Plant Archives Vol. 25, Supplement 1, 2025 pp. 2310-2312 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.317

IDENTIFICATION OF RESISTANCE SOURCE AGAINST POD BORER COMPLEX IN PIGEONPEA (*CAJANUS CAJAN* L. MILL SP.) UNDER MULTIPLE ENVIRONMENTS OF RAINFED CONDITION

Mayuri Sahu[1*], Gautam Kumar Jatav[1], Vikas Singh[2], Nirmodh Prabha[1] and R.R. Kanwar[1]

[1]Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, 492 012, India

[2]Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, 492 012, India.

*Corresponding author E-mail: mayuri.igkv@gmail.com

(Date of Receiving : 20-10-2024; Date of Acceptance : 12-12-2024)

ABSTRACT

Investigation for identification of resistance source against pod borer complex in pigeonpea genotypes under field conditions was carried out during *kharif* 2022-2023 at three locations *viz.*, Research Cum Instructiona Farm College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Sant Kabir College of Agriculture and Research Station, Kabirdham and Shaheed Gundadhur College of Agriculture and Research station, Jagdalpur. In the genotype screening against pod borer complex *viz. M. vitrata, H. armigera and M. obtusa*, it was found that the tested genotypes ICP-6994, RP-5, RPS2014-21, RPS2014-11, C.G. Arhar-1, RPS2014-03, RP-2, RPS2014-1, RPS2015-29, RPS2014-6, RPS2014-32, ICP-7379, ICP-7005 and RPS2014-34 had low pod damage percentage along with high yield as (35.50%, 1407), (36.50%, 1342), (36.50%, 1303), (31.00%, 1268), (22.50%, 1241), (34.50%, 1233), (30.00%, 1190), (28.50%, 1187), (29.00%, 1182), (32.00%, 1171), (30.00%, 1156), (28.50%, 1118), (36.50%, 936) respectively and the genotypes RP-7, RPS2014-19, RP-7373, RPS2014-31, RP-3 had moderate pod damage percentage along with higher yield as (40.50%, 1330), (37.50%, 1326), (41.00%, 1192), (39.00%, 1180), (39.00%, 1161). It signifies allelic chance for resistance against per cent pod borer complex.

Keywords **:** Pigeonpea, pod borer complex, genotype, *Maruca Vitrata, Helicoverpa armigera, Melanagromyza obtuse*.

Introduction

Among legumes, pigeonpea [*Cajanus cajan* (L.) Millsp.] occupies an important place in rainfed agriculture. In India, pigeonpea (2n=22) holds most significant status as it is a multipurpose most adaptable food legume, with widespread uses as food, feed, fodder, and fuel. It has tremendous potential to solve the challenge of global pulse production under the threat of climate change, soil degradation and increasing production costs (Saxena *et al*., 2016). Pigeonpea is a perennial plant with a short lifespan, hardy, widely grown, and drought-tolerant crop (Chaudhary *et al*. 2011). It plays a critical role in maintaining the soil fertility by fixing the atmospheric nitrogen and by falling down the dry leaves of pigeon pea on the soil surface. Pigeon pea is affected by various abiotic stresses during its life cycle such as moisture, temperature, photoperiod and mineral stresses. They also allow for its cultivation in array of environments and cropping systems. Pigeonpea flowers are zygomorphic, bisexual, and primarily yellow in colour. The cleistogamous floral biology of pigeonpea encourages self-fertilization. Pigeonpea is a crop that is frequently cross-pollinated, with repots ranging from 25 to 70 percent from natural out-crossing from different regions (Saxena *et al*., 1990).

Split seed without the seed coat, also referred to as "Dal," contains about 24% more protein than green pigeonpeas (21%) and mature seeds (18.8%). Over mature seeds and split-seeds, the green seed has the highest crude fiber (8.2%) and fat (2.3%) contents. Pigeon pea also contains minerals and trace elements like calcium, magnesium, copper, iron, and zinc. It is a great source of protein because it contains lysine and threonine in good proportions, two essential amino acids. In addition to its nutritional value, it is a key component of traditional folk medicine in countries like China, India, and others. Pigeonpea leaves are used in India to treat diabetes, abdominal tumors, sores, and wounds (Sivaraj *et al*., 2022).

In India, pigeonpea is cultivated in about 28.78 million hectare with total production of 25.46 million tons and productivity of 919 kg per hectare whereas in Chhattisgarh pigeonpea is cultivated in about 65.9 thousand hectare with total production of 39.9 million tons and productivity of 605 kg per hectare (Anonymous 2021). Pandey (2017) Observe that up to 250 insect species have been known to attack pigeonpea, with pod-borers and pod fly being the most destructive pests and causing serious damage to the plant's reproductive organs. (Singh et al. 2014, Yadav et al. 2016). These insects infest this crop from seedling to harvest stage; however, only a small number of them have been shown to significantly damage the crop. Tyagi and Keval (2021). Among all insects, pod fly *Melanagromyza obtusa* (Malloch) (Diptera: Agromyzidae) is the most obnoxious one causing grain damage ranging from 20 to 80%.

Material and Methods

Investigation on "Screen pigeonpea genotypes under field conditions against pod borer complex". was carried out during *kharif* 2022-2023 at three environments with different climate. By growing a total of 20 genotypes of pigeonpea at each three environments in RCBD design with 2 replications. The crop was sown on 8^{th} July during *Kharif* 2022-23; maintaining a row to row and plant to plant spacing of 60 cm x 20 cm, respectively. The observations were recorded as pod damage (%), randomly selected 100 pods are taken from each treatment for checking damage done by the insects at the time of harvest from each plot and the nature of damage of *Helicoverpa armigera* is large round and regular holes on the pods while *Maruca vitrata* cause irregular scrapping and holes on the pods and *Melanagromyza obtuse* maggots cause boring into the soft seeds and feed on grain.

Pod damage: Damaged pods were recorded at harvest on 100 pods of each entry.

[% Pod damage = (No. of damaged Pods/ No. of observed Pods) X 100]

The percentage of pod damage at maturity of test entry is compared with that of the check cultivar in the trial. The test entries are then graded using a formula derived from Abbott (1925):

$$\text{Pest Resistance (\%)} = \frac{\text{P.D. of check}\ \ \text{P.D. of test genotype}}{\text{P.D. check}} \times 100$$

Where P.D. = Mean of % pod damaged

Table 1 : The pest resistance percentage is then converted to 1 to 9 rating adopting the following scale:

Pest Resistance (%)	Pest Resistance Rating (PRR)	Abbreviation
100	1 Immune	I
75 to 99	2 Highly resistant	HR
50 to 75	3 Resistant	R
25 to 50	4 Moderately resistant	MR
10 to 25	5 Tolerant	T
-10 to 10	6 Equal to check	EC
-25 to -10	7 Moderately susceptible	MS
-50 to -25	8 Susceptible	S
-50 or less	9 Highly susceptible	HS

Source- Abbott (1925)

Result and Discussion

The development of new resistant plant cultivars involves key steps to explore or create genetic diversity for the trait of interest and selection of best-performing genotypes. After harvesting of pod all the data observed for the occurrence of insect pests was noted. The genotypes differed significantly from one another in terms of cumulative pod damage, which ranged from 22.50 to 41.00. The variation in cultivar susceptibility to pest infestation may be due to antibiosis, morphological and physiological character of plant, the number of glands and hairs, and plant age. Among the tested genotypes ICP6994, RP5, RPS2014-21, RPS2014-11, C.G. Arhar-1, RPS2014-03, RP2, RPS2014-1, RPS2015-29, RPS2014-6, RPS2014-32, ICP-7379, ICP-7005 and RPS2014-34 had low pod damage percentage along with high yield as (35.50%, 1407), (36.50%, 1342), (36.50%, 1303), (31.00%, 1268), (22.50%, 1241), (34.50%, 1233), (30.00%, 1190), (28.50%, 1187), (29.00%, 1182), (32.00%, 1171), (30.00%, 1156), (28.50%, 1118), (36.50%, 936) respectively and the genotypes RP-7, RPS2014-19, RP-7373, RPS2014-31, RP-3 had moderate pod damage percentage along with higher yield as (40.50%, 1330), (37.50%, 1326), (41.00%, 1192), (39.00%, 1180), (39.00%, 1161). It signifies allelic chance for resistance against per cent pod borer complex. These resistant genotypes should be further evaluated to establish the types of genes coding for their resistance. Data from the genetic studies will enable breeders to effectively harness the resistance gene(s) for the development of improved Pigeonpea varieties that are resistant.

With the identification of several promising lines characterized by good levels of resistance to pod borer complex, development of improved Pigeonpea with resistance to this pest appears feasible in the foreseeable future.

Table 2: Average meteorological data

Average meteorological data during crop growth period of pigeonpea (*Kharif,* July 2022 to February 2023) at 3 locations

Trial Locations	Latitudes	Longitude	Max. temp (°C)	Min. Temp (°C)	Annual rain fall (mm)	Total rainy days	Rain fall (mm)	Rainy days	Relative Humidity		Sun sine (hours)
									I	II	
Raipur	21°.22"N"	81°.71"E"	31.06	18.68	1015.2	50	29.01	1.43	86.43	48.97	5.24
Kawardha	21°.98"N"	81°.23"E"	31.89	17.51	1075.2	49	30.7	1.4	86.0	76.4	5.0
Jagdalpur	19°.22"N"	81°.87"E"	28.71	5.05	1721.5	84	49.19	2.40	89.69	54.31	5.15

Source: Department of Agrometeorology, COA, IGKV, Raipur

Table 3 : Pooled per cent pod damage by Pod borer complex in different pigeon pea genotypes

Genotype	(%) Pod damge			Cumulative pod damage	PSI	Grade	Category	Plot yield (Kg/ha.)
	Jagdalpur	Kabirdham	Raipur					
RP-3	11	12.5	15.5	39.00	-17.82	7	MS	1161
RP-5	16.5	8.5	11.5	36.50	-10.27	6	EC	1342
RP-2	11	11	8	30.00	9.37	6	EC	1190
ICP-7379	11.5	10.5	8	30.00	9.37	6	EC	1156
ICP-6994	15.5	10.5	9.5	35.50	-7.25	6	EC	1407
ICP-7005	9.5	11	8	28.50	13.90	5	T	1118
RPS2014-1	11.5	8.5	8.5	28.50	13.90	5	T	1187
RPS 2014-11	7	12.5	11.5	31.00	6.34	6	EC	1268
RPS 2014-21	19.5	11	6	36.50	-10.27	6	EC	1303
RPS 2014-19	13	12.5	12	37.50	-13.29	7	MS	1326
RPS 2014-6	11	9.5	11.5	32.00	3.32	6	EC	1171
RPS 2015-29	9	10	10	29.00	12.39	5	T	1182
RPS 2014-03	15	14	5.5	34.50	-4.23	6	EC	1233
RPS 2014-31	17.5	12	9.5	39.00	-17.82	7	MS	1180
RPS2014-34	17	9.5	10	36.50	-10.27	6	EC	936
RPS 2014-32	12.5	8.5	9	30.00	9.37	6	EC	1171
C.G. Arhar-1	6.5	9.5	6.5	22.50	32.02	4	MR	1241
RP-7	15.5	12	13	40.50	-22.36	7	MS	1330
RP-7373	13	12.5	15.5	41.00	-23.87	7	MS	1192
BDN-716 (Check)	11	10.6	11.5	33.10	0.00	0	Check	1135

PSI = Pest Susceptible Index T = Tolerant HS = Highly susceptible MR = Moderately resistant
MS = Moderately susceptible EC = Equal to check R = Resistance

References

Abbott, W.S. (1925). A method of computing the effectiveness of an insecticide. *Journal of Economic Entomolgy*, **18**: 265-267.

Anonymous. (2021). Project coordinator's report 2021-22. AICRP on pigeonpea. 27-31.

Chaudhari, A.K., Sultana R., Pratap, A., Nandarajan, N. and Jha, U.C. (2011). Breeding for abiotic stress in pigeonpea. *Journal Food Legumes*, **24**(3) : 165-174.

Pandey, Anand Sager (2017). Studies on pod infesting insect pest complex of pigeonpea *Cajanus cajan* L. (Millsp.) and their control with insecticides and biopesticides: A review. *International Journal of Chemical Studies*, **5**(5): 1380-1385.

Saxena, K.B., Singh, L and Gupta, M.D. (1990). Variation for natural out-crossing in pigeonpea, *Euphytica* **46**: 143-148.

Singh, J., Kumar, A., Fiyaz, A. and Singh, M.K. (2016). Stability analysis of pigeonpea genotypes by deployment of AMMI model under rainfed environment. *Legume Research*, **41**(2): 182-188.

Singh, R.P., Mishra, M.K. and Ali, S. (2014). Evaluation of pigeonpea lines against lepidopterous pod borers. *Indian Journal of Entomology,* **76**(2): 155-157.

Sivaraj, P., kumar, Anil. and Koti, S.R. (2022). Training concepts in noice clustering classifier. A case study for pigeonpea crop mapping. *Remote Sensing Applications Society and Environment*, **26**, 100736.

Tyagi, S. and Keval, R. 2021. Physicochemical traits of pigeonpea genotypes and resistance to pod fly *Melanagromyza obtusa* (Malloch). *Indian Journal of Entomology,* **83**(3): 434-437.

Yadav, D. K., Sachan, S. K., Singh, G. and Singh, D. V. 2016. Insect pests associated with pigeon pea variety upas 120 in western Uttar Pradesh, India. *Plant Archives,* **16**(1): 140-142