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Field Reaction of Certain Pigeonpea (*Cajanus cajan* (L.) Millsp.) Genotypes to Gram Pod borer, *Helicoverpa armigera* (Hubner)

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ABSTRACT

Eight medium duration pigeonpea genotypes were screened for three years during *kharif* season of 2003, 2004 and 2005, to evaluate for their field reaction against *Helicoverpa armigera* (Hubner) at Agricultural Research Station, Warangal, Andhra Pradesh. Observations on mean oviposition, larval infestation and per cent pod damage due to *H. armigera* over three years were computed. The entry VRG-1 recorded significantly lowest oviposition (2.69 eggs plant^{-1}) followed by WRG-27 (5.15 eggs plant^{-1}), LRG-41 (5.67 eggs plant^{-1}). Significantly lowest larval load was found in VRG-1(1.31 larvae plant^{-1}), WRG-27 (1.45 larvae plant^{-1}) followed by LRG-41 (1.87 larvae plant^{-1}). Least pod damage of 7.80% was found in the entry LRG-41. The entries LRG-41, WRG-55 and WRG-27 gave higher yields of 2382, 2246 and 1808 kg ha^{-1} respectively and were superior to the check entries ICPL-332, ICPL-84060 and ICP-8863.

Key words : *Helicoverpa armigera*, Pigeonpea, Screening

Pigeonpea (*Cajanus cajan* (L.) Millsp.) is an important pulse crop grown mainly during rainy season in Andhra Pradesh, India. More than 150 insect species feed on this crop, of which gram pod borer, *Helicoverpa armigera* (Hubner) is the most damaging pest worldwide (Shanower *et al*., 1999). The pest can cause complete crop loss (Reed and Lateef, 1990). Since pigeonpea is grown mostly under subsistence farming, use of resistant varieties against pod borer is a cheap, economical alternative either alone or in combination with other methods of insect pest management. Therefore, identification of cultivars resistant/tolerant to *H. armigera* is of much value in crops like pigeonpea. Screening of more than 14000 pigeonpea accessions has revealed very low levels of resistance to *H. armigera* (Reed and Lateef, 1990). Several lines of pigeonpea such as ICPL-7703, ICPL-332, ICPL-87088, ICPL-84060 and ICPL-87089 with low to moderate levels of resistance have been identified (Lateef, 1992; Sachan, 1992). Information on resistance to *H. armigera* in certain newly developed cultures is not available. Keeping this in view, the present study was conducted to evaluate certain pigeonpea genotypes for their level of field resistance to *H. armigera*.

MATERIAL AND METHODS

The experiment was conducted at Agricultural Research Station, Warangal, Andhra Pradesh during *kharif* season of 2003, 2004 and 2005. Eight medium duration pigeonpea genotypes and three checks (ICPL-332, ICPL-84060 and ICP-8863) were evaluated for their relative resistance to pod borer. Entries including checks were sown in randomized block design with three replications. Each entry was sown in plot size of 3.6 x 4 mts at inter row spacing of 90 cm and intra row spacing of 20 cm. The soil was clay loam in texture. The crop was grown following all recommended agronomic practices. However, no plant protection measures were taken up. The incidence of pod borer started from flowering and continued up to maturity of pods. Observations on oviposition and larval population were taken during peak insect infestation on five randomly selected plants in each entry. Pod damage by *H. armigera* was assessed by collecting total pods from five randomly selected plants in each entry at maturity. Pod borer damage was quantified by expressing number of damaged pods as per cent of total pods. The per cent pod damage was transformed to Arcsine values for statistical analysis. Seed yield for each plot was calculated as plot yield and hectare yield was computed from this.

Table 1. Oviposition and larval population of *Helicoverpa armigera* in certain pigeonpea genotypes.

Entry	Number of eggs plant^{-1}				Number of larvae plant^{-1}			
	2003	2004	2005	Mean	2003	2004	2005	Mean
WRG-27	4.93	2.07	8.47	5.15	2.60	1.53	0.20	1.45
WRG-55	6.20	1.33	10.00	5.85	4.20	1.47	0.20	1.96
VRG-1	2.93	1.20	3.93	2.69	1.20	2.27	0.47	1.31
LRG-41	5.20	2.07	9.73	5.67	2.60	2.40	0.60	1.87
JKM-205	17.00	5.47	8.60	10.35	2.33	5.73	0.73	2.93
JKM-207	13.67	2.80	9.00	8.49	3.73	4.13	0.33	2.73
JKM-211	14.67	5.00	8.73	9.47	3.87	2.00	0.47	2.11
JKM-219	16.67	5.93	10.47	11.02	3.87	4.20	0.80	2.96
ICPL-332 (c)	13.00	3.07	8.53	8.20	3.33	1.87	0.93	2.04
ICPL-84060 (c)	16.67	2.00	10.60	9.76	2.07	2.33	0.60	1.67
ICP-8863 (c)	15.27	2.80	10.80	9.62	2.67	1.80	0.60	1.69
SEm±	0.93	0.39	0.66	0.28	0.41	0.31	0.13	0.19
CD (5%)	1.95	0.82	1.37	0.59	0.86	0.65	0.27	0.41
CV (%)	9.96	15.63	8.96	4.43	17.22	14.06	28.94	11.60

Table 2. Per cent pod damage due to *Helicoverpa armigera* and yield obtained in certain pigeonpea genotypes.

Entry	Per cent pod damage				Yield (kg ha^{-1})			
	2003	2004	2005	Mean	2003	2004	2005	Mean
WRG-27	7.98 (16.37)	13.47 (21.41)	5.08 (13.00)	8.84 (17.22)	1893	1139	2391	1808
WRG-55	7.38 (15.76)	19.80 (26.39)	5.45 (13.50)	10.88 (19.26)	3055	1484	2198	2246
VRG-1	6.53 (14.75)	30.05 (33.23)	7.03 (14.70)	14.53 (22.41)	351	241	402	331
LRG-41	5.88 (14.03)	12.70 (20.83)	4.83 (12.68)	7.80 (16.21)	2850	1875	2421	2382
JKM-205	9.50 (17.95)	13.50 (21.43)	6.88 (15.10)	9.96 (18.37)	830	589	1572	997
JKM-207	7.81 (16.20)	14.73 (22.19)	5.52 (13.56)	9.35 (17.69)	1062	934	1161	1052
JKM-211	13.09 (21.14)	15.51 (23.10)	7.14 (15.49)	11.91 (20.18)	1243	625	1252	1040
JKM-219	6.88 (15.20)	15.48 (23.11)	6.03 (14.17)	9.46 (17.91)	1055	1065	1333	1151
ICPL-332 (c)	7.15 (15.48)	17.83 (24.94)	5.36 (13.31)	10.00 (18.52)	1144	940	1631	1238
ICPL-84060 (c)	11.24 (19.55)	16.98 (24.32)	7.65 (16.05)	11.96 (20.22)	682	509	1292	828
ICP-8863 (c)	16.46 (23.91)	14.94 (22.74)	7.92 (16.29)	13.11 (21.22)	952	448	1119	839
SEm±	(1.18)	(2.19)	(1.16)	(1.06)	167	212	109	90.1
CD (5%)	(2.46)	(4.57)	(2.41)	(2.22)	347	443	228	188
CV (%)	(8.35)	(11.18)	(9.86)	(6.84)	14.84	29.04	8.78	8.72

The values in parentheses are Arc sine transformed values.

Table 3. Number of healthy and total pods in certain pigeonpea genotypes.

Entry	Number of healthy pods plant^{-1}				Number of total pods plant^{-1}			
	2003	2004	2005	Mean	2003	2004	2005	Mean
WRG-27	265	186	305	252	285	216	322	274
WRG-55	236	279	241	252	255	353	255	288
VRG-1	76	27	127	77	81	39	137	86
LRG-41	251	201	294	248	267	229	309	268
JKM-205	201	284	188	224	215	323	201	246
JKM-207	194	159	208	187	209	188	220	206
JKM-211	255	167	188	203	298	196	203	232
JKM-219	227	234	216	225	244	274	230	249
ICPL-332 (c)	251	225	222	233	269	282	234	262
ICPL-84060 (c)	191	237	178	202	215	292	193	233
ICP-8863 (c)	161	128	178	156	193	150	193	179

RESULTS AND DISCUSSION

The data on oviposition, larval infestation of gram pod borer in different entries is presented in Table 1. Among the three checks of pigeonpea, ICPL-332 recorded least oviposition during 2003, 2005 while ICPL-84060 recorded lowest number of eggs during 2004. Mean oviposition over 3 years confirmed that ICPL-332 had significantly low oviposition than ICPL-84060 and ICP-8863 while these two checks recorded low larval population consistently during all the three years. ICPL-332 recorded low larval population equivalent to ICP-8863 in 2004.

The reaction of eight test entries to *Helicoverpa* oviposition and larval infestation was variable during the three years. The entry VRG-1 consistently recorded least oviposition by *Helicoverpa* during 2003, 2004 and 2005 among all the test entries including checks and was found to be better than the resistant check ICPL-332, by being less preferred for oviposition. The entries WRG-27, LRG-41, WRG-55 recorded mean oviposition of 5.15-5.85 eggs/plant, significantly higher than VRG-1 but superior to all other entries including checks.

The entry VRG-1 recorded lowest number of larvae plant^{-1} (1.2) during 2003 while WRG-55 and WRG-27 have recorded lowest larvae of 1.47 and 1.53 per plant, respectively, during the year 2004 and 0.2 larvae per plant during the year 2005. Mean larval population of three years revealed significantly lowest larval load in VRG-1(1.31), WRG-27 (1.45), followed by LRG-41 (1.87), which were equivalent to the checks ICPL-84060 (1.67) and ICP-8863 (1.69) in sustaining similar larval infestation.

Level of pod damage and yield obtained (Table 2) indicated that the resistant check, ICPL-332 recorded mean pod borer damage of 10% during the experimental period, which was equivalent to ICPL-84060 (11.96%) and was significantly lower than other check ICP-8863 (13.11%). ICPL-332 gave significantly higher yield of 1238 kg ha^{-1} than the other two checks.

Mean pod damage due to *H. armigera* indicated lowest damage of 7.80% in LRG-41. Even the performance of WRG-27, JKM-207, JKM-205 and JKM-219 was similar to LRG-41 and these entries recorded significantly lower damage level than the three checks. Significantly higher yield was obtained in the entries WRG-55 and LRG-41 in all the three years of testing and recorded mean grain yield of 2382 and 2246 kg ha^{-1}, respectively. The entry WRG-27 produced mean grain yield of 1808 kg ha^{-1} and was next best to LRG-41 and WRG-55. Sharma et al. (2005) expressed that search for genotypes with recovery resistance through their ability to have more pods and recover from initial damage would be more rewarding since it is almost impossible to get high level of resistance against *H.armigera* in any legume crop. In the present study, total number of pods and healthy pods plant^{-1} were

comparatively lesser in JKM 205, JKM 207, JKM 219 than WRG-55, WRG-27, LRG-41 (Table 3). Thus, higher yields in the local cultures WRG-55, LRG-41, WRG-27 inspite of sustaining pod damage equivalent to that in JKM-205, JKM-207, JKM-219 could be due to existence of tolerance mechanism *i.e.,* recovery resistance in these entries.

The entry VRG-1, though recorded lower oviposition and larval damage, pod damage was not consistent over years and also gave significantly lowest mean seed yield of 331 kg ha^{-1}. Though the entry WRG-55 showed variable reaction of oviposition, larval infestation and pod damage by *Helicoverpa,* it gave consistently superior yields during all the three years. The performance of local cultures WRG-27 and LRG-41 was more consistent in terms of all the parameters of pest infestation and also yield.

The result would be useful to the farmers to choose the locally adaptable entries viz., LRG-41 and WRG-55 with bollworm resistance/ tolerance without compromising the yield.

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