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SCREENING OF CERTAIN GENOTYPES AND ADVANCE CULTURES OF GROUNDNUT AGAINST GROUNDNUT BRUCHID (*Caryedon serratus* O)

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ABSTRACT
A Screening experiment was conducted with 52 genotypes/varieties by using no choice test to study their resistance and susceptibility to *Caryedon serratus* at Regional Agricultural Research Station, Nandyal. The cumulative results of six months revealed that mean no. of eggs laid were ranged from 5.82 to 157.58 eggs /100g pods and adult emergence was ranged from 9.13 to 70.76. The lowest % weight loss was recorded in Greeshma (1.96) and the highest % of weight loss was noticed in TCGS1330, K1847, K1813 and Vemana which recorded 24.83, 25.68, 28.14 and 28.24, respectively.

KEY WORDS: Groundnut, Genotypes, Varieties, Groundnut bruchid, *Caryedon serratus.*

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is a leguminous king of oilseed crop cultivated in the semi-arid and subtropical regions of the world. It is grown in nearly 100 countries in six continents between 40^{o} N and S of the equator in nearly 24.6 m ha, with a production of 41.3 m.t. and productivity of 1676 kg ha^{-1} during 2014-15. China, India, Nigeria, USA and Myanmar are the leading groundnut producing countries in the world. Asia with 11.6 m ha (47.15%), and Africa with 11.7 m ha (47.56%), hold maximum global area under groundnut. Developing countries in Asia, Africa and South America account for over 97% of world groundnut area and 95% of total production. However, the productivity of Asia (2217 kg ha^{-1}) and Africa (929 kg ha^{-1}) is very poor as compared to America (3632 kg ha^{-1}) (FAO,STAT, 2015). Globally 50% of groundnut produce is used for oil extraction, 38% for confectionary use and 12% for seed purpose. In India, about 80% is used for oil extraction, 11% as seeds, 8% as direct food and 1% for export to other countries. It is highly difficult to store the oilseeds as they suffer a great damage during storage due to insect pests and microorganisms. It is truly said that' a grain saved is a grain produced". At present, the only solution for stabilizing per capita availability is to reduce storage losses. Groundnut is stored as both pods and kernels and, both of these are susceptible to insects, fungi and mites in storage. One hundred insect species are reported to attack the stored groundnuts (Redlinger and Davis, 1982). Of these, eight insect species are of major importance and six are of minor importance. Among them, the groundnut borer/ groundnut bruchid, *Caryedon serratus* (Olivier) is a well known pest of economic importance. It has been reported as a pest of international importance in stored groundnut and is wide spread in various groundnut growing areas of the world (Davey, 1958)."Recently, some consignments of Indian groundnuts were facing difficulty due to the presence of infestation of 'Olivier' bugs on huge level. The port authorities in Vietnam were not clearing this cargo exports of groundnut of 5.92 lakh tonnes and value of shipment was 38,304 crores (Anonymous, 2016). Screening of the genotypes and varieties is one of the tools for identification of resistance and susceptible cultivars which will be used for futurebreeding programme.

MATERIALS AND METHODS

The experiment was conducted in the laboratory of Entomology at Regional Agricultural Research Station, Nandyal, Kurnool District during 2015-16. Twenty eight genotypes/varieties *viz.*,K1452, K1501, K1535, K1677, K1699, K1702, K1706, K1719, K1725, K1787,K1789, K1800, K1801, K1802, K1805,K1809, K1811, K1813, K1847, K1951, K2014, K2074, K2075, K6, K9, Kadiriharithaandhra, Anantha, and K7 (BOLD) were procured from Agricultural Research Station, Kadiri. Whereas 22 genotypes/varieties *viz.* TCGS1073, TCGS1157, TCGS1270, TCGS1273, TCGS1278, TCGS1323, TCGS1327, TCGS1330, TCGS1333, TCGS1335, TCGS1337, TCGS1345, TCGS1346, TCGS1349,TCGS1375, ISK2014-9, Narayani, Dharani, Abhaya, Prasuna, Greeshma and Vemana were procured from Regional Agricultural Research Station, Tirupati, Andhra Pradesh.TAG-24 (Thrombay-Akola Groundnut-24) and TAG-51 (Thrombay-Akola Groundnut-51) which are popular entries grown in Rayalaseema region were purchased from local market and included as test entries.
All the genotypes/varieties procured were kept in an almirah and subjected to fumigation with one 3g aluminium phosphide tablet for disinfestations. Each genotype/

variety was considered as treatment replicating thrice with 1.5 kg for each replication.

Experimentation

From each genotype, for each replication, 1.5 kg pods were taken into fresh cloth bags. Five pairs of newly emerged *C. serratus* bruchids were released into these cloth bags. The mouth of cloth bag was tied. Three replications were maintained for each treatment. The adults were removed after 15 days from the bags. For data recording through destructive sampling every time 100 g pods were taken.

Oviposition and Adult Emergence

At every 15 days, from 100 g representative sample, the no of eggs laid on selected pods and adults emerging from different treatments were counted. Adults were removed at every time. This process was continued upto 180 days. The data on oviposition and adult emergence was pooled and subjected to statistical analysis

Pod Damage

At every 15 days, from selected 100 gm pods, from each treatment, the data was collected on number of damaged pods and healthy pods. Weights of both damaged and healthy pods were also recorded. The % damage of pods by count and weight were calculated with the help of following formulae (Lal, 1990).

$$\% \text{ pod damage (by count)} = \frac{\text{Number of bored pods}}{\text{Total number of pods}} \times 100$$

$$\% \text{ pod damage (by weight)} = \frac{\text{Weight of bored pods}}{\text{Total weight of pods}} \times 100$$

Weight Loss

Weight loss was calculated by deducting the final weight of sample at the period of termination of the experiment i.e., at 180 days after the initiation of the experiment and from initial weight taken during initiation of the experiment and the data was converted to the percentage by the formula.

$$\text{Weight loss} = \frac{W1 - W2}{W1} \times 100$$

W1 = initial weight of pods
W2 = final weight of pods

Statistical Analysis

The oviposition and adult emergence was subjected to square root transformation and % pod damage (by count and by weight), weight loss were transformed in to angular transformed values; The data was then subjected to complete randomized design analysis (Snedecor and Cochran, 1967) and then subjected to statistical analysis by SPSS, 2012 for DMRT.

RESULT AND DISCUSSIONS

A total of 52 genotypes / varieties were screened against *C. serratus*and the results obtained are presented here under.The cultures were stored for six months under cloth bag storage and were observed for fecundity, adult emergence, % pod damage (by count and by weight) and weight loss at 15 days interval.

Oviposition

Among the genotypes screened, the mean no of eggs laid were ranged from 5.82 to 157.58 eggs / 100 g pods. Lowest no of eggs 5.82 eggs / 100 g pods were observed in K1787 which was on par with K2075 and K1805 which recorded 9.04 and 10.10 eggs / 100 g pods, respectively. The highest no. of eggs were observed in K1811, K1813, K2074 and K1800 which recorded 144.97, 147.82, 147.93 and 157.58 eggs / 100 g pods, respectively and were also found on par with each other.

The results indicated that the genotypes K1787, K2075 and K1805 were least preferred and the genotypes K1811,K1813, K2074 and K1800 were highly preferred by *C. serratus* for oviposition. Jyothsna (2014) reported K1271 (17.33), ICGV05100 (20.67) and K9 (23.33) were least preferred while K6 and TCGS750, K8, TMV2, Bheema, ICGV9114 were most preferred by the *Caryedon serratus* for oviposition. The findings of Najitha *et al.* (2013) shows that the varieties K-1621, Greeshma, K-1535, K -1563 and TCGS -1043 were least preferred by *C. serratus.* Similarly, the work of Haritha (1998) revealed that ICG (FDRS10), TMV2 and ICGS44 were highly preferred for oviposition by *C serratus*.

The findings of Venugopal Reddy (1990), Shivalingaswamy and Balasubramanian (1992), Ghorpade *et al.* (1998), Devi and Rao (2000), Mishra (2005) and Prasad *et al.* (2012) also support the present results. .

Adult Emergence

Out of 52 genotypes screened against *C. serratus* adult emergence, the lowest adult emergence (9.13) was observed in Dharani which was on par with K1677, TCGS1073, K6, K1719, K2014, K9, K1452, Kadiri Harithaandhra, K1706, K1951, Greeshma, Ananatha, K1787, TCGS1349, TAG51 which recorded 13.54, 14.22, 14.51, 16.07, 16.36, 16.74, 16.88, 17.15, 18.03, 18.17, 18.36, 18.78, 19.19, 19.31 and 19.72 emerged adults, respectively.The highest adult emergence was observed in ISK2014-9, K1811 and K1847 which recorded 54.56, 62.50 and 70.76 emerged adults respectively and were also found on par with each other (Table 4.3). The results obtained pertaining to the differences in varietal response against *C. serratus* adult emergence are agreement with Jyothsna (2015) who reported that the lowest number of adults were emerged from K1271, ICGV05100 and K9 while the highest number of adults were recorded from

TCGS750, K6, TMV2 and K8. The findings of Shivalingaswamy and Balasubramanian (1992) also supports the present results which revealed that the mean number of groundnut bruchid adults emerged varied with the groundnut varieties. The present results are also in conformity with the results of Haritha (1998) who reported that the % adult emergence from different groundnut varieties ranged from 45.20 to 97.00.

Similarly, the reports of Venugopal Reddy (1990), Rama Devi and Rao (2000), Mishra (2005) and Prasad *et al.* (2012) also revealed differential response of adult emergence by bruchid in different varieties of groundnut which are in line with the results of the present study.

% Pod Damage (by Count)

The genotype K2075 recorded lowest (2.88 / 100 g pods) % pod damage by count which was significantly superior and on par with K7, K1805 and K1677 which recorded 4.12, 4.31 and 4.50 % pod damage by count per 100 g pods, respectively (Table 1). However, the highest % pod damage by count was observed in K1811, TCGS1073, K1501,Vemana, K1847, K1800 and K1813 which recorded 34.45, 34.90, 36.94, 37.33, 37.73, 38.40 and 39.41 % damaged pods by count per 100 g pods, respectively and were also found on par with each other.

The results of the % pod damage (by count) by *C. serratus* revealed that there was a significant difference among the varieties with respect to % pod damage (by count) and it varied from 2.88 to 39.41 per cent.

Najitha *et al.* (2013) reported that Abhaya variety pods were not attacked by *C. serratus.* Kadiri 5, K-1576, K-1501, K-1621, TPT-4 and Greeshma recorded 1.61, 10.42, 11.55, 16.78, 17.46 and 18.22 % pod damage (by count) respectively

TABLE 1: Screening of genotypes/varieties against groundnut bruchid *C.serratus* in storage under laboratory conditions

Genotypes / Varieties	Oviposition over6 months	Adult emergence over 6 months	% pod damage by count over 6 months	% pod damage by wt over 6 months	% Weight loss
K1719	19.45[b]	16.07[a]	7.23[b]	7.27[a]	6.44[a]
	(4.47)	(4.07)	(15.60)	(12.40)	(12.13)
K1725	16.10[b]	20.14[b]	16.36[d]	16.33[c]	5.95[a]
	(4.07)	(4.54)	(23.84)	(23.82)	(13.92)
K1789	97.96[g]	34.21[c]	25.69[f]	19.65[d]	20.53[c]
	(9.92)	(5.89)	(30.39)	(26.29)	(26.89)
K1801	46.71[d]	20.61[b]	18.66[e]	17.19[c]	11.59[b]
	(6.87)	(4.59)	(25.56)	(24.47)	(18.19)
K1805	10.10[a]	37.58[c]	4.31[a]	12.93[c]	14.78[c]
	(3.26)	(6.17)	(11.97)	(21.06)	(22.55)
K2014	32.00[c]	16.36[a]	12.44[c]	13.23[c]	6.87[a]
	(5.70)	(4.11)	(20.61)	(21.23)	(13.21)
K2074	147.93[i]	38.46[c]	31.77[g]	26.76[e]	22.97[c]
	(12.18)	(6.24)	(34.27)	(31.09)	(27.30)
K2075	9.04[a]	19.74[b]	2.88[a]	5.33[a]	1.97[a]
	(3.09)	(4.50)	(9.73)	(13.32)	(7.79)
K6	24.12[c]	14.51[a]	29.15[g]	25.37[e]	5.20[a]
	(4.96)	(3.87)	(32.66)	(30.23)	(13.06)
K9	38.26[d]	16.74[a]	29.00[g]	24.60[e]	10.44[b]
	(6.23)	(4.15)	(32.55)	(29.70)	(18.81)
KadiriHarit	22.58[c]	17.15[a]	29.60[g]	24.53[e]	10.92[b]
haandhra	(4.80)	(4.20)	(32.92)	(29.66)	(19.24)
Anantha	14.04[b]	18.78[a]	25.84[f]	24.83[e]	14.83[c]
	(3.81)	(4.39)	(30.54)	(29.83)	(22.57)
K1809	73.03[f]	21.44[b]	19.96[e]	17.97[d]	21.16[c]
	(8.58)	(4.68)	(26.47)	(25.00)	(27.32)
K1452	14.28[b]	16.88[a]	17.46[e]	11.27[b]	4.33[a]
	(3.84)	(4.17)	(24.69)	(19.60)	(10.87)
K1468	35.34[d]	29.24[b]	10.45[c]	11.17[b]	6.24[a]
	(5.99)	(5.45)	(18.70)	(19.29)	(14.09)
K1501	137.12[h]	49.96[c]	36.94[h]	29.33[e]	23.41[d]
	(11.73)	(7.10)	(37.41)	(32.74)	(28.92)
K1535	21.53[c]	27.36[b]	6.95[b]	7.92[b]	10.16[b]
	(4.69)	(5.28)	(15.24)	(16.29)	(18.58)
K1677	12.81[b]	13.54[a]	4.50[b]	5.02[a]	3.18[a]
	(3.65)	(3.75)	(12.20)	(12.75)	(10.23)
K1699	64.41[e]	26.15[b]	17.23[e]	17.02[c]	10.52[b]
	(8.06)	(5.16)	(24.47)	(24.34)	(18.69)
K1702	26.33[c]	25.61[b]	7.74[b]	6.22[a]	5.32[a]
	(5.18)	(5.11)	(16.13)	(14.37)	(12.57)
K1706	47.33[d]	18.03[a]	17.35[e]	14.92[c]	7.92[b]
	(6.92)	(4.30)	(24.56)	(22.66)	(15.98)
K1787	5.82[a]	19.19[a]	24.56[f]	17.57[d]	6.04[a]
	(2.51)	(4.44)	(29.70)	(24.77)	(14.13)
K1800	157.58[i]	42.57[c]	38.40[h]	30.34[f]	21.64[c]
	(12.57)	(6.56)	(38.27)	(33.40)	(27.71)

K1802	16.97[b]	45.07[c]	5.47[b]	5.66[a]	15.94[c]
	(4.18)	(6.75)	(13.49)	(13.69)	(23.48)
K1811	144.97[i]	62.50[d]	34.45[h]	26.89[e]	23.03[c]
	(12.06)	(7.94)	(35.92)	(31.21)	(28.67)
K1813	147.82[i]	40.43[c]	39.41[h]	30.37[f]	28.14[d]
	(12.18)	(6.40)	(38.84)	(33.40)	(32.02)
K1847	120.08[h]	70.76[d]	37.73[h]	30.21[e]	25.68[d]
	(10.98)	(8.44)	(37.83)	(33.27)	(30.43)
K1951	19.08[b]	18.17[a]	24.97[f]	20.97[d]	3.89[a]
	(4.42)	(4.32)	(29.93)	(27.23)	(11.23)
K7	57.60[e]	25.79[b]	4.12[a]	4.33[a]	3.60[a]
	(7.62)	(5.13)	(11.64)	(11.99)	(10.92)
Narayani	14.62[b]	23.19[b]	15.92[d]	16.51[c]	6.97[b]
	(3.89)	94.87)	(23.46)	(23.95)	(15.21)
Dharani	74.02[f]	9.13[a]	7.70[b]	4.68[a]	4.07[a]
	(8.63)	(3.10)	(15.78)	(11.89)	(11.48)
Abhaya	136.14[h]	36.76[c]	21.75[f]	19.76[d]	20.32[c]
	(11.69)	(6.10)	(27.78)	(26.34)	(26.77)
TCGS1073	50.22[e]	14.22[a]	34.90[h]	26.40[e]	19.59[c]
	(7.12)	(3.84)	(36.19)	(30.89)	(26.19)
TCGS1157	43.39[d]	34.28[c]	14.42[d]	12.97[c]	14.18[c]
	(6.63)	(5.90)	(22.28)	(21.08)	(22.11)
Prasuna	83.46[f]	34.21[c]	13.46[d]	12.87[c]	11.42[b]
	(9.16)	(5.89)	(21.44)	(20.77)	(19.65)
ISK2014-9	92.96[g]	54.56[d]	18.03[e]	17.87[d]	4.65[a]
	(9.67)	(7.42)	(25.07)	(24.95)	(12.34)
TCGS1375	126.63[h]	24.92[b]	23.29[f]	22.68[d]	12.34[b]
	(11.28)	(5.04)	(28.76)	(28.25)	(20.54)
TCGS1330	82.52[f]	49.04[c]	33.29[g]	25.83[e]	24.83[d]
	(9.11)	(7.04)	(35.22)	(30.52)	(29.87)
TCGS1273	70.51[f]	41.86[c]	24.87[f]	21.78[d]	8.21[b]
	(8.43)	(6.51)	(29.90)	(27.80)	(16.28)
TCGS1278	63.58[e]	32.39[b]	17.27[e]	18.26[d]	14.66[c]
	(8.01)	(5.73)	(24.54)	(25.28)	(22.44)
TCGS1333	41.26[d]	45.89[c]	16.09[d]	13.56[c]	9.71b
	(6.46)	(6.81)	(23.47)	(21.54)	(17.61)
TCGS1345	16.56[b]	27.92[b]	13.36[d]	11.27[b]	10.96[b]
	(4.13)	(5.33)	(21.42)	(19.59)	(19.20)
TCGS1349	40.24[d]	19.31[a]	6.61[b]	5.17[a]	6.06[a]
	(6.38)	(4.45)	(14.88)	(13.11)	(14.14)
TCGS1346	45.10[d]	32.38[b]	11.46[c]	11.52[b]	8.50[b]
	(6.75)	(5.73)	(19.75)	(19.81)	(16.82)
TCGS1335	63.90[e]	43.00[c]	13.98[d]	11.33[b]	16.17[c]
	(8.02)	(6.60)	(21.92)	(19.66)	(23.70)
TCGS1270	59.18[e]	20.63[b]	19.32[e]	16.66[c]	16.55[c]
	(7.73)	(4.60)	(26.06)	(24.03)	(23.95)
TCGS1323	29.94[c]	49.08[c]	16.25[d]	16.87[c]	15.80[c]
	(5.52)	(7.04)	(23.72)	(24.18)	(23.35)
TCGS1327	25.00[c]	19.92[b]	9.50[c]	8.56[b]	12.20[b]
	(5.05)	(4.52)	(17.93)	(16.98)	(20.39)
Greeshma	29.77[c]	18.36[a]	11.57[c]	9.68[b]	1.96[a]
	(5.50)	(4.34)	(19.87)	(18.12)	(7.98)
Vemana	23.31[c]	29.75[b]	37.33h	28.17[e]	28.24[d]
	(4.88)	(5.50)	(37.64)	(32.02)	(31.96)
TAG24	36.91[d]	33.26[b]	9.89[c]	9.27[b]	13.20[b]
	(6.12)	(5.81)	(18.26)	(17.67)	(21.27)
TAG51	55.24[e]	19.72[b]	19.09[e]	15.99[c]	20.09[c]
	(7.47)	(4.50)	(25.89)	(23.56)	(25.71)
SEm±	**0.364**	**0.48**	**1.08**	**1.29**	**3.40**
CD	**1.023**	**1.35**	**3.04**	**3.63**	**2.40**

Values in parentheses are transformed values

Means followed by same letters are not significantly different by DMRT

% Pod Damage (by Weight):

The % pod damage by weight was ranged from 4.33 to 30.37 % across the 52 lines screened against *C. serratus* infestation. The lowest % pod damage by weight was noticed in K 7 with 4.33 % pod damage by weight / 100 g pods. The highest % pod damage by weight was observed in K1800 and K1813 which recorded 30.34 and 30.37 %

pod damage by weight / 100 g pods, respectively and were also found on par with each other (Table 1).

The results of the % pod damage (by weight) by *C. serratus* shows that there was a significant difference among the varieties with respect to % pod damage (by weight) and it varied from 4.33 to 30.37 per cent. Najitha *et al.* (2013), reported that no pod damage was observed in Abhaya variety of groundnut and was on par with Kadiri 5, K-1576, and K-1501 which recorded 1.5, 8.25, and 10.25 % damage (by weight) respectively and the highest % of pod damage (by weight) was recorded in K-1463 (85%) which indicates the differences in feeding preference of *C. serratus.*

% Weight Loss

The lowest % weight loss was recorded in Greeshma (1.96) which was significantly superior and on par with K2075, K1677, K7, K1951, Dharani, K1452, ISK2014-9, K6, K1702, K1725, K1787, TCGS1349, K1468, K1719, K2014 and Narayani The highest % of weight loss was noticed in TCGS1330, K1847, K1813 and Vemana which recorded 24.83, 25.68, 28.14 and 28.24, respectively and were also found on par with each other.

The above results revealed that the % weight loss of groundnut pods varied from 1.96 to 28.24 % which indicates a clear cut varietal preference reaction to *C. serratus.* The reports of Najitha *et al.* (2013) revealed that Abhaya variety of groundnut recorded zero % weight loss followed by Kadiri 5, Greeshma, TPT-4, Rohini, Kadiri 007 bold, and TCGS 1043 while maximum weight loss was recorded in Kadiri 008, K-1463, TPT-1 and K-1641 bold which confirms the preferential feeding of *C. serratus.*

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