Website : www.asthafoundation.in
Frontiers in Crop Improvement
Vol 11 (1) : 41-43 (January-2023) Print ISSN : 2393-8234 Online ISSN : 2454-6011
Astha Foundation, Meerut (U.P.) India

Screening of Advanced Breeding Lines of Groundnut for Resistance to *Caryedon serratus*

Nataraja Maheshala*, Harish G., Narendra Kumar, Ananth Kurella, Praharaj C.S. and Savaliya S.D.
ICAR-Directorate of Groundnut Research, Junagadh-362001, Gujarat, India
**Corresponding Author Email : natarajatan@gmail.com*

Abstract

Forty advanced breeding lines of groundnut were screened for resistance to bruchid, *Caryedon serratus* at ICAR- Directorate of Groundnut Research, Junagadh.Lines, PBS 22059 and PBS 22049 were least preferred by bruchids for oviposition (34.3 and 35.0 eggs per 50 g pod sample, respectively) and adult emergence (22.0 and 23.0 adults per 50 g pod sample, respectively).Accordingly, these two lines received the lowest pod damage (38.2 and 38.6%, respectively) and weight loss (37.5 and 39.3%, respectively) by bruchids.These advanced breeding lines can be further evaluated for biophysical and chemical resistance factors and utilized for crop improvement to reduce postharvest losses.

Key words : *Arachishypogaea, bruchids, eggs, plant resistance, pod damage, weight loss.*

Introduction

Host plant resistance (HPR) is an important component of integrated pest management. Plant resistance is there lative amount of heritable qualities that influence the ultimate degree of damage done by the insect (1, 2). Screening of the groundnut genetic material is necessary to identify the modes and levels of resistance to insect-pest. Groundnut bruchid, *Caryedonserratus* Olivier is an important primary storage pest of groundnut causing losses up to100% (3). Bruchids are distributed in all most all groundnut growing regions of the world. In India, they were reported from Odisha to Gujarat and Tamil Nadu to Jammu and Kashmir (4). They inflict both direct (pod/kernel damage) and indirect losses to stored groundnut. Indirect losses include heating, mixing with body parts/feces, creating congenial environment for spread of *Aspergillus* fungi and aflatoxin contamination (4, 5). Egg laying and pod damage by bruchids varied for different genetic material (6, 7). In this study, advanced breeding lines of groundnut were screened for resistance to bruchids. Identifying source(s) of bruchid resistance will help in crop improvement programs thereby reducing the post-harvest losses.

Materials and Methods

The experiment was conducted in 2015 at the ICAR-Directorate of Groundnut Research, Junagadh, Gujarat. Forty advanced breeding lines from Plant Breeding Section (PBS) were screened in laboratory condition for resistance to bruchid. A complete random experimental design was followed with three replications. The newly emerged male and female adults were collected and paired. Two pairs of bruchids were released per 50 g pod sample. Experimental set up was kept undisturbed for 7 days, adults were removed, and numbers of eggs laid on all the pods were counted. After one month of incubation, adult emergences from the pods were recorded daily. After all the adults have emerged, numbers of damaged and undamaged pods as well as weights of damaged and undamaged pods were recorded from each experimental unit. Pod damage and weigh loss were determined using the following formulae :

$$\text{Pod damage (\%)} = \frac{\text{number of damaged pods}}{\text{total number of pods}} \quad 100$$

$$\text{Weight loss (\%)} = \frac{\text{weight of damaged pods}}{\text{total number of pods}} \quad 100$$

Data on oviposition and adult emergence were square root transformed while, pod damage and weigh loss were ArcSine transformed prior to ANOVA.

Results and Discussion

Adult bruchids have laid eggs (range: 34.3-102.7eggs per 50 g of pods) in all the advanced breeding lines (Table-1). However, lines PBS 22059 and PBS 22049 were least preferred by bruchids for oviposition (34.3 and 35.0 eggs per 50 g pod sample, respectively). Similarly, from 50 g pods of lines, adult emergences ranged from 22.0 to 97.0. Lines, PBS 22059 and PBS 22049 were recorded with 22.0 and 23.0 adult emergence per 50 g pod sample, respectively. The pod damage and weigh losses ranged respectively from 38.2 to 99.2% and 37.5 to 99.1%. In accordance with the oviposition and adult emergence, lines PBS22059 and PBS 22049 were noted with the lowest pod damage (38.2 and 38.6%, respectively) and weight loss (37.5 and 39.3%, respectively) by bruchids. Observations were in accordance with the several earlier

Received : November-2022; Revised : December-2022; Accepted : December-2022

Table-1 : Response of bruchid, *C. serratus* to pods of groundnut advanced breeding lines.

Advanced breeding lines	Number of eggs laid	Number of adults emerged	Percent pod damage	Percent weight loss in pods
PBS 12163	67.7 (8.2)*	62.7 (7.9)*	85.6 (68.4)#	88.6 (71.4)#
PBS 12181	34.7 (5.9)	32.3 (5.7)	51.4 (45.9)	47.5 (43.5)
PBS 12074	62.7 (7.7)	61.0 (7.6)	67.8 (56.5)	65.5 (54.7)
PBS 12067	73.3 (8.5)	68.7 (8.3)	95.7 (80.2)	95.2 (80.4)
PBS 12029	73.0 (8.4)	69.0 (8.2)	78.3 (62.5)	83.4 (67.5)
PBS 12185	58.3 (7.6)	55.0 (7.3)	75.3 (61.2)	76.4 (62.1)
PBS 12038	70.0 (8.3)	66.0 (8.0)	93.4 (75.5)	93.6 (76.1)
PBS 12183	49.3 (6.9)	46.3 (6.7)	64.3 (53.5)	63.3 (52.9)
PBS 12092	64.0 (8.0)	58.0 (7.6)	85.4 (67.6)	80.7 (64.0)
PBS 12180	102.7 (10.1)	97.0 (9.8)	80.6 (64.6)	80.0 (64.3)
PBS 12186	97.0 (9.8)	92.7 (9.6)	93.5 (79.3)	93.8 (79.7)
PBS 12018	52.7 (7.2)	48.0 (6.9)	79.0 (63.1)	78.7 (62.7)
PBS 12168	55.0 (7.3)	50.3 (7.0)	71.4 (59.0)	71.3 (59.6)
PBS 12009	63.3 (7.9)	58.3 (7.6)	83.8 (66.8)	84.5 (67.2)
PBS 12032	66.0 (8.0)	61.7 (7.7)	74.7 (60.9)	66.3 (56.0)
PBS 12116	94.3 (9.7)	88.0 (9.4)	99.2 (87.0)	99.1 (86.9)
PBS 12172	65.3 (8.1)	59.7 (7.7)	90.7 (72.7)	88.5 (70.5)
PBS 12175	97.3 (9.8)	87.0 (9.2)	92.4 (74.6)	92.2 (74.4)
PBS 12167	87.0 (9.3)	83.0 (9.0)	96.0 (81.0)	96.3 (81.8)
PBS 12066	100.0 (10.0)	92.7 (9.6)	95.4 (79.9)	98.2 (83.8)
PBS 13003	34.7 (5.8)	27.7 (5.2)	34.5 (35.8)	35.0 (36.1)
PBS 12171	53.3 (7.2)	31.7 (5.6)	45.8 (42.6)	45.8 (2.6)
PBS 13021	56.7 (7.5)	53.0 (7.2)	56.3 (48.7)	58.7 (50.2)
PBS 18004	38.0 (6.1)	34.0 (5.8)	40.9 (39.5)	39.8 (38.8)
PBS 18006	58.3 (7.6)	55.0 (7.4)	52.9 (46.9)	53.6 (47.3)
PBS 18035	63.7 (8.0)	51.0 (7.1)	46.8 (43.2)	52.5 (46.5)
PBS 18038	75.3 (8.6)	38.0 (6.1)	45.7 (42.4)	43.6 (41.1)
PBS 18045	52.3 (7.1)	30.7 (5.5)	40.5 (39.5)	40.3 (39.4)
PBS 18057	51.3 (7.1)	41.0 (6.3)	47.3 (43.4)	49.9 (45.0)
PBS 18062	51.0 (7.0)	43.0 (6.5)	60.2 (51.3)	62.2 (52.5)
PBS 18064	57.0 (7.3)	48.7 (6.8)	63.3 (53.2)	64.7 (54.0)
PBS 22005	46.7 (6.8)	48.0 (6.9)	64.9 (53.7)	67.6 (55.3)
PBS 22008	74.0 (8.6)	44.7 (6.5)	61.5 (52.1)	63.8 (53.6)
PBS 22046	48.0 (6.7)	44.3 (6.5)	53.3 (47.9)	54.8 (48.8)
PBS 22049	35.0 (5.9)	23.0 (4.4)	38.6 (38.2)	39.3 (38.5)
PBS 22050	55.3 (7.4)	36.0 (6.0)	44.5 (41.8)	46.8 (43.2)
PBS 22053	64.3 (8.0)	54.0 (7.3)	70.7 (57.8)	71.4 (58.4)
PBS 22058	67.7 (8.1)	38.3 (5.6)	75.8 (60.9)	77.2 (62.0)
PBS 22059	34.3 (5.8)	22.0 (4.7)	38.2 (38.2)	37.5 (37.7)
PBS 22060	36.0 (6.0)	33.7 (5.8)	41.7 (40.2)	41.4 (40.0)
SEm (±)	0.8	0.8	5.4	5.8
CD (P=0.05)	2.2	2.1	15.1	16.3
CV (%)	17.4	18.5	16.3	17.4

Mean of three replications. Values in the parenthesis are * $\sqrt{}$ and # Arcsine transformed.

reports indicating variations in oviposition, adult emergence and pod damage by bruchids on different genetic material (6, 7). Groundnut cultivars with moderate reticulation on pods were less preferred by bruchids for egg laying (8, 9, 10, 11, 12, 13) reported negative relationship between the concentrations of phenols and tannins in the pod with bruchid development, while shell thickness contributed for resistance. Hence, further studies on identification of biophysical and chemical factors responsible for bruchid resistance needs to be ascertained for advanced breeding lines, PBS 22059 and PBS 22049. Information generated can be utilized for crop improvement programs targeting the containment of postharvest losses in groundnut.

References

1. Painter R.H. (1951). Insect resistance in crop plants, *The Macmillan Company*, New York, p. 481.
2. Arul G. and Kumawat K.C. (2022). Efficacy of insect growth regulators as grain protectants of stored chick pea against *Callosobruchus chinensis* L. *Progressive Research : An International Journal*, 17(2): 104-107.
3. Harish G., Naganagoud A., Sreenivas A.G., Somashekar, Sharangouda Hiregoudar and Kisan B. (2022). Studies on Population build up and damage potential of major stored grain insect pest. *Frontiers in Crop Improvement* (9): 2111-2114.
4. Ranga Rao G.V., Rameshwar Rao V. and Nigam S.N. (20100. Postharvest insect pests of groundnut and their management, Information Bulletin No. 84, *International Crops Research Institute for the Semi-Arid Tropics*, Patancheru, p. 20.
5. Nesci A., Montemarani A., Etcheverry M. and Members of the Research Career of Consejo Nacional de Investigaciones Científicasy Técnicas (2011), Assessment of mycoflora and infestation of insects, vector of *Aspergillus* section Flavi, in stored peanut from Argentina. *Mycotoxin Research*, (27): 5-12.
6. Prasad T.V., Gedia M.V. and Savaliya S.D. (2012). Screening of groundnut cultivars against seed beetle, *Caryedonserratus*, *Indian Journal of Plant Protection,* (40): 342-343.
7. Sreedhar M., Singh D.V., Megha G., Reddy D.V.C., 2020a, Evaluation of groundnut genotypes for resistance to bruchid *Caryedonserratus* (Olivier), *Indian Journal of Entomology*, (82): 583-587.
8. Manjunath J., Manjula K., Vasanthi R.P., Naik K.S.S., Hariprasad K.V., Muralikrishna T., Prasad T.N.V.K.V. and Ravindra Reddy B. (2020). Studies on physical parameters and classification of groundnut genotypes/varieties against groundnut bruchid (*Caryedonserratus* O), *Journal of Entomology and Zoology Studies,* (8): 1482-1489.
9. Devi D.R. and Rao N.V. (2000). A note on reaction of groundnut varieties to the bruchid *Caryedonserratus* (Olivier), *Journal of Research ANGRAU,* (28): 41-43.
10. Sreedhar M., Singh D.V., Shahi U.P. and Reddy D.V.C. (2020b). Physical and biochemical bases of resistance in groundnut against bruchid, *Caryedonserratus* (Olivier), *Journal of Stored Products Research*, (87): 101594.
11. Premkumar P., Arulprakash R., Chitra N., Paramasivam M. and Uma D. (2020). Screening of groundnut genotypes against *Caryedonserratus* (Olivier), *Indian Journal of Entomology*, (82): 836-841.
12. Harish G., Rathnakumar A.L., Kumar Narendra, Ajay B.C., HolajjerPrasanna, Savaliya S.D. and Gedia M.V. (2012). Comparative response of Groundnut genotypes to bruchid beetle, *Caryedonserratus* Oliver in storage, *Annals of Plant Protection Sciences*, (20): 140-144.
13. Sakhare V.M., Mutkule D.S. and Sangle R.M. (2019). Relative susceptibility of some on different groundnut varieties to groundnut bruchid, *Caryedonserratus* (Olivier) in storage, *Journal of Entomology and Zoology Studies*, (7): 936-940.