BIOLOGY OF THE BLACK LEAFHOPPER, *Ricania speculum* Walker on PATOLA (*Luffa cylindrica* (L) Roem)

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ABSTRACT

Eggs of black leafhopper, *Ricania speculum* Walker, were laid in batches on the nether surface of patola leaves (*Luffa cylindrica* (L) Roem) and were commonly covered with white mealy secretions. Incubation period of eggs on both detached and undetached leaves lasted 17 days. Total development period ranged from 40-71 days for males and 37-73 days for females when reared on detached leaves, and 41-61 days for males and 40-61 days for females on undetached leaves. There were 5 nymphal instars. The male to female ratio was 1:1.32 for those reared on detached leaves and 1:1.82 on undetached leaves. Of the 5 alternate hosts tested, ampalaya (*Momordica charantia* L.) sustained the insects for the longest period, i.e., until the 4th instar. An unidentified species of spider preyed on both the nymphs and adults.

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KEY WORDS: Black leafhopper. *Ricania speculum* Walker. Mass rearing. Patola. *Luffa cylindrica.* Life history and behavior. Host range. Natural enemy.

INTRODUCTION

The black leafhopper, *Ricania speculum* Walker, is a serious insect pest of patola (*Luffa cylindrica* (L) Roem). Both nymphs and adults suck the sap of the plant so that during heavy infestation the upper leaves turn yellow and dry prematurely (Fig. 1). The pest feeds also on developing fruits (Fig. 2) preventing them to reach harvestable size. When infestation is high, the honeydew excreted by the leafhopper serves as substrate for fungal growth. Thus, the leaf surface becomes black thereby affecting photosynthesis. Matarong (1983) observed that heavy infestation by the black leafhopper could cause

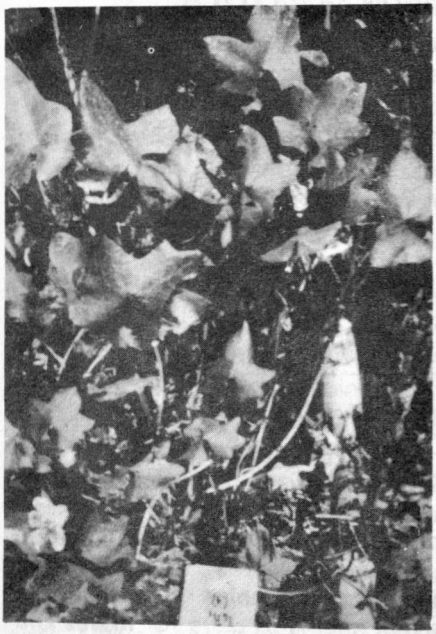

Fig. 1. Yellowing of patola leaves as a result of black leafhopper feeding.

about 20% yield reduction.

Gabriel (1975) mentioned that the black leafhopper is a pest of cucurbits. Likewise, Esguerra and Gabriel (1969) and Rejesus and Aguda (1975) gave a brief description of adults. No detailed biological information about the pest is available.

MATERIALS AND METHODS

Mass Rearing of Pest.— Nymphs and adults were collected from the field, brought to the laboratory and sorted out. Nymphs of similar sizes were placed in separate rearing bottles provided with excised patola leaves as food. The adults were paired and placed in cages provided with fresh patola leaves. Each leaf petiole was wrapped with a wad of

Fig. 2. Black leafhopper nymphs on developing and mature fruits of patola.

Fig. 3. Nylon cloth cases with patola leaves used for studying the biology of the black leafhopper on undetached plant parts.

moist cotton, tied with thread, and hung in the cage to serve as food and egg-laying substrate.

Until oviposition ceased, portions of leaves containing the eggs were cut out daily and transferred to petri dishes lined with moist cotton. The eggs were then allowed to hatch.

Life History and Behavior.— Preliminary observations showed high mortality when newly hatched nymphs were transferred to petri dishes. Hence, these nymphs were allowed to stay on the leaves until the second instar. One hundred second instar nymphs were then transferred individually to rearing bottles provided with excised leaves as food. The bottles were covered with fine mesh nylon cloth to prevent the nymphs from escaping. Another 100 nymphs were taken and placed on undetached leaves enclosed in nylon cloth (Fig. 3). Daily observations were made on these cultures and the total developmental period, number of nymphal instars, mortality rate and nymphal behavior were recorded. The sex of emerging adults was determined by its size and by examining their genitalia. The number of eggs laid by the females, longevity of adults and mating behavior were also recorded.

Determination of Host Range.— Using the described procedure for studying the insect's life cycle, newly hatched nymphs were reared on 5 other suspected host plants which were either growing near or around the patola plantation and on those closely related to patola. Plants that showed signs of feeding were used as hosts for rearing the black leafhopper for one generation.

Table 1. Duration (days) of the developmental period and other characteristics of *Ricania speculum* Walker reared on patola.

Developmental Period/Characteristic	Detached Leaves				Undetached Leaves			
	Male (22 individuals)		Female (29 individuals)		Male (23 individuals)		Female (43 individuals)	
	Range	Average	Range	Average	Range	Average	Range	Average
Incubation Period of Eggs		17		17		17		17
First stadium	6-15	8.45 ± 2.09	6-15	8.41 ± 2.23	6-8	6.43 ± 0.49	5-8	6.02 ± 0.34
Second stadium	5-11	6.14 ± 1.35	5-9	6.10 ± 1.09	6.10	8.26 ± 1.21	6-10	8.32 ± 1.03
Third stadium	5-11	7.36 ± 1.66	3-11	7.10 ± 1.73	5-13	7.56 ± 1.78	5-13	8.44 ± 1.79
Fourth stadium	7-17	9.77 ± 3.53	6-21	9.72 ± 2.89	7-13	9.52 ± 1.74	7-13	9.19 ± 1.70
Total Nymphal Period	23-54	31.72 ± 6.91	20-56	31.33 ± 4.65	24-44	31.77 ± 9.95	23-44	31.97 ± 10.31
Total Developmental Period	40-71	48.72 ± 8.17	37-73	48.33 ± 7.38	41-60	48.77 ± 4.68	40.61	48.97 ± 3.99
Longevity of Adults	1-20	11.68 ± 7.11	1-33	19.83 ± 10.52	1-31	14.69 ± 10.62	1-35	22.86 ± 10.33
Fecundity			20-125 eggs	73.84 eggs			25-520 eggs	245.88 eggs
Ratio (M:F)		1.00:1.32				1.00:1.82		

Identification of Natural Enemy. — Field-collected nymphs and adults were brought to the laboratory and allowed to feed on the host plants for 2 weeks to rear parasites. In the field, predators preying on *R. speculum* of patola were also observed.

RESULTS AND DISCUSSION

Life History and Behavior.

Life Cycle. — Incubation period of eggs and the average total developmental period of both sexes were the same but the mean longevity of the hopper was greater on undetached than on detached patola leaves (Table 1). The insect underwent 5 nymphal instars. The total nymphal period did not vary significantly between sexes and between detached and undetached leaves. The total mortality of the nymphs was higher when the insect was reared on detached leaves (43.6%) than on undetached ones (29%) (Table 2). Death was caused largely by a disease manifested initially by

Table 2. Mortality (%) of *Ricania speculum* Walker at different instars when reared on patola.

Nymphal Instar	Percent Mortality	
	Detached Leaves	Undetached Leaves
First Instar	8.6	9.0
Second Instar	2.0	11.0
Third Instar	5.0	9.0
Fourth Instar	28.0	0
Total	43.6	29.0

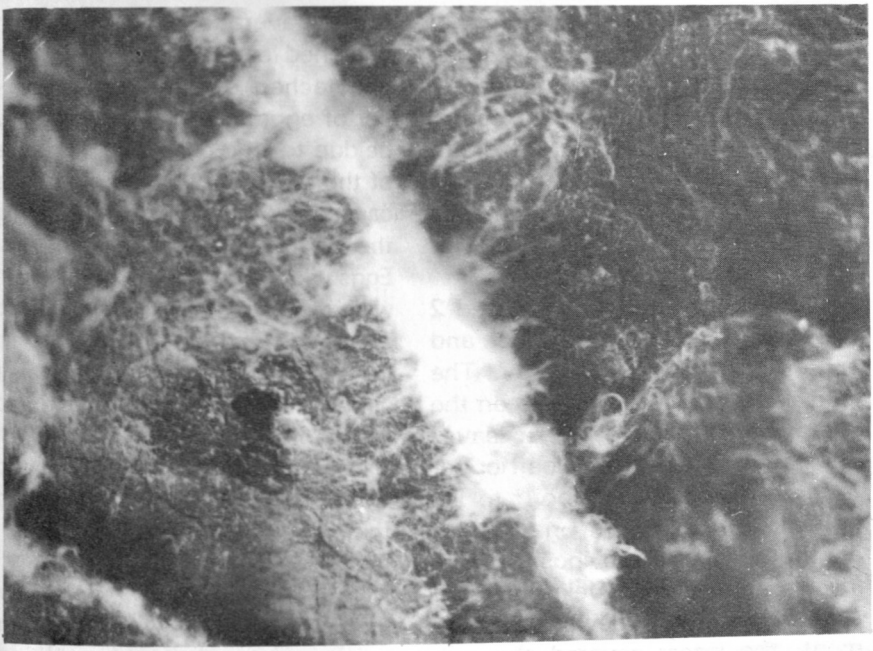

Fig. 4. Mealy secretions which cover the eggs of the black leafhopper.

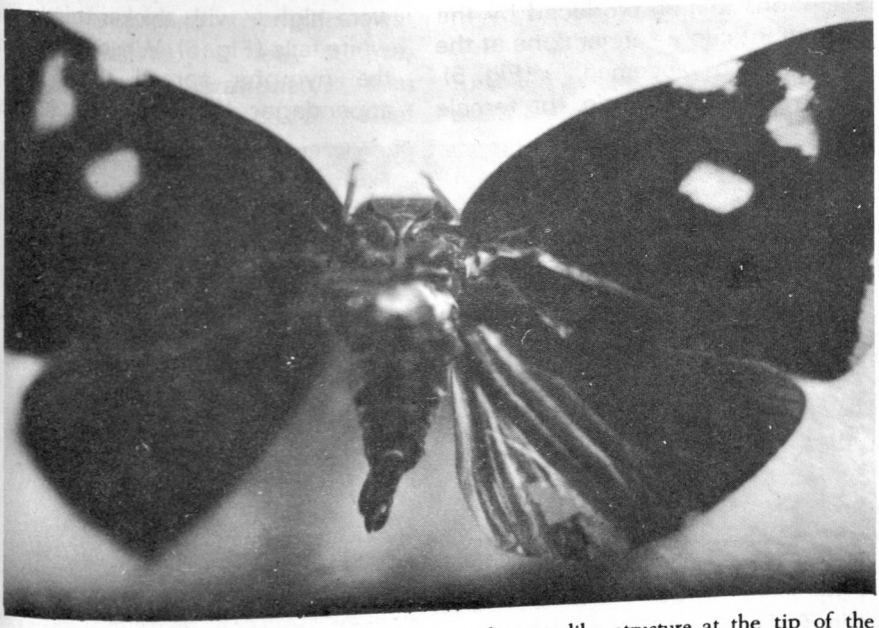

Fig. 5. Female adult black leafhopper showing the cup-like structure at the tip of the abdomen which produces mealy secretions that cover the newly laid eggs.

sluggishness and discontinuance of feeding. The nymphs then turned black and became mummified. Isolation of the suspected causal organism on the general medium, tryphon glucose yeast agar (TGYA) was a failure. A special medium was probably necessary.

Oviposition. — Egg laying started 2 to 3 days after adult emergence and continued up to the 8th day. The eggs were laid mostly in rows on the nether surface of the patola leaves any time of the day. The leafhopper became restless when about to lay eggs and moved from one leaf to another. Then the ovipositor was inserted into the leaf veins in rapid succession. By sideward movement, the insect covered the oviposition sites with cottony mealy secretions (Fig. 4) produced by the prominent cuplike projections at the tip of the abdomen (Fig. 5) Throughout its life cycle, the female laid an average of 73.84 eggs on detached leaves and 245.88 eggs on undetached ones. The lower number of eggs laid on the former may be due to the lower turgor pressure of the plant cells which might have caused some difficulty in inserting the ovipositor into the plant tissues. Eggs which measured about 0.5 mm wide x 1 mm long were ovoid and clear white when newly laid then turned creamy white 1 to 3 min after deposition. Nymphs were white and minute measuring about 0.5 mm wide x 1.5 mm long. They moved around the petri dish and jumped immediately when disturbed.

Nymphal Deveiopment. — Nymphs at various instars were similar in appearance and color but different in size. Those in the later instars were higher with thicker bristle-like white tails (Fig. 6). When disturbed, the nymphs spread the tail-like appendages. When a nymph jumps,

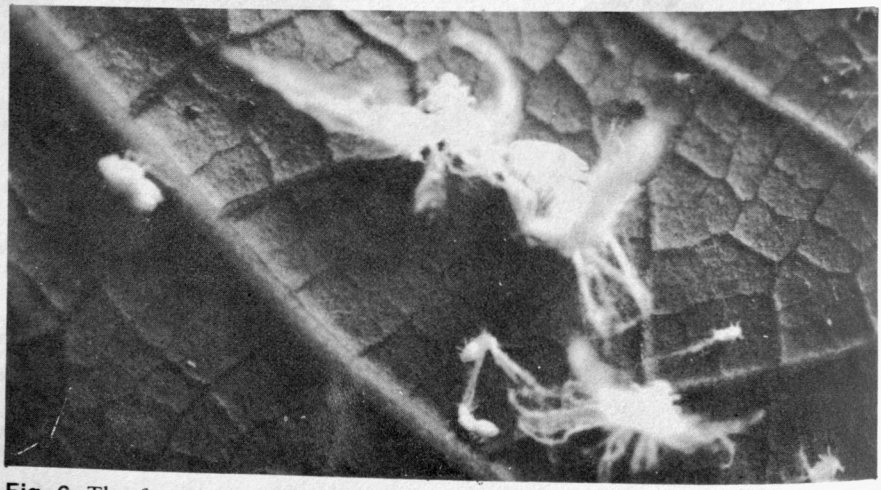

Fig. 6. The four different nymphal stages of the black leafhopper. Note the tail-like structure that spreads when they are disturbed.

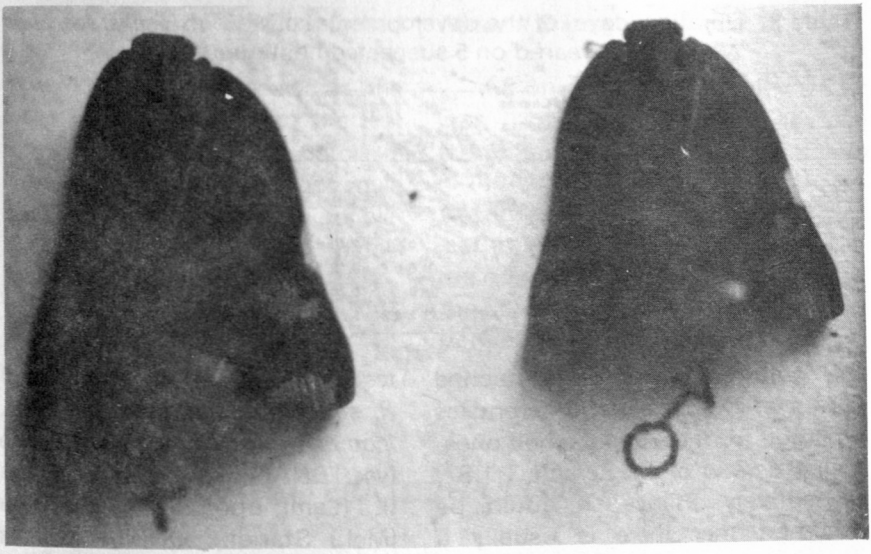

Fig. 7. Male and female black leafhopper adults. Note the transparent spots on their forewings.

it descends to another surface very slowly possibly to minimize injury.

Newly-hatched nymphs first moved around the leaf surface, became more stationary, then pierced the undersurfaces of the leaf to suck the sap. When about to molt, they became stationary, stopped feeding and formed a slit at the back which became wider after 20 to 30 min and through which a sluggish pinkish white nymph came out. The nymph began to crawl around and started to feed 1 to 2 min after, leaving the shed-off skin still attached to the nether surface of the leaf.

Adult Emergence and Mating Behavior.— Adult emergence occurred any time of the day. Nymphs stopped feeding, became stationary, and a slit which soon became wider was formed at the back of the nymph. The adult black leafhopper (Fig. 7) finally emerged from this slit. The wings of the adult remain crumpled and still attached to the exuvium until they dry. The adult began to walk around and fed on the leaves 5 min later. Courtship began 1 to 2 days after emergence. The male first tried to "kiss" the female by letting their faces touch while the female adult remained stationary. Then the male moved around the female several times, and once the female was ready, the male inserted itself under the body of the latter. Mating is accomplished when tips of the abdomen of the male and female become connected. Copulation takes place for several hours if the insects are not disturbed.

Male-Female Ratio.— Twenty-two males and 29 females emerged from

Table 3. Duration (days) of the developmental period of *Ricania speculum* Walker when reared on 5 suspected host plants.

Host Plant	Detached Leaves — Nymphal Stages				Undetached Leaves — Nymphal Stages			
	First	Second	Third	Fourth	First	Second	Third	Fourth
Morning Glory	6.70 ± 1.15	0	0	0	3.00 ± 2.49	0	0	0
Sweet Potato (BNAS 51)	6.40 ± 1.43	0	0	0	2.10 ± 0.99	0	0	0
Upo	7.56 ± 2.93	4.88 ± 1.12	0	0	3.32 ± 2.11	0	0	0
Squash	5.80 ± 1.14	4.16 ± 2.19	0	0	6.76 ± 4.89	2.82 ± 1.17	0	0
Ampalaya	2.77 ± 1.27	8.10 ± 1.32	7.81 ± 2.76	9.33 ± 2.87	5.88 ± 2.77	8.66 ± 1.13	0	0

the cultures reared on detached leaves while 23 males and 43 females emerged from the undetached ones, giving a ratio of 1:1.32 and 1:1.82, respectively. Hence, it could be assumed that there is usually a preponderance of female black leafhoppers in the field.

Host Plants.

The 5 other plants which were tested as possible alternate hosts of *R. speculum* were morning glory, *Ipomoea triloba* Linn; sweet potato (var. BNAS-51), *Ipomoea batatas* (L.) (Lam); upo, *Lagernaria sicinaria* (Mol.) Standl.; squash, *Cucurbita maxima* Duch and ampalaya, *Momordica charantia* L.

The black leafhopper was reared up to the fourth instar on detached leaves of ampalaya and only until the second instar on the undetached

Fig. 8. An unidentified predatory spider feeding on adult of *R. speculum*.

ones as well as on both detached and undetached leaves of squash (Table 3). Insects reared on the other 3 plants died during the first instar. In the absence of patola in the field, the black leafhopper could possibly maintain a very low population on ampalaya until patola becomes available.

Natural Enemy.

An unidentified predatory spider was observed to prey on the nymphs and adults of *R. speculum* in the field (Fig. 8). It moved slowly toward the nymphs and adult black leafhoppers which were busy feeding on patola. In a quick movement, the spider caught and held the prey between its mandibles and fed on it.

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