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Screening of soybean genotypes for resistance against Stemfly, *Melanagromyza sojae* and stem girdler, *Obereopsis brevis* in Adilabad district, Telangana

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Abstract
Field experiment carried out in Agricultural Research Station (ARS), Adilabad during *kharif*, 2017, to evaluate the performance of different germplasms of soybean *viz.*, RVS-2001-4-1, RVS-29, JS-20-34, Basara, JS-93-05, JS-335, JS-20-69, RVS-18, JS-20-29, AIsb-50 and RKS-18 against the resistance of stemfly, *Melanagromyza sojae* and stem girdler, *Oberiopsis brevis* results revealed among different germplasms, JS-20-34, Basara, JS-335, RVS-18 and JS-20-29 were found to be moderately resistant whereas, JS-93-05 was found to be highly susceptible against stemfly. Similarly, RVS-2001-4-1, Basara, JS-335, JS-20-69, JS-20-29 RKS-18 and AIsb-50 were found to be moderately resistant whereas, JS-93-05 was found to be susceptible against stem girdler.

Keywords: Stem girdler, *Obereopsis brevis*, stem girdler, oberiopsis brevis

1. Introduction
Soybean [*Glycine max* (L.) Merrill] is native to East Asia, where it appears to have been cultivated from a wild species known as *'Glycine soja'* and it is commonly known as soya which is grown for its protein (40 per cent) and oil (20 per cent) around the world. It also contains 35 per cent carbohydrates, 6-7 per cent total mineral, 5-6 per cent crude fiber, 5 per cent ash (Chauhan *et al*, 2002) [2]. And it is a rich source of vegetable oil and ranks first with 56.753 Million metric tonnes of oil production globally and India is the sixth largest soybean oil producing country in the world with1.440 Million metric tonnes of oil production (SOPA, 2019) [13] with cultivated area of 113.98 lakh ha during 2019-20 whereas, in Telangana, it occupies an area of 1.77 lakh ha with a production potential of 2655 tonnes and productivity of 1500 kg/ha (SOPA, 2020) [14].
Soybean is attacked by about twenty major pests and out of these stemfly (*Melanagromyza sojae*) and stem girdler (*Oberiopsis brevis*) are predominant pest in Northern part of the country which account for more than 25% reduction in yield. These insect pest and its yield losses can be reduced by cultivation of insect resistant 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 and 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, 2018) [6]. Kundu *et al*., (1995) reported 18.6 per cent to 40.1 per cent yield losses in soybean due to stemfly (*M. 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 it 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) [12] and may reduce the grain yield up to 33 per cent (Singh and Singh 1992) [8].
Keeping this in view, experiment was conducted to get the performance of different soybean germplasms in Agricultural Research Station (ARS), Adilabad during *kharif*, 2017 and 2018 against stemfly (*M. sojae*), stem girdler (*O. brevis*) in field condition so that their susceptibility or tolerance can be concluded based on that technical study was carried out.

2. Materials and Methods

Screening of germplasms against the stem fly (*M. sojae*) and stem girdler (*O. brevis*) on soybean was determined by conducting a field experiment at Agricultural Research Station (ARS), Adilabad during *kharif*, 2017 in randomized block design (RBD) with three replications and eleven treatments. The plot size 5 × 5 m with a spacing of 45 x 5 cm was followed between the rows and plants of soybean. The eleven germplasms (RVS-2001-4-1, RVS-29, JS-20-34, Basara, JS-93-05, JS-335, JS-20-69, RVS-18, JS-20-29, AIsb-50 and RKS-18) were evaluated. Data was collected on weekly intervals by recording per cent damage and stem tunneling due to stemfly and stem girdler and 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.

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

$$\text{Per cent damage \%} = \frac{\text{No. of plants infested}}{\text{Plant height}} \times 100$$

The data were converted to appropriate transformed values and subjected to statistical analysis categorization was done following the AICRPs method (Sharma, 1996) [11].

2.1 Statistical analysis

The data obtained from all observations *viz.*, per cent tunnel damage and per cent damage weren converted into angular transformation and values were subjected to Randomized block design (RBD) analysis by using Microsoft excel software.

3. Results and Discussion

Eleven germplasms are tested for relative field resistance against stemfly and stem girdler and five germplasms were moderately resistant with percentage damage ranging from 10.60 to 13.80 percentage against stemfly. Whereas, one was highly susceptible with percentage damage of 18.60 percentage against stemfly Sekhar *et al.* (2000) [7]. Similarly seven germplasms were moderately resistant with percentage damage ranging from 17.04 to 18.60 percentage against stem girdler and one was highly susceptible with percentage damage of 22.80 percentage against stem girdler.

3.1 Per cent stem tunneling

Stem tunneling (%) recorded in different germplasms ranged from 10.60 to 18.60. Out of eleven germplasms, five germplasms JS-20-34, Basara, JS-335, RVS-18 and JS-20-29 were par with respect to per cent stem tunneling and reported moderately resistant. Whereas, RVS-2001-4-1, JS-20-69, RKS-18 and AIsb-50 recorded low resistant, which was ranging between 14.20 to 16.20 per cent Kundu and Mehra (1989) [4] and Bhattacharya and Rathore (1980) [1] and JS-93-05 was reported as highly susceptible.

3.2 Stem girdler plant damage

The extent of plant damage among different germplasms varied from 17.04 to 22.80 per cent. Categorization according to "AICRPS" method revealed that RVS-2001-4-1, Basara, JS-335, JS-20-69, JS-20-29 RKS-18 and AIsb-50 were moderately resistant with per cent damage ranging between 17.04 to 18.60. RVS-29, JS-20-34 and RVS-18 were reported low resistant and JS-93-05 was found to be susceptible against stem girdler. It is to be noted that plant infestation alone does not necessarily cause reduction in grain yield Sharma (1995) [10] reported that per cent plant damage (typical "cut off" symptoms) is more appropriate criteria for screening germplasms against stem girdler.

Fig 1: Stem girdler, *O. brevis* grub in soybean

Fig 2: Stem girdler, *O. brevis* tunneling in soybean

Table 3.1: Field screening of soybean genotypes for resistance against insect pests during *kharif*, 2017

Treatments	Stem fly (%)	Stem girdler (%)	Yield (kg/ha)
RVS-2001-4-1	15.86 (23.43) LR	17.04 (24.34) MR	2136
RVS-29	18.20 (25.20) S	19.20 (25.93) LR	1768
JS-20-34	10.60 (18.98) MR	21.40 (27.52) LR	1697
Basara	13.80 (21.76) MR	18.10 (25.13) MR	1956
JS-93-05	18.60 (25.53) HS	22.80 (28.50) S	1680
JS-335	11.62 (19.91) MR	18.26 (25.27) MR	1941
JS-20-69	14.20 (22.10) LR	18.60 (25.51) MR	1872
RVS-18	11.40 (19.69) MR	20.70 (27.01) LR	1724
JS-20-29	12.56 (20.73) MR	17.40 (24.62) MR	2374
RKS-18	16.20 (23.69) LR	17.84 (24.93) MR	1985
AISb-50	14.60 (22.43) LR	17.26 (24.51) MR	2047

CD at 5%	2.90	3.61	374.34
CD at 1%	3.92	4.51	NS

*Significant at 5%
Figures in parenthesis are angular transformed values
HR = Highly resistant, R = Resistant, MR = Moderately resistant, LR = Low resistant, S = Susceptible, HS = Highly susceptible

Conclusion

Among the different germplasms of soyabean, against the resistance of stemfly, *M. sojae* and stem girdler, *O. brevis* the germplasm JS-20-34, Basara, JS-335, RVS-18 and JS-20-29 were found to be moderately resistant whereas, JS-93-05 was found to be highly susceptible against stemfly. Similarly, RVS-2001-4-1, Basara, JS-335, JS-20-69, JS-20-29 RKS-18 and AIsb-50 were found to be moderately resistant whereas, JS-93-05 was found to be susceptible against stem girdler.

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