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SCREENING OF GREENGRAM GERMPLASM AGAINST COWPEA WEEVIL *CALLOSOBRUCHUS MACULATUS* (F)

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ABSTRACT

Green gram (*Vigna radiata*) germplasm was evaluated against cowpea weevil *Callosobruchus maculatus* (F.) infestation under laboratory conditions at the Department of Zoology, BSNV PG College, University of Lucknow during 2024 on thirty *Vigna radiata* germplasms. Parameters measured included, number of egg laid/ 100 seeds, adult emergence, mean developmental period, growth index and resistant index. Remarkable variation were observed for all the parameters. The most resistance germplasm IPM-2014-9 (Varsha) and IPM-302-2 (Kanika) recorded 2.33± 0.33 and 2.67± 0.32 no. of eggs/ 100 seed compared to PDM-54 with 25.33± 0.88 eggs/ 100 seeds. No adult emergence was observed in IPM-2014-9 and IPM-302-2; highest emergence was 90.52± 3.60 in BMS-18-1; there was no development in IPM-2014-9 and IPM-302-2. Highest growth index was 0.88± 0.001 in BMS-18-1. IPM-2014-9 and IPM-302-2 are highly resistant while BMS-18-1, BMS-18-2 and SELECTION 18-4 are highly susceptible.

Key words: Screening, *Callosobruchus maculatus*, *Vigna radiata*, eggs laid/ 100 seeds, adult emergence, mean developmental period, growth index, resistant index, susceptibility, lifecycle

Grain legumes are rich in protein, carbohydrates, magnesium, zinc, calcium and iron (Asif, 2013; Singh and Swami, 2024). In India as well as in world a variety of pulses are cultivated, and mung bean occupies third position. Seed quality is important for productivity and marketing and also can result in 30% increase in yields (Afzal et al., 2016; Singh and Swami, 2024). *Callosobruchus maculatus* (F.) is the most notorious causing damage both under field and storage conditions (Raja et al., 2007) leading to 10-15% yield loss (Adugna, 2006). Globally, India is the biggest consumer and producer of *Vigna radiata* (green gram), with worldwide production of about 65% (Pratap et al., 2012). Major stored grain pest species of Bruchidae are *Callosobruchus maculatus*, *C. chinensis* and *C. analis*. These are observed in stored grain such as cowpea, black gram and green gram (Okonkwo, 1996; Mulatu, 2000; Raja, 2000; Park, 2003; Singh and Swami, 2024). Stored seeds are vulnerable to pest attack because of their prolonged period of storage. This study evaluates the host preference of *C. maculatus* on 30 varieties of green gram.

MATERIALS AND METHODS

The research was conducted at the Department of Zoology, BSNV PG, College, University of Lucknow, Lucknow during the 2024. Rearing of weevils was done at Department of Zoology, in the Entomology laboratory. The culture was maintained at 28 °C and RH of 70%. The insect culture were maintained on 500 g disinfected cowpea seeds in BOD incubator which were then infested with 20 unisex beetles. The experiment was carried out up to third generation. The freshly emerged adults were further used for screening (Sarwar, 2012). Thirty germplasms of *Vigna radiata* were arranged from the National Seed Corporation and ICAR- Indian Institute of Pulse Research, Kanpur. The germplasms were examined for checking free from eggs and were kept at 5 °C for one week and thereafter left for 24 hr under at laboratory conditions (28 °C and RH 70%). The assessment was performed in completely randomized design (CRD) with three replications. Five pairs of newly emerged adults/ replication were used. No-choice test was adopted for screening, and 100g of each were weighed and kept separately in 1 ℓ glass jar and five pairs of freshly emerged (0-2 days old) weevils were allowed. After this, jars were secured with muslin cloth and sealed with rubber band. After 7 days, weevils were taken out from each jar. The germplasms were examined on daily basis for observations on fecundity and fertility (% adults emergence), mean developmental period, growth index (GI) and resistant index. Fecundity analysis, fertility assay, mean developmental period (days) and growth index of *C. maculatus* were checked.

Observations were taken from 1st to 3rd generation. Eggs laid on each was counted after 7 days of release with magnifying glass. Emergence was noted at every 24 hr/ % adult emergence was calculated (Sharma and Thakur, 2014).

RESULTS AND DISCUSSION

The results showed significant differences. Variation was observed for egg, adult emergence, developmental period, growth index, and resistant index (Table 1). Number of eggs laid in no -choice condition by five pairs of *C. maculatus* varied- 2.33± 0.33 in IPM-2014-9 (Varsha) to 25.33± 0.88 in PDM-54 (Moti). Less oviposition was seen in IPM-2014-9 (2.33eggs/ 100 seeds). PDM-54 was the preferred as it recorded significantly one more of eggs laid/ 100 seeds. Sharma and Thakur (2014) revealed that seeds with smooth surface were more favoured for oviposition; also others (Shaheen et al., 2006; Patil et al., 2009; Tripathi et al., 2015; Raghuwashi et al., 2016; Waghmare and Bantewad, 2020).

Adult emergence differ significantly from (0.00 0.00) to (18.67± 0.67) (Table 1). The lowest emergence was seen in IPM 2014-9 (0.00-0.00) and in IPM 302-2 (0.00/ 0.00) while highest was in PDM-54 (18.67± 0.67). Mean developmental period varied from zero days to 31.77± 0.50 days. The lowest developmental period of zero days was in IPM 2014-9 IPM 2014-9 and in IPM 302-2. The highest period of 31.77/ 0.50 days was in mutant germplasm EC 391178. According to Tripathi et al. (2015), the developmental period was shorter in susceptible germplasms PDM-54, PDM-139, IPM-02-3, IPM-02-14, IPM-409-4, IPM-205-7 and longer in resistant germplasms EC391178 of cowpea.

Growth index of *C. maculatus* on different *Vigna*

Table 1. Host preferences in green gram against *C. maculatus*

S. No.	Germplasm	No. of eggs laid	No. of adult emerged	% Adult emergence	Mean developmental period (days)	Growth index	Resistant index
1.	PDM-54 (Moti)	25.33± 0.88	18.67± 0.67	73.69± 0.89	25.67± 0.33	0.073± 0.001	S
2.	PDM-139 (Samrat)	19.33± 0.67	8.67± 0.33	45.00± 2.89	22.00± 0.58	0.075± 0.002	S
3.	IPM -02-3	15.33± 0.67	12.67± 0.33	82.74± 1.49	26.00± 0.01	0.073± 0.001	S
4.	IPM-02-14	16.33± 0.88	11.33± 0.67	69.45± 2.78	24.93± 0.52	0.074± 0.002	S
5.	IPM-2014-9 (Varsha)	2.33± 0.33	0.00± 0.00	0.00± 0.00	0.000± 0.000	0.000± 0.000	HR
6.	IPM- 409-4 (Heera)	13.34± 0.88	11.00± 0.58	82.65± 1.38	26.33± 0.88	0.073± 0.003	S
7.	IPM- 302-2 (Kanika)	2.67 ±0.33	0.00±0.00	0.00± 0.00	0.000± 0.000	0.000± 0.000	HR
8.	IPM 512-1 (Soorya)	7.67± 0.33	2.00± 0.01	26.19± 1.19	25.67± 0.67	0.055± 0.002	MR
9.	CO-7	13.67± 1.20	9.67± 0.33	71.47± 4.52	27.00± 0.58	0.069± 0.003	MS
10.	PUSA-1431	10.00± 0.58	5.67± 0.33	57.07± 4.52	25.00± 0.01	0.070± 0.002	MS
11.	IPM- 205-7 (Virat)	9.33± 0.33	6.00± 0.001	64.45± 2.22	25.00± 0.58	0.072± 0.003	S
12.	PDM-11	12.00± 1.16	7.00± 0.58	58.49± 0.83	25.33± 0.33	0.070± 0.001	MS
13.	IPM-410-3 (Shikha)	11.33± 0.67	8.67± 0.33	76.67± 1.67	26.93± 1.10	0.070± 0.003	MS
14.	SMC-1827	13.03± 1.00	9.33± 0.67	71.86± 0.43	26.00± 0.60	0.070± 0.002	MS
15.	TCR-82	12.05± 0.38	7.33± 0.33	56.62± 3.44	27.27± 0.73	0.064± 0.001	MS
16.	EC 520024	2.34± 0.58	1.00± 0.01	61.11± 2.03	31.00± 0.58	0.056± 0.004	MR
17.	BMS-18-1	17.33± 0.33	15.67± 0.33	90.52± 3.60	22.33± 0.33	0.88± 0.001	HS
18.	EC 520026	10.02± 0.58	4.33± 0.33	43.30± 1.67	28.13± 1.16	0.58 ± 0.003	MR
19.	UPM 98-1	2.35 ± 0.01	1.00± 0.01	50.00± 0.01	25.00± 0.58	0.68 ± 0.002	MS
20.	EC 391178	4.00 ± 0.01	1.33± 0.33	33.33± 0.33	31.77± 0.50	0.047± 0.003	R
21.	BMS-18-2	11.34± 0.67	9.67±0.33	85.55± 2.22	23.67± 0.33	0.082± 0.001	HS
22.	CO-8	11.67± 0.33	6.67± 0.33	57.07± 1.26	24.67± 0.88	0.071± 0.003	S
23.	AKM 96-4	6.00± 1.00	3.67± 0.67	60.83± 0.83	23.67± 0.33	0.075± 0.003	S
24.	CO-4	7.33± 0.67	4.67± 0.33	63.89± 1.39	24.57± 0.30	0.074± 0.001	S
25.	EC 520041	4.67± 0.33	2.67± 0.33	56.67± 3.33	25.67± 0.33	0.068± 0.001	MS
26.	SELECTION 18-4	14.67± 0.67	12.33± 0.33	84.22± 1.49	22.33± 0.33	0.086± 0.001	HS
27.	AKM 96-1	13.33± 1.20	10.33± 0.88	77.75± 3.20	26.05± 0.62	0.072± 0.003	S
28.	SML-115	13.00± 1.00	9.33± 0.67	71.86± 0.43	26.60± 0.60	0.070± 0.002	MS
29.	HUM-12	12.67± 1.20	11.00± 1.00	86.97± 2.19	25.00± 0.00	0.078± 0.001	S
30.	ML-515	12.33± 0.33	9.33± 0.33	75.64± 0.64	26.33± 0.88	0.071± 0.002	S

Note: S-Susceptible, HS-Highly susceptible, MS-Moderately susceptible R- Resistant, MR-Moderately resistant, HR-Highly resistant.

radiata germplasms ranging from 0.00 ± 0.0 in 2014-9 IPM 2014-9 and in IPM 302-2 to 0.88± 0.001 recorded in BMS-18-1. IPM302-2 with the growth index of 0.00 ± 0.0 was statistically at par with 0.047 0.003 in EC391178, 0.055 0.002 in IPM 512-1, 0.58 0.003 in EC 520026, 0.069 0.003 in C0-7, 0.078 0.001 in HUM-12. The highest was seen in 0.88 0.001 in BMS-18-1which was statistically at par with germplasms SELECTION 18-4 (0.086 0.001) Umrao and Verma (2003) revealed that the resistant germplasms. The current study had some germplasms that indicated resistance which was confirmed by Sarwar (2012).

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AUTHOR CONTRIBUTION STATEMENT

Both authors contributed equally.

CONFLICT OF INTEREST

No conflict of interest.

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