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Emergence of adult pest and loss of groundnut pod in storage period

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Abstract

The screening test of thirteen ground nut cultivars were conducted to study their resistance and susceptibility to *Caryedon serratus* in the laboratory at 70% RH and 28 ± 1 °C. The successful development of adult beetles widely varied from 0.0 to 29.0 after one month. The variety OG 52-1 proved to be immune to the attack up to one month of storage. Percentage of weight loss due to beetle infestation was varied from 1.2 to 17.8% in first month of storage. The cultivar OG 52-1 recorded least weight loss.

Keywords: Ground nut, resistance, larval instars, adult, beetle

Introduction

Ground nut (*Arachis hypogaea* L.) also known as peanut, is a legume that ranks 6th among the oil seed crops and 13th among the food crops of the world. Oilseeds contribute the major source of dietary lipid requirement of human health. Among the food materials oilseeds occupied important position. During storage time it is infested by different insect and pest. Out of the dangerous pest ground nut seed beetle is one of the major pest. In India, *C. serratus* was first reported to be infesting groundnut round the year in Andhra Pradesh and Tamil Nadu in 1914 (Fletcher, 1914) [1]. Subsequently, several workers reported its distribution from Rajasthan, Gujarat, Madhya Pradesh, Maharashtra, Uttar Pradesh, Punjab, Haryana, Jammu and Kashmir, Himachal Pradesh, Tamil Nadu, Kerala, Andhra Pradesh and Orissa (Ranga Rao and Wightman 1999, Manjunath *et al.* 2018 [2, 3]. Reports on damage to seeds of legumes by this insect in storage as well as in the field from different parts of the world have been well documented (Cunningham and Walsh, 2002, Nandagopal and Prasad 2004) [4, 5].

Materials and Methods

Studies were conducted on the biology of groundnut seed beetle *Caryedon serratus* (Oliv.) and management of these beetles by various methods on the stored groundnut in the laboratory. Attempts have also been made to screen out the popular groundnut cultivars against the pest attack and factors of resistance contributed by those cultivars.

Test insect. = *Caryedon serratus* (Oliv.), (Bruchidae: Coleoptera)

The groundnut seed beetle is one of the obnoxious pest and multiplies rapidly under Orissa climatic conditions inflicting damage both in the larval and adult stages. The test insect is defined by its very broad hind femur, serrated antenna and elytra that do not completely cover the last part of the abdomen.

Prior to start the culture of insects, dried pods were disinfested with Aluminium Phosphide tablets for 7 days. A weekly interval of fresh culture was set, so as to get a steady supply of freshly emerged beetles which were used in different experiments.

Groundnut seed beetle Beetles of both the sexes were collected with the help of aspirator and specimen tubes from the infested stocks of groundnut. Rearing and multiplication of the insects were carried out in specimen bottles of 15 x 10 cm size in the storage laboratory of the Department of Entomology. For mass collection of insects flat bottom flasks of 10 lit capacity containing sufficient groundnut pods and mouth of the flask was covered by a piece of muslin cloth and tied firmly with the rubber bands. These flasks containing insects were kept in dark till the next generation was completed and sufficient number of adults available for further investigations.

Matured dried harvest pods of groundnut cultivation were collected from groundnut scheme, "Breeder seed production". 13 cultivars of groundnut popularly grown were selected for resistant studies against the beetle, *Caryedon serratus*, (Table 1). The pods were fumigated with Aluminium Phosphide and healthy pods of different cultivars were collected for the experimental purpose.

In resistant study, selected cultivars were subjected to artificial infestation with five pairs of freshly emerged beetles to 30 pods in 15 x 10cm glass containers tied with muslin cloths. Then jars were kept in desiccators at 70% RH and 28 ± 1 °C temperature for the completion of life cycle of the pest. Frequent observations were recorded for the adult emergence in the test entries. The number of beetles emerged and number of pods damaged were counted and converted into percentage of emergence and weight loss.

Finally, after completion of the life cycle, the number of the beetles emerged from the varieties were recorded separately for resistance/ susceptibility of the pest to the test groundnut varieties. Pod damage of the test entries were counted and converted into percentage of damage and weight loss at one-month intervals.

Thirteen groundnut entries were collected and subjected to artificial infestation with five pairs of beetle on 30 test pods to study their relative resistant/ susceptibility to groundnut seed beetles. Five pairs of adult of *Caryedon serratus* (Oliv.) in each specimen jar containing 30 pods were released. The number of adults and number of pods damaged were counted and converted into percentage.

Test groundnut cultivars is exhibited significant difference in degree of successful development of insect were mainly grouped into five categories as follows:

Categories	Range/No. of beetles
Immune	None
Highly resistant	0-5
Resistant	5-10
Susceptible	10-20
Highly susceptible	>20

Result and Discussion

Screening and categorisation of groundnut cultivars to *Caryedon serratus*.

To determine the relative resistance of 13 groundnut cultivars, pods were subjected to infestation by freshly emerged *C. serratus* adult at 28 ± 1 °C and 70% RH. The percentage of successful development of adult beetles in test cultivars varied from 0.0 to 29.0 after one month, 1.0 to 64.0 after two months and 3.0 to 206.0 adults after three months which clearly demonstrated a difference in varietal of characters in test cultivars to seed beetles. (Table - 2)

Kapadia (1995) [6] reported that groundnut varieties like JL-24, GG-21 and GAUG-10 were most preferred to *C. serratus* attack where as J624 was the least preferred one. Biswas & Maity (1996) [7a] tried with seven groundnut cultivars for *C. serratus* infestation and observed that number of beetles were 8.0 to 30.0, 14.1 to 64.8 and 31.5 to 207.5 beetles after one, two and three months respectively. They also stated that SG-84 followed by TAG-24 cultivars recorded as tolerant cultivars in comparison to JL-24 and AK-12-24, which were most susceptible to the pest attack.

In the present investigations only OG 52-1 showed no infestation and KADIRI-3, J-11, TAG-24 & GG-2 which were recorded $\leq 10\%$ damage after one month and considered

immune and resistant respectively. After second and third month only OG 52-1 recorded highly resistant and all other cultivars noted 22.3 to 206.0 beetles and considered highly susceptible but only KADIRI-3 recorded 11.3 beetles after two months of storage and considered susceptible. In the study of Kapadia (1995) [8], Biswas & Maity (1996) [7b] JL-24 was most preferred by pest which is confirmed in this study. Regarding other varieties Biswas & Maity (1996) [7c] studied with AK-12,24, ICGS-44, TAG-24 and TG-3 record that these varieties how most preferred, which are also confirmed as susceptible cultivars to *C. serratus* attack in the present investigations. J-11 i/i least preferred variety as for the report of Kapadia (1995) [9], Aizan *et al.* (2016) [10] but in present investigation it is categorised as highly susceptible, which needs further investigations.

In the present investigation OG 52 -1 showed highly resistant to the beetle attack up to 3 months. Another cultivar i.e., KADIRI-3, which showed moderately resistant up to two month of storage. These cultivars were not tested by previous workers so to confirm the results. So, it needs further investigations.

Weight loss of groundnut cultivars due to *Caryedon serratus* attack

Thirteen groundnut cultivars were stored in natural condition and adults of *C. serratus* were released from their infestation to the groundnut pods. Before storage, initial weight of pods were recorded and final weights were made after one, two and three months to access the loss of damage to the kernel by the pest in month of August. Observation revealed that after storage period of one month the loss due to the beetles was varied from 1.20 to 17.80% and weight loss differed significantly among the test groundnut cultivars. Least weight loss i.e., 1.2% was found in OG 52-1 though the cultivar did not produce any beetle after one month. So loss in weight was recorded i.e., 17.8% followed by 13.06% in KISAN and SB - XI respectively (Table 3). Same also observed by Prasad and Ravindra (2018) [11].

After 60 days of storage the weight loss varied from 1.8 to 25.1% and differed significantly among the treatments. As in first month of storage, least weight loss was recorded i.e., 1.8% in the cultivars OG 52-1 where as maximum weight loss i.e., 25.1% found in ICGS - 44. In all other test entries the percentage of loss was increased and differed significantly. After 3 months of storage, weight loss varied from 2.2 to 35.2% and varied significantly. As in previous months least loss in weight i.e., 2.2% was recorded in OG 52 -1 and highest in ICGS - 44. Comparatively bearable loss was recorded in OG - 933 (11.3%) followed by KADIRI - 3 (12.2%) after 3 months of storage. (Table - 3)

The weight loss varied 1.2 to 17.8%, 1.8 to 25.1% and 2.2 to 35.2% in test entries after one, two and three months respectively. The variation of loss of weight was significantly differed in the test cultivars. Among the test entries minimum weight loss was recorded i.e., 1.2%, 1.8% and 2.2% in OG 52-1 followed by 3.5%, 6.9% and 12.2% in KADIRI-3 after one, two and three months respectively. Maximum weight loss was recorded in KISAN variety of groundnut i.e., 17.8% after one month where as the 25.1% and 35.2% were found in ICGS-44. Though the highest number of beetles were counted in JL-24 cultivar in all the time accordingly weight loss was not much in comparison to the other cultivars. (Table- 3). Study conducted by Dick (1987) [12], Harshala (2021) [13] showed that up to 20% pod damage noted by pest. Biswas &

Maity (1996) ^[7d] noted the maximum weight loss i.e., 43.2% was recorded in ICGS-44 after three months of storage. In the present investigation maximum weight loss i.e., 25.1% and 35.2% was measured on ICGS-44 in second and third month

respectively which in agreed with result of the above authors. Therefore, *C. serratus* is most damaging pest of stored groundnut and resistant variety like OG 52-1 should be preferred for keeping in long term storage.

Table 1: Details of groundnut cultivars screened for *Caryedon serratus* (Oliv.).

SI. No.	Cultivars	Origin	Maturity duration in days	
			Kharif	JRabi
1.	SB-XI	Junagadh	110	120
2.	KISAN	Chiplima	105	115
3.	GG-2	Junagadh	105	115
4.	KADIRI-3	Kadiri	120	135
5.	OG52-1	Chiplima	100	110
6.	ICGS-11	ICRISAT	120	135
7.	TG-3	Trombay	105	115
8.	JL-24	Jalgaon	105	115
9.	OG-983	Chiplima	105	115
10.	J-II	Junagadh	105	115
11.	ICGS-44	ICRISAT	120	135
12.	TAG-24	Trombay	105	115
13.	AK-12-24	Anakapalli	100	110

Table 2: Number of emergence of *Caryedon Serratus* (Oliv.) on groundnut cultivars in different storage periods.

SI. No.	Varieties	Number of Adult emerged					
		After 1 month *		1 After 2 months ▲		1 After 3 month ÷	
1.	SB-XI	14.66	(3.88)	31.3	(34.03)	45.6	(1.66)
2.	KISAN	28.66	(5.39)	63.3	(52.73)	113.3	(2.05)
3.	GG-2	10.0	(3.23)	22.3	(28.20)	57.3	(1.76)
4.	KADIRI-3	6.33	(2.59)	11.3	(19.65)	28.60	(1.46)
5.	OG 52-1	0.0	(0.70)	1.0	(5.74)	3.0	(0.54)
6.	ICGS - 11	12.66	(3.62)	32.0	(34.44)	48.0	(1.68)
7.	TG-3	24.66	(5.49)	59.3	(50.36)	90.3	(1.95)
8.	JL-24	29.0	(5.42)	64.0	(53.10)	206.0	(2.31)
9.	OG-933	17.33	(4.22)	50.6	(45.38)	69.0	(1.84)
10.	J-II	8.0	(2.90)	23.6	(29.10)	45.6	(1.66)
11.	ICGS- 44	25.33	(5.07)	55.0	(47.87)	104.3	(2.01)
12.	TAG - 24	10.0	(3.22)	24.6	(29.77)	411.3	(1.62)
13.	AK - 12 - 24	25.0	(5.04)	58.0	(49.60)	101.3	(2.00)
	S.Em(±)		0.094		0.329		0.063
	CD (0.05)		0.276		0.962		0.183

* Square root transform data

▲ Arc Sin transform data

÷ Log transform data

Table 3: Weight loss (%) due to *Caryedon serratus* (Oliv.) damage at different storage periods.

Sl. No.	Varieties	After 1 month *		After 2 months *		After 3 months ▲	
1.	SB-XI	13.06	(3.67)	15.0	(3.93)	18.2	(25.30)
2.	KISAN	17.80	(4.26)	23.3	(4.87)	28.9	(32.50)
3.	GG-2	15.90	(4.03)	22.1	(4.75)	23.8	(29.20)
4.	KADIRI - 3	3.56	(2.09)	6.9	(2.73)	12.2	(20.40)
5.	OG 52-1	1.2	(1.30)	1.8	(1.51)	2.2	(8.53)
6.	ICGS- 11	13.4	(3.73)	15.7	(4.02)	15.5	(23.20)
7.	TG-3	4.5	(2.23)	11.5	(3.46)	18.6	(25.55)
8.	JL-24	12.8	(3.65)	19.8	(4.50)	32.5	(34.78)
9.	OG-933	5.23	(2.36)	8.6	(3.02)	11.3	(19.67)
10.	J-11	11.4	(3.44)	14.03	(3.80)	16.1	(23.65)
11.	ICGS- 44	12.23	(3.56)	25.1	(5.05)	35.2	(36.43)
12.	TAG - 24	5.3	(2.40)	12.4	(3.59)	22.6	(28.30)
13.	AK-12-24	7.9	(2.90)	18.1	(4.31)	27.9	(31.90)
	S.Em(±)		0.031		0.016		0.206
	CD (o.o5)		0.092		0.047		0.604

* Square root transform data

▲ Arc Sin transform data

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