HOST RANGE AND BIOLOGY OF *AMRASCA BIGUTTULA BIGUTTULA*

(HEMIPTERA: CICADELLIDAE)

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ABSTRACT

The present investigation was carried out during 2015-2017. Total 17 host plant species belong to 8 different families were recorded of okra jassid at Talwandi Sabo. This pest was noticed first time feeding mainly on green leaves of okra crops in Talwandi Sabo (Bathinda), Punjab. The biology studies revealed that the life cycle of cotton jassid passed through three different stages i.e. egg, nymph, and adult. The nymph passed through five instars and the average duration (days) of each instar was found to be 2.06 ± 0.7 , 3.53 ± 1.0 , 3.67 ± 1.1 , 4.40 ± 1.1 and 4.73 ± 1.0 days, respectively on okra crop. The adult longevity of male and female cotton jassid was observed to be 15.80 ± 1.6 , 18.66 ± 1.8 days, respectively on okra crop.

KEYWORDS: *Amrasca Biguttula Biguttula*, Okra, Host range & Biology

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INTRODUCTION

Okra (*Abelmoschus esculentus* L.) annual summer vegetable crop is grown commercially throughout the tropical and sub-tropical regions of the world (Kochhar, 1986). It consists of dietary fiber, carbohydrates, protein, vitamin A, vitamin B, vitamin C and minerals (iodine, magnesium, and potassium) (Farinde, *et. al.*, 2007; Dilruba, *et. al.*, 2009; Saifullah & Rabbani, 2009). It has many medicinal properties and used for treating renal colic, leucorrhoea, chronic dysentery and general weakness (Singh & Singh, 2000). Despite its many medicinal uses, Okra is infested by many sucking insect pests (Singh, *et. al.*, 1993; Kakar & Dobra, 1988; Dhandapani, *et. al.*, 2003). Earlier 72 species of insects were reported on okra out of these okra jassids was considered as the major pest (Maqsood, *et. al.*, 2017). Okra jassid (*Amrasca biguttula biguttula*) belongs to family Cicadellidae and order Hemiptera. The adults are elongate and wedge-shaped with a pale green body. Its forewings have black spots on each of the apical margin and two black spots on the vertex of the head. The adults are very active with sideway movements, but quick to hopping (Jayarao, *et. al.*, 2015). The nymphs and adults both suck plant sap and introduce salivary toxins that impair photosynthesis (Hormechan, *et. al.*, 2001). In view of the above facts, the present studies on Host Range and Biology of *Amrasca biguttula biguttula* (Hemiptera: Cicadellidae) were carried out.

MATERIALS AND METHODS

Host range of cotton jassid was studied by making collections with aspirator from different plants at Talwandi Sabo. Assessment of infestation by *A. biguttula biguttula* on various crops was done as per the scale is

given below:

1 Grade: 0-2 jassid per leaf

2 Grade: 3-5 jassid per leaf

3 Grade: 6-8 jassid per leaf

4 Grade: >8 jassid per leaf

Colonies were raised using okra seedling grown in pots the colonies were raised confined the jassids on the potted plants. Adult male and female population of *A. biguttula biguttula* were released on the potted plants for egg laying. The neonate populations were used in different studies later on.

A large number of male and female were released on the potted plants for 24 hr. They were removed the next day morning and the plants were covered with the glass chimney. The plants were observed daily for the emergence of the nymph. The period between the egg laying and first hatching was taken on the incubation periods of eggs. The eggs were laid singly within the tissues. They were observed after dissecting the plant's tissue under the dissecting microscope.

In order to study the number and the duration of the nymphal instars, 15 neonate nymphs were released singly on leaves of okra, with only cotyledonary leaf, and under in plastic containers (4.0 × 3.0 cm) which were duly numbered (Brar, 1976). Daily observations were made to note the change of the instar and to remove the exuviae if any. The exuviae were removed with a moist camel-hair brush at the time of the observations. The interval between two moultings was taken as the duration of the nymphal instar and the total nymphal instar and the total nymphal period was taken as the interval between the time of the release of a neonate nymph and the emergence of the adult. The survival percentage of nymphs during different months and sex ratio of the adults reared from the nymphs in the laboratory were also worked out.

15 newly emerged adults were confined each on a separate okra, covered with the muslin cloth. Daily observations were made. The interval from the date of emergence of adult (male or female) to its death indicated the longevity.

The data were analyzed statistically and the mean and standard deviation were calculated using Microsoft Excel 2013.

RESULTS AND DISCUSSIONS

The result revealed that total 17 host plant species belong to 8 different families were recorded at Talwandi Sabo. It was found that the *A. biguttula biguttula* is polyphagous and caused severe damage to many host plants (Table 1). This wide host range makes the *A. biguttula biguttula* polyphagous. *A. biguttula biguttula* is polyphagous pest which found throughout the year on cotton, brinjal and China rose but it migrates to various crops for their survival and causes considerable damage to various economically important crops (Faleiro & Rai, 1985).

Amrasca biguttula biguttula shown maximum infestation on host plants, okra (*Abelmoschus esculentus*), cotton (*Gossypium hirsutum*) and brinjal (*Solanum melongena*) (Table 1).

Table 1: Host Plants of *A. Biguttula Biguttula* (Ishida) with its Infestation Level at Talwandi Sabo

Host category	Botanical Name	Common Name	Family	Infestation
Field crops	<i>Gossypium hirsutum</i>	Cotton	Malvaceae	4 grade
	<i>Arachis hypogaea</i>	Groundnut	Fabaceae	1 grade
	<i>Cajanus cajan</i>	Pigeon pea	Fabaceae	1 grade
	<i>Glycine max</i>	Soyabean	Fabaceae	2 grade
	<i>Sorghum bicolor</i>	Sorghum	Poaceae	3 grade
	<i>Vigna unguiculata</i>	Cowpea	Fabaceae	1 grade
	<i>Zea mays</i>	Maize	Poaceae	3 grade
	<i>Vigna radiata</i>	Mung bean	Fabaceae	1 grade
Vegetables	<i>Abelmoschus esculentus</i>	Okra	Malvaceae	4 grade
	<i>Raphanus sativus</i>	Radish	Brassicaceae	1 grade
	<i>Solanum lycopersicum</i>	Tomato	Solanaceae	2 grade
	<i>Solanum melongena</i>	Brinjal	Solanaceae	4 grade
	<i>Solanum tuberosum</i>	Potato	Solanaceae	2 grade
Ornamental crops	<i>Calendula officinalis</i>	Marigolds	Asteraceae	2 grade
Fruit trees /trees	<i>Morus nigra</i>	Mulberry	Moraceae	1 grade
Weeds	<i>Amaranthus spp.</i>	Amaranth	Amaranthaceae	3 grade
	<i>Chloris gayana</i>	Rhodes grass	Poaceae	3 grade

The female inserted its eggs into plant tissues such as tender petioles, twigs and succulent leaves. But they prefer to lay eggs in the leaf tissue, veins usually in the spongy parenchymatous layer between the vascular bundles and the epidermis. The freshly laid eggs were translucent, slightly oval shaped and yellow in color. The fecundity in case of a single female was ranged from 13-18 eggs with an average of 15.66 ± 1.71 eggs (Table 2). The incubation period of eggs varied from 3 to 7 days with an average of 5.06 ± 1.16 days (Table 2). The eggs were oblong and tapered slightly towards the anterior end.

Leafhopper females deposit eggs inside leaf veins (Agarwal, *et. al.*, 1978; Singh & Agarwal, 1988). Eggs are laid singly within or near the major leaf veins in the parenchymatous layer between the vascular bundles and epidermis. The nymph and adults suck the cell sap from the ventral surface of leaves and also inject their saliva into the tissues causing toxemia. The affected leaves first become pale green, then yellow, radish and finally brick red or brown in color. This change is accompanied by curling and the leaves gradually dry away. The plants become stunted in growth and bear less number of buds and flowers; thereby the yield is adversely affected (Butani & Jotwani, 1983).

The nymphs of *A. biguttula biguttula* emerged and passed through five nymphal instars. The newly emerged nymphs were transparent and yellowish in color. The description of the five instars is given below:

The duration of first instar nymphal stage ranged from 1-3 days with an average of 2.06 ± 0.79 days (Table 2). The nymphs were creamy-whitish color. Head was rounded in front. The eyes were blackish-brown in color and the antennae were setaceous. The wings were absent. Second instar nymph lasted for 2-5 days with a mean of 3.53 ± 1.06 days (Table 2). The second instar nymphs were having dull rudimentary wing pads along the posterior margin of sides of meso and metathorax. The antennae were setaceous and longer than those of the first instar. The nymphs measured 1.05 to 1.10 mm in length with an average of 1.07 mm. The third instar nymphal period ranged from 2-6 days with an average of 3.67 ± 1.11 days (Table 2). The nymph was yellowish green in color with prominent wing pads. The duration of the fourth instar nymph ranged from 3-6 days with a mean of 4.40 ± 1.12 days (Table 2). The fourth instar nymph was yellowish green, with wing pads reaching up to fourth abdominal segment. The nymphs were quite active. The final instar nymphal period ranged from 3-6 days with an average of 4.73 ± 1.09 days (Table 2). The fifth instar nymph was greenish yellow in color

with wing pads reaching up to the ninth abdominal segment. The antennae quite long setaceous.

The male and female longevity was studied during different 15 replications, each on separate okra plant. The male longevity was ranged from 13-19 days with an average of 15.80 ± 1.61 days. The female longevity was ranged from 17-22 days with an average of 18.66 ± 1.88 days (Table 2).

Previously, Thirumalaraju (1984) reported total 17.20 eggs laid per female on okra. The longevity of adult male varied from 12 to 17 days with a mean of 15.90 ± 1.58 days, while for female it ranged from 12 to 18 days with a mean of 16.38 ± 1.83 days. The entire lifespan of leafhopper was 19 to 35 days with an average of 27.63 ± 4.42 days.

Shivanna, *et al.*, (2009) was recorded the average developmental periods of egg, 1st, 2nd, 3rd, 4th and 5th, nymphal instar were 6.53 ± 0.58 , 1.88 ± 0.64 , 2.08 ± 0.70 , 2.18 ± 0.90 , 2.28 ± 0.62 and 3.28 ± 0.89 days, respectively and the total nymphal period was 11.68 ± 3.74 days. The fecundity varied from 17 to 24 with an average of 20.33 ± 2.65 eggs. The average longevity of male and female adults was 15.90 ± 1.58 and 16.38 ± 1.83 days, respectively on okra crop.

Similarly, Jayasimha, *et al.*, (2012) reported the incubation period of eggs average of 6.42 ± 0.37 days. The duration of 1st instar nymphal stage average of 1.49 ± 0.33 days. 2nd instar nymphal stage mean of 1.19 ± 0.22 days. 3rd instar nymphal stage average of 1.16 ± 0.15 days. The duration of 4th instar nymphal stage means of 1.60 ± 0.39 days. The 5th instar nymphal stage average of 1.97 ± 0.29 days on okra.

Jayarao, *et al.*, (2015), reported data of the incubation period lasts for 6.55 ± 0.40 days. The duration of nymphal instars was 1st (6.55 days), 2nd (1.67 days), 3rd (1.27 days), 4th (1.33 days), 5th (1.67 days) and adult (2.10 days). The total nymphal period was 8.04 ± 0.51 days. The male and female had a longevity of 16 and 18 days respectively, with a total fecundity of 17.53 ± 0.52 per female on okra.

Table 2: Nymphal Period of *Amrasca Biguttula Biguttula* on Okra

No. of Observation	Fecundity (no. of eggs)	Egg duration (days)	Duration of nymphal instars of <i>A. Biguttula Biguttula</i> (days)					Adult longevity (days)	
			1 st instar	2 nd instar	3 rd instar	4 th instar	5 th instar	Male	Female
1	18	5	2	4	2	4	5	15	17
2	17	4	3	4	4	6	5	15	19
3	14	6	1	2	4	6	3	18	20
4	16	3	2	4	3	5	4	17	21
5	18	4	1	5	6	5	5	13	17
6	16	4	2	5	5	6	6	17	22
7	15	7	3	3	4	3	3	14	17
8	14	5	2	4	3	5	6	16	19
9	16	7	3	3	5	4	6	15	17
10	13	6	2	2	4	5	5	17	22
11	13	5	3	5	3	4	4	16	18
12	15	4	1	3	3	3	5	19	21
13	18	5	2	2	2	3	3	16	18
14	17	6	3	4	4	4	6	14	17
15	15	5	1	3	3	3	5	15	18
Mean $\pm$ SD	15.66 ± 1.7	5.06 ± 1.1	2.06 ± 0.7	3.53 ± 1.0	3.67 ± 1.1	4.40 ± 1.1	4.73 ± 1.0	15.80 ± 1.6	18.66 ± 1.8

*Mean of 15 observations

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