

Original Research Article

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Biology and Bionomics of Tur Pod Bug, *Clavigralla gibbosa* (Spinola) on Variety- Saket under Laboratory Conditions in Gird Agri-climatic Region of Madhya Pradesh

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ABSTRACT

Biology and bionomics of Pigeonpea pod bug, *Clavigralla gibbosa* Spinola on Pigeonpea variety viz., Saket was studied during Kharif-2018 at RVSKVV, Gwalior (M.P.) under laboratory condition at the room temperature $28 \pm 2^\circ\text{C}$ and relative humidity 72-75 per cent from October to November. Eggs were laid in clusters in the batches of 5-40 eggs. The incubation period was varied from 5-7 days with an average of 5.80 ± 0.79 days. The total nymphs duration was varied from 15-21 days with an average of 17.70 ± 2.06 days. Total adult life of male varied from 3-28 days with an average of 15.20 ± 0.943 days and that of a female range from 5-35 days with an average of 22.40 ± 10.05 days. Total life cycle was completed in 17-30 days with an average of 23.60 ± 3.63 days. The results revealed that the pre-oviposition, oviposition and post-oviposition period varied from 2-14, 5-20 and 4-18 days with an averaged 7.80 ± 3.58 , 12.10 ± 5.13 and 9.40 ± 4.01 days, respectively. The fecundity was 20-19 eggs with an average of 101.40 ± 66.59 per female, respectively.

Keywords

Pigeonpea, Variety-Saket, *Clavigralla gibbosa*, Biology and Bionomics

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Introduction

Pigeon pea (*Cajanus cajan*) is an important crop in semiarid and subtropical farming systems, providing high quality vegetable protein, animal feed and firewood. After Chickpea, Pigeonpea is second most important

pulse crop grown in country. Pigeon pea ranks six in area and production in comparison to other legumes such as Beans, Peas and Chickpea. India has virtual monopoly in pigeon pea production accounting to 90% of world's total production and occupies an area of 3.88 M ha with a production of 3.29 MT

(Anonymous, 2014). In India the area, production and productivity of pigeon pea was 4.46 M ha, 4.18 MT and 937 kg ha⁻¹, respectively during 2017. Whereas, In Madhya Pradesh the area, production and productivity of pigeon pea 6.47 lakh ha, 8.39 lakh tones and 1296 kg ha⁻¹, respectively during 2017-18. (Anonymous, 2017-18).

As many as 250 insect sp. have been recorded to attack pigeon pea (Upadhyay *et al.*, 1998). Insect pests feeding on flowers, pods, and seeds are the most important biotic constraint affecting tur yield. Gram pod borer (*H. armigera*), tur plume moth (*E. atomosa*), spotted pod borer (*Maruca vitrata*), tur pod fly (*Melanagromyza obtusa*), tur pod bug (*C. gibbosa*) and blister beetle (*Mylabris spp.*) are one of the most important constraints for low productivity of redgram in India. Among the sucking insects, tur pod bug is the most important pests in India (Basu and Mitra, 1978).

The pod bug damage in pigeon pea was recorded from 25-40% (Adati *et al.*, 2007). It was once considered to be a minor pest of pigeon pea but, has assumed the status of a major pest (Singh and Singh, 1978). Both the nymphs and adults of the pest suck the cell sap from the developing grains of the green pods. In case of heavy infestations the pods get shriveled. The bug also sucks sap from leaves, flowers and tender shoots, but pods are most preferred.

Damage Seeds become shrivelled with dark patches. Such seeds do not germinate and are not fit for human consumption. On an average it causes 25.20% pod and 28.38% grain damage (Veda, 1993). Unfortunately, the literature on its biology provides only the fragmentary information on average duration of the life stages of the insect. Such study has not been conducted in the region so far. Hence, the study on the biology and

bionomics of *Clavigralla gibbosa* on pigeon pea carried out in experimental laboratory.

Materials and Methods

A field experiments was laid down on the biology of tur pod bug on pigeon pea variety Saket under laboratory condition at the room temperature 28 ± 2 °C and relative humidity 72-75 per cent at Department of Entomology, RVSKVV, Gwalior (M.P.) from October to November during *Kharif*- 2018. Five pairs of adults tur pod bug, *C. gibbosa* were collected from variety saket and caged separately in pairs in glass jars covered with muslin cloth on the top and tied with rubber bands. Fresh twig with pods of pigeon pea cultivar saket were provided daily to the caged pairs of *C. gibbosa*. The twigs were placed into moistened cotton at the bottom of the glass jar. The nymphs were reared in petri-dishes lined with a blotting paper to absorb liquid excreta on immature pods with leaves. The petri-dishes were changed after 2-3 days and cleaned with soap water to maintain hygienic conditions. The pods were changed daily in order to supply fresh food to the nymphs. Observations on the moulting and other remarkable external changes in developing nymphs were recorded daily during nymphal period.

The observations on number of egg laid were counted daily with the help of a hand magnifying lens till the death of adult female. Eggs were removed from the leave as, pods and other plant part with a fine camel hairbrush and were placed over moist filter paper in petri-dishes one egg kept in each petri-dish (total-10) and incubation period, number of nymphs instars, nymphs period, pre-oviposition and post-oviposition period, different instars bionomics in each in star of length, width of body and life cycle of adult (egg to Adult) were recorded. Measurements were done using graded scales (1-150 mm).

Results and Discussion

The results on the biology of tur pod bug, *C. gibbosa* studied under laboratory conditions from October to November during *Kharif*-2018 have been summarized in Table 1.

Biology and bionomics of tur pod bug, *C. gibbosa*

Biology and Bionomics of tur pod bug, *C. gibbosa* studied on pigeon pea variety- Saket during *Kharif*-2018 at Department of Entomology laboratory, RVSKVV, Gwalior (M.P.).

Eggs

The fresh laid eggs glued to the surface of pods or leaves were pale yellow (creamy) white in colour. After few hours the colour changed to light chocolate and ultimately brownish in colour. Freshly laid fertile and unfertile eggs were oval in shape but after 24 hrs, unfertile eggs become ship like in appearance, whereas, such type of shape was not found in case of fertile eggs. These is in close agreement with the findings of Rana and Patel (2001) who reported that colour of eggs and changed to dark brown before hatching on arhar, after 24 hrs.

While Singh and Patel (1968) reported that eggs were mostly brown and sometimes brownish white or dorthy brown in colour.

The result showed that on a single female laid varied from 20-190 eggs with an average 101 ± 66.59 eggs.

Eggs were laid in clusters in the batches of 5 to 40 eggs (Table 1). Sometimes overlapping of the eggs was also noticed. Whereas, earlier workers (Singh *et al.*, 2005; Rana and Patel, 2001) reported that the fecundity was range from 80 to 153 and 78 to 290 eggs/ female.

Incubation period

The incubation period of eggs varied from 5-7 days with an average of 5.80 ± 0.79 days (Table 1). Earlier workers Chitrlekha *et al.*, 2017 reported that the incubation period was 5.7 days. This finding is in confirmation with (Kumar and Dhurairaj, 2006; Misra *et al.*, 2000) is rather higher in comparison to present findings. However, Chhabra *et al.*, 1993 reported little varied with the incubation period to be 8 days.

Nymphal instars

Nymphal instars development was observed in five stages. There were no much differences among the different nymphs instars. The details of the nymphs instars are as follows.

Newly hatched first instar nymph was fragile or creamy yellowish in colour. Numerous setae were scattered on the whole body surface and readily visible on antenna, head, thorax and legs. The antenna and some other parts of legs were of pink colour. The pink colour changed to dark red and finally chocolate within 3-4 hrs of hatching. A 'Y' shaped ecdysial line is prominent on the vertex. The rostrum was four segmented having four stylets and the first basal segment is shorter and thicker than remaining ones. Metathorax is smaller than the prothorax and mesothorax. All parts of leg covered with fine hairs. The tarsus had two tarsomere which were more or less of equal size. Pretarsus had a pair of claws, in between the claws, a pair of knob shaped pulvilli was distinctly visible. Dorsolateral outgrowths i.e. scoli were present on the second, third, fourth, fifth, sixth and seventh abdominal segments. Two round shaped aroma glands were present on dorsal side of abdomen. The colour of aroma gland was pink in beginning but later changed to shady chocolate. The upper one was placed between the fourth and fifth and lower

between the 5th and 6th segments. The duration of the 1st instar nymph varied from 1-3 days with an average of 1.90 ± 0.57 days. The body length of nymph varied from 1.38-1.75 mm with an average 1.56 ± 0.18 mm, respectively (Table 1). These findings are in support of the studies made by (Rana and Patel, 2001) who reported that the newly hatched nymphs were delicate and pale yellowish in colour. (Singh and Patel, 1968) also noted that newly hatched nymphs were delicate, pale clay yellowish to pinkish in colour and length measured of 1.58 mm. The second instar nymphal resembles the 1st instar nymphal except in a pair of black strong spines on the either side of prothorax which become obvious in this instar. These spines were referred as thoracic spines. The duration of the 2nd instar nymph varied from 2-4 days with an average of 2.70 ± 0.82 days. The body and antennae length of nymph varied from 2.02-2.90 and 1.80-2.30 mm with an average 2.60 ± 0.32 mm and 2.09 ± 0.18 mm, respectively (Table 1).

There is no other remarkable change except the appearance of a pair of wing pads on the thoracic region in third nymphal instar. The thoracic spines become quite important in this instar. The duration of the 3rd instar nymph varied from 2-5 days with an average of 2.90 ± 0.99 days. The body and antennae length of nymph varied from 2.90-4.60 mm and 2.50-3.40 mm with an average 4.12 ± 0.62 mm and 3.00 ± 0.27 mm, respectively (Table 1).

The newly moulted fourth instar nymphal was rather similar to the preceding instars except for the wing pads become eminent and grow up to the second abdominal segment. Each scoli turned into black colour and a whitish line also occur with scoli. The duration of the 4th instar nymph varied from 4-6 days with an average of 4.60 ± 0.84 days. The body and antennal length of nymph varied from 4.95-6.12 mm and 4.50-4.70 mm with an average 5.52 ± 0.53 mm and 4.62 ± 0.08 mm,

respectively (Table 1). Fifth instar nymphal was as big as adult. Wing pads develop into prolong up to fourth abdominal segments. The duration of the 5th instar nymph varied from 4-7 days with an average of 5.60 ± 0.117 days. The body and antennal length of nymph varied from 7.50-9.90 mm and 5.50-6.60 mm with an average 8.63 ± 0.92 mm and 6.20 ± 0.38 mm, respectively. (Lefroy, 1909; Bindra, 1965; Kapoor, 1966 and Ombir *et al.*, 1992) also reported the nymphs passing through five instars. The total nymphal period was found varied from 15-21 days with an average of 17.70 ± 2.06 days. The present finding concord with the findings of Chitalekha *et al.*, 2017 they recorded that five nymphs instars with an average of 1.7, 2.4, 3.8, and 5.1 days for 1st, 2nd, 3rd, 4th and 5th nymphs instars respectively and total nymphs duration was 14.9 days (Table 1).

Adult

The newly emerged adult was yellow to light salmon colored but after 2-3 hrs. changed to brown. The antennal was four segmented and out of which flagellum was thicker and darker than the preceding two segments of pedicel. The distal portion of femur of hind legs was much swollen and bears two stout big spines in addition to some other spines. The tarsus which in earlier instar was described to bear only two tarsomere had now three segments. The last tarsomere had a pair of single shaped claws. Five pair of spiracles was present on the dorsolateral side of abdomen. The fore wings almost covered the entire abdominal length. The hind wings were dirty white and membranous with yellowish brown costal margin. Scoli reduced completely in this stage. The female was bigger than male. In case of female, the tip of abdomen when viewed dorsally appears straight, whereas, it appears with a V shaped notch when viewed ventrally. Adult longevity of male was found to be shorter than the female.

Table.1 Life history, longevity, fecundity and bionomics of tur pod bug, *Clavigralla gibbosa* (Spinola) on variety- Saket under laboratory conditions

Developmental stages	Duration (Days)		Body length (mm)		Antenna length (mm)	
	Range	Mean ± SD ± SEM	Range	Mean ± SD ± SEM	Range	Mean ± SD ± SEM
Incubation period	5-7	5.80 ± 0.79 ± 0.25	-	-	-	-
Nymphal period			-	-	-	-
1st instar	1-3	1.90 ± 0.57 ± 0.18	1.38-1.75	1.56 ± 0.18 ± 0.06	-	-
2nd instar	2-4	2.70 ± 0.82 ± 0.26	2.02-2.90	2.60 ± 0.32 ± 0.10	1.80-2.30	2.09 ± 0.18 ± 0.06
3rd instar	2-3	2.90 ± 0.99 ± 0.31	2.90-4.60	4.12 ± 0.62 ± 0.19	2.50-3.40	3.00 ± 0.27 ± 0.09
4th instar	4-6	4.60 ± 0.84 ± 0.27	4.95-6.12	5.52 ± 0.53 ± 0.17	4.50-4.70	4.62 ± 0.08 ± 0.02
5th instar	4-7	5.60 ± 1.17 ± 0.37	7.50-9.90	8.63 ± 0.92 ± 0.29	5.50-6.60	6.20 ± 0.38 ± 0.12
Total nymphal duration	15-21	17.70 ± 2.06 ± 0.65	-	-	-	-
Total life cycle (days)	17-30	23.60 ± 3.63 ± 1.15	-	-	-	-
Pre-oviposition	2-14	7.80 ± 3.58 ± 1.13	-	-	-	-
Oviposition	5-20	12.10 ± 5.13 ± 1.62	-	-	-	-
Post-oviposition	4-18	9.40 ± 4.01 ± 1.27	-	-	-	-
Total Adult life (days)						
Male	3-28	15.20 ± 9.43 ± 2.98	8.10-9.00	8.67 ± 0.24 ± 0.07	5.70-6.50	6.16 ± 0.31 ± 0.10
Female	5-35	22.40 ± 10.05 ± 3.18	9.50-10.80	9.98 ± 0.44 ± 0.14	6.10-7.45	6.78 ± 0.58 ± 0.18
Fecundity	20-190	101.40 ± 66.59 ± 21.06				

*Mean of 10 observations

The total life duration of adult male and female varied from 3-28 days and 5-35 days with an average of 15.20 ± 0.943 days and 22.40 ± 10.05 days, respectively. These findings are close agreement with (Misra *et al.*, 2000 and Singh *et al.*, 2005) recorded 33.70 days on UPAS-120 and 13.6 days of male adult on Manak and 44.80 days on UPAS-120 and 15.0 days of female adult life on Manak. The Chitalekha *et al.*, 2017 also reported that total adult life of male was 15.6 and that of a female 23.7 days. The length of body and antennal varied from 8.10-9.00 mm and 5.70-6.50 mm with an average of 8.67 ± 0.24 mm and 6.16 ± 0.31 mm in male and 9.50-10.80 mm and 6.10-7.45 mm with an average of 9.98 ± 0.44 mm and 6.78 ± 0.58 mm in female. These findings are close agreement with (Rana and Patel, 2001) who reported that the newly hatched adult was yellow to light salmon in colour and changed to brown within a few hrs. Head was small in size and dark brown in colour. Thorax was numerous covered with golden coloured hairs. Abdomen was wedge shaped and pale brown in colour with blackish edges. The female bug was larger with enlarged abdomen than male. The results are in confirmation with the findings of Ombir, 1981; Singh and Patel, 1968). The total life cycle of tur pod bug was varied from 17.00-30.00 days with an average of 23.60 ± 3.63 days. (Bindra, 1965; Choudhary and Dhamdhare, 1981, and Dhudhsia *et al.*, 1986) reported that much variation in longevity *i.e.* from few days to 155 days. Similar findings were reported by Chitalekha *et al.*, 2017 they observed that total life cycle was completed in 24.11 days on an average.

Pre-oviposition, oviposition and post-oviposition period

The pre-oviposition period varied from 2-14 days with an average of 7.80 ± 3.58 days. Ealier workers (Bindra, 1965; Choudhary and Dhamdhare, 1981; Dhudhsia *et al.*, 1986)

reported that pre-oviposition period from 1-10 days. The oviposition period was observed of 5-20 days with an average of 12.10 ± 5.13 days. The post-oviposition period were 9.40 ± 4.01 days ranging from 4-18 days. However, (Singh *et al.*, 2005) recorded 4.2 days of post oviposition period on Manak. (Misra *et al.*, 2000) recorded that the 10.70 days of post-oviposition period on UPAS-120. The results is in confirmation with the findings of (Chitalekha *et al.*, 2017) revealed that the pre-oviposition, oviposition and post-oviposition period averaged 7.5, 12.8 and 8.6 days on pigeonpea variety Manak, respectively.

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