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RESEARCH ARTICLE

Screening of soybean varieties against girdle beetle and other pests

■ HARISH KUMAR NETAM*[1] AND SUJEET SINGH KANWAR[2]

[1]Department of Entomology, Indira Gandhi Krishi Vishwavidyalaya, RAIPUR (C.G.) INDIA
[2]Department of Genetics and Plant Breeding, Indira Gandhi Krishi Vishwavidyalaya, RAIPUR (C.G.) INDIA

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*Corresponding author:
harish.netam15@gmail.com

ABSTRACT

The experiment was conducted on Randomized Block Design in entomology field with plot size of 1m x 5m, row to row spacing 30 cm, replicated three times and date of sowing of this crop 5th july 2010. Total numbers of girdle beetle affected plants were recorded in each plot at ten days interval. In a screening trial with 12 genotypes including three check varieties, girdle beetle infestation ranged from 1.7 damaged plants in L129, H_2 P_2 and F5 02-2 Sel-3 to 3.7 damaged plants per meter row in genotype G_4 P_{15}. L129 with 3.1 larvae per meter row was least infested by lepidopterous pests and F_1 P_{21} with 5.3 larval/meter row was most damaged by caterpillar pests.Similary, genotype L129 with 2.8 insects/plant was least preferred and F_4 P_{20} with 3.7 sucking pests/ plant was most preferred by white flies and jassids. Based on overall pest incidence, genotype L129 with least number of girdle beetle damaged plants and lepidopterous larvae per meter row and minimum density of sucking pests per plant was least preferred by these insects recording 31.1 q/ha grain yield.

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INTRODUCTION

Soybean is a wonder crop of twentieth century. It is an excellent source of protein and oil. It is a two dimensional crop as it contains about 40-42 per cent high quality protein and 20-22 per cent oil. It also contains 20-30 per cent carbohydrates. The protein quality of soybean is equivalent to that of meat, milk products and eggs. Hence, it is well established fact that soybean is cheap source of protein and edible oil. These characteristics have made soybean to fit well in sustainable agriculture. During the late sixties and early seventies, the soybean crop was considered to be comparatively safe crop as regards to insect pest attack. However, Gangrade (1976) reported over 99 insect species attacking soybean crop at Jabalpur.but now the situation has changed and as many as 275 insect species have been recorded attacking soybean crop in India. Researchers in many parts of India have confirmed that seed yield and seed quality are being adversely affected by major insect pests *viz.,* girdle beetle, tobacco caterpillar, green semilooper, *Helicoverpa armigera*, jassids and white fly.

MATERIALS AND METHODS

Twelve advanced genotypes of soybean were screened against girdle beetle and other pests under randomized block design in which plot size was 1m x 5m, row to row spacing 30 cm, replicated three times. The crop was sown on 5th July 2010 to evaluate the incidence of girdle beetle and other pests during *Kharif* season. Screening of nine genotypes of soybean along with three check entries, was carried out in randomized block design with plot size of 1m x 5m, row to row spacing 30 cm, replicated three times The entries were sown on 4th July, 2010.

Observations recorded :

The observations were taken at ten days interval by counting the total numbers of plants and number of plants

infested by girdle beetle and other major pests from randomly selected one meter row lengths in each plot. The observations were initiated with first appearance of girdle beetle on the crop. The varieties screened are listed in Table A.

Stastical analysis :

The data on girdle beetle infested plants were converted into percentage infestation.The data so obtained were subjected to arc sine transformation for statistical analysis. Using the formula $\sqrt{X} = \sin^{-1} P$, where, X = transformed value and P = percentage data. This transformed data were then analyzed by the method of analysis of variance as described by Gomez and Gomez (1984). The "F" test was used at 5 per cent level of significance. Critical difference (CD) values were analyzed at 5 per cent level of significance. The skeleton of analysis of variance and formula used for various estimations are given in Table B.

The following formulae were used for standard error, critical difference and co-efficient of variance estimations :

$$\text{(a) S.E.}\pm = \sqrt{\frac{EMS}{R}}$$

$$\text{(b) C. D.} = \sqrt{\frac{EMS}{R}} \times t_{11}\ \text{(D.F. at 5\%)}$$

$$\text{(c) C.V. (\%)} = \sqrt{\frac{EMS}{R}} \times 100$$

where,

R = Number of Replications, D.F = Degrees of freedom
T = Number of Treatments, S.S. = Sum of square
C.D. = Critical difference, C.V. = Coefficient of variance
M.S.S. = Mean sum of square, EMS = Error mean square
S.E.± = Standard error of means, GM= General mean
t = error degree of freedom at 5% level of significance

RESULTS AND DISCUSSION

A trial was conducted during *Kharif,* 2010 to screen nine genotypes of soybean against girdle beetle and other major insect pests with three zonal checks. The genotypes were sown in Randomized Block Design with plot size 1m X 5m, row to row spacing 30 cm, replicated three times. The trial was sown on 4th July 2010. Total number of plants and number of plants infested by girdle beetle, number of lepidopterous caterpillars per meter row length and mean population of sucking pests per plant were recorded at ten days interval.

Based on the data (Table 1) recorded for girdle beetle infestation, the number of girdle beetle damaged plants/meter row ranged from 1.70 to 3.70. Minimum incidence of girdle beetle (1.7 damaged plants/meter row) was observed on three genotypes *viz.*, F_5 02-2 sel-3, H_2P_2 and L129. It was followed F_4P_{21} and H_5P_{19} each with 2.3 damaged plants/ meter row. Genotype G_4P_{15} with 3.7 damaged plants/meter row was most damaged by girdle beetle as against 2.3 to 2.7 damaged plants per meter row in check varieties.

Table A : List of soybean varieties for screening against girdle beetle

Sr. No.	Treatment no.	Varieties
1.	V_1	F_1P_{21}
2.	V_2	F_4P_{20}
3.	V_3	F_4P_{21}
4.	V_4	FS 02-2 sel.3
5.	V_5	G_4P_{15}
6.	V_6	H_2P_5
7.	V_7	H_2P_2,
8.	V_8	H_5P_{19}
9.	V_9	L_{129},
10.	V_{10}	Check 1* Bragg
11.	V_{11}	V_{11} - Check 2* RKS-18
12.	V_{12}	V_{12} -Check 3* JS-97-52

Table B : The skeleton of the analysis of variance

Source of variation	DF	SS	MSS	F cal	F tab	S.E.±	C.D. 5%
Replication (R)	(R-1)=2						
Treatment (T)	(T-1)= 11						
Error	(R-1)(T-1)=22						
Total	RT-1= 35						

Table 1 : Incidence of major insect pests on promising genotypes of soybean and grain yield during *kharif*, 2010

Sr.No.	Genotype	Incidence/ meter row length: No. of plants damaged by *Obereopsis brevis*	No. of larvae: *Spodoptera litura*	No. of larvae: *Chrysodecxis acuta*	Total	Mean population/ plant: *Bemisia tabaci*	Mean population/ plant: *Empoasca kerri*	Grain yield Q/ha.
1.	F_1P_{21}	3.3	3.1	2.2	5.3	2.4	1.1	28.9
2.	F_4P_{20}	2.7	3.0	1.6	4.6	2.5	1.2	31.1
3.	F_4P_{21}	2.3	3.3	1.8	5.1	2.5	0.8	35.5
4.	F_5 02-2 Sel-3	1.7	2.3	1.0	3.3	2.2	1.0	35.5
5.	G_4P_{15}	3.7	3.4	1.7	5.1	2.6	1.0	28.9
6.	H_2P_5	2.7	2.8	1.3	4.1	2.5	1.1	31.1
7.	H_2P_2	1.7	2.6	1.6	4.2	2.1	0.9	37.8
8.	H_5P_{19}	2.3	2.4	1.8	4.2	2.2	1.0	31.1
9.	L 129	1.7	1.9	1.2	3.1	2.1	0.7	31.1
Zonal checks								
10.	Bragg	2.7	3.2	2.0	5.2	2.5	1.3	37.8
11.	RKS-18	2.3	3.0	1.9	4.9	2.5	1.2	24.4
12.	JS-97-52	2.3	3.0	2.0	5.0	2.7	1.1	28.9

The same genotypes were screened for resistance against major caterpillar pests, tobacco caterpillar (*Spodoptera litura)* and semilooper (*Chrysodecxis acuta)*. Among the different genotypes, L129 with 1.9 larvae per meter row was least preferred by *Spodoptera litura.* It was followed by F5 02-2 sel-03 and H_5P_{19} with 2.3 and 2.4 larvae per meter row, respectively. Genotype G_4P_{15} with 3.4 larvae/meter row was most attacked by tobacco caterpillar, among the test entries. Genotype F5 02-2 sel-03 with 1.0 larvae per meter row was least attacked by green semilooper (*C. acuta*). It was followed by H_2P_5, H_4P_{20}, H_2P_2 with 1.3, 1.6 and 1.6 larvae per meter row, respectively. Genotype F_1P_{21} with 2.2 larvae per meter row was most attacked by the semilooper. It was followed by L129, H_5 P_{19} and P_4 P_{21} with 1.9,1.8 and 1.8 larvae per meter row, respectively, as against 1.9 to 2.0 larvae per meter row in check varieties.

Based on total lepidopterous larval infestation, genotype F_1P_{21} with 5.3 larvae per meter row was most attacked as against 4.9 to 5.2 larvae per meter row in check entries. Genotype L129 with 3.1 larvae per meter row was least preferred by the lepidopterous pests and it was followed by F5 02-2 sel-3 with 3.3 larvae per meter row.

Among the sucking pests, the incidence of whitefly was comparatively higher than that of jassids. The incidence of whiteflies ranged from 2.1 whiteflies per plant on H_2P_2 and L129 to 2.6 whiteflies per plant on genotype G_4P_{15} as against 2.5 and 2.7 whiteflies per plant in check entries. Similarly, the jassid incidence ranged from 0.7 to 1.2 jassids per plant on the test entries.

Genotype L129 with least jassid infestation (0.7 per plant) was least preffered by the jassids, whereas, F_4 P_{20} with 1.2 jassids per plant was most attacked as against 1.1 to 1.3 jassids per plant on the check entries.

Based on overall pest incidence, genotype L129 with least number of girdle beetle damaged plants per meter row(1.7), least number of lepidopterous caterpillars per meter row (3.1) and least number of whitefly (2.1) and jassids (0.7) per plant was least preferred by these insect pests.

The grain yield among different test genotypes ranged from 35.5 to 28.9 q/ha as against 24.4 to 37.8 q/ha yield in check entries. The highest yield of 35.5 q/ha was recorded with genotypes F_4 P_{21} and F_5 02-2 Sel-03 as against 31.1 q/ha yield in L129, the most resistant genotype against all the insects.

The Directorate of Soybean Research reported that out of 54 genotypes of soybean evaluated against major pests, JS-97-52 had 2.22 girdle beetle damaged plants at Kota and 2.24 and 2.81 girdle beetle damaged plants per meter row in variety JS-97-52 and Bragg at Amravati (DSR, 2006; DSR, 2007). This is almost similar to the present finding with 2.3 and 2.7 girdle beetle infested plants per meter row in JS-97-52 and Bragg, respectively.

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