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Research Article

STUDIES ON THE BIOLOGY AND LIFE CYCLE OF *DYSDERCUS KOENIGII* (FABRICIUS) ON *ABELMOSCHUS ESCULENTUS* IN JAMMU REGION (J&K)

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ABSTRACT

Dysdercus koenigii (Fabricius), also known as red cotton bug, is one of the major pests of okra in India. It damages the crop plant by sucking the sap from leaves and the developing fruits. Both adult and nymphal instars reduce the fruit quality and crop yield. Its biology was studied during the year 2016. It undergoes hemimetabolous type of development. There are five instars that completed their development in 35.48±3.59 days. The total life cycle from egg laying to adult emergence completed in 36 to 47 days with an average of 41.48±4.38 days. The adult male lived longer with an average of 21.8±2.38 days than the female adult with an average of 16.5±1.11 days.

INTRODUCTION

Dysdercus koenigii (Fabricius) belonging to the order Hemiptera, sub-order Heteroptera and family Pyrrhoioridae, is an economically important cotton pest. It is commonly known as Red cotton Bug and is reported to flourish on other malvaceous plants such as *Abelmoschus esculentus* (Okra), Holly-hock and non-malvaceous plants like *Nicotiona tobaccum* (tobacco) and *Ipomea batata* (Varma and Patel, 2012). It is one of the most serious insect pests of okra with exhaustive damaging properties found wide spread in difference states of India such as Bihar, Gujrat, M.P, Orissa, Karnataka, Andhra Pradesh, Tamil Nadu and U.P. The adults and the nymphs suck sap from the leaves and ripened fruits causing curling of leaves and fruits. As a consequence of excessive infestation, the crop plant become becomes weak and stunted thereby reducing the crop growth and yield. Okra is an economically important crop plant found attacked by many insect pests with *D. koenigii* as the one of the major pests. The plant owes great significance due to its edible nature which further substantiates the need for its thorough study. In Jammu region little work has been done on the life cycle of Red cotton Bug due to which restricted information is available for study. In view of this, the present study was conducted in Jammu region.

MATERIALS AND METHODS

The study was conducted in the study area during the year 2016 at three different stations of Jammu region viz., Jammu, Samba and Rajouri in the crop fields and also in the laboratory. The standing crop was scanned properly and *D. koenigii* was found as one of the serious pests. Eggs were collected from the crop fields and were kept in the lab condition for incubation in Petri-dishes. Newly hatched nymphs were transferred to other Petri-dishes which were lined by moist filter paper and provided with fresh leaves. Filter paper and food were changed after every second day. Nymphs were observed daily and data was recorded with regards to moulting, duration and size of each nymphal instars. All life stages were recorded morphometrically. The mode and extent of damage caused by the adults as well as by nymphs were studied by observing the symptoms of damage in the crop fields and also in the laboratory.

Distribution

D. koenigii is commonly found in India, (Panizzi *et al.*, 2015) Pakistan and southeastern Asia. (Jaleel *et al.*, 2013).

Common names

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 (Varma and Patel, 2012).

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Host plants

The species is a pest of cotton crops, although cotton is not its preferred choice of hosts, as it prefers *Alcea rosea* and *Hibiscus*. It is also reported to flourish on other malvaceous plants such as *Abelmoschus esculentus* (Okra), Holly-hock and non-malvaceous plants like *Nicotiona tobaccum* (tobacco) and *Ipomea batata* (Varma and Patel, 2012). As each host plant ages and becomes unsuitable, the winged adults migrate to new host plants of the same or different species. While migrating, they often feed on nectar from non-host plants and probe fruits with their rostra (beak-like mouthparts). These fruits are often citrus, perhaps because citrus and cotton are often grown in close proximity (Panizzi *et al.*, 2015).

RESULTS AND DISCUSSION

Life cycle of D. koenigii

Mating:- After 2-3 days of emergence from 5th instar, adult males & females were found ready for copulation. The male adult first approached the female adult for copulation. The male then mounted on the female abdomen and then bent its abdomen downward in order to come in contact with genitalia of the female and initiate copulation. The male descends from the female abdomen and turned back in order that they had their heads in their opposite direction. The copulating pair continues to feed and moved in the direction which was determined by female as the female was stronger and larger than the male. The copulation was lasted for few hours to 2-3 days.

Ovi-position and fecundity:- After copulation the couple were dispersed. Female moves over the host plant for the selection of the site suitable for egg laying. Eggs were laid in masses on the moist soil or in the crevices in the ground. Each female laid 100-120 eggs and mated three times in her life.

Incubation Period and Hatching:- Eggs were creamy white, soft to touch, spherical or oval in shape which turns yellowish orange prior to hatching. Eggs were laid in masses on the moist soil. The duration of the incubation period was 5-7 days with an average of 6.0±0.79 days. However, Verma & Patel (2013) reported incubation period of 4-7 days with an average of 4.97±0.82 days. The length and breadth of an egg were 1.05 to 1.21 mm with an average of 1.13±0.07mm and 0.75 to 0.86 mm with an average of 0.80±0.04 mm respectively.

Nymphs:- In the life history of *D.koenigii*, five nymphal instars were observed. Bionomics and duration of each nymphal instar was described as under:-

First instar:- The first emerged nymph was orange in colour which turns to red colour within one day. Jaleel *et al*., 2013 observed the colour of the 1st instar was orange to blood red colour within one day. Verma & Patel (2012) reported the colour of the 1st nymphal instar changed after 24 hrs from orange buff to red. Duration of 1st instar lasted for 2-3 days with an average of 2.5±0.41 days. Their Length and breadth were 1.38 to 1.72mm with an average of 1.56±0.14mm and 0.76 to 0.80 with an average of 0.78±0.02mm respectively.

a Mating Pair

b Eggs

c First Instars

d 2nd Instar

e Third Instar

f Fourth Instar

g Fifth Instar

Figures a-g Different stages during biology of *Dysdercus koenigii*

Table 1 Body Length & width from egg to adult *Dysdercus koenigii*

Developmental Stages	Length (mm)		Width (mm)	
	Range	Mean ± SD	Range	Mean ± SD
Egg	1.05- 1.21	1.13 ± 0.07	0.75 - 0.86	0.80 ± 0.04
Nymphal instars:-				
1st instar	1.38- 1.72	1.56 ± 0.14	0.76 - 0.80	0.78 ± 0.02
2nd instar	2.03- 2.41	2.25 ± 0.16	1.31 - 1.62	1.47 ± 0.13
3rd instar	4.00- 4.52	4.26 ± 0.21	1.58 - 1.81	1. 73 ± 0.09
4th instar	4.98- 6.00	5.50 ± 0.40	2.53 - 3.02	2.75 ± 0.19
5th instar	8.00- 10.12	9.07 ± 0.88	3.20 - 3.50	3.37 ± 0.12
Adult:-				
Male	12.01- 14.00	13.11 ± 0.74	6.85 - 7.81	7.26 ± 0.45
Female	15.15- 15.38	15.26 ± 0.09	8.14 - 8.74	8.42 ± 0.24

Second instar:- The newly hatched second instar was reddish colour and oval shape. It was similar in appearance to that of first nymphal instar but was larger in size. The eyes were appeared black and dotted with red pigment. The mesonotum was seen distinctly and smaller than pronotum. Duration of second instar lasted for 3 to 4 days with an average of 3.54±0.39 days. Their length and breadth were 2.03 to 2.41 mm with an average of 2.25±0.16 mm and 1.31 to 1.62 mm with an average of 1.47±0.13 mm respectively.

Table 2 Duration of *Dysdercus koenigii* development

Developmental Stages	Duration(Days)	
	Range	Mean ± SD
Incubation Period	5 – 7	6.0 ± 0.79
Nymphal instars		
1st instar	2 – 3	2.5 ± 0.41
2nd instar	3 – 4	3.54 ± 0.39
3rd instar	4 – 5	4.44 ± 0.41
4th instar	10-12	11 ± 0.79
5th instar	12-16	14 ± 1.58
Total Nymphal Period	31-40	35.48 ± 3.59
Total Life Cycle Duration	36-47	41.48 ± 4.38
Adult Period		
Male	19-25	21.8 ± 2.38
Female	15-18	16.5 ± 1.11
Total Life Period		
Male	50-65	57.28 ± 5.97
Female	46-58	51.98±4.69

Third instar:- The freshly moulted instar was flat shape with triangular head and orange red in colour which turned to reddish colour within 24 hours, three pairs of ill defined dorsal spots developed on the abdominal region. Third instar differed from the first and second instar nymphs in the appearance of wing pad on the thorax regions. Duration of third instar lasted for 4 to 5 days with an average of 4.44±0.41 days. Their length and breadth were 4.00 to 4.52 mm with an average of 4.26±0.21 mm and 1.58 to 1.81 mm with an average of 1.73±0.09 mm respectively.

Fourth instar:- The fourth instar of *D. koenigii* was deep red in colour and tubular in shape. Wing pads of mesothoracic region developed and reached upto the posterior margin of the metathorax. The distal region of wing pad was dark in colour as compared to proximal part. The metathorax segment was seen only in its mid dorsal area. White transverse bands appeared on the third to seventh abdominal sterna (segment). Duration of fourth instar lasted for 10 to 12 days with an average of 11±0.79 days. Their length and breadth were 4.98 to 6.00 mm with an average of 5.50±0.40 mm and 2.53 to 3.02 mm with an average of 2.75±0.19 mm respectively.

Fifth instar:- Fifth nymph was also deep red in colour and tubular in shape. Wing pads become prominent. The antennae and legs were black in colour while the proboscis was deep red in colour. Each antenna was 5-segmented. On the anterior region of prothorax a white band appeared. The nymph that developed into adult male was smaller than that of female. Duration of fifth instar lasted for 12 to 16 days with an average of 14±1.58 days. Their length and breadth were 8.00 to 10.12 mm with an average of 9.07±0. 88 mm and 3.20 to 3.50 mm with an average of 3.37±0.12 mm respectively.

Adult:- The adult was brilliant red in colour and medium in size. The head was triangular shaped with 5 segmented antennae. The thorax was well developed and joined with head by a cervix which was indistinguishable from the dorsal side due to overhanging of pronotum. The pronotum made an appearance of convex shield and large in size. It was abroad at

posterior end narrow anteriorly. The three thoracic segments joined together to form mesothorax which were 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 and the distal region differ in the distribution of veins with well marked veins in the distal part and fewer in proximal part the forewings bore a black oval spot in the centre. The hind wings were transparent, membranous and broader than the forewings the posterior margin of each abdominal sternum bears a white transverse band which was broader at the middle and narrow at the ends. There were no distinction between male and female adult but, generally male is smaller than the female in length and width.

CONCLUSION

In the present investigation, the body length and width and life stages of *D. koenigii* were studied. The results obtained for life duration and bionomics of *D. koenigii* were variable from previous work of Kamble (1971) who studied the life cycle and bionomic of this pest on okra fruits. The change in feed could cause changes in the life cycle, biology, vigor and other parameters of the *D. koenigii* (Lot, 1956; Kohno and Ngan, 2004; Kohno and Ngan, 2005; Socha, 2008). The change of temperature could also alter the duration and other parameters of an insect (Schlichting and Pigliucci, 1998). Kamble (1971) and, Varma and Patel (2012) studied the biology and bionomics of this pest at 24±7.76°C while we studied these parameters at controlled temperature (28±2°C). This temperature change might be responsible for variable results of life duration and bionomics of *D. koenigii* from the previous work of Kamble (1971) and Varma and Patel (2012) in the current study.

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