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Research Paper

YIELD ATTRIBUTES AND THEIR INFLUENCE ON POD BORERS IN PIGEONPEA (*CAJANUS CAJAN*) (L.) MILLSP.]

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Abstract

Studies conducted on the influence of different yield attributes of pigeonpea genotypes on podfly incidence revealed that pod length, number of seeds damaged per pod and test weight showed a non-significant positive correlation with pod damage due to podfly, *Melanagromyza obtusa.* However, a negative and non-significant correlation was observed with number of seeds per pod with r = -0.120 suggesting that the genotypes having bolder seeds with high test weight were more prone to the damage by podfly, *M. obtusa.* Further, concluded that the genotypes which recorded lowest pod damage relatively showed high seed yield per plant. However, some genotypes recorded higher grain yield even though they had high infestation.

Key words: Pigeonpea, pod and seed characters, *H. armigera*, *M. vitrata*, *M. obtusa*.

INTRODUCTION

Pigeonpea is the most versatile food legume with diversified uses as food, feed, fodder and fuel. The productivity of pigeonpea is low in India as a whole due to many factors. More than 300 insect species have been reported infesting the crop. The attack by insect pests particularly pod borers those that attack reproductive structures, including buds, flowers and pods such as gram pod borer (*Helicoverpa armigera,* Hubner), spotted pod borer (*Maruca vitrata,* Gayer) and podfly (*Melanagromyza obtusa,* Malloch) are of great significance (Lateef and Reed, 1990). Though pod borer complex can be controlled by application of insecticides having new mode of action but the cost involved is very high. A genotype possessing inbuilt resistance to the pest will be preferred to its manifold advantages like, low input cost, avoidance of pesticide cost besides eliminating residue problems and environmental pollution so that promising genotypes could further be used in breeding programme for development of resistant varieties. Hence an experiment was conducted to screen 49 genotypes for their resistance or tolerance to pod borers.

MATERIAL AND METHODS

The experiment was conducted at Regional Agricultural Research Station, Lam, Guntur, Andhra Pradesh during *Kharif,* 2011 in a Randomized block design with 49 genotypes replicated twice. Each germplasm accession was accommodated in two rows each of 4 m length. After receipt of sufficient rains, sowing was taken up by adopting 1.8 m x 0.2 m spacing between rows and plants, respectively. The seeds were sown with the help of gorru. Thinning was done at 25 days after sowing to maintain uniform population. Recommended fertilizer dosage of 20 kg N and 50 kg P_2O_5 per ha was adopted. At the time of harvest five plants in each genotype were tagged for recording the observations on the following yield attributes and the average values were subjected to statistical analysis.

Pod length (cm)

The length of fully developed pods was measured from the base of the pod to the tip by using scale at harvest. Pods were categorized as small (4 cm), medium (4-5 cm) and large (>5 cm) based on length of pods.

Number of seeds per pod

The average number of seeds in ten fully developed, mature, undamaged pods was taken at random from each selected plant.

Test weight (g)

A random sample of hundred well-developed, healthy, clean, whole dried seeds was taken and weighed for obtaining the test weight for each genotype.

Size of the seed

Based on the test weight, the seeds are classified as small (<7 g/100 seed weight), medium (7-9 g/100 seed weight) and large (9-11 g/100 seed weight) and very large (>11 g/100 seed weight).

Pod yield (g)

From each selected plant dry pods were harvested and their weights were recorded after thorough sun drying.

Seed yield (g)

From each selected plant dry pods were harvested and threshed separately. Grain weights were recorded after thorough sun drying.

RESULTS AND DISCUSSION

The results obtained on yield attributes and their influence on pod borers in pigeonpea were presented in Table 1.

Pod length. The pod length of different genotypes ranged between 5.2 cm (WRG 51) to 7.3 cm (ICP 7035 with 6.3 cm mean pod length. Pod length showed a non-significant positive correlation with pod damage by *M. obtusa* (r = 0.188). This may be due to the fact that relatively long pods harbour more number of maggots and thereby more pod damage. The present study was in accordance with Thakur *et al.* (1989) but, the results were in contrary to Durairaj (1999), where the pod fly damage exerted negative association with pod length. However, Dhakla *et al*. (2010) reported that there was no significant relation between pod length and pod fly susceptibility.

Number of seeds per pod. The average number of seeds per pod of different genotypes was 4.1. It ranged from 3.6 (BSMR 853, SM 18, WRG 51, LRG 103) to 4.8 (2011-7). The genotypes showed wide variation in number of seeds per pod. The relationship between number of seeds per pod and the damage due to podfly showed a non-significant negative correlation with r = -0.120. It indicates that pods with more number of seeds suffered less damage due to podfly. The results were in agreement with findings of Durairaj (1999) who showed that the genotypes having more number of grains per pod had less pod damage.

Test weight. The test weight of different genotypes varied from 8.5 (BWR 376) to 14.9 g (2011-5) with a mean of 11.4 g. Correlation studies between test weight and pod damage due to podfly resulted a non-significant positive relationship (r = 0.268) suggesting that the genotypes having bolder seeds with high test weight were more prone to the damage by podfly, *M. obtusa.* The findings were in agreement with Lal *et al.* (1988), Reddy *et al*. (1990), Durairaj (1999) and Minja *et al.* (1999) who reported that the pigeonpea cultivars with bolder seeds suffered more damage than the small seeded ones due to podfly *i.e*., positive correlation with test weight.

Size of the seed. Based on the test weight, the seeds are classified as small (<7 g/100 seed weight), medium (7-9 g/100 seed weight) and large (9-11 g/100 seed weight) and very large (>11 g/100 seed weight).

Pod yield. Maximum pod weight per plant was recorded in ICPL-84060 (575.5 g) per plant followed by WRG-114 (522.3 g), SM-97 (512.7 g), ICPL-98008 (477.9 g) and SM-146 (477.8 g).

Minimum pod weight was observed in ENT-11 (123.0 g) the next were PEG-45-2 (162.4 g), JSA-72-3 (162.6 g), ICP-7035 (167.5 g) and ICPL-96058 (172.9 g).

Seed yield. The observations recorded on seed weight per plant in each genotype revealed that the average seed weight was 208.4 g per plant. The yield of different genotypes ranged between 82.4 to 354.8 g per plant. ICPL-98008 recorded highest grain weight per plant (354.8 g) followed by ICPL-84060, SM-18, SM-97, MAL-19 and ICP-13198 with 331.8 g, 330.4 g, 326.2 g, 312.5 g and 300.8 g per plant, respectively. The lowest grain weight was observed in ENT-11 (82.4 g), comes behind were JSA-72-3 (116.1 g), PEG-45-2 (117.3 g), ICP-7035 (122.8 g) and ICPL-96058 (125.1 g).

The genotypes which recorded lowest pod damage relatively showed high seed yield per plant. Anantharaju and Muthiah (2008) reported that the higher grain yield has been recorded in LRG 41 and hybrid LRG 41 × ICPL 87119 with lowest yield loss against *H. armigera.* However, some genotypes recorded higher grain yield even though they had high infestation. It was in conformity with the findings of Chandraka *et al*. (1981) and Patel and Patel (1990) who reported that the grain yield of GAUT 82-90 and GAUT 83-17 were significantly higher even though they had relatively high infestation of *H. armigera* and pod fly.

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Table 1. Yield attributes of different pigeonpea genotypes and their influence on pod borers

S.No	Genotype	Pod length (cm)	No of pods/plant	Pod yield /plant (g)	No of seeds/pod	Test weight (g)	Grain yield / plant (g)	Per cent pod damage due to		
								H. armigera	***M. vitrata***	***M. obtusa***
1	ICPL-909	4.4	751	280.4	3.6	12.5	190.0	16.4(23.9)	10.8(19.2)	30.8(33.7)
2	ICPHaRL 4979-2	5.0	686	238.6	3.9	10.5	166.9	4.0(11.5)	17.6(24.8)	9.3(17.7)

3	ICP-7035	5.0	400	167.5	4.1	15.3	122.8	3.0(9.8)	4.9(12.8)	8.8(17.2)
4	ICPL-84060	5.1	786	575.5	3.8	11.8	331.8	5.6(13.6)	23.3(28.8)	23.9(29.3)
5	ICPHaRL 4985-4	6.1	735	377.9	3.8	12.9	260.9	21.3(27.3)	13.1(21.0)	19.4(26.1)
6	ICP-10531	4.7	726	367.3	3.5	9.7	233.1	6.7(15.0)	20.1(26.6)	12.2(20.4)
7	ICPHaRL4985-11	5.1	693	360.5	3.7	11.5	235.0	5.7(13.7)	26.9(31.3)	18.8(25.3)
8	ENT-11	8.3	372	123.0	4.5	14.5	82.4	12.5(20.7)	6.7(15.0)	38.6(38.4)
9	ICPL-77303	4.9	614	370.8	3.8	7.6	237.9	8.1(16.5)	9.4(17.8)	13.5(21.4)
10	ICPL-332WR	5.1	574	255.5	3.8	12.3	140.3	7.8(16.1)	11.4(19.7)	17.7(24.5)
11	ICPL-87119	4.8	606	228.1	3.8	13.3	140.6	4.4(11.7)	12.2(20.4)	15.0(22.7)
12	ICP-8863	5.1	658	261.5	3.9	10.6	160.0	6.4(14.7)	8.6(17.0)	28.9(32.6)
13	JSA-72-3	4.9	431	162.6	3.6	13.7	116.1	20.9(27.2)	5.2(13.1)	23.6(29.1)
14	SM-1	5.0	340	248.9	3.5	9.9	219.7	5.5(13.5)	10.2(18.5)	16.9(24.3)
15	BWR-376	4.6	639	388.5	3.6	11.2	294.0	8.0(16.3)	3.3(10.5)	12.9(20.9)
16	PEG-45-2	5.6	289	162.4	4.7	9.0	117.4	10.2(18.6)	6.2(14.3)	21.5(27.7)
17	ICPHaRL-4978-5	4.9	480	305.3	3.7	11.2	196.1	18.1(25.1)	15.1(22.9)	9.6(18.0)
18	ICPL-87089	5.8	488	350.5	3.7	12.3	222.7	10.5(18.7)	14.0(22.0)	19.5(25.9)
19	ICPL-20036	4.7	688	212.9	3.7	11.5	150.0	6.7(14.9)	31.6(34.2)	24.2(28.8)
20	LRG-41	4.7	538	387.5	3.4	12.7	267.3	7.5(15.9)	9.3(17.8)	16.7(24.1)
21	ICPHaRL 4985-1	6.0	585	300.7	4.2	9.9	187.5	12.8(20.9)	8.4(16.8)	26.6 (31.1)
22	ICPL-98008	4.5	760	477.9	3.6	9.0	354.8	5.3(13.3)	13.2(21.2)	24.3(28.8)
23	ICPL-85063	4.7	710	352.3	3.6	10.5	231.5	14.4(22.3)	27.6(31.7)	27.9(31.9)
24	ICP-13198	5.6	716	437.5	3.8	11.4	300.8	4.9(12.7)	11.2(19.4)	25.3(30.1)
25	ICPHaRL-4989-7	5.1	494	187.5	3.6	9.6	127.5	9.34(17.8)	10.8(19.2)	13.6(21.6)
26	SM-13	5.3	486	410.3	3.8	12.3	252.0	23.8(29.2)	12.3(20.5)	9.9(18.3)
27	SM-146	5.3	670	477.8	3.8	9.7	263.9	10.5(18.9)	15.8(23.4)	14.7(22.5)
28	WRG-114	6.0	996	522.3	3.8	10.9	275.0	13.3(21.4)	11.7(20.0)	27.1(31.4)
29	WRG-53	5.3	799	252.5	3.5	10.4	172.5	9.9(18.3)	10.5(18.9)	24.7(29.7)
30	SM-108	5.7	635	376.6	4.1	12.5	238.7	12.6(20.8)	17.8(24.9)	21.7(27.8)
31	SM-9	5.5	719	275.8	4.0	10.7	206.3	21.2(27.4)	24.7(29.8)	18.9(25.8)
32	SM-97	5.9	648	512.7	4.2	9.8	326.2	11.2(19.5)	7.7(16.1)	14.8(22.7)
33	CORG-9701	4.8	500	306.7	3.9	8.3	184.6	4.1(11.6)	5.7(13.7)	6.1(14.2)
34	JKM-144	5.5	258	187.4	3.6	10.8	160.7	10.3(18.6)	12.6(20.8)	8.3(16.7)
35	SM-144	5.7	503	462.1	4.3	11.0	252.3	5.1(13.0)	16.3(23.8)	19.4(26.2)
36	WRG -5	4.9	637	300.1	3.8	9.1	187.5	6.9(15.1)	25.6(30.4)	15.9(23.5)
37	SM -18	5.0	976	471.6	3.9	10.2	330.4	11.6(19.9)	14.2(22.0)	26.4(30.9)
38	SM- 30	4.7	725	375.1	3.5	12.7	236.9	5.5(13.5)	6.7(14.8)	21.5(27.6)
39	MAHANANDI-1	5.1	385	226.1	3.7	9.9	140.6	11.2(19.5)	3.9 (11.4)	8.6(17.1)
40	MAL 19	6.2	778	462.1	4.0	9.8	312.5	14.9(22.7)	13.5(21.5)	18.0(25.0)

41	WRG -150	5.2	788	212.0	3.7	11.5	147.1	17.2(24.5)	17.3(24.6)	17.2(24.4)
42	CHILAKA- 1	5.4	836	362.	4.1	9.0	285.9	21.2(27.2)	14.1(22.0)	34.6(36.0)
43	ICPL 322	5.7	486	200.2	4.2	10.0	130.0	16.2(23.7)	22.8(28.5)	9.4(17.8)
44	MAHANANDI-2	6.0	701	300.5	3.9	13.2	190.5	18.0(25.0)	13.4(21.4)	15.4(23.1)
45	ICPL- 96058	5.3	465	172.9	3.4	9.2	125.1	28.1(32.0)	20.9(27.2)	7.4(15.8)
46	WRG-51	6.3	685	175.8	3.6	10.7	140.0	27.2(31.4)	25.2(30.1)	15.4(23.1)
47	WRG-47	5.8	393	320.3	3.7	9.3	162.5	4.7(12.5)	8.9 (17.3)	30.9(33.8)
48	SM-5	4.9	620	187.5	3.9	11.3	141.7	9.9(18.3)	28.3(32.2)	20.7(26.9)
49	SM-67	5.3	681	325.0	4.0	9.8	262.5	7.9(16.3)	25.5(30.3)	25.5(30.3)
	Mean	5.3	615	315.5	3.8	10.9	208.4	--	--	--
	F-test	--	--	Sig.	--	--	Sig.	Sig.	Sig.	Sig.
	Sem±	0.2	34.8	22.6	1.7	1.8	28.7	1.7	1.6	2.6
	CD(P=0.05)	0.6	98.8	64.1	4.9	5.2	81.6	4.8	4.5	7.3
	C.V (%)	5.4	8.0	10.1	3.7	12.4	19.5	12.6	10.2	14.4

Figures in parenthesis are arc sin percentage transformed values.