collected from the field and brought to the laboratory to start a stock culture. The collected insects were placed in a screened cage (46 cm H x 20 cm W x 30 cm L) with living Kalpao (a susceptible taro variety) plants as food. The plants were changed whenever the leaves started to dry up.

Behavior and Life History Study

Fifty nymphs from the stock culture were individually reared in test tubes (2 cm Dia. x 15 cm H). Each tube was covered with nylon tulle fastened with rubber bands. Taro setts with 2-3 leaves were provided as food for the cultures. Water was placed inside the test tubes to prolong the life of the setts.

Changes in size, color and behavior of the nymphs were observed daily and the duration of each stadium was noted. The change in instar was determined by the presence of the exuvia in the taro leaves after each molt.

Host Range Study

Plants related to taro such as *Caladium bicolor* (Ait) Vent and *Xanthosoma* sp.; crops like *Ipomoea batatas* (L.) Lam, *Manihot esculenta* Crantz and *Cucurbita maxima* L.; and weeds which include *Monochoria vaginalis* (Burm.f.) Presl., *Ipomoea aquatica* Forsk, *Euphorbia hirta* L., *Commelina benghalensis* (L.), *Rottboellia exaltata* L.f., *Cyperus difformis* L., *Amaranthus spinosus* L., *Digitaria sanguinalis* (L.) Scop., *Echinochloa crusgalli* (L.) Beauv. and *Ludwigia octovalvis* (Jacq.) Raven were found in the vicinity of the taro field. Leaves of these plants were collected, brought to the laboratory, and individually placed in rearing jars provided with water. Then, 20 first and second instar nymphs were

introduced per jar. Three jars were maintained for each plant species. Jars were covered with nylon tulle to prevent the insects from escaping.

Due to the sucking mode of feeding of taro planthoppers, it was difficult to observe whether the insects were feeding or not such that demise of an insect was always considered to be caused by starvation. Plants were considered hosts if the insect pests were still alive after 24 hours and non-hosts if otherwise.

Natural Enemies Study

Field observations were made to record the predators and parasites of the planthoppers. Predatory and parasitic species were brought to the laboratory and reared for identification.

RESULTS AND DISCUSSION

Life History

The duration of the different developmental stages of the taro planthopper is shown in Table 1. The insect undergoes five nymphal instars with varying periods. The first, fourth and fifth stadia and the total developmental period did not differ between the male and female adults. However, differences were observed in the second and third stadia and in the longevity of the adult with females usually living longer than males.

Mating and Oviposition Behavior. Mating lasts for 3-8 minutes each time and is repeated after a short break of about 5-10 seconds. A pair mates 2-3 times a day.

The adult female starts to lay eggs 10-12 days after mating. The eggs are usually laid in pairs as the female inserts its ovipositor into the taro stalk (Fig. 1). A mated female planthopper lays an average of 168 eggs during its entire oviposition period.

Eggs. Incubation period lasts for 1-3 days. Newly laid eggs are soft, whitish, translucent and elongated but the color changes as the embryo develops. When about to hatch, the soft covering of the egg turns yellowish brown and the nymph starts to move out.

Nymphs. The newly hatched nymph is whitish and gradually turns brown as it matures. Feeding which is accomplished by inserting the proboscis of the insect into the stalk starts a few minutes after emergence. After feeding for sometime, the nymph moves to another feeding site. The insect ceases feeding about 10-12 minutes before and after molting. It anchors itself firmly on the stalk of a taro plant, then its body starts to alternately expand and contract until the dorsothoracic part of the outer skin splits. Shedding of the cuticle lasts about 10 minutes. A brownish color can be seen covering the first thoracic region of the nymph as it reaches the third and fourth instars. Likewise, the tips of its tarsal claws become dark brown to black.

A very low percentage mortality (8%) was observed during the first three nymphal instars of the insect. This was attributed mainly to

Table 1. Duration of the developmental stages of taro planthoppers *(Tarophagus proserpina* Kirk) reared on taro setts.

Developmental Stage	Duration (days)			
	Male [1]		Female [2]	
	Range	Mean	Range	Mean
Incubation Period	1-3	1.63 ± 0.56	1-3	1.88 ± 0.74
Nymphal Period				
First Stadium	1-2	1.31 ± 0.48	1-2	1.25 ± 0.44
Second Stadium	2-5	2.45 ± 1.01	3-6	2.83 ± 0.96
Third Stadium	3-6	3.73 ± 1.12	2-6	3.41 ± 0.92
Fourth Stadium	3-6	4.31 ± 1.12	3-7	4.25 ± 1.29
Fifth Stadium	12-23	17.58 ± 3.33	16-25	17.50 ± 2.95
Total Nymphal Period	22-35	29.22 ± 3.56	26-35	29.35 ± 2.52
Total Developmental Period	26-38	30.86 ± 3.56	27-38	31.29 ± 3.14
Longevity of Adult	48-73	58.50 ± 5.54	55-76	61.38 ± 4.99

[1] Average of 22 individuals

[2] Average of 24 individuals

Figure 1. Portion of a taro petiole showing a pair of eggs of *Tarophagus proserpina* Kirk. (40X)

Figure 2. Adult *Tarophagus proserpina* Kirk. (40X)

improper handling of immature insects and to attacks of a parasitic mite belonging to Family Trobidiidae and a predatory gastropod.

Adults. The male and female taro planthoppers have the same morphological structures. They differ only in size, the male being smaller than the female (Fig. 2), and in their genital structures.

The wings of the female adult have an average expansion of 7-9 mm and are folded in roof-like fashion beyond the abdomen. Its body has white lines running dorsally from the head to the terminal end and the length ranges from 3.6 - 4.1 mm. The male adult has an average wing expansion of 6-8 mm and the average body length is 2-4 mm.

Adult genitalia. The male genital plate is large and rounded (Fig. 3) and is located on the ninth abdominal segment. The pygofer is small, pointed, and with spines. The valve and plate protrude at the terminal segment.

The female genitalia (Fig. 3) is located on the ventral abdominal segment. The ovipositor blade runs from the second abdominal segment and extends beyond the tip of the sheath. The pygofer is broad, runs along the ovipositor, and provided with spines at the tip.

Host Range

The taro planthopper was observed to feed on a variety of plants in the field and in the laboratory. Of the 15 species of plants individually placed in rearing jars and offered in the laboratory, the insect readily fed on 8 plants within 24 hours. The other plant species did not show any sign of feeding by the insect.

The following plants were considered possible alternate hosts of the taro planthopper: ornamental gabi, *Caladium bicolor* (Ait) Vent.; yautia, *Xanthosoma* sp.; sweet potato, *Ipomoea batatas* Linn. (Lam); cassava, *Manihot esculenta* Crantz; weeds such as milkweed, *Euphorbia hirta* L.; kangkong, *Ipomoea aquatica* Forsk; gabi-gabi, *Monochoria vaginalis* (Burm.f.) Presl.; and alikbangon, *Commelina benghalensis* L.

Plants which were not fed on by the insects after 24 hours were aguingay, *Rottboellia exaltata* L.f.; pandan-pandan, *Cyperus difformis* L.; spiny amaranth, *Amaranthus spinosus* L.; crab grass, *Digitaria sanguinalis* L. (Scop.); barnyard grass, *Echinochloa crusgalli* (L.) Beauv.; malapako, *Ludwigia octovalvis* (Jacq.) Raven; and squash, *Cucurbita maxima* L.

Natural Enemies

Egg Predator. A predatory ant species was observed boring into the solidified slimy substance which sealed the oviposition tunnel in the taro petiole. It entered by opening the tunnel and then fed on the contents of the eggs. Due to the difficulty in determining the number of eggs destroyed by the ants, the percentage predation was not calculated.

Nymph and Adult Predator. Larvae of a mite species (Fig. 4a)

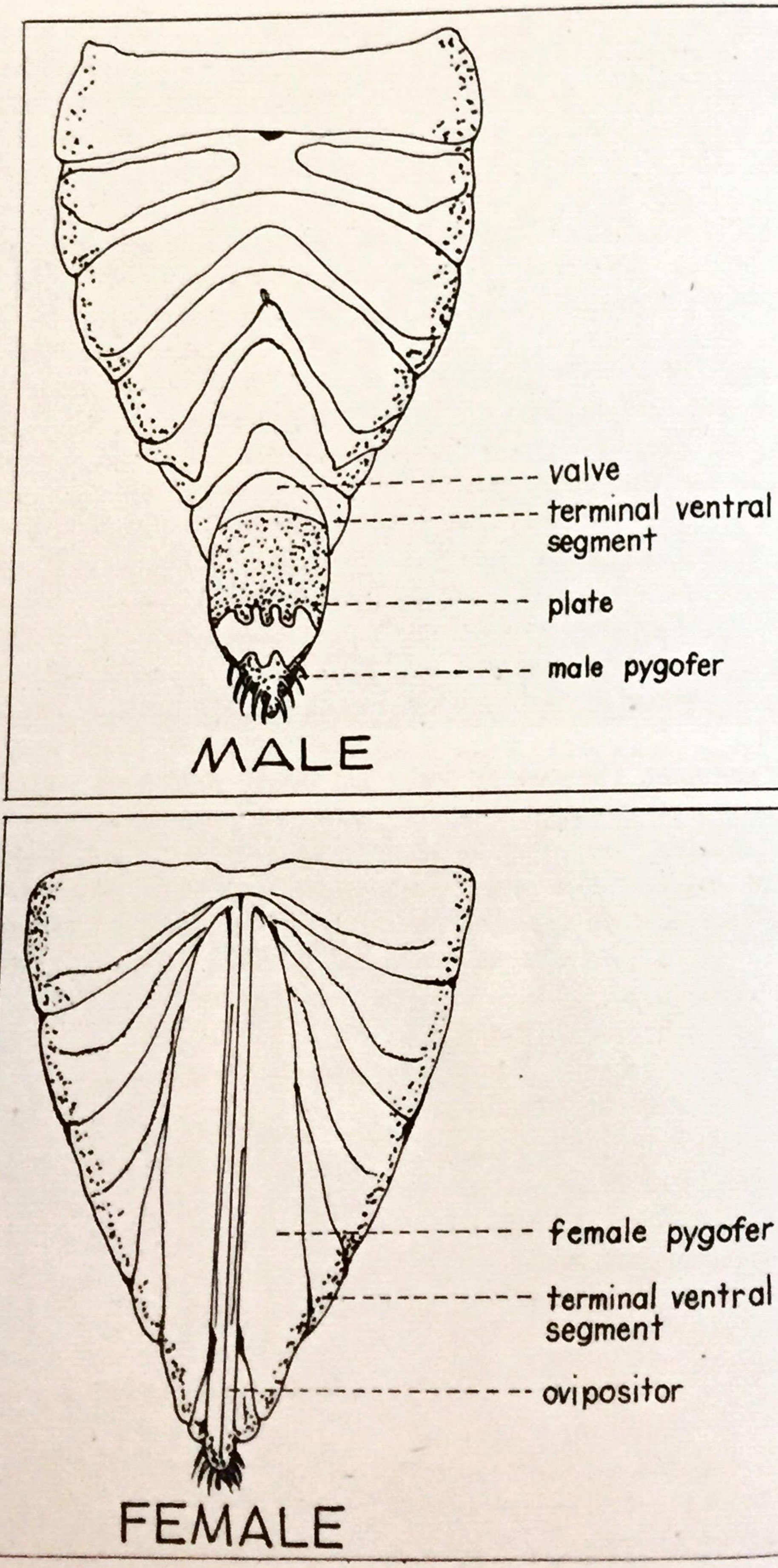

Figure 3. Genitalia of *Tarophagus proserpina* Kirk.

Figure 4. Natural enemies of *Tarophagus proserpina* Kirk
a. Parasitic mite b. Gastropod

belonging to Family Trobidiidae (Raros, pers. comm., Dept. of Plant Protection, ViSCA) were found attacking the planthoppers in the field. Of the 150 planthoppers collected, 13% was found to be infested with mite larvae.

A minute species of gastropod was also found clinging to the body of the nymph planthoppers. Of the 150 planthoppers collected, 14.7% was found infested with this gastropod which sucked the blood of the nymphs (Fig. 4b).

LITERATURE CITED

KNOTT, J.E. and DEANON, J.R. 1970. Vegetable Production in Southeast Asia. University of the Philippines Press. 36 pp.

NATIONAL FOOD AND AGRICULTURAL COUNCIL. 1975. Gabi marketing. Department of Agric., Diliman, Quezon City. 26 pp.

PHILIPPINE COUNCIL FOR AGRICULTURE AND RESOURCES RESEARCH. 1976. The Philippines recommends for taro. pp. 12-20.