Research Paper :

Biology of leafhopper, *Amrasca biguttula biguttula* on sunflower

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SUMMARY

Biological studies conducted on predominant species of sunflower leaf hopper, *Amrasca biguttula biguttula* (Ishida) at RARS, Raichur, Karnataka. The results revealed that, the leaf hopper laid about 16-22 egg and laid five nymphal instars in the development. The adult longevity of male was 22.80 days and female was 26.00 days.

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Sunflower (*Helianthus annus* L.) is an important oilseed crop of Karnataka, Andra Pradesh, Maharashtra and Tamil Nadu. It is bestowed with green canopy of leaves up to the maturity stage, thus becomes a reservoir of a number of insect pests of these, sucking pests, like leafhopper, whitefly and thrips cause serious problems resulting reduction in seed yield. Among these sucking pests leafhopper, *Amrasca biguttula biguttula* (Ishida) appears in serious farm causing crop loss up to 46 per cent (Anonymous, 1997). The pest is of economic importance in Karnataka. The incidence would start from seedling stage and prevails throughout crop period. Stunted growth of plant, cupped and crinkling leaves, burnt appearance of leaf margin are the symptoms of damage (Anonymous, 2000). Taking these points into consideration the detailed biology of the leafhopper, *A. biguttula biguttula* on sunflower was undertaken.

MATERIALS AND METHODS

Studies on the different parameters of the biology of leafhopper on sunflower hybrid (KBSH-1) were carried out from July to September 2003, at Regional Agricultural Research Station, Raichur with the following methods.

Maintenance of pure culture:

Population of leafhopper was maintained on okra and sunflower plants grown in the pots under rearing cage measuring one cubic meter size. The pots were filled with soil properly mixed with FYM. The overnight soaked seeds were sown in such pots. The pots were watered daily and urea was added to these pots every month to ensure green succulent plants.

The final instar nymphs of leafhopper were collected from sunflower and okra fields at research farm with help of aspirator and released to 25 days old plants under rearing cage. The population was maintained on these okra plants. Like this, culture of leafhopper was maintained throughout the investigation period.

Pre-ovipositional period:

For pre-ovipositional studies (including pre-mating and mating periods), a pair of freshly emerged adult leafhoppers of both sexes from

pure culture was released into microcages made out of plastic tube of 7 cm x 5 cm size with a plastic lid covered on one side with the help of clip and muslin cloth covered with rubber band on the other side. These microcages were fixed to the leaf of sunflower plants in such a way that the adult would remain on the under surface of the leaf. Daily two microcages were opened, leaves were processed and observed for oviposition. This was continued till the first egg was laid and duration was recorded.

Oviposition period:

For ovipositional studies, a single leaf was placed in microcage and a pair of adult leafhoppers was released. Such enclosed leaf was daily observed for the oviposition. Duration between the first egg laid and the least egg laid was recorded, which indicates period of oviposition.

Fecundity:

The single leaf of sunflower was taken in the microcages and pair of newly emerged leafhoppers were released. Daily, the leaf was changed and old one was collected and observed for the oviposition. The egg count was made by following the method by Parrella and Robb (1982).

Nymphal instars:

The nymphal instars were studied by transferring the freshly hatched nymphs in the microcages individually by fixing the microcage to the leaves of the sunflower plant in the plot. The number of instars and days required for each instars were recorded based on the moulted or case skin in each instar the length and width of the nymph was measured by using ocular micrometer after calibrating with stage micrometer.

Adult longevity:

The duration of the adult leafhoppers from emergence till their death was recorded by enclosing them in microcage fixed to single sunflower leaf. Observation also made on the morphology of all stages.

RESULTS AND DISCUSSION

Studies were on the biology of leafhopper, *A. biguttula biguttula* on sunflower under prevailed weather parameters. Details of the biological studies made are presented in Table 1 and 2.

The female leafhopper laid the eggs in the plant tissue singly on midrib and veins. Freshly laid egg was translucent and yellowish in colour. After 20-24 hour of oviposition, they turned to greenish yellow and slightly hooked towards anterior end and other end being broadly pointed. Just before hatching, a pair of brownish red eyes shined through the chorion near the anterior end. The egg measured on an average 0.61 ± 0.056 mm in length and 0.22 ± 0.02 mm in width. The incubation period ranged from six to seven days with an average of 6.80 ± 0.45 days. Present findings are in confirmation with the results of Tirumalraju (1984), Satybramatti *et al.* (1988) who also reported similar behaviour in oviposition, physical appearance and reported length and width of 0.632 m and 0.24 mm, respectively. Kiran Kumar and Bhat (2003) reported the incubation period of 7.27 days on sunflower. The slight variation in both oviposition and incubation periods may be due to climatic conditions, the consumption rate and quantum of nutrient assimilated by different species of leafhoppers and also species complex.

Nymphal instars:

The present findings revealed that *A. biguttula biguttula* had five nymphal instars.

Freshly emerged first instar nymph was tiny delicate transparent and yellowish in colour. Eyes were conspicuous, reddish brown and oval. The duration of first instar nymph ranged from three to four days, with an average of 3.55 ± 0.45 days. The average length and width of first instar nymph was 0.68 ± 0.05 mm and 0.28 ± 0.03 mm, respectively.

The second instar nymph had superficially white eyes and dark reddish colour underneath. There was development of rudimentary wing pads along the posterior sides of meso and metathorox. The duration of second instar nymph ranged from three to four days, with an average of 3.06 ± 0.24 days. The mean length and width of second instar nymph was 1.08 ± 0.02 mm and 0.37 ± 0.02 mm, respectively.

The third instar nymph was yellowish green in colour with small wing pads. The duration of third instar nymph was three to four days with an average of 3.6 ± 0.48 days. The average length and width was 1.30 ± 0.05 mm and 0.56 ± 0.21 m, respectively.

The fourth instar nymph was also yellowish green in colour with increase in size of wing pads. The duration of fourth instar nymph was one to two days with an average of 1.80 ± 0.40 days. The average of length and width was 1.64 ± 0.06 mm and 0.63 ± 0.22 mm, respectively.

The fully developed fifth instar nymph was greenish yellow in colour and eyes were prominent, whitish in colour with more enlarged wing pads having black dots

Table 1: Biology of leafhopper, *Amrasca biguttula biguttula* on sunflower

Stage of development	Numbers observed	Duration in days		Mean
		Mini-mum	Maxi-mum	
Egg period	15	6	7	6.80 ± 0.45
Nymphal instars *				
I Instar	15	3	4	3.55 ± 0.45
II Instar	15	3	4	3.06 ± 0.24
III Instar	15	3	4	3.60 ± 0.48
IV Instar	15	1	2	1.80 ± 0.40
V Instar	15	2	3	2.80 ± 0.40
Total nymphal period	--	12	17	14.81 ± 0.42
Life period *	--	18	24	21.55
Pre-mating period	15	1	1.5	1.34 ± 0.18
Mating period ***	15	5	10	7.30 ± 1.92
Pre-ovipositional period	15	2	4	3.00 ± 0.61
Ovipositional period	15	6	12	11.86 ± 1.62
Fecundity (number of eggs)	15	16	22	20.40 ± 1.76
Adult longevity **				
Male	10	21	26	22.80 ± 1.56
Female	10	23	28	26.00 ± 1.70

* - 15 Numbers ** - 10 Numbers *** - In minutes

Table 2 : Morphometry of leafhopper, *Amrasca biguttula biguttula*

Life stages	No. of observations	Length (mm)			Width (mm)		
		Min.	Max.	Mean ± SD	Min.	Max.	Mean ± SD
Egg	15	0.48	0.64	0.61 ± 0.06	0.18	0.23	0.22 ± 0.02
I Instar	15	0.61	0.72	0.68 ± 0.05	0.21	0.29	0.28 ± 0.03
II Instar	15	1.04	1.09	1.08 ± 0.02	0.35	0.40	0.37 ± 0.02
III Instar	15	1.25	1.38	1.30 ± 0.05	0.54	0.59	0.56 ± 0.21
IV Instar	15	1.52	1.70	1.64 ± 0.06	0.62	0.69	0.63 ± 0.22
V Instar	15	2.00	2.08	2.06 ± 0.02	0.69	0.74	0.73 ± 0.21
Adult							
Male	10	2.03	2.20	2.10 ± 0.06	0.61	0.71	0.65 ± 0.045
Female	10	2.62	2.98	2.74 ± 0.13	0.70	0.76	0.74 ± 0.03

at the base. The duration of the fifth instar nymph was two to three days, with an average of 2.80 ± 0.40 days. The average length and width of last instar nymph was 2.06 ± 0.02 mm and 0.73 ± 0.21 mm, respectively. The total nymphal period was found to vary from 12 to 17 days on sunflower with an average of 14.81 ± 42 days.

The present findings about nymphal instars, duration and size were in close agreement with the results of Tirumal Raju (1984) and Kiran Kumar and Bhat (2003) with slight variation which may be due to climatic conditions and difference in the host specificity.

Adult male and female leafhoppers:

The adult male was green in colour and smaller than female having a pair of black dots one on each of the apical end of the tegmina. Male can be sexed based on the blunt and round abdominal tip with prominent of adeagus. The longevity of male was 21 to 26 days with an average of 22.80 ± 1.56 days. The average length and width of male leafhopper was 2.10 ± 0.06 mm and 0.65 ± 0.45 mm, respectively. While that of female was similar to adult female in physical appearance. The longevity of female was 23 to 28 days with an average of 26.00 ± 1.70 days. The average length and width of female leafhopper was 2.74 ± 0.13 mm and 0.74 ± 0.03 mm, respectively.

The pre-oviposition period of female ranged from two to four days with an average of 3.0 ± 0.61 days.

Whole oviposition period lasted for 6.0 to 12.0 days with an average of 11.86 ± 1.62 days. The fecundity of female ranged from 16.0 to 22 eggs with an average of 20.40 ± 1.76 eggs. These findings are in closed confirmation with the report of Tirumalraju (1984) and Ramangoud (1993) with slight variation which may be attributed to difference in the climatic conditions, host plant and species complex.

The total life cycle of leafhopper occupied 26.0 days on sunflower, which was in confirmation with earlier report of Satyabramatti *et al.* (1988) who reported life cycle of leafhopper lasting for 20-28 days on sunflower. This variation in life cycle may be due to difference in the climatic conditions prevailing during the experimentation period in different locations.

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