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Screening of soybean germplasms for resistance against Stemfly and stem girdler

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Abstract

The field trial was conducted at Agricultural Research Station, Adilabad during the *khari* season 2017. In the study eight soybean germplasms comprising of advanced breeding lines, released varieties were evaluated for resistance against stemfly and stem girdler. Some new parameters that have direct impact on grain yield have been used to categorize the germplasms into resistance groups. Accordingly, Basara, JS-335, JS-9305, DSB-2803 and KDS-756 were found to be highly resistant and KDS-869, MACS-1460 and RSC-1046 were found to be highly susceptible against stemfly and stem girdler.

Keywords: Stemfly, stem girdler, % damage and % tunneling

Introduction

Soybean, *Glycine max* (L). Metill, is attacked by about twenty different major insect pests. Out of these stemfly (*Melanagromyza sojae*), stem girdler (*Oberiopsis brevis*) are predominant in Northern part of the country, which contribute about 60% of area and production. These insect pests account for more than 25% reduction in yield. The most economical way to deal with these insect pests and avoid yield losses, is to cultivate insect resistant/tolerant varieties. Hybridization involving identified resistant sources and agronomically suitable genotypes, is in progress at Agricultural Research station (ARS), Adilabad, Telangana. Few advanced generation progenies have exhibited good yield potential. But their response against major insect-pests was not deciphered. In order to identify potential resistant genotypes against stemfly, stem girdler. Field screening was carried out using more screening criteria. The crop is infested by more than 275 insect pests on different plant parts of soybean throughout its growth stage and about a dozen of them have been reported causing serious damage to soybean from sowing to harvesting (Ramesh Babu, 2010) [6]. Kundu *et al.*, (1995) reported 18.6 per cent to 40.1 per cent yield losses in soybean due to stemfly (*Melanagromyza sojae*). In India, stemfly infestation is as high as 85-90 per cent. Ansari and Sharma (2000) observed 19.5 per cent to 30.72 per cent girdle beetle infestation. The stemfly, *Melanagromyza sojae* attacks the soybean throughout the growing season, but the most vulnerable period is within three to four weeks after germination the maggot may tunnel up to 70% of the stem length (Singh and Singh, 1990) [13] and may reduce the grain yield up to 33 per cent (Singh and Singh 1992) [14].

To get the performance of different soybean germplasms with objective *i.e.* Screening of soybean germplasms against stemfly (*Melanagromyza sojae*), stem girdler (*Oberiopsis brevis*) in field condition against stemfly, stem girdler so that their susceptibility or tolerance can be concluded a technical study was carried out.

Material and Methods

Eight germplasms consisting of advanced lines, released varieties were sowed in Randomized block design with three replications at Agricultural Research Station (ARS), Adilabad (Telangana), India during *Khari*, 2018. Each genotype had 5 × 5 m plot size and sown at 45 cm row spacing. Observations on per cent damage and stem tunneling due to stemfly and stem girdler were recorded. Number of infested plants by stemfly (Hole at the base of the plant) and stem girdler (ring formation) were counted in each plot per meter row length and converted to per cent damage stem tunneling was calculated by following formula.

$$\text{Tunnel damage \%} = \frac{\text{Length of tunnel}}{\text{Plant height}} \times 100$$

The data were converted to appropriate transformed values and subjected to statistical analysis categorization was done following the AICRPs method (Sharma, 1996) [10].

Results and Discussion

Eight germplasms are tested for relative field resistance against stemfly and stem girdler. Five germplasms were highly resistant with per centage damage ranging from 13.82 to 17.26 per centage against stemfly three germplasms were highly susceptible with per centage damage ranging from 21.32 to 26.32 per centage against stemfly Sekhar *et al.* (2000) [8]. Similarly five germplasms were highly resistant with per centage damage ranging from 11.77 to 17.36 per centage against stem girdler. Three germplasms were highly susceptible with per centage damage ranging from 20.49 to 27.96 per centage against stem girdler.

Per cent seedling mortality

The per cent seedling mortality in different germplasms ranged between 2.77 and 5.22. It is interesting to note that one germplasm JS-335 showed 2.77 per cent seedling mortality. Talekar (1989) [16] described per cent seedling mortality as the most important criteria for screening against stemfly as it leads to reduction in plant population at a very early stage. From this point of view the germplasms showing 2.77 per cent seedling mortality seem to have great importance.

Per cent stem tunneling

Stem tunneling (%) recorded in different germplasms ranged

from 8.18 to 9.85. Out of eight germplasms, five germplasms Basara, JS-335, JS-9305, DSB-2803 and KDS-756 were at par with respect to per cent stem tunneling remaining three germplasms KDS-869, MACS-1460 and RSC-1046 recorded highly susceptible, which is reported to be 9.85 per cent (Kundu and Mehra, 1989) [5] Bhattacharya and Rathore (1980) [1] however, did not find any correlation between stem tunneling and grain yield. In earlier studies soybean varieties PK-462, PK-416, PK-564 and Shivalik were reported to be highly tolerant to damage by stemfly (Sharma *et al.* 1994) [11].

Stem girdler plant infestation

The stem girdler plant infestation in different germplasms varied between 2.47 (Basara) to 5.65 (MACS 1046) per meter row length on the basis of categorization Basara, JS-335, JS-9305, DSB-2803 and KDS-756 were found to be highly resistant (HR). KDS-869, MACS-1460 and RSC-1046 were highly susceptible.

Stem girdler plant damage

The extent of plant damage among different germplasms varied from 11.77 to 27.96 per cent. Categorization according to "AICRPS" method revealed that Basara, JS-335, JS-9305, DSB-2803 and KDS-756 were highly resistant. KDS-869, MACS-1460 and RSC-1046 were highly susceptible. It is to be noted that plant infestation alone does not necessarily cause reduction in grain yield Sharma (1995) [9] reported that per cent plant damage (typical "cut off" symptoms) is more appropriate criteria for screening germplasms against stem girdler.

Table 1: The Treatments Girdle beetle Leaf Hopper

Treatments	<i>Spodoptera</i> (no. /mrl)	Girdle beetle (No. of damage plants/mrl)	Girdle beetle/mrl % Damage % Tunneling		Stemfly (No. of damage plants /mrl)	Stemfly/mrl % Damage % Tunneling		Whitefly/leaf	Leaf Hopper /leaf	Yield Kg/ha
Basara	3.94 HR (1.98)	2.47	12.65 HR (3.56)	13.71 (3.7)	3.21	16.20 HR (4.02)	8.18 (2.86)	9.41 MR (3.07)	2.69 HR (1.64)	2260
JS-335	5.96 MR (2.44)	2.30	11.77 HR (3.43)	12.35 (3.51)	2.77	13.82 HR (3.72)	8.47 (2.91)	6.53 HR (2.55)	2.95 HR (1.72)	2240
KDS-869	7.98 LR (2.82)	4.18	20.49 HS (4.53)	14.21 (3.77)	4.49	21.32 HS (4.62)	9.22 (3.04)	12.03 LR (3.47)	4.93 HS (2.22)	2176
JS-9305	6.76 MR (2.60)	3.36	14.76 HR (3.84)	13.46 (3.67)	2.89	14.78 HR (3.84)	8.56 (2.93)	10.88 LR (3.30)	2.64 HR (1.62)	1890
DSB-2803	6.36 MR (2.52)	3.22	16.56 HR (4.07)	12.81 (3.58)	3.09	15.65 HR (3.96)	8.85 (2.97)	6.97 HR (2.64)	3.41 HR (1.85)	2206
MACS-1460	7.46 LR (2.73)	5.28	26.76 HS (5.17)	14.36 (3.79)	5.11	25.29 HS (5.03)	9.44 (3.07)	13.61 HS (3.69)	5.77 HS (2.4)	1906
KDS-756	7.82 LR (2.79)	4.29	17.36 HR (4.17)	13.87 (3.72)	3.84	17.26 HR (4.15)	8.74 (2.96)	11.48 LR (3.39)	4.21 HS (2.05)	1660
RSC-1046	9.56 HS (3.09)	5.65	27.96 HS (5.29)	14.87 (3.86)	5.22	26.32 HS (5.13)	9.85 (3.14)	13.85 HS (3.71)	5.86 HS (2.42)	2260
SE±(M)	0.63	-	0.012	0.003	-	0.006	0.007	1.33	0.015	6.02
CD 1%	1.93	-	0.040	0.010	-	0.018	0.021	2.81	0.046	25.36
CD 5%	1.39	-	0.05	0.014	-	0.025	0.029	2.02	0.063	18.27
CV %	11.42	-	0.50	0.152	-	0.24	0.39	10.91	1.31	0.52

Conclusion

It may be concluded from the present study that resistance against stemfly and stem girdler. Basara, JS-335, JS-9305,

DSB-2803 and KDS-756 were found to be highly resistant and KDS-869, MACS-1460 and RSC-1046 were found to be highly susceptible against stemfly and stem girdler.

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