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Screening of Pigeonpea Genotypes against Major Insect Pests of Pigeonpea (*Cajanus cajan* (L.) Millsp.)

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ABSTRACT

Nine pigeonpea genotypes, namely PA 686, AL 2371, RKVP 1156, PA 739, NUPPC-7A, VLA 1 (ch), AL 2481, PA 23-5, and WRGE-171, along with three checks (AL 882, PAU 881, and UPAS 120), were screened against the major insect pests of pigeonpea crop i.e. *Maruca vitrata* and *Apion clavipes.* It was found that WRGE-171 recorded the highest mean larval population (2.76/5 plants) and web formation (6.56/5 plants) by *M. vitrata,* while PA 23-5 had the lowest in both parameters with 1.04 and 2.56, respectively. While, the highest mean population of *A. clavipes* was recorded in NUPPC-7A with 10.64/5 plants, while the lowest was observed in PA 23-5 (4.52/5 plants). Pod damage assessment revealed that PA-739 was moderately resistant to *M. vitrata,* while VLA 1 (ch) and RKPV 1156 showed moderate resistance to *A. clavipes.* NUPPC-7A and VLA 1 (ch) also showed moderate resistance to grain damage by *M. vitrata* and *A. clavipes,* respectively. In contrast, PA 686, AL 2371, and WRGE-171 were highly susceptible to pod and grain damage by *M. vitrata,* with WRGE-171 also highly susceptible to *A. clavipes.* The highest yield was recorded in PA 23-5 (254.20 kg/ha) and the lowest yield in WRGE-171 (97.75 kg/ha). This study not only offer a sustainable and eco-friendly approach to reducing pesticide dependency but also hold promise for enhancing crop productivity and profitability of pigeonpea crop.

Keywords *A. clavipes, M. vitrata,* Pigeonpea, Screening, Genotypes.

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INTRODUCTION

Pigeonpea (*Cajanus cajan* (L.) Millsp.), also referred to as tur, arhar, or red gram, is a significant legume grown mainly in tropical and subtropical regions. The seeds are rich in protein (around 20–22%) and contain valuable minerals and essential amino acids. In India, it ranks as the second most important pulse crop after chickpea, occupying about 5.05 million hectares, with an annual yield of 4.34 million tons and an average productivity of 859 kg per hectare (Agricultural Statistics at a Glance 2022). Nagaland, the area and production of pigeonpea during the year 2020-21 were 3210 hectares and 2950 tonnes, respectively (Anonymous 2022).

The highest avoidable loss of 79.05% was recorded in pigeonpea due to *Maruca vitrata* infestation with eight larvae per plant (Mahalle and Taggar 2018). Apion is a destructive key pest of pigeonpea in Tripura, a North Eastern state of India (Nair *et al.* 2017). In northeast India, 49.38% and 31.35% of pod damage are reported to be caused by *Apion clavipes* and *Maruca obtusa,* respectively (Patra *et al*. 2016). The cultivation of pest resistant varieties is a more practical and cost effective approach, especially since pigeonpea is predominantly grown by poor and marginal farmers. It is therefore necessary to identify cultivars that are resistant or tolerant to pests. Keeping in view the above facts, the present study was conducted to identify the resistant varieties against the major insects.

MATERIALS AND METHODS

The experiment was carried out in the experimental farm, Department of Entomology, SAS, Nagaland University, Medziphema. A total of 12 genotypes (PA 686, AL 2371, RKPV 1156, PA-739, NUPPC-7A, VLA 1 (ch), AL 2481, PA 23-5 and WRGE-171) and 3 Check (PAU 881, AL 882 and UPAS 120) obtained from AICRP on pigeonpea, SAS, NU, Medziphema were sown during *kharif* season, 2023. The crop was cultivated following standard agronomic practices, and the experiment was conducted using a Randomized Block Design (RBD) with 12 treatments and 3 replications. From each genotype and unit plot, five plants were randomly selected for observation. The immature and mature stages of major insect pests were recorded at weekly intervals, beginning with pest appearance and continuing until crop maturity. Insect counts from the three replications were averaged separately for each genotype at each interval. Pod damage assessment due to insect pests was carried out when the crop reached 80% maturity.

Based on the pod damage by individual insect in each genotype, the pest resistance/ susceptibility % was calculated using the formula given by Abott (1925) and then converted to Pest Resistance Rating (PRR) from 1 to 9 scale. Based on the PRR, category of resistance was given for each genotype and for each insect (Table 1).

Table 1. Category of resistance for each genotype based on Pest Resistance Rating (PRR).

Pest resistance (%)	Pest Resistance Rating (PRR)	Category
100	1	Immune
75 to 99.9	2	Highly resistant
50 to 74.9	3	Resistant
25 to 49.9	4	Moderately resistant
10 to 24.9	5	Tolerant
-10 to 10	6	Equal to check
-25 to – 10	7	Moderately susceptible
-50 to -24.9	8	Susceptible
-50 to less	9	Highly susceptible

$$\text{Pest resistance (\%)} = \frac{(\text{\% P. D in check - \% P. D in test entry})}{(\text{\% P. D in check})} \times 100$$

where, P. D = Mean of % pods or seed damaged

Each genotypes were harvested individually at 80% crop maturity and grain yield per plot was recorded and converted to kg per hectare by using the following formula.

$$\text{Grain yield per hectare} = \frac{W}{A} \times 10{,}000$$

where,
W= Weight of grain per plot
A= Area of the plot

All the data recorded were subjected to statistical analysis as per the Randomized Block Design procedure and insect population data were transformed with square root transformed vx+0.5 method and the pod and grain damage data were angular transformed.

RESULTS AND DISCUSSION

The first incidence of spotted pod borer, *M. vitrata* was observed on the 38th SW in all genotypes except in PA 23-5, RKPV 1156 and UPAS 120 (Table 2) and the population persisted up to 46th SW in all the

Table 2. Screening of pigeonpea genotypes against larval population of *Maruca vitrata* during 2023.

Treatments	Genotypes	No. of *Maruca vitrata* larvae/5 plants									
		38th SW	39th SW	40th SW	41st SW	42nd SW	43rd SW	44th SW	45th SW	46th SW	Over all mean
1	PA 686	1.07	2.27	2.67	2.87	3.00	3.67	2.00	1.53	1.00	2.23
		(1.25)	(1.66)	(1.78)	(1.83)	(1.87)	(2.04)	(1.58)	(1.43)	(1.22)	(1.65)
2	AL 2371	1.6	2.33	2.93	3.00	4.27	2.00	3.07	1.60	1.13	2.44
		(1.45)	(1.68)	(1.85)	(1.87)	(2.18)	(1.58)	(1.89)	(1.45)	(1.28)	(1.71)
3	RKPV 1156	-	1.20	1.53	1.67	1.67	2.33	1.13	0.87	0.67	1.23
			(1.30)	(1.43)	(1.47)	(1.47)	(1.68)	(1.27)	(1.17)	(1.07)	(1.32)
4	PA-739	0.2	1.13	1.67	2.33	1.47	1.33	1.00	0.67	0.27	1.12
		(0.83)	(1.27)	(1.47)	(1.68)	(1.38)	(1.22)	(1.22)	(1.22)	(0.84)	(1.27)
5	NUPPC-7A	1.00	1.33	1.47	1.67	2.33	2.67	2.20	1.87	0.93	1.79
		(1.22)	(1.35)	(1.40)	(1.47)	(1.64)	(1.78)	(1.64)	(1.54)	(1.20)	(1.51)
6	VLA 1 (ch)	0.87	1.27	1.27	2.00	2.27	1.33	1.00	0.87	0.13	1.22
		(1.17)	(1.33)	(1.38)	(1.58)	(1.66)	(1.30)	(1.22)	(1.17)	(0.95)	(1.31)
7	AL 2481	1.13	2.00	3.00	4.60	4.33	2.33	3.00	2.27	1.27	2.66
		(1.26)	(1.58)	(1.87)	(2.26)	(2.20)	(1.68)	(1.87)	(1.66)	(1.33)	(1.78)
8	PA 23-5	-	1.00	1.60	1.27	2.47	1.33	0.93	0.47	0.27	1.04
			(1.22)	(1.45)	(1.38)	(1.45)	(1.34)	(1.19)	(1.14)	(0.84)	(1.24)
9	WRGE-171	2.07	2.93	3.27	3.33	4.00	4.33	2.87	1.33	0.73	2.76
		(1.60)	(1.85)	(1.94)	(1.96)	(2.12)	(2.20)	(1.83)	(1.35)	(1.11)	(1.81)
10	AL 882	1.27	1.47	1.93	2.47	2.67	3.00	2.73	1.60	0.67	1.98
		(1.33)	(1.40)	(1.56)	(1.72)	(1.78)	(1.87)	(1.79)	(1.45)	(1.08)	(1.57)
11	PAU 881	0.87	1.53	1.73	2.00	2.67	3.13	2.87	1.47	0.87	1.90
		(1.17)	(1.42)	(1.49)	(1.58)	(1.78)	(1.87)	(1.83)	(1.22)	(1.14)	(1.55)
12	UPAS 120		1.00	1.27	1.47	2.00	2.60	1.40	1.13	0.20	1.23
			(1.22)	(1.38)	(1.35)	(1.57)	(1.58)	(1.52)	(1.30)	(0.95)	(1.32)
	Sem ±		0.06	0.06	0.05	0.05	0.07	0.07	0.06	0.05	0.03
	CD at 5%		0.16	0.17	0.15	0.16	0.21	0.19	0.17	0.16	0.09

Figures in parenthesis are $\sqrt{X+0.5}$ transformed value.

genotypes. Different peaks of maruca population were observed from the 41st to 43rd standard week for different genotypes with the highest count of 4.60 larvae/ 5 plants recorded in genotype AL 2481 on the 41st SW and the larval population gradually declined thereafter with the lowest count of 0.13 larvae/ 5 plants observed in VLA 1 (ch) on the 46th SW. These findings are in accordance with the study by Dharavath *et al.* (2021) who reported that *M. vitrata* larval population increased gradually from 37th to 47th SMW in pigeonpea. In contrast with the present finding, Ugale *et al.* (2021) observed maximum population of *M. vitrata* during 51st SMW. The difference may be due to variation in climatic condition in different locations.

When considering the overall mean of the larval population of *M. vitrata,* varying numbers of larvae were observed on different genotype ranging from 1.04 larvae/ 5 plants in genotype PA 23-5 to 2.76 larvae/5 plants in genotype WRGE-171 as against checks, AL 882 (1.98 larvae /5 plants), PAU 881 (1.90 larvae /5 plants) and UPAS 120 (1.23 larvae /5 plants) respectively. The present findings are in close agreement with Verma *et al*. (2017) who revealed that the mean larval population ranged from lowest in UPAS 120 x H82-1 (P3) (1.65 larvae/ 5 shoots) to highest in H82-1 × PUSA 992 (P5) (2.78 larvae/5 shoots) as against checks 2.15, 1.49 and 1.42 larvae/5 shoots on PA 291, PUSA 992 and UPAS 120, respectively.

Number of webs by *Maruca vitrata*

It was found that all genotypes showed significant differences with respect to webs formed by *M. vitrata* from 38th to 46th standard week (SW) (Table 3). The highest no. of webs was recorded in genotype WRGE-171 from the 38th to 46th SW.

The overall mean of the no. of webs formed by

Table 3. Screening of pigeonpea genotypes against no. of webbing by *Maruca vitrata* during 2023.

Treatments	Genotypes	No. of *Maruca vitrata* webbing/5 plants									
		38th SW	39th SW	40th SW	41st SW	42nd SW	43rd SW	44th SW	45th SW	46th SW	Over all mean
1	PA 686	2.67 (1.78)	3.07 (1.89)	3.13 (1.91)	3.27 (1.94)	3.33 (1.96)	4.93 (2.33)	3.00 (1.87)	2.93 (1.85)	2.67 (1.78)	3.22 (1.93)
2	AL 2371	3.87 (2.09)	4.00 (2.12)	4.33 (2.20)	5.67 (2.48)	6.33 (2.61)	5.47 (2.44)	5.13 (2.37)	4.07 (2.14)	2.00 (1.58)	4.54 (2.25)
3	RKPV 1156	-	4.13 (2.15)	4.87 (2.32)	4.93 (2.33)	5.00 (2.34)	6.60 (2.66)	4.33 (2.20)	4.27 (2.18)	3.67 (2.04)	4.20 (2.17)
4	PA-739	2.33 (1.68)	2.93 (1.85)	3.67 (2.04)	3.73 (2.06)	3.47 (1.99)	3.13 (1.91)	2.73 (1.80)	2.00 (1.58)	1.00 (1.22)	2.78 (1.81)
5	NUPPC-7A	3.00 (1.87)	3.67 (2.04)	4.13 (2.15)	4.27 (2.18)	4.33 (2.20)	4.00 (2.12)	3.47 (1.99)	2.07 (1.60)	1.00 (1.22)	3.33 (1.96)
6	VLA 1 (ch)	3.67 (2.04)	4.33 (2.20)	4.87 (2.32)	5.27 (2.40)	5.30 (2.41)	5.13 (2.37)	4.67 (2.35)	4.00 (2.17)	0.67 (0.84)	4.21 (2.17)
7	AL 2481	3.87 (2.09)	4.67 (2.27)	4.87 (2.32)	4.93 (2.33)	4.73 (2.29)	4.60 (2.26)	4.33 (2.20)	4.27 (2.18)	3.67 (2.04)	4.44 (2.22)
8	PA 23-5	-	3.00 (1.87)	3.33 (1.96)	3.47 (1.99)	3.87 (2.09)	3.27 (1.94)	3.00 (1.76)	2.00 (1.52)	1.07 (1.30)	2.56 (1.75)
9	WRGE-171	5.87 (2.52)	6.33 (2.61)	6.47 (2.64)	6.87 (2.71)	7.27 (2.79)	7.33 (2.80)	6.67 (2.68)	6.87 (2.71)	5.40 (2.43)	6.56 (2.66)
10	AL 882	3.13 (1.90)	4.47 (2.23)	4.73 (2.29)	5.00 (2.35)	5.67 (2.51)	5.73 (2.39)	5.00 (2.35)	3.13 (1.87)	2.00 (1.58)	4.32 (2.19)
11	PAU 881	3.33 (1.82)	4.27 (2.17)	4.33 (2.20)	4.47 (2.26)	4.67 (2.39)	4.73 (2.30)	4.00 (2.20)	3.20 (1.97)	2.00 (1.52)	3.89 (2.09)
12	UPAS 120	-	5.33 (2.47)	5.53 (2.51)	5.73 (2.66)	5.87 (2.63)	5.93 (2.51)	5.60 (2.47)	5.00 (2.35)	3.87 (1.87)	4.76 (2.29)
	Sem±		0.04	0.04	0.03	0.04	0.05	0.05	0.06	0.06	0.03
	CD at 5%		0.12	0.12	0.10	0.12	0.14	0.14	0.16	0.17	0.10

Figures in parenthesis are √X+0.5 transformed value.

M. vitrata, varying numbers of webs were observed in different genotypes ranging from minimum of 2.56 webs /5 plants in PA 23-5 to maximum 6.56 webs/5 plants in WRGE-171 as compared to checks AL 882 (4.32 webs /5 plants), PAU 881 (3.89 webs /5 plants) and UPAS 120 (4.76 webs /5 plants), respectively. The result obtained in present investigation are in conformity with Sujayanand *et al*. (2021) who observed larval webbing per plant from 0.13 (JA 4) to 10.13 (MN 5).

Population of apion weevil, *Apion clavipes*

Apion weevil commenced during the 38th SW in all genotypes and remained active till the crop maturity. The maximum pest intensity was noticed during the pod setting and grain filling stage i.e from 43rd to 45th SW. The population gradually decreased during grain maturity (Table 4). Different peaks of apion population were observed from the 43st to 45rd standard week for all genotypes, with the highest count recorded in genotype WRGE-171 (20.33 / 5 plants) on 45th SMW. Although populations declined after reaching the peak, they remained relatively high, with the lowest count of 5.07 /5 plants observed in genotype PA 23-5 on 47th SW. These findings are in accordance with Nair *et al.* (2017) who observed *Apion clavipes* as the most important pest which was associated with the crop starting from seedling to harvesting stage. Worku *et al.* (2018) also reported that the incidence of adult apion was the least in seedling stage, and this increased gradually starting from early vegetative stage (0.77/ plant) to pod initiation stage (5.00/ plant) and the peak stage was attained during the early grain filling stage. Subsequently, the population declined to its lowest level during the maturity stage.

The overall mean of the grubs and adult popula-

Table 4. Screening of pigeonpea genotypes against population of *Apion clavipes* during 2023.

Treatments	Genotypes	No. of *Apion*/5 plants										
		38th SW	39th SW	40th SW	41st SW	42nd SW	43rd SW	44th SW	45th SW	46th SW	47th SW	Over all mean
1	PA 686	2.47	4.00	4.33	6.33	7.33	10.27	11.00	15.00	12.60	12.00	8.53
		(1.72)	(2.12)	(2.20)	(2.61)	(2.80)	(3.28)	(3.39)	(3.94)	(4.20)	(3.53)	(3.01)
2	AL 2371	1.33	3.00	3.67	5.67	10.00	12.33	15.00	12.00	11.27	10.00	8.43
		(1.35)	(1.87)	(2.04)	(2.48)	(3.24)	(3.58)	(3.94)	(3.54)	(3.76)	(3.23)	(2.99)
3	RKPV 1156	0.87	0.93	1.67	2.73	3.93	5.27	6.73	14.27	8.67	8.00	5.31
		(1.17)	(1.19)	(1.58)	(1.79)	(2.10)	(2.40)	(2.68)	(3.91)	(2.89)	(2.91)	(2.41)
4	PA-739	0.87	1.00	1.73	3.47	5.07	6.00	11.67	8.00	6.27	5.27	4.96
		(1.16)	(1.22)	(1.45)	(1.99)	(2.36)	(2.55)	(3.49)	(2.91)	(2.09)	(2.26)	(2.34)
5	NUPPC-7A	3.93	4.67	6.87	7.87	7.93	10.00	18.00	16.33	15.87	14.93	10.64
		(2.11)	(2.27)	(2.71)	(2.89)	(2.90)	(3.24)	(4.30)	(4.10)	(5.29)	(3.93)	(3.34)
6	VLA 1 (ch)	0.87	1.47	1.67	3.27	4.27	8.00	13.93	8.33	5.93	5.40	5.31
		(1.17)	(1.40)	(1.47)	(1.93)	(2.18)	(2.91)	(3.80)	(2.97)	(1.98)	(2.42)	(2.41)
7	AL 2481	1.40	1.93	3.33	6.47	7.00	16.13	9.33	9.13	8.47	7.53	7.07
		(1.38)	(1.56)	(1.96)	(2.64)	(2.74)	(4.08)	(3.13)	(3.10)	(2.82)	(2.83)	(2.75)
8	PA 23-5	0.27	1.13	2.00	3.13	4.07	10.20	7.00	6.47	5.87	5.07	4.52
		(0.87)	(1.28)	(1.58)	(1.90)	(2.14)	(3.27)	(2.73)	(2.63)	(2.51)	(2.35)	(2.24)
9	WRGE-171	4.13	4.93	5.67	7.47	8.53	9.73	11.67	20.33	10.00	10.60	9.31
		(2.15)	(2.33)	(2.48)	(2.82)	(3.00)	(3.20)	(3.49)	(4.56)	(3.33)	(3.33)	(3.13)
10	AL 882	1.47	2.00	1.93	4.53	4.73	5.93	9.07	15.27	9.60	5.13	5.97
		(1.40)	(1.58)	(1.56)	(2.24)	(2.28)	(2.54)	(3.09)	(3.97)	(3.18)	(2.37)	(2.54)
11	PAU 881	1.00	1.87	1.73	3.93	4.00	5.33	6.93	12.33	8.33	7.60	5.29
		(1.22)	(1.54)	(1.49)	(2.10)	(1.97)	(2.41)	(2.63)	(3.58)	(2.97)	(2.83)	(2.41)
12	UPAS 120	2.13	2.73	3.53	6.27	6.73	9.67	10.60	12.67	11.60	10.27	7.62
		(1.62)	(1.80)	(2.00)	(2.60)	(2.69)	(3.14)	(3.33)	(3.63)	(3.87)	(3.28)	(2.85)
	SE m±	0.05	0.07	0.07	0.08	0.07	0.07	0.08	0.07	0.10	0.10	
	CD at 5%	0.15	0.19	0.20	0.22	0.21	0.20	0.24	0.22	0.29	0.30	

Figures in parenthesis are $\sqrt{X+0.5}$ transformed value.

tion of *A. clavipes* showed varying numbers of apion in different genotypes ranging from 4.52/ 5 plants in PA 23-5 to 10.64/ 5 plants in NUPPC-7A as compared to checks AL 882 (5.97/ 5 plants), PAU 881 (5.29 / 5 plants) and UPAS 120 (7.62 /5 plants).

Extend of damage caused by major insect pest in pigeonpea genotypes

The observation on percent pod and grain damage was recorded at 80% crop maturity.

% pod damage by M. vitrata

The data presented in Table 5 showed the percent pod damage by *M. vitrata* ranging from 7.67% to 24.00% in different genotypes. Among the tested genotypes, the minimum pod damage was observed in PA-739 (7.67%) followed by NUPPC-7A (8.33%), VLA 1(ch) (10.00%), RKPV 1156 (12.67%) while maximum pod damage was observed in PA 686 (24.00%) followed by AL2371 (22.00%), WRGE-171 (21.00%), AL 2481(14.67%), PA 23-5 (13.33%) as compared to checks, AL 882 (11.00%), PAU 881(15.00%) and UPAS 120 (13.33%). Similar results are also reported by Divyasree *et al.* (2021) where it was found that pod damage due to *M. vitrata* varied from 4.67 to 22.67 %.

As shown in Table 5, out of 12 pigeonpea genotypes, PA-739 showed moderately resistant to *M. vitrata* damage with a damage rating of 4. NUPPC-7A was rated as tolerant with a rating of 5. VLA 1(ch) was found to be equal to check with a damage rating of 6 RKPV 1156 and PA 23-5 were found to be moderately susceptible with damage rating of 7 similar to check UPAS 120. AL 2481 and check PAU 881 were both found to be susceptible with a rating of 8. While three genotypes PA 686, AL 2371 and WRGE-171 was found to be highly susceptible with a rating of 9.

Table 5. Comparative performance showing percent pod damage in some pigeonpea genotypes against major insects pest during *kharif* 2023.

Sl. No.	Genotypes	Percent pod damage by *M. vitrata*	R/S rating	Percent pod damage by *A. clavipes*	R/S rating
1	PA 686	24.00 (29.33)	9	22.67 (28.42)	6
2	AL 2371	22.00 (27.92)	9	23.67 (29.08)	6
3	RKPV 1156	12.67 (20.64)	7	17.67 (24.84)	4
4	PA-739	7.67 (15.48)	4	25.33 (30.03)	6
5	NUPPC-7A	8.33 (16.58)	5	28.67 (32.36)	7
6	VLA 1 (ch)	10.00 (18.42)	6	15.33 (23.04)	4
7	AL 2481	14.67 (22.49)	8	24.67 (29.77)	6
8	PA 23-5	13.33 (21.26)	7	26.67 (31.05)	6
9	WRGE-171	21.00 (27.10)	9	32.33 (34.13)	8
10	AL 882	11.00 (19.28)	-	24.33 (29.53)	-
11	PAU 881	15.00 (22.73)	8	27.33 (31.44)	7
12	UPAS 120	13.33 (13.08)	7	24.67 (19.78)	6
	SEm ±	0.47		1.01	
	CD at 5%	1.38		2.96	

Figures in parenthesis are arc-sin transformed value.

% pod damage by A. clavipes

The data presented in Table 5 revealed that none of the genotypes were found free from the incidence of *A. clavipes*, with pod damage percent varying significantly from 15.33% in VLA 1(ch) to 32.33 % in WRGE-17, compared to 24.33%, 27.33% and 24.67% in checks, AL 882, PAU 881 and UPAS 120, respectively.

Based on the percent pod damage, the genotypes were classified on a scale of 1-9 for pest susceptibility/resistance rating (Table 5). Out of 12 pigeonpea genotypes, RKPV 1156 and VLA 1(ch) showed moderately resistant to *A. clavipes* damage with a damage rating of 4. PA 686, AL 2371, PA-739, AL 2481, PA 23-5 and UPAS-120 were found to be equal to check with a damage rating of 6. NUPPC-7A was found to be moderately susceptible with damage rating of 7 similar to check PAU 881. WRGE-171 was found to be susceptible with a rating of 8.

CONCLUSION

The study revealed significant variation in *Maruca vitrata* larval population, web formation, and apion incidence across pigeonpea genotypes, influencing pod and grain damage. Genotypes like PA 23-5 and PAU 881 (ch) showed tolerance to grain damage with high yields, while NUPPC-7A and VLA 1 (ch) exhibited moderate resistance to Maruca and Apion, respectively. In contrast, genotypes such as AL 2371 and WRGE-171 were highly susceptible, underscoring the need for effective pest management. Although PA 686 yielded well despite high susceptibility, combining pest resistance with yield potential remains essential. Integrating host plant resistance with strategic management practices can effectively manage pests and enhance crop outcomes. This study offers a sustainable and eco-friendly approach to reducing pesticide dependency. It also highlights the importance of breeding programs focused on developing resistant varieties and further research on pest interactions and resistance mechanisms.

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