

## BIOECOLOGICAL STUDIES OF *AMRASCA DEVASTANS* (DISTANT) ON OKRA (*ABELMOSCHUS ESCULENTUS*) IN KARACHI PAKISTAN\*

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**Abstract.** The biology of *Amrasca devastans* (Distant) was studied on okra (*Abelmoschus esculentus*) leaves under laboratory conditions, to determine the growth, longevity and reproduction of the leafhopper. Studies were also made on the incubation period and oviposition potential of females. These studies have revealed that this species is capable to feed and breed on at least nine plant species. At a temperature range of 80–89°F, it survives for 9–37 days, and can lay on the average 17.7 eggs per female. The eggs have an average incubation period of 8.4 days. The nymphal period on the average lasts for 11.1 days. Total nymphal mortality of the leafhopper in laboratory was 12.1%. The species breeds to extremely huge numbers on okra and mostly feeds on the leaves rendering them dead very soon. The results fairly agree with Afzal and Ghani<sup>2</sup> and Saxena and Saxena,<sup>10</sup> but differ in some details.

Of more than 24 species of *Empoasca* complex known in India and Pakistan, *Amrasca devastans* is one which causes serious damage to cotton, okra, brinjal and a large number of other plants. Distant<sup>6</sup> described the species *Empoasca devastans* from Nagpur (India). The species became well-known very soon as a pest of cotton, okra and certain other plants. Ghauri<sup>7</sup> described a new genus *Amrasca* from India with *Amrasca splendens* as type species and also placed *E. devastans* in the genus. The new combination is: *Amrasca devastans* (Distant), and *Empoasca devastans* Distant.

The present account deals with the biology of *A. devastans* on okra leaves in the laboratory.

### Material and Methods

Okra (*Abelmoschus esculentus*) plants were grown in pots and were kept free, from infestation of leafhoppers. When each plant was 6–8 in in height, it was brought into seminatural environment of the laboratory. Humidity and maximum and minimum room temperatures were recorded daily. Late instar nymphs of *Amrasca devastans* were brought from the field and enclosed on leaves of okra plants, in muslim cum polythene sleeve as used by Ahmed.<sup>3</sup> The adults which moulted, were taken out with an aspirator, and kept in pairs in another similar sleeve, for allowing them to mate. A glass-lamp chimney with muslin coverings at its both open ends was occasionally used to cover the okra leaf and for keeping the pair trapped. The leaf was inserted in the chimney from the open cloth end, after which a pair was also introduced. The opening was closed round the stem of the leaf with a paper pin. The chimney cage was held inclined by a clamp and a stand.

A mated pair which had been allowed free feeding and egg laying on a numbered leaf for 24 hr was every time taken out and introduced in a new sleeve or chimney and a new numbered leaf. The leaf was marked with date and kept enclosed, so that no other leafhopper could disturb it. The above procedure was continued until the female died. The infested plants were daily observed for nymphal hatching.

The first instar nymphs which hatched out were kept in plastic minicages<sup>3</sup> kept pressed on okra leaves with the help of rectangular cardboard pieces. The cardboard pieces larger than the width of the leaf were cut, placed on the dorsal side of the leaf and held in place with a rubber band. On the ventral side of the leaf, the plastic minicage was placed under a rubber band and held tight. The leaf was held upright with a string on the cardboard and tied to a rod of the stand. The cage was observed after every 24 hr for the cast skin, showing moulting.

**Mating and Oviposition.** The leafhoppers usually mate on the underside of the leaf but occasionally on the upper surface, in the early hours of the morning or late in the evening. The male shows enormous premating activity by moving its hind legs and wings and finally places itself tail to tail with the female. They remain in coitus from a few minutes to half-an-hour.

Mating takes place at least 24 hr after the emergence of the adults. The mated female starts laying eggs within 2–3 days at temperature usually above 75°F. The eggs are embedded singly in the epidermis with the help of ovipositor along the sides of midrib, or major veins of the leaf. The first instar nymphs usually remain close to the site of their emergence and resume feeding immediately after hatching. After a lapse of a few hours, they become active, and stout. In 5 moults, they reach maturity.

### Life History

The life history of 30 adults was studied on okra.

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Tables 1 and 2 indicate the data of various stages of oviposition and life history of *A. devastans*. During July the females of *A. devastans* lived for 4–37 days (average 17.1), oviposited for 3–8 days (average 4.5) and individual female laid 10–29 eggs (average 17.1). The incubation period was 4–11 days (average 8.4) and total life history passed in 15–23 days (average 22.1).

**Principal Host Plants.** The principal host plants of *A. devastans* are okra, cotton and brinjal. The leafhopper is found on okra from June to August. Its peak infestation is in the month of August, after which it starts shifting to cotton. By October its population starts getting low. With the harvest of cotton and onset of winter, its overall activity diminishes considerably. However, it occurs in small numbers on brinjal, potato and hollyhock. During January–February, the infestation of the species is at its minimum. From March it again starts its activity on okra.

The choice of the main host plants lies in the fact that the epidermis may be soft enough for the female ovipositor to rupture and lay eggs. Later, when the nymphs hatch, the epidermis should be soft enough for feeding. Lal and Husain<sup>9</sup> stated, that it was not the hairiness of the leaves that makes a variety resistant. The resistance of hairy varieties was due to the inability of jassids to feed on it, and their inability to oviposit on them.<sup>9</sup> The Jassid resistant character was due to the toughness of the cuticle of the leaf, which prevented the ovipositor to enter the tissues.

**Alternate Host Plants.** When the main host plants are not available, the leafhopper feeds and reproduces on other plants.

TABLE 1. LIFE SPAN AND FECUNDITY OF *Amrasca devastans* (FEMALE) ON OKRA LEAVES (1973).

Pair No.	Female hatched on	Mated on	Oviposition started on	Total life (day)	Oviposited for (day)	Total eggs laid
1	July 2	July 3	July 5	4	3	10
2	" 3	" 4	" 6	22	5	19
3	" 4	" "	" 8	6	4	14
4	" 10	" "	" 14	36	6	28
5	" 10	" 12	" 17	37	8	29
6	" 18	" "	" 27	9	3	9
7	" 15	" 16	" 17	6	3	13
			Average	17.1	4.5	17.7

TABLE 2. LIFE HISTORY OF *Amrasca devastans*.

Stage	Duration range in days	Average (days)
Egg	4–11	8.4
First	2–4	2.8
Second	2–4	2.3
Third	1–3	2.0
Fourth	1–3	1.9
Fifth	1–3	11.1
Total life history (Egg to adult)	15–23	22.1

Afzal and Ghani have listed the following plants as alternate host plants. (a). *Althea rosea* (hollyhock); (b). *Solanum tuberosum* (potato); (c). *Hibiscus tiliaceus*; (d). *Helianthus annuus* (Sunflower); and (e). *Datura fastuosa* (Datura).

Bhatia<sup>4</sup> mentioned castor (*Ricinus communis*) and artichoke (*Cynara scolymus*) as alternate host plants. Cherian and Kylasams<sup>5</sup> have mentioned sunflower as a food plant and not as a host plant, as stated by Afzal and Ghani.<sup>1</sup> Husain and Lal<sup>8</sup> listed 'ban kapas' (*Hibiscus vitifolius*), 'sunkukra' (*Hibiscus cannabius*) and some cucurbits as its food plants. The present workers also recorded castor (*Ricinus communis*), 'sem' (*Lablab niger*), 'pea' (*Pisum sativum*), 'salad' (*Latuca sativa*), 'kadu' (*Lagenaria vulgaris*), and 'falsa' (*Grewia asiatica*) as alternate host and food plants of the leafhopper.

**Feeding Effects.** The nymphs feed on the ventral side of the leaf, but adults are occasionally found feeding on the dorsal side. At the site of feeding small areas of burn patches, usually known as hopper burn appear.

Afzal and Ghani<sup>2</sup> studied the feeding effect of *A. devastans* on cotton and found that it affects the growth in height of the plant, flower and boll production, and technological properties of lint. The insect similarly attacks new and tender leaves of the okra plant. The eggs are laid by the female on the newer leaves rather than old ones. In severe infestation the whole leaf turns yellowish and falls off. The desapping of the leaf affects the growth of the plants and quality of the fruit.

## Discussion

*Amrasca devastans* had been reared earlier on cotton by many workers.<sup>2,8,11</sup> Saxena and Saxena<sup>10</sup> studied its biology and life history on okra fruit, whereas the present work deals with its biology and ecology on leaves of okra. The comparative results derived from the three types of study reveal, that okra leaves are given preference by the leafhopper for the purpose of egg laying and feeding. Not only the higher population of *A. devastans* on okra plant, but also the life history data sufficiently support this contention. According to Husain and Lal,<sup>8</sup> and Verma and Afzal<sup>11</sup> 80% of first instar nymphs reached adult stage on cotton leaves, whereas Saxena and Saxena<sup>11</sup> successfully reared 86% of first instar nymphs into adult stage. The present workers completed development of about 88% of first instar nymphs on okra leaves. Verma and Afzal<sup>12</sup> reported that a female laid 6.6–9.0 eggs on susceptible variety of cotton, whereas Saxena and Saxena<sup>11</sup> reported 9.1–14.3 (average 11.6) eggs by a female on okra fruit. The present workers have discovered that a female lays 11–29 (average 17.7) eggs on okra leaves. We can indirectly conclude that the leafhopper appears to prefer okra leaves over all other host plants and their parts. It is also supported by the fact, as has been agreed by Saxena and Saxena<sup>11</sup> that in nature, the leafhopper prefers to feed and breed on okra leaves, rather than fruits. The total life of the adult and total nymphal period



on cotton have been stated to be 35-90 and 7-29 days respectively. These results vary considerably from those drawn by Saxena and Saxena<sup>10</sup> and the present workers. The corresponding figures for okra fruit had been 35-50 days and for okra leaves 4-37 days (average 17.1) and 9-13 days (average 11.1).

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