The Andhra Agric. J 64 (2): 406-409, 2017

Physical Tolerance of Groundnut Pods of certain Genotypes to *Caryedon serratus* (Olivier)

Rekha G, Gopala Swamy S V S, Sandhya Rani C and Prasanna Kumari V
Department of Entomology, Agricultural College, Bapatla 522 101, Andhra Pradesh

ABSTRACT

An experiment was conducted to assess the relative preference of groundnut bruchid and physical basis of tolerance in nineteen genotypes of groundnut. The results showed that the number of eggs laid by *C. serratus* ranged from 20.33 to 47.33 eggs/100 g of different genotypes of groundnut and the lowest number of eggs was laid in Narayani (20.33) and per cent adult emergence was ranged between 67.08 and 88.70, the highest per cent adult emergence was recorded in Dharani (88.70). The less susceptible genotypes, Narayani, K 9 and ICGV 87846 had smaller pod size (length×width), thicker pod shell and possessed prominent to moderate reticulation. Thus, the physical characters of pods of groundnut genotypes influenced their susceptibility/tolerance reaction to the bruchid.

Key words: *Groundnut bruchid, Screening for tolerance.*

Groundnut is an important oil seed crop grown commercially in many parts of India. About 65% of the groundnut produce is being stored by farmers, seed agencies and other processing units for 6-9 months before final use. The groundnut bruchid, *Caryedon serratus* (Olivier), is the most important insect pest that infests both kernels and intact pods during storage. Apart from 55% loss in pod weight, the quality of nuts was deteriorated due to increase of free fatty acids (Kumari *et al.,* 2002), contamination with insect exuviae and excreta comprising uric acid. Management of this insect pest has become problematic due to its continued exposure to various synthetic insecticides over the period and subsequent development of resistance. Moreover, pesticides being lipophilic are retained by oilseeds, which are rich in lipids and fats (Rajendran and Devi, 2004). Hence, there is a need for alternatives to chemical measures for the protection of stored groundnut. One of the means by which bruchid damage on stored groundnut can be curtailed is by breeding varieties which can genetically or physically resist the damage by the pest. The basis of susceptibility/ resistance of different genotypes to the bruchids may involve physical and physiological mechanisms which range from simply minimizing the effect of insect attack to adversely affecting the insect growth and development (Singh and Ishivaku, 2000). Considering these facts, certain genotypes were screened against groundnut bruchid in storage and their physical characters influencing insect preference were also studied.

MATERIAL AND METHODS

A total of nineteen groundnut genotypes were obtained from Agricultural Research Stations of Andhra Pradesh and ICRISAT, Hyderabad. Thus, eight genotypes; Abhaya, Dharani, Narayani, TPT 4, TCGS 1157, TCGS 1342, TCGS 1343 and TCGS 1273 genotypes from Regional Agricultural Research Station, Tirupathi, six genotypes; Harithandra, K 6, K9, K 1501, K1535 and K 1454 from Agricultural Research Station, Kadiri and five genotypes; ICGV 03057, ICGV 91114, ICGV 00350, ICGV 87846 and ICGV 93468 from ICRISAT, Hyderabad were screened.

The insect population of groundnut bruchid required for the experiment was cultured on disinfested groundnut kernels. About 250 g of groundnut kernels were taken in a plastic jar measuring 45 x 15 cm and about 20 mating pairs of *C. serratus* adults were released and allowed for ten days for oviposition by females. Adults were removed and released into another jar containing groundnut kernels. The newly emerged adults were transferred into fresh kernels and used for further multiplication of culture and also for conducting the experiments. Genotypes were screened under no-choice (insects were allowed to oviposit and feed irrespective of their choice). Healthy groundnut pods (100 g) of each genotype were taken in a plastic container (1000 ml capacity). Three pairs of newly emerged *C. serratus* beetles were released into each jar. Three replications were maintained for each treatment. The adult beetles were removed after 10 days from the jars and the number of eggs laid on pods of different genotypes was counted. Later the jars were kept for observation under laboratory conditions till the emergence of adults. The adults of *C. serratus* that emerged from different treatments were counted daily and removed from the respective jars. Counting was continued till they cease to emerge. Final data was pooled to get the total number of adults emerged from each genotype. Based on the oviposition preference and adult emergence, tolerant and susceptible genotypes were identified; certain physical characters of pods responsible for their reaction were also observed.

To understand the physical basis of tolerance, parameters such as pod size (length×width), weight (g), pod shell thickness (mm) were recorded for 20 groundnut pods of each genotype. Length, width of pods and pod shell thickness were measured using digital Vernier calipers and expressed in millimeters (mm) (ISTA, 1985). Width and pod shell thickness were taken at two points (seed center points) and mean values were worked out. Pod weight of each genotype was taken individually with the help of analytical balance and expressed in grams. Observations of all the parameters were taken for 20 pods of each genotype. Pod reticulation for the nineteen genotypes was characterized based on DUS characters.

RESULTS AND DISCUSSION

Results indicated that the insects reacted differently on different genotypes for oviposition and none of the genotypes was free from eggs (Table 1). The lowest number of eggs was laid in Narayani (20.33), the lowest oviposition on Narayani may be due to prominent reticulations on pod surface. Haritha *et al.* (1999) recorded lowest oviposition on 1CGS 76 pods with prominent reticulation. Among the Tirupathi genotypes, Dharani was found with higher number of eggs (44.0) high number of eggs per pod may be due to the presence of three seeded pods. Prasad *et al.* (2012) recorded high number of eggs on three seeded pods as compared to single and double seeded pods. Among, Kadiri genotypes K 6 recorded higher number of eggs (42.00) and was on par with K 1535 (41.00). Bigger size of the pods might have contributed for higher oviposition as reported by Dick (1987). Similarly, lowest number of eggs was recorded in K 9 (21.0) which had small sized pod compared to other Kadiri genotypes. Among ICRISAT genotypes, ICGV 87846 recorded the lowest number of eggs (30.33) which was on par with TCGS 1157 (28.67). Highest number of eggs was noticed in ICGV 00350. Similar preference to bigger sized pods by *C. serratus* was observed with genotype ICG (FDRS 10) (Haritha *et al.,* 1999).

The number of emerged adults varied from 5.33 to 23.33 per five pods from the tested groundnut genotypes (Table 1). The minimum number of adult emergence was noticed in genotypes K 9 (5.33) and Narayani (7.0 per five pods) which were at par with each other. Among the Tirupathi genotypes Dharani recorded the maximum number of adult emergence 23.33 per five pods. Minimum number of adult emergence was noticed in Narayani (7.0) followed by TPT 4 (9.33) and Abhaya (11.0) with adult emergence per five pods. Among the Kadiri genotypes, in K 1535 the maximum number of adult emergence (18.0 per five pods) was recorded. Among the ICRISAT genotypes, ICGV 87846 recorded the minimum adult emergence (9.67) and maximum in ICGV 00350 (19.33) per five pods.

Among the different genotypes, pod length was maximum in ICGV 87846 (33.05 mm) and it was minimum in K 9 (22.18 mm) (Table 1). Similarly, the pod width was also maximum in ICGV 87846 (13.39) and minimum in Abhaya (10.73 mm) and K 9 (10.77 mm). Thus, length×width was maximum in ICGV 87846 (443.12) and minimum in genotype K 9 (239.54). The pod shell thickness of different groundnut genotypes significantly differed and ranged between 0.63 and 1.02 (mm), with the minimum in ICGV 93468 (0.63 mm) and followed

Table 1. Relative preference of *Caryedon serratus* to pods of certain groundnut genotypes having varied physical characters.

S. No.	Genotype	Eggs/ 100 g (No.)	Adult Emergence (No.)	Length (mm)	Width (mm)	Length×Width (mm×mm)	Pod shell Thickness (mm)	Pod Weight (g)	Pod Reticulation
1	TCGS 1273	23.00 (4.78)^{a}	17.33 (4.14)^{abc}	27.55^{efg}	13.34^{fg}	368.65^{i}	0.89^{cd}	1.01^{fg}	Moderate
2	TCGS 1157	28.67 (5.35)^{b}	22.33 (4.71)^{cde}	32.96^{ij}	13.17^{fg}	436.34^{j}	0.85^{def}	1.13^{cdef}	Smooth
3	TCGS 1342	33.33 (5.77)^{bcd}	27.0 (5.19)^{efgh}	30.43^{h}	11.68^{c}	355.55^{ij}	0.87^{cde}	1.23^{abcd}	Smooth
4	TCGS 1343	40.67 (6.37)^{ef}	33.33 (5.77)^{hijk}	34.97^{k}	12.37^{d}	431.17^{j}	0.77^{gh}	1.14^{cdef}	Smooth
5	TPT 4	21.67 (4.65)^{a}	16.33 (4.03)^{ab}	27.02^{cdefg}	11.78^{c}	319.40^{cdef}	0.79^{fg}	0.72^{i}	Smooth
6	Abhaya	22.67 (4.75)^{a}	17.33 (4.14)^{abc}	27.03^{cdefg}	10.73^{a}	289.15^{b}	0.77^{gh}	0.93^{gh}	Smooth
7	Narayani	20.33 (4.50)^{a}	13.67 (3.69)^{a}	26.63^{cdef}	11.39^{bc}	304.27^{bcde}	0.80^{efg}	1.05^{efg}	Prominent
8	Dharani	44.00 (6.63)^{fg}	39.00 (6.24)^{jk}	26.63^{cdef}	12.36^{d}	329.50^{efgh}	0.70^{hi}	0.94^{gh}	Smooth
9	K 6	42.00 (6.48)^{efg}	33.67 (5.80)^{hijk}	27.17^{defg}	10.78^{a}	294.28^{bcd}	0.81^{efg}	1.27^{abc}	Moderate
10	Harithandra	32.33 (5.68)^{bc}	25.33 (5.02)^{def}	24.82^{b}	11.81^{c}	293.09^{bc}	0.82^{defg}	1.07^{efg}	Smooth
11	K 9	21.00 (4.57)^{a}	14.33 (3.77)^{a}	22.18^{a}	10.77^{a}	239.54^{a}	0.85^{def}	0.83^{hi}	Prominent
12	K 1501	32.33 (5.68)^{bc}	26.00 (5.08)^{defg}	26.31^{bcde}	13.25^{fg}	349.76^{ghi}	0.84^{defg}	1.35^{a}	Smooth
13	K 1535	41.00 (6.40)^{efg}	36.00 (5.99)^{ijk}	28.43^{g}	12.81^{def}	364.30^{i}	0.80^{efg}	1.07^{efg}	Smooth
14	K 1454	31.67 (5.62)^{bc}	25.67 (5.06)^{def}	28.49^{g}	11.34^{bc}	324.20^{efg}	1.02^{a}	1.27^{abc}	Smooth
15	ICGV 91114	39.33 (6.27)^{def}	31.67 (5.63)^{fghi}	25.59^{bcd}	12.56^{de}	322.48^{defg}	0.94^{bc}	1.08^{defg}	Smooth
16	ICGV 00350	47.33 (6.88)^{g}	40.33 (6.35)^{k}	31.20^{hi}	10.94^{ab}	341.65^{fghi}	0.86^{cdef}	1.19^{bcde}	Smooth
17	ICGV 93468	42.00 (6.48)^{efg}	32.33 (5.67)^{ghij}	28.14^{fg}	12.98^{efg}	366.23^{i}	0.63^{i}	1.30^{ab}	Prominent
18	ICGV 03057	37.00 (6.08)^{cde}	29.00 (5.37)^{fgh}	25.36^{bc}	12.47^{de}	315.80^{bcdef}	0.98^{ab}	0.98^{fgh}	Smooth
19	ICGV 87846	30.33 (5.50)^{b}	21.00 (4.58)^{bcd}	33.05^{j}	13.39^{g}	443.12^{j}	0.82^{defg}	1.37^{a}	Moderate
	SEm±	0.18	0.21	0.64	0.19	9.34	0.03	0.06	-
	CD(0.05)	0.5	0.6	1.78	0.54	28.942	0.076	0.15	-
	CV%	5.34	7.22	5.17	7.2	8.76	7.91	8.5	-

Values in parentheses are square root transformed values; In each column values with similar alphabet do not vary significantly at P=0.05.

by Narayani (0.70), Abhaya and TCGS 1343 (0.77) and maximum in K 1454 (1.02 mm). Lazar and Panickar (2016) also observed that seed width and seed weight had no correlation with oviposition by *C. maculatus* on mungbean genotypes. The pod weight of groundnut genotypes significantly differed and ranged from 0.72 to 1.35 (g). Maximum pod weight was noticed in K 1501 (1.35 g), ICGV 93468 (1.30 g), where as the minimum pod weight was noticed in TPT 4 (0.74 g) followed by K 9 (0.83 g). Similar observations were also made by Anamika and Jayalaxmi (2016) where in, female *C. maculatus* preferred fresh chickpea seeds having more quantity of resources for egg laying as they ensure the nutrition of her offspring.

The pods of Narayani possessed prominent reticulation and the genotype TCGS 1273 had moderate reticulation, all other Tirupathi genotypes had mild reticulation (Table 1). Among the Kadiri genotypes, K 6 and K 9 genotypes had pods with moderate reticulation. In ICRISAT genotypes, ICGV 93468 and ICGV 87846 had prominent and moderate reticulated pods respectively. The less susceptible genotypes; Narayani, K 9 and ICGV 87846 possessed prominent to moderate reticulations while the susceptible genotypes; Dharani, K 1535 and ICGV 03057 had smooth or less reticulation on the pods. It was evident that the pods with prominent reticulation were less preferred by the groundnut bruchid for oviposition as compared to smooth or less reticulated pods. This was in agreement with the report of Devi and Rao (2000) that the groundnut cultivars; TCGS 61, TMV 2 and TPT 3, which had moderate reticulation, were less preferred by *C.*

serratus for egg laying. Similarly, minimum numbers of eggs were laid by pulse beetles on wrinkled grain genotypes of cowpea (Fawki *et al*, 2012).

Thus, the physical characters of groundnut pods of different genotypes influence their susceptibility/tolerance reaction to groundnut bruchid. The less susceptible genotypes, Narayani, K 9 and ICGV 87846 had smaller pod size (length×width), thicker pod shell and possessed prominent to moderate reticulations while the susceptible genotypes, Dharani, K 1535 and ICGV 03057 had larger pod size (length×width), thin pod shell and smooth or less reticulation on the pods.

LITERATURE CITED

Anamika K and Jayalaxmi G 2016 Fecundity and preferential oviposition by pulse beetle, *Callosobruchus maculatus* (F.) on chickpea (*Cicer arietinum* L.) var Dollar. *Legume Research*, 39 (2): 310-314.

Devi D R and Rao N V 2000 A note on reaction of groundnut varieties to the bruchid *Caryedon serratus* (Olivier). *Journal of Research ANGRAU,* 28 (3): 41-43.

Dick KM 1987. Pest management in stored groundnuts. *Information Bulletin No. 22.* International Crop Research Institute for Semi-Arid Tropics, Pattancheru. A.P.

Fawki S, Khaled A S, Fattah H M A, Hussein M A, Mohammed M I and Salem D AM 2012 Physical and biochemical basis of resistance in some cowpea varieties against *Callosobruchus maculatus* (F.). *Egyptian Journal of Pure and Applied Science*, 1: 51-61.

Haritha V, Vijayalakshmi K, Krishnamurthy M M and Arjunarao P 1999 Relative preference of *Caryedon serratus* (Olivier) (Coleoptera: Bruchidae) for selected groundnutgenotypes in storage. *Journal of Entomological Research,* 23 (1): 71-74.

ISTA 1985 International Rules for Seed Testing. Seed Science Technology, 13: 299-355.

Kumari D A, Vijay S, Sudhir R V and Tejkumar S 2002 Quantitative and qualitative losses caused by pod bruchid, *Caryedon serratus* (Olivier) (Bruchidae: Coleoptera) in stored groundnut. *Indian Journal of Plant Protection*, 30 (2): 213-214.

Lazar L and Panickar B 2016 Losses Due to Pulse Beetle *Callosobruchus maculatus* on greengram. *Indian Journal of Entomology*, 78 (1): 65-71.

Prasad T V, Gedia M V and Savaliya S D 2012 Screening of groundnut cultivars against seed beetle, *Caryedon serratus*. *Indian Journal of Plant Protection*, 40(4): 342-343

Rajendran S and Devi H S C 2004 Oilseeds-storage and insect pest control, Review. *Journal of Food Science and Technology*, 41 (4): 359-367.

Singh B B and Ishivaku M F 2000 Genetics of rough seed coat texture in cowpea. *Journal of Heredity,* 91 (2): 170-174.

(Received on 6.06.2016 and revised on 7.01.2017)