
BIOLOGY OF RED COTTON BUG (*D. Koenigii*)

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ABSTRACT

A study on biology of red cotton bug was carried out at a mean temperature $25.5 \pm 7.76^{\circ}\text{C}$ and an average relative humidity of 55.19 ± 21.36 per cent. The study revealed that the eggs were soft to touch and whitish in colour with oval or spherical in shape. The average incubation period was 4.97 ± 0.82 days with an average hatching percentage of 87.33 ± 3.61 . The colour, shape, duration and size of first, second, third, fourth and fifth instar nymphs were carried out. The total nymphal duration was recorded as 37.52 ± 1.71 days. The adult was strongly built, medium size and scarlet reddish in colour. The colour, shape, longevity, total life period and size of male and female were carried out. The average pre-oviposition, oviposition and post-oviposition periods were 7.6 ± 1.12 , 8.92 ± 0.88 and 7.26 ± 0.79 days, respectively. The fecundity of red cotton bug was 95.2 ± 19.13 eggs/female in a life period.

INTRODUCTION

The red cotton bug, *Dysdercus koenigii* (Fabricius) belonging to the family Pyrrhocoridae of the order Hemiptera is an important pest of cotton. This insect has been reported to thrive well on other malvaceous plants like holly-hock, okra (*Abelmoschus esculentus*) or other non malvaceous plants like sweet potato (*Ipomea batata*), tobacco (*Nicotiana tabacum*) etc. Red cotton bug is one of the important insects found damaging cotton crop in various states viz., Gujarat, Uttar Pradesh, Bihar, Madhya Pradesh and Tamil Nadu. The red cotton bug is called by various vernacular names in different parts of India such as *Chainpa* in Punjab, *Behna* in Kanpur,

Kappa poka in Orissa, *Lal chingum* in Uttar Pradesh and *Lal chusiya* in Gujarat. The nymphs and adults suck up the juice from the seed of either green or ripe cotton bolls. Both are voracious feeder and cause extensive damage to the crop. The damaged bolls remain shrivelled and vitality of plant and the quality of the lint is also severally affected in case of heavy infestation. The insect remained very active during October to March (Awasthi, 2002).

MATERIALS AND METHODS

Rearing technique

To establish the mass culture in the laboratory, nymphs and adults of red cotton bug were collected in the glass jar from cotton field. The green tender bolls of cotton with pedicel were brought to the laboratory as a food for the nymphs and adults. The pedicel of cotton boll was wrapped with cotton swab soaked in water to maintain its turgidity. Such prepared bolls were kept at the bottom of rearing jar (18 cm height x 9 cm diameter) and collected nymphs and adults were released in the rearing jar. The mouth of jar was covered with piece of muslin cloth and held tight with rubber band (Plate I). The food was replaced everyday morning. The excreta of the insect as well as left food was removed by using hair brush to maintain sanitation and keep culture healthy. The adults reared in laboratory were used to study various biological aspects.



Plate I. Mass rearing of *D.koenigii* in the laboratory

RESULTS AND DISCUSSION

Red cotton bug *Dysdercus koenigii* (Fabricius) (Pyrrhocoridae : Hemiptera) is one of the major pest causing severe damage to cotton. The study on biology of red cotton bug, *Dysdercus koenigii* (Fabricius) (Pyrrhocoridae : Hemiptera) was carried out in the laboratory of Department of Agricultural Entomology, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar at an average room temperature of $25.50 \pm 7.76^{\circ}\text{C}$ and at an average relative humidity of 55.19 ± 21.36 per cent during October, 2007 to December 2007.

A study on biology of *D. koenigii* indicated that the eggs of *D. koenigii* were soft to touch, whitish in colour with oval or spherical in shape which later on became buff yellow before hatching. The eggs were laid in masses on the soil. An average length and breadth of egg was 1.08 ± 0.02 and 0.76 ± 0.08 mm, respectively (Table1). The average incubation period was 4.97 ± 0.82 days and average hatching percentage was 87.33 ± 3.61 (Table2).

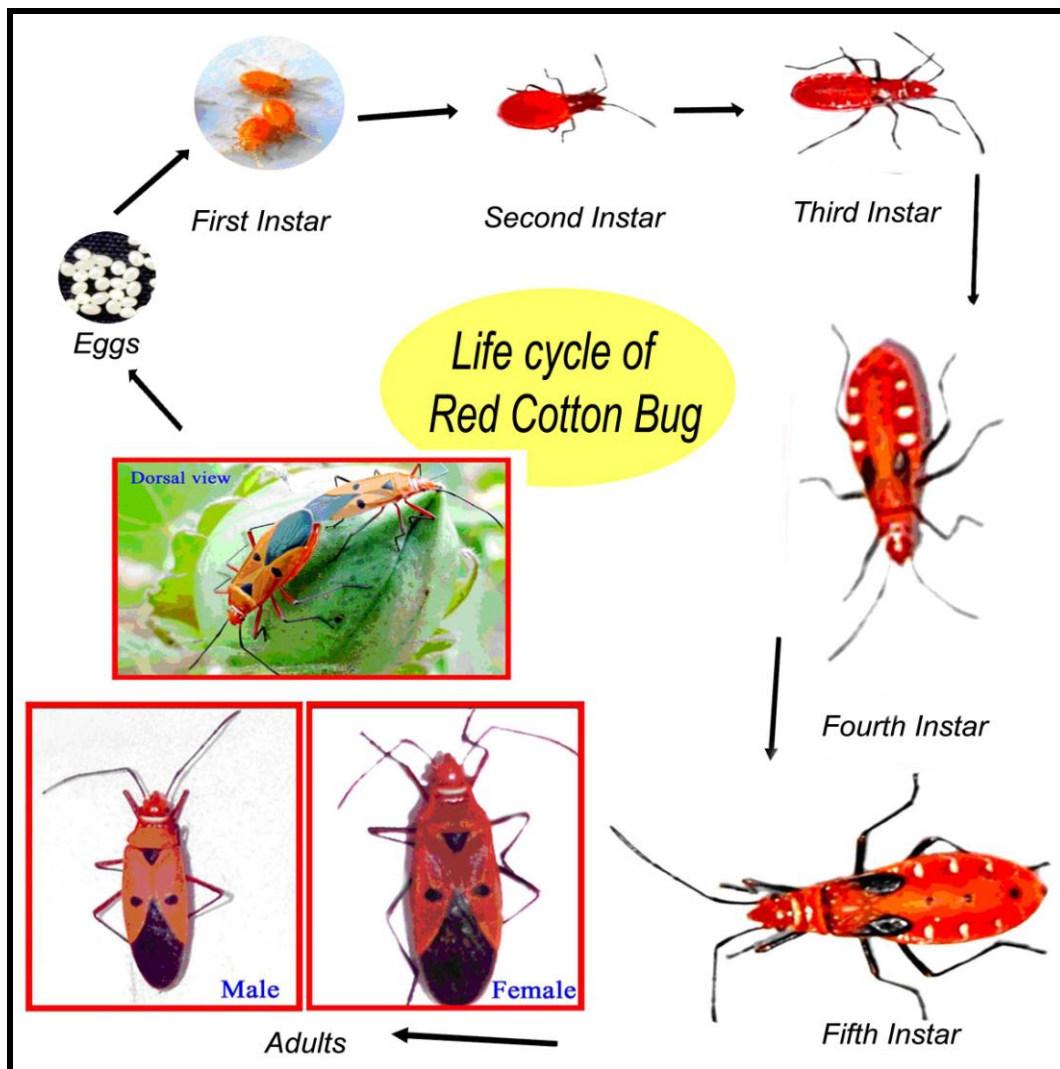
The nymph of *D. koenigii* passed through five instars. The newly moulted first instar nymph of *D. koenigii* was oval in shape with orange buff in colour changing to red after 24 hours. The head was narrower than the thorax and abdomen. The compound eyes were red and located on dorsolateral position on either side of the head. The average length and breadth of first instar nymph was 1.62 ± 0.17 and 0.98 ± 0.16 mm, respectively (Table1). The average duration of first instar nymph was 2.51 ± 0.50 days (Table2). The newly moulted second instar nymph of *D. koenigii* was oval in shape and reddish in colour. The eyes were black and dotted with red pigment. The mesonotum was also distinct but smaller than the pronotum. The average length and breadth of second instar nymph was 2.82 ± 0.57 and 1.25 ± 0.29 mm, respectively (Table1). The average duration of second instar nymph was 3.52 ± 0.50 days (Table2).

The freshly moulted third instar nymph of *D. koenigii* was flat in shape with triangular head and reddish in colour. The most striking change in this instar was emergence of wing pads from the mesothoracic and metathoracic regions. Three pairs of very faint dorsal spots also developed on the abdomen. The average length and breadth of third instar nymph was 3.82 ± 0.78 and 1.65 ± 0.99 mm, respectively (Table1). The average duration of third instar nymph was 4.51 ± 0.50 days (Table2). The

fourth instar nymph of *D. koenigii* was cylindrical in shape and scarlet red in colour. The mesothoracic wing pads developed considerably to reach the posterior margin of the metathorax. The distal margin of the wing pad was deep black as compared to the proximal part. The metathorax was visible only in its mid-dorsal area. White transverse bands appeared from one side to other on the third to seventh abdominal sterna. The average length and breadth of fourth instar nymph was 7.02 ± 1.21 and 2.51 ± 0.44 mm, respectively (Table1). The average duration of fourth instar nymph was 11.92 ± 1.42 days (Table2). The freshly moulted fifth instar nymph of *D. koenigii* was cylindrical in shape and scarlet red in colour. The legs and antennae were black in colour. The mesothoracic wing pads became very prominent. A white band appears on the anterior margin of prothorax. The nymph to develop into female adult was larger than the male. The average length and breadth of fifth instar nymph was 8.17 ± 1.30 and 3.46 ± 0.62 mm, respectively (Table1). The average duration of fifth instar nymph was 14.86 ± 0.80 days (Table 2).

The adults of *D. koenigii* were strongly built, medium sized and scarlet reddish in colour. The head was triangular in shape. The antennae was five segmented. The thorax was well defined and joint with head by a cervix which was not visible from the dorsal side due to over hanging pronotum. The pronotum was large and appearing like a convex shield. It was narrow at anteriorly and broad posteriorly. Mesothorax was best developed of three thoracic segments which attached to the first pair of wings. The mesonotum was broader as compared to the pronotum and metanotum. The forewings were longer and narrower than the hind wings. The proximal region of the forewings has fewer thinner veins while, distal region has well defined veins. The forewings bore a black oval spot in the centre. The hind wings were transparent, membranous and broader than the forewing and during repose, remained concealed under the later. The posterior margin of each abdominal sternum bears a white transverse band which was broader at the middle. There were no any special morphological characters to distinguish male and female adult but, male is smaller than the female in length and width. For the purpose of mating, a male mount on the abdomen of the female, bend its abdomen downward to bring it in contact with the female genitalia and establish copulation. The male then descends and turns black so that they have their heads in opposite direction. Both the copulating individuals continue to feed and move about in the direction determined by the female as it was stronger and larger than the male. The adult have been observed in copulate for as

long as 3 days. The average length and breadth of male red cotton bug was 12.10 ± 1.0 and 4.09 ± 0.33 mm, respectively. Whereas, it was 13.56 ± 1.04 and 4.84 ± 0.26 mm, respectively in female red cotton bug (Table1).



The average pre-oviposition, oviposition and post-oviposition periods were 7.6 ± 1.12 , 8.92 ± 0.88 and 7.26 ± 0.79 days, respectively (Table2). The average longevity of male and female red cotton bug was 22.33 ± 1.44 and 16.93 ± 0.80 days, respectively. The longevity of male was longer than female. The average fecundity of female red

cotton bug was 95.2 ± 19.13 eggs. The total life cycle of *D. koenigii* was 60.0 ± 3.52 days in case of male red cotton bug and 55.68 ± 2.42 days in case of female at an average room temperature of $25.50 \pm 7.36^{\circ}\text{C}$ and an average relative humidity of 55.19 ± 21.36 per cent. The average sex ratio (male : female) of *D. koenigii* was 1 : 1.20.

CONCLUSION

Studies on biology of red cotton bug was carried out at a mean temperature $25.5 \pm 7.76^{\circ}\text{C}$ and an average relative humidity of 55.19 ± 21.36 per cent. The study revealed that the eggs were soft to touch and whitish in colour with oval or spherical in shape. The average length and breadth of egg was 1.08 ± 0.02 mm and 0.76 ± 0.08 mm, respectively. The average incubation period was 4.97 ± 0.82 days with an average hatching percentage of 87.33 ± 3.61 . The colour, shape and size of first, second, third, fourth and fifth instar nymphs were carried out. The average length and breadth of first, second, third, fourth and fifth instar nymphs were 1.62 ± 0.17 , 2.82 ± 0.57 , 3.82 ± 0.78 , 7.02 ± 1.21 and 8.17 ± 1.30 mm in length and 0.98 ± 0.16 , 1.25 ± 0.29 , 1.65 ± 0.99 , 2.51 ± 0.44 and 3.46 ± 0.62 mm in breadth, respectively. The average duration of first, second, third, fourth and fifth instar nymphs were 2.51 ± 0.50 , 3.52 ± 0.50 , 4.51 ± 0.50 , 11.92 ± 1.42 and 14.86 ± 0.80 days, respectively. The total nymphal duration was recorded as 37.52 ± 1.71 days. The adult was strongly built, medium size and scarlet reddish in colour. The forewings bear a black oval spot in centre. The hind wings were transparent, membranous and broader than the forewing and during repose, remains concealed under the later. The male and female measured on an average 12.10 ± 1.00 mm and 13.56 ± 1.04 mm in length and 4.09 ± 0.33 mm and 4.84 ± 0.26 in breadth, respectively. The average longevity of male and female was 22.33 ± 1.44 and 16.93 ± 0.80 days, respectively. The average pre-oviposition, oviposition and post-oviposition periods were 7.6 ± 1.12 , 8.92 ± 0.88 and 7.26 ± 0.79 days, respectively. The total life period of male and female was 60.00 ± 3.52 and 55.68 ± 2.42 days, respectively. The fecundity of red cotton bug was 95.2 ± 19.13 eggs/female in a life period. The red cotton bug passed through six generations during the study period. The nymph and adults of red cotton bug were voracious feeder, infesting leaves, flower and boll of cotton and suck up the juice from the seed of either green or riped cotton bolls. The infested bolls were shriveled and dry up. In severe infestation, the vitality of the plant was affected and the damage also destroyed the germinating power of seed by

the loss of its oil contents. The cotton lint was also stained by yellow excreta of nymphs and adults.

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Table 1 : Measurement of different stages of red cotton bug, *D.koenigii*

Stages		Length (mm)			Breadth (mm)		
		Min.	Max.	Av. $\pm$ S.D.	Min.	Max	Av. $\pm$ S.D.
Egg		1.05	1.12	1.08 ± 0.02	0.73	0.81	0.76 ± 0.08
Nymph	I instar	1.42	1.95	1.62 ± 0.17	0.78	1.06	0.98 ± 0.16
	II instar	2.12	3.52	2.82 ± 0.57	1.09	1.56	1.25 ± 0.29
	III instar	3.14	4.72	3.82 ± 0.78	1.52	1.82	1.65 ± 0.99
	IV instar	5.28	8.85	7.02 ± 1.21	2.14	3.26	2.51 ± 0.44
	V instar	6.92	11.65	8.17 ± 1.30	2.87	4.58	3.46 ± 0.62
Adult	Male	10.80	13.85	12.10 ± 1.00	3.58	4.42	4.09 ± 0.33
	Female	13.52	14.92	13.56 ± 1.04	4.38	5.06	4.84 ± 0.26

Table 2 : Period of different stages of red cotton bug, *D. koenigii*

Sr	Particulars		Duration (Days)		
			Min.	Max.	Av. $\pm$ S.D.
1.	Egg period		4	7	4.97 $\pm$ 0.82
2.	Nymphal period				
	i.	I instar	2	3	2.51 $\pm$ 0.50
	ii.	II instar	3	4	3.52 $\pm$ 0.50
	iii.	III instar	4	5	4.51 $\pm$ 0.50
	iv.	IV instar	11	13	11.92 $\pm$ 1.42
	v.	V instar	14	16	14.86 $\pm$ 0.80
3.	Total nymphal period		35	41	37.52 $\pm$ 1.71
4.	Adult period				
	i.	Male	20	25	22.33 $\pm$ 1.44
	ii.	Female	16	18	16.93 $\pm$ 0.80
5.	Total life period				
	i.	Male	55	66	60.0 $\pm$ 3.52
	ii.	Female	51	59	55.68 $\pm$ 2.42
	Preoviposition period		6	9	7.6 $\pm$ 1.12
	Oviposition period		8	10	8.92 $\pm$ 0.88
	Postoviposition period		6	8	7.26 $\pm$ 0.79
	Fecundity		65	120	95.2 $\pm$ 19.13
6.	Temperature ($^{\circ}$ C)		12.5	35.6	25.5 $\pm$ 7.76
7.	Relative Humidity (%)		23.4	85.3	55.19 $\pm$ 21.36