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Bioassay studies for bruchid (*Callosobruchus chinensis*) resistance in F_7 inter-specific generation of pigeonpea (*Cajanus cajan*)*

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Pigeonpea (*Cajanus cajan* L.) is one of the most important rainfed and drought-tolerant pulse crops. It has diversified uses and grown in a wide range of soils and climatic zones of India. India has the distinction of being the top producer and consumer of pigeonpea in the world accounting for 78% of the global output. The pigeonpea pulse beetle (*Callosobruchus chinensis* L.) causes considerable damage to almost all stored pulses and badly affects the quality of seeds (Patel *et al*. 2005). This pest not only cause direct damage by reducing dry weight but also shown reduction of quality of grain and seed viability converting the seed unfit for the human consumption and as well as for planting in next season (Das *et al*. 2005). The initial infestation occurs in the field and from there it is carried over to stores where the population can rapidly build up (Prevett 1961). Adult female laid eggs on pigeonpea seeds, which hatch within five to seven days. The young larvae bore into seeds and complete their development inside by feeding on the seed tissues. At the end of their development stage, adults emerge from the seeds leaving holes at the exit points (Patro *et al*. 2007). Inter-specific hybridization has been used for improvement of crop plants by transferring the desirable genes and chromosomes from wild to cultivated species. Keeping in the mind that genetic resistance is the cheapest source of resistance in managing biotic stress, study have been initiated to identify possible sources of resistance to bruchid beetle.

A laboratory experiment was conducted at pulse quality laboratory of Department of Genetics and Plant Breeding, GBPUA&T Pantnagar during 2008 in completely randomized design (CRD). The experimental material comprised 81 F_7 progenies of nine interspecific hybrids derived using cultivated parents, viz UPAS120, Pant A134, ICPL 84023 and wild species, viz *Cajanus cajanifolius*, *Cajanus scarabaeoides* and *Cajanus acutifolius.* Twenty healthy well-dried seeds of each line were weighed and placed in separate bottles. Each bottle was then infested with two pairs (male and female) of freshly emerged bruchids. The adults were allowed to mate and lay eggs. Seven days after infestation when the eggs became distinctly visible, the total numbers of eggs were counted using a magnifying glass. This constituted potential number of adults expected to emerge from eggs in the each bottle. A daily count of adults emerged in each bottle was made until 50 DAI. The counted adults were removed from the bottles. Counting was terminated at 50 DAI to eliminate the possibility of including second generation adults in the count. Based on the cumulative total of adults emerged from each bottle at 50 DAI and the initial number of eggs, per cent adult emergence was computed in each bottle. After 50 DAI the final weight was taken and by using the initial and final weight the weight loss was calculated in percentage. All the nine inter-specific progenies of pigeonpea derived of wild species (*C.cajanifolius*, *C.acutifolius, C.scarabaeoides*) exhibited differential responses to infestation by *Callosobruchus chinensis* with respect to oviposition, per cent of adult emergence, developmental period, number of holes/seed and per cent weight loss in seed weight as compared parents, viz ICPL84023, PA134, and UPAS120. All treatments of the study were critically counted and recorded for each sample on the basis of seed damage; progenies were earmarked as resistant/ tolerant/ susceptible using appropriate scale given by Prevett 1961.

All the nine inter-specific progenies of pigeonpea were screened in present study exhibited differences with respect

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*Short note

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Table1 Bioassay of bruchid (*Callosobruchus chinensis*) on different interspecific progenies of pigeonpea

F_7 generation	Incubation period (days)	Developmental period (larval+pupal)	Adult emergence (%)**	Oviposition period (days)	No. of eggs laid*/20 seeds # (fecundity)	No. of holes/ 20 seeds	Per cent weight loss (g)
ICPL84023 × *C.cajanifolius*	6.44 (2.62)	19.55 (2.61)	26.87 (3.96)	5.88 (2.42)	7.11 (2.21)	8.98 (1.85)	10.65 (2.46)
ICPL84023 × *C.acutifolius*	7 (2.73)	23.77 (2.95)	47.40 (5.76)	6.55 (2.57)	7.77 (2.46)	12.66 (4.01)	18.28 (3.44)
ICPL84023 × *C.scarabaeoids*	4.11 (1.94)	20.0 (2.80)	34.30 (4.96)	7.77 (2.87)	9.11 (2.69)	6.88 (4.38)	15.44 (3.37)
PA134 × *C.cajanifolius*	4.44 (2.08)	20.33 (2.81)	40.89 (5.69)	9.66 (3.18)	13.33 (3.5)	7.2 2 (3.43)	14.04 (3.47)
PA134 × *C.acutifolius*	5.33 (2.33)	21.66 (2.99)	32.53 (5.17)	8.33 (2.95)	19.66 (4.23)	7.5 (3.2)	16.83 (3.66)
PA134 × *C.scarabaeoides*	6.22 (2.57)	22.44 (2.84)	28.11 (4.17)	8.22 (2.94)	5.22 (1.91)	6.22 (1.85)	4.62 (1.78)
UPAS120 × *C.cajanifolius*	5.55 (2.30)	22.33 (2.82)	23.50 (3.94)	6.44 (2.45)	20.88 (3.95)	7.22 (2.95)	16.42 (3.31)
UPAS120 × *C.acutifolius*	5.0 (2.20)	24.66 (3.83)	50.10 (6.32)	7.11 (2.66)	10.44 (3.10)	6.98 (3.38)	14.42 (3.39)
UPAS120 × *C.scarabaeoides*	7.0 (2.73)	18.33 (2.51)	27.77 (3.48)	7.55 (2.83)	2.44 (1.34)	6.25 (1.28)	3.72 (1.37)
PA134	5.0 (2.11)	27.17 (4.11)	48.70 (5.31)	7.02 (2.87)	14.33 (3.4)	9.66 (2.11)	23.69 (5.4)
ICPL84023	6.22 (2.57)	26.57 (4.3)	61.28 (7.32)	7.46 (2.81)	14.87 (3.81)	6.66 (3.01)	15.97 (3.81)
UPAS120	5.53 (2.33)	27.12 (4.41)	69.65 (7.65)	8.26 (2.90)	15.22 (4.80)	10.66 (2.45)	12.95 (3.1)
SEm±	0.714	2.19	1.16	0.765	0.681	0.681	0.771
CD at 5%	(-)	3.11*	(-)	2.15	1.92*	0.192*	2.006*

Average of nine replication of 20 seeds; Data in parentheses are arcsin transformed

to oviposition, adult emergence from infested seeds, developmental period and loss in seed weight depicted in Table 1.

Among all progenies UPAS120× *C.cajanifolius* recorded highest (20.88) oviposition compared to other progenies while the lowest oviposition were recorded in the cross UPAS120×*C.scarabaeoides*. Kitch *et al.* (1993) suggested that ovipositional non-preference could be a practical form of resistance to *C. maculates*. The incubation period was observed in the range of 6.33–12.0 days. It was observed delayed in the UPAS120 × *C. scarabaeoides* (7.0 days) and ICPL84023 × *C. acutifolius* (7.0 days) as compared to cultivated parents which showed early incubation (PA134 (5.0), ICPL84023(6.22) and UPAS120(5.53)) leading to more damage. The developmental period was in the range of 20.57–26.0 days, whereas percent of adult emergence was recorded in the range of 23.5–50.1%. UPAS120 × *C. scarabaeoides* showed minimum developmental period 18.33 days, followed by 22.44days (PA134 × *C. scarabaeoides*) as compared to checks PA134 (27.17days), ICPL84023 (26.57days) and UPAS120 (27.12days) while UPAS120× *C.cajanifolius* had shown vary less support to adult emergence, followed by ICPL84023 × *C. acutifolius* and UPAS120 × *C. acutifolius.* The development period and per cent adult emergence are the two most discriminating indicators for evaluation of bruchid susceptibility or resistant varieties (Redden and McGuire 1983).

All the inter-specific progenies were also recorded the per cent weight loss (Table1). The extent of dry weight loss was significant by higher in the susceptible genotypes. The per cent weight loss varied from 3.722 to 23.69 gm. Minimum per cent weight loss was recorded on UPAS120 × *C. scarabaeoides* (3.72g), followed by 18.28g on ICPL84023 × *C. acutifolius*, 16.83 g on PA134 × *C. acutifolius* and 15.44 g on ICPL84023 × *C. scarabaeoides.* The number of wholes/ 20 seeds was observed in range of all progenies 6.22-–12.66. PA134 × *C.scarabaeoides* progeny showed lowest (6.22) holes/20 seed, followed by 8.98 on ICPL84023 × *C. cajanifolius* and 7.5 on PA134 × *C. acutifolius*.

SUMMARY

The results of bioassay indicated that per cent adult emergence, mean time of adult emergence and per cent weight loss were most important parameters which helped in categorizing the genotypes into susceptible or resistant. Out of nine interspecific progenies, one of progeny UPAS120 × *C. scarabaeiodes* was found least susceptible for *Callosobruchus chinensis*, while other progenies in the descending order for resistance to bruchid were UPAS120 × *C. cajanifolius*, PA134 × *C. scarabaeiodes*, PA134 × *C. acutifolius*, ICPL84023 × *C. cajanifolius* and ICPL84023 × *C. scarabaeiodes.* Since genetic resistance is the cheapest source of resistance in managing the biotic stress, the resistant material found in this study will definitely useful in the pigeonpea improvement programme especially for bruchid resistance.

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