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Biology of groundnut bruchid, *Caryedon serratus* (Olivier) on different groundnut varieties

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Abstract

An experiment was conducted at Oilseed Research Station, Latur, Maharashtra, to “Studies on biology of groundnut bruchid, *C. serratus* (Olivier) on different groundnut varieties in storage condition” during 2017-18. Ten groundnut varieties were used for biology studies in which the lowest oviposition period of *C. serratus* 3.50 days was recorded on LGN-1. While the highest oviposition period (8.50 days) was observed on groundnut variety of JL-24. The shortest incubation period of *C. serratus* i.e. 4.00 days was observed on groundnut varieties RTNG-53 and TKG-BOLD whereas, highest incubation period of 6.25 days was observed in RHRG-1135 groundnut varieties. In case of larval emergence of *C. serratus* is less number of larvae emerged from JL-24 (69.75) while the highest number of *C. serratus* larvae emerged from RHRG-1135 (89.75). The longer larval duration of *C. serratus* 34.00 days was observed on TAG-24 followed by JL-24 (33.00). While shorter larval duration was recorded in RHRG-1135 i.e. 24.75 days. The highest growth index was recorded on variety RTNG-53 (0.333). The lowest number larvae pupated was recorded in JL-24 (66.00). The highest number larvae pupated was observed in RHRG-1135 (85.25). The shortest pupal duration was observed on JL-24 (12.75 days). Longer pupal duration was recorded in TKG-BOLD (15.25). The lowest number of adults 57.75 emerged from JL-24 while the highest number of adults was recorded from RHRG-1135 (80.25). The highest longevity of adults *C. serratus* was recorded on TKG-BOLD (14.25 days). Whereas, lowest longevity adults were observed in JL-24 (12.75days).

Keywords: Groundnut, *Caryedon serratus*, biology, storage

1. Introduction

Groundnut (*Arachis hypogaea* L.) belongs to family Leguminaceae, a leading oilseed crop of many tropical and sub-tropical countries of the world. It contains 48 to 50 percent oil and 26 to 28 percent protein. Oleic acid and linoleic acid accounts for 75 to 80 percent of the total fatty acid in groundnut oil [13]. In Maharashtra, area under groundnut cultivation was 2.40 Million hectare with production of 2.37 Million tons and productivity comprises 988 kg per hectare [1]. Groundnut is stored pods and kernels and both of these are susceptible to attack of insect-pests in storage. One hundred insect species are reported to attack the stored groundnuts [19]. Of these, eight insect species are of major importance and six minor importance. Out of dangerous pest groundnut seed bruchid, *C. serratus* is one of the major pests. *C. serratus* has been reported as a pest of international importance in stored groundnuts and wide spread in various groundnut growing areas of the world [4]. *C. serratus* belongs to the family Bruchidae of the order Coleoptera. In India, *C. serratus* was first reported to be infesting groundnut round the year in Andhra Pradesh and Tamil Nadu in 1914 [5]. *C. serratus* is regarded as the only species that can penetrate intact pods to infest kernels the losses due to vary from 19.0 to 60.0 percent [24]. The larvae of *C. serratus* bore into the seeds via small holes and feed on the embryo and the endosperm and final instar grub comes out for pupation through exit holes [3]. Insect infestation caused considerable qualitative and quantitative losses to the groundnut either stored in shell for seed purpose or unshelled for milling purpose. The beetle damage not only reduces the weight and nutrient value but also adversely affects the quality of seed and oil. *C. serratus* infestation causes loss in dry mass of the kernels, increased levels of free fatty acids in the oil (thereby lowering the quality) and reduction in germination potential [9].

2. Material and Methods

“Study on the biology of groundnut bruchid, *C. serratus* (Olivier) in storage” was conducted during 2017-18 on groundnut varieties at Oilseed Research Station, Latur, Maharashtra. Ten varieties were screened for their relative response to bruchid, beetle (*C. serratus*) using choice

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test under relative room condition in a CRD with four replications. Healthy groundnut pods (100 g) of the test varieties were weighed and kept separately in the glass jars. Five pairs of newly emerged *C. serratus* beetles were released into each jar. The mouths of the jars was covered with muslin cloth and held tight with rubber bands. Four replications were maintained for each treatment. The jars were kept in laboratory observed for egg laying, pupation and emergence of the adults. The adults emerging from different varieties were counted daily and removed from the respective jars. Counting was continued till they cease to emerge. At the end, final data was pooled to arrive at the total number of adults emerged from each variety.

3. Results

3.1 Egg

The data presented in the Table 1 revealed that the number of egg laid on the groundnut varieties and the fecundity ranged between 81.75 to 105.50 eggs per 100 gm. of pods. Minimum numbers of eggs were laid on JL-24 (81.75). While maximum egg laying was recorded on RHRG-1135 (105.50). The results revealed that the bruchid exhibited differential preference for oviposition periods to groundnut varieties Table 1. The oviposition period of the *C. serratus* on groundnut varieties varied significantly, and ranged to the tune of 3.50 to 8.50 days.

Table 1: The fecundity and oviposition period of *C. serratus* on different groundnut varieties

Sr. No.	Groundnut variety	Fecundity	Oviposition period (days)
1	TAG-24	85.00 (9.24)	6.25
2	TLG-45	99.50 (10.00)	6.50
3	JL-24	81.75 (9.06)	8.50
4	LGN-123	83.20 (9.14)	4.75
5	LGN-1	96.75 (9.86)	3.50
6	RHRG-1135	105.50 (10.29)	5.00
7	RTNG-53	100.75 (10.06)	4.00
8	TKG-BOLD	93.25 (9.68)	5.00
9	RTNG-27	95.50 (9.79)	4.00
10	JL-776	103.75 (10.21)	4.50
S.E. \pm		0.043	0.38
C.D. at 5%		0.123	1.10
C.V (%)		3.14	4.68

Figures in parentheses are square root $\sqrt{X+0.5}$ transformed values.

3.2 Larva

The data on effect of different groundnut varieties on the incubation period of *C. serratus* presented in Table 10 revealed that the incubation period of *C. serratus* reared on different groundnut varieties varied significantly. The minimum incubation period 4.00 to 4.50 days of *C. serratus* was observed in 6 varieties viz., TAG-24, JL-24, RTNG-53, TKG-BOLD, RTNG-27 and JL-776 whereas, maximum incubation period of 5.00 to 6.25 days was observed in LGN-1, LGN-123, TLG-45 and RHRG-1135 groundnut varieties. The number of larvae emerged of the *C. serratus* insect in

groundnut varieties varied significantly and ranged between 69.75 to 89.75 larvae. The less number of larvae emerged from JL-24 (69.75). The highest number of *C. serratus* larvae emergence from RHRG-1135 (89.75). The other five varieties ranged between 80.25 to 84.75 the number of larvae emerged. Effect of different groundnut varieties on larval duration of *C. serratus* was presented in Table 2. The longer larval duration of *C. serratus* (34.00 days) was observed on TAG-24. The shorter larval duration was observed by RHRG-1135 (24.75days).

Table 2: The mean incubation period, mean larval duration, number of larva emerged and growth index of *C. serratus* on different groundnut varieties

Sr. No.	Groundnut variety	Mean incubation period (Days)	Number of larvae emerged	Mean larval duration (Days)	Growth index
1	TAG-24	4.25	79.50	34.00	0.230
2	TLG-45	5.00	84.75	30.00	0.236
3	JL-24	4.50	69.75	33.00	0.109
4	LGN-123	5.00	80.25	30.50	0.308
5	LGN-1	5.00	82.25	32.00	0.154
6	RHRG-1135	6.25	89.75	24.75	0.243
7	RTNG-53	4.00	85.75	31.25	0.333
8	TKG-BOLD	4.00	79.50	25.75	0.255
9	RTNG-27	4.50	81.25	27.00	0.220
10	JL-776	4.24	88.25	28.00	0.243
S.E. \pm		0.39	2.00	1.43	0.043
C.D. at 5%		1.13	5.82	4.14	0.123
C.V (%)		5.13	4.89	4.65	3.14

The data on growth index presented in Table 2 revealed that there was significant difference among the varieties. The lowest growth index of was found JL-24 (0.109) was recorded by followed by LGN-1 (0.154). The highest growth index *C. serratus* was recorded on variety RTNG-53 (0.333).

3.3 Pupa

Effect of different groundnut varieties on number of larvae pupated and pupal duration of *C. serratus* was presented in Table 3 revealed that the number of larvae pupated of the *C. serratus* on groundnut varieties varied from 66.00 to 85.25 pupa. The pupal durations of *C. serratus* varied in between 12.75 and 15.25 days, on different groundnut varieties.

Table 3: The number larvae pupated and pupal duration of *C. serratus* on different groundnut varieties

Sr. No.	Groundnut variety	No. of larvae Pupated	Pupal duration (days)
1	TAG-24	75.50	13.50
2	TLG-45	80.25	13.50
3	JL-24	66.00	12.75
4	LGN-123	76.25	14.75
5	LGN-1	78.25	15.00
6	RHRG-1135	85.25	14.50
7	RTNG-53	81.50	15.00
8	TKG-BOLD	75.25	15.25
9	RTNG-27	77.25	13.25
10	JL-776	83.75	14.00
S.E. \pm		1.87	0.50
C.D. at 5%		5.43	1.45
C.V. (%)		4.80	5.06

3.4 Adult

Table 4: The number of adult emerged, adult longevity and mean development period of *C. serratus* on different groundnut varieties

Sr. No.	Groundnut variety	Number of Adult emerged	Adult longevity (Days)	Mean development period (Days)
1	TAG-24	67.25	13.50	75.75
2	TLG-45	76.25	13.25	75.00
3	JL-24	57.75	12.75	77.00
4	LGN-123	72.25	13.75	75.50
5	LGN-1	77.25	13.25	74.25
6	RHRG-1135	80.25	13.00	67.50
7	RTNG-53	76.25	13.75	76.00
8	TKG-BOLD	70.00	14.25	70.75
9	RTNG-27	73.00	13.50	68.75
10	JL-776	77.25	13.50	70.500
S.E. \pm		1.39	0.27	1.70
C.D. at 5%		4.03	0.79	4.95
C.V. (%)		3.82	4.08	4.67

The data presented in Table 4 the adult emerged observed from different groundnut varieties varied from 57.75 to 80.25. In the remaining varieties the adult emergence ranged from 70.00 to 73.00. The results clearly indicated that the varieties which were not preferred for egg laying and took more time to complete the development resulted in low adult emergence while then varieties which favoured high oviposition and took less time to complete the development period recorded high adult emergence. The differences were observed in respect of longevity of adult *C. serratus* when reared at different groundnut varieties. The highest longevity of adult *C. serratus* was recorded on TKG-BOLD (14.25 days). The lowest longevity adult was observed in JL-24 (12.75days), respectively. The groundnut bruchid recorded the shortest developmental period in RHRG-1135 (67.50 days) while it took maximum time to complete the development in JL-24 (77.00 days).

4. Discussion

4.1 Egg

The results are in agreement with the findings of Mishra (2005) who reported that the number of eggs laid by groundnut bruchid on different varieties ranged from 14.00 to 94.00. Similarly, Venugopal Reddy (1990) [23], Shivalingaswamy and Balasubramanian (1992) [22] also observed differential response of oviposition by bruchid on different varieties of groundnut pods. Rekha *et al.* (2017) [18] reported that groundnut genotype viz., Narayani and K 9 were found to be less preferred by the bruchid for oviposition (20.33 and 21.0 eggs/ 100g pods respectively) whereas, the highly susceptible genotype, ICGV 350 that possessed smooth

reticulation received 47.33 eggs/ 100g pods. Kapadia (1995) [12] reported average oviposition periods of *C. serratus* were 2.00 and 23.00 days with a range of 1 to 3 days and 8 to 40 days, respectively. Halle (1999) recorded oviposition period as 4.21 to 8.7 days, respectively. Ranaware *et al.* (2011) [17] also observed differential response of oviposition by bruchid on groundnut. The result in respect of fecundity and oviposition of *C. serratus* on pods of different groundnut varieties in the present investigation are in good line with the results reported by above referred research workers.

4.2 Larva

The results are in agreement with the findings of Kapadia (1995) [12] who observed average incubation period of 2.63 days with a range of 2 to 5 days. According to Mittal *et al.* (1969) [14] who found that maximum period of larval development (60.25 days) and minimum population development (22.98 percent) in the variety TMV-3, while the variety TMV-2 was susceptible with minimum period of larval development (23.5 days) and maximum population development (60.77 percent). Kapadia *et al.* (1995) [12] studied the relative larval duration of *C. serratus* on groundnut and found that the variety J-11 which prolonged the larval period (30-94 days) in the beetle was less preferred than the other varieties JL-24, GG-2. According to Nadaf (2008) [15] recorded growth index of *C. serratus* on different groundnut varieties from 0.012 to 0.049. The lowest growth index of 0.012 was recorded in OG-5 groundnut variety while higher growth index was recorded in GG-2 (0.049) which supports present findings.

4.3 Pupa

According to Kapadia (1995) ^[12], pupal period of *C. serratus* on an average was 12.88 days with a range of 10 to 22 days. Ramadevi (1996) ^[16] found pupal periods of *C. serratus* has 15.5 days. Sharma *et al.* (2017) ^[21] also observed differential response of oviposition by bruchid on groundnut.

4.4 Adult

The results are in agreement with the findings of Shivalingaswamy and Balasubramanian (1992) ^[22]. He reported that the mean number of adults emerged from different groundnut varieties varied from 49.00 (JL-24) to 90.33 (S-206). Harish *et al.* (2012) ^[8] evaluate thirty groundnut genotypes (18 of Virginia bunch, 5 Spanish bunch and 7 Virginia runner group) for their relative response to *C. serratus* using no choice test under laboratory condition (32 to 35°C). The results showed that the number of eggs laid by *C. serratus* ranged from 19.3 to 115.0 and adult emergence varied from 11.0 to 63.7 beetles. Rekha *et al.* (2017) ^[18] screened highly susceptible genotype, ICGV 350 that possessed smooth reticulation reported that it and received 47.33 eggs/ 100g pod sand resulted in emergence of 40.33 adults.

Sardesai (1961) ^[20] reported that the adult beetle of *C. serratus* male and female lived for 11.72-14.47 days, with little difference between the sexes. According to Calderon *et al.* (1967) ^[2] the *C. serratus* adults lived 10-15 days, with female longevity greater than male under laboratory condition at 25°C temperature and R.H.70 percent. Ghorpade *et al.* (1998) ^[6] studied the relative susceptibility of seven groundnut cultivars to pod borer, *C. serrate* in storage. They reported shortest developmental period (66.22 days) in SB-11 and maximum in RVB-1 (98.17 days).

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