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Relative susceptibility of some on different groundnut varieties to groundnut bruchid, *Caryedon serratus* (Olivier) in storage

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Abstract

Ten different groundnut varieties were used for relative susceptibility to *C. serratus*. The test varieties were grouped into three categories as resistance, moderately resistance, susceptible, moderately susceptible and highly susceptible. The variety JL-24 recorded minimum egg count (81.75 eggs), moderately resistance (5.00), high mean development period (77.00 days) and minimum weight loss (45.29%). While physical parameters recorded by the JL-24 groundnut variety were high shell thicknesses (0.94 mm) with low inter pod space (45.77 cc). whereas, RHRG-1135 variety recorded highest egg count (105.50 egg), high index of susceptibility (6.17), lowest mean development period (67.50 days) and maximum weight loss (52.16%). The physical parameters recorded by the RHRG-1135 groundnut variety were low shell thickness. The lowest number of adults 57.75 emerged from JL-24 while the highest number of adults was recorded from RHRG-1135 (80.25).

Keywords: Groundnut, *Caryedon serratus*, relative susceptibility, physical parameters

Introduction

Groundnut (*Arachis hypogaea* L.) is the 13th most important food crop and fourth most important source of edible oil in the world. It is grown on 26.4 md kernels and, both of these are susceptible to insect, fungi and mites in storage. One hundred insect species are reported to attack the stored groundnuts (Redlinger *et al.*, 1982) [14]. Of these, eight insect species are of major importance and six minor importances. One of the major pest is groundnut seed bruchid, *Caryedon serratus* (Conway, 1983) [1]. *C. serratus* belongs to the family Bruchidae of the order coleoptera. The degree of susceptibility of groundnut in storage depends largely on whether or not the groundnuts are shelled and the extent to which pods or kernels are damaged before being placed in store. Female beetle lays eggs on pods and kernels; larva bore into the pods and kernels causing damage up to 60 per cent and the resultant weight loss of about 50 per cent in groundnut and further prone to aflatoxin contamination which make it for unfit for human consumption (Rathanakumar *et al.*, 2012) [4]. The beetle damage not only reduces the weight and nutrient value but also adversely affects the quality of seed and oil. Infestation causes loss in dry mass of the kernels, increased levels of free fatty acids in the oil (thereby lowering the quality) (Howe, 1965) [6]. *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 per cent (Weightman *et al.*, 1987) [18]. Therefore, the present investigation was undertaken to find out relative susceptibility of groundnut varieties to the bruchid beetle in storage.

Materials and Methods

The studies on “Studies on relative susceptibility of some on different groundnut varieties to groundnut bruchid, *caryedon serratus* (oliver) in storage condition” were conducted during 2017-2018 on groundnut varieties at Oilseed Research Station, Latur, Maharashtra. Ten varieties were screened for their relative response to bruchid, beetle (*C. serratus*) using choice test under relative room condition in a CRD with four replication. Healthy groundout pods (100 g) of the test varieties was 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 was kept in laboratory jar were observed for egg count, adult emergence, mean development period, index of susceptibility, index of suitability, per cent

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survival, growth index and per cent weight loss of pods due to *C. serratus*. The test varieties were classified into five

categories based on the index of susceptibility as suggested by Mensah (1986) [8].

Categorization of test varieties based on index of susceptibility (Mensah, 1986)

Category	Index of susceptibility
Resistance	0-2.5
Moderately Resistance	2.6-5.0
Moderately Susceptible	5.1- 7.5
Susceptible	7.6-10.0
Highly Susceptible	>10.0

Results

Table 1: Egg count, adult emergence and mean development period of *C. serratus* on different groundnut varieties

Sr. No.	Groundnut variety	Egg count/100 g of pods	No. of adults emerged	Mean development period (days)
1	TAG-24	85.00 (9.24)	67.25	75.75
2	TLG-45	99.50 (10.00)	76.25	75.00
3	JL-24	81.75 (9.06)	57.75	77.00
4	LGN-123	83.20 (9.14)	72.25	75.50
5	LGN-1	96.75 (9.86)	77.25	74.25
6	RHRG-1135	105.50 (10.29)	80.25	67.50
7	RTNG-53	100.75 (10.06)	76.25	76.00
8	TKG-BOLD	93.25 (9.68)	70.00	70.75
9	RTNG-27	95.50 (9.79)	73.00	68.75
10	JL-776	103.75 (10.21)	77.25	70.50
	S.E. ±	0.043	1.39	1.70
	C.D. at 5%	0.123	4.00	4.95
	C.V(%)	3.14	3.82	4.67

Figures in parentheses indicate transformation square root $\sqrt{X+0.5}$ values.

Egg count, No. of adults emerged and Mean development period (days)

The data presented in the Table 1 revealed that the number of egg laid on the groundnut varieties 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 and RHRG-1135 (105.50). 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 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).

Table 2: The index of susceptibility, index of suitability and growth index of *C. serratus* on different groundnut varieties

Sr. No.	Groundnut variety	Index of susceptibility	Index of suitability	Growth index
1	TAG-24	5.42	0.055	0.230
2	TLG-45	5.73	0.057	0.236
3	JL-24	5.00	0.044	0.109
4	LGN-123	5.75	0.060	0.308
5	LGN-1	5.61	0.050	0.154
6	RHRG-1135	6.17	0.054	0.243
7	RTNG-53	5.94	0.064	0.333
8	TKG-BOLD	5.42	0.063	0.255
9	RTNG-27	5.00	0.052	0.220
10	JL-776	5.31	0.050	0.243
	S.E. ±	0.61	0.052	0.043
	C.D. at 5%	1.85	0.0156	0.123
	C.V (%)	4.56	3.153	3.14

Index of susceptibility, Index of suitability and Growth index

The index of susceptibility to the *C. serratus* on groundnut varieties varied ranged from 5.00 to 6.17. The lowest index of

susceptibility was recorded in JL-24 (5.00). The higher index of susceptibility was observed in RHRG-1135(6.17). The index suitability of the pest on groundnut varieties ranged from 0.044 to 0.064. The variety JL-24 with 0.044 index of suitability was found to be superior with the lowest index of suitability compared to other varieties. LGN-1 and JL-776 were found to be the next best varieties with suitability index of 0.050 each. The higher index of suitability was recorded in RTNG-53 (0.064). The data on growth index of *C. Serratus* was significant difference among the test varieties. The lowest growth index of JL-24 (0.109). The data presented in the Table 2 revealed that the highest growth index *C. serratus* was recorded on variety RTNG-53 (0.333).

Table 3: Grouping of groundnut varieties based on the index of susceptibility to *C.serratus*

Sr. No.	Groundnut variety	Scale	Index of susceptibility	Category
1	TAG-24	5.1-7.5	5.42	Moderately Susceptible
2	TLG-45	5.1-7.5	5.73	Moderately Susceptible
3	JL-24	2.6-5.00	5.00	Moderately Resistance
4	LGN-123	5.1-7.5	5.75	Moderately Susceptible
5	LGN-1	5.1-7.5	5.61	Moderately Susceptible
6	RHRG-1135	5.1-7.5	6.17	Moderately Susceptible
7	RTNG-53	5.1-7.5	5.94	Moderately Susceptible
8	TKG-BOLD	5.1-7.5	5.42	Moderately Susceptible
9	RTNG-27	2.6-5.00	5.00	Moderately Resistance
10	JL-776	5.1-7.5	5.31	Moderately Susceptible

The data presented in the Table 3 represent grouping of groundnut varieties based on index susceptibility. The index of susceptibility of *C. serratus* on ranged between 5.00 - 6.17. The variety JL-24 (5.00) recorded moderately resistance index of susceptibility followed by RTNG-27 (5.00). The variety TKG-BOLD (5.42), TAG-24 (5.42), LGN-1 (5.61), TLG-45 (5.73), LGN-123(5.75), RTNG-53 (5.94) and RHRG-1135 (6.17) recorded moderately susceptible. At the varieties were categorized as two moderately resistance and another moderately susceptible to *C. serratus*.

Table 4: The per cent survival and per cent weight loss of *C. serratus* on different groundnut varieties

Sr. No.	Groundnut variety	Per cent survival of adults	Per cent pod weight loss
1	TAG-24	71.92 (58.00)	48.42 (44.09)
2	TLG-45	76.64 (61.10)	46.36 (42.91)
3	JL-24	70.62 (57.18)	45.29 (42.30)
4	LGN-123	76.45 (60.97)	48.69 (44.25)
5	LGN-1	80.11 (63.51)	45.77 (42.57)
6	RHRG-1135	76.16 (60.77)	52.16 (46.24)
7	RTNG-53	76.29 (60.86)	48.53 (44.16)
8	TKG-BOLD	75.29 (60.19)	48.32 (44.04)
9	RTNG-27	76.44 (60.96)	47.88 (43.78)
10	JL-776	74.57 (59.72)	48.50(44.14)
S.E. ±		4.89	1.14
C.D. at 5%		1.68	3.30
C.V (%)		4.46	4.73

Figures in parentheses indicate arcsine transformed values.

Per cent survival of adults and Per cent pod weight loss

The data presented in the Table 4 revealed that the per cent survival of adults of *C. serratus* on groundnut varieties ranged between 70.62 to 80.11 per cent. The JL-24 variety recorded the lowest (70.62%) of adult survival. The varieties which recorded more than 75% survival of *C. serratus* were RHRG-1135 (76.16%) RTNG-53 (76.29%), RTNG-27 (76.44%), TLG-45 (76.64%), TKG-BOLD (75.29%) and LGN-1 (80.11%).The per cent pod weight loss of *C. serratus*. The lowest per cent pod weight loss (45.29%) by the variety JL-24. The highest per cent weight loss (52.16%) was recorded in RHRG-1135.

Table 5: Shell thickness, inter pod and inter kernel space on different groundnut varieties.

Sr. No.	Groundnut variety	Shell thickness (mm)	Inter pod space (cc)	Inter kernel space (cc)
1	TAG-24	0.69	59.88	33.36
2	TLG-45	0.82	58.70	37.25
3	JL-24	0.94	45.77	40.23
4	LGN-123	0.77	52.10	38.15
5	LGN-1	0.74	60.46	41.49
6	RHRG-1135	0.64	58.80	45.40
7	RTNG-53	0.73	55.11	37.10
8	TKG-BOLD	0.70	51.62	37.31
9	RTNG-27	0.66	54.99	39.00
10	JL-776	0.67	54.20	38.14
S.E. ±		0.05	2.32	2.00
C.D. at 5%		0.15	6.74	5.82
C.V (%)		3.95	5.43	5.35

Shell thickness (mm) Inter pod/ kernel space

The data pertaining to the shell thickness of groundnut varieties Table 5 varied from 0.64 mm to 0.94 mm. The shell thickness was lowest in RHRG-1135 (0.64mm), whereas it

was maximum in JL-24 (0.94mm). The inter pod space in different varieties varied from 45.77 cc to 60.46 cc. The lowest inter pod space was recorded in JL-24 (45.77cc). The highest inter pod space was recorded in LGN-1 (60.46cc).The inter kernel space in kernels of different varieties varied from 33.36cc to 45.40cc. It was lowest (33.36cc) in TAG-24. The highest inter kernel space was recorded in RHRG-1135 (45.40 cc).

Discussion

Egg count, No. of adults emerged and Mean development period (days):

The results are in agreement with the findings of Mishra (2005) [10] reported that the number of eggs laid by groundnut bruchid on different varieties ranged from 14.00 to 94.00. Rekha *et al.* (2017) [15] 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 and reported that it received 47.33 eggs/ 100g pods. The results are in agreement with the findings of Shivalingaswamy and Balasubramanian (1992) [16]. They 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) [4] evaluate thirty groundnut genotypes (18 of Virginia bunch, 5 Spanish bunches and 7 Virginia runner group) for their relative response to *C. serratus* 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) [15] screened highly susceptible genotype, ICGV 350 that possessed smooth reticulation and reported that it received 47.33 eggs/ 100g pods and resulted in emergence of 40.33 adults. The mean development period of the test insect recorded in various treatments varied from 67.50 days to 77.00 days. The results are in agreement with the findings of Haritha (1998) [5] she reported that minimum mean development period of 42.32 days was observed in the highly preferred groundnut variety ICGS-44. Shivalingaswamy and Balasubramaniam (1992) [16] also reported that the mean development period in different groundnut varieties ranged between 45.55 days and 48.99 days. Ghorpade *et al.* (1998) [3] studied the relative susceptibility of seven groundnut cultivars to pod borer, *C. Serratus* in storage. They reported shortest developmental period (66.22 days) in SB-11 and maximum in RVB-1 (98.17 days).

Index of susceptibility, Index of suitability and Growth index

Mishra (2005) [10] reported that the variety ICGS-11 which exhibited the lowest index of susceptibility (2.8) was significantly superior to the rest of the varieties while significantly highest index of susceptibility of 6.2 noticed in AK 12-24 followed by TMV-2 (5.7), J-11 (5.7), ICGS-44 (5.7), GG-2 (5.6) and JL-24 (5.6) which was more damaged by the groundnut bruchid. According to Haritha (1998) [5] the genotype ICGS44and ICGV9117 with an index of susceptibility of 9.966 and 9.160, respectively showed highly susceptible reaction while ICGV86590 (6.536), TMV2 (8.752) were moderately susceptible whereas ICGS11 (5.875) and ICGS76 (5.908) were least susceptible to bruchid attack. According to Nadaf (2008) [11], reported variety OG-52-1 with 0.021 index suitability was found to be significantly superior with the lowest index suitability compared to other varieties

the recorded significantly higher index of suitability was recorded in K-4 (0.057) and was on par with TCGS-888 (0.054). According to Nadaf (2008) ^[11] growth index of *C. serratus* on different groundnut varieties was recorded 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.

Grouping of groundnut varieties

The index of susceptibility to the *C. serratus* on groundnut varieties varied ranged from 5.00 to 6.17. As per the scale given by Mensah (1986) ^[8].

Per cent survival of adults and Per cent pod weight loss

Nadaf (2008) ^[11] reported that the less per cent survival of *C. Serratus* was found to be quite significant the Bold variety of OG-52-1 with 58.51 per cent. The results are in conformity with the finding of Shivalingaswamy and Balasubramanian (1992) ^[16]. They reported that the weight loss due to damage by *C. serratus* in different groundnut varieties ranged between 12.51% and 35.81%. Haritha (1998) ^[5] observed the minimum weight loss due to *C. serratus* in least preferred varieties ICGS76 (2.20%) and ICGS11 (3.0%) while significantly more weight loss was recorded in TMV2 (25.7%). Prasad *et al.* (2012) ^[12] reported that GG3 and TAG 24 which recorded less number of eggs, adult emergence and low pod damage recorded less reduction in weight loss of 9.70% as against the highly preferred variety ICG (FDRS) 10 which recorded a maximum weight loss of 56.70%. Kapadia (1994) ^[7] reported that *C. Serratus* infestation resulted in weight loss in Kampalla local groundnut variety up to 68.33%

Shell thickness (mm) Inter pod/ kernel space

Vishwamitra (2011) ^[17] reported that seed coat thickness of pigeonpea does not have any influence on the development of *C. chinensis*. Haritha (1998) ^[5] reported that the relation of inter granular space of groundnut varieties with index of susceptibility, weight loss and adult emergence was positive while the correlation was negative and non-significant with mean development period. Dasbak *et al.* (2009) ^[2] reported that pigeonpea cultivars were more inter granular space are susceptible to *C. chinensis*. Vishwamitra (2011) ^[17] reported that the inter granular space observed in resistant and moderately resistant pigeonpea varieties was significantly less while it was comparatively more in moderately susceptible varieties especially Durga (50 cc), WRG-53 (48 cc) and WRGE-18 (48 cc).

Conclusion

In the present investigation, it can be concluded that the groundnut variety JL-24 was found moderately resistance to groundnut bruchid, *C. Serratus* infestation, which recorded minimum egg count, high mean development period, less adult emergence, lowest growth index and minimum weight loss. The physical parameter of JL-24 variety recorded high shell thickness with low inter pod space due to which less incidence of *C. Serratus* was recorded while other physical parameters did not show any influence on the biology of groundnut bruchid.

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