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Influence of varietal screening on major sucking insect - pests of soybean

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ABSTRACT

To find out the resistant varieties of soybean major sucking insect-pests for Southern Rajasthan. **Study Design:** Field trial: Randomized Block Design. **Palace and Duration of investigation:** The study was conducted at Rajasthan College of Agriculture, Udaipur during *Kharif* 2022 and 2023. 5 plants were randomly selected from each plot. The observations on the number of nymph and adults of whiteflies and jassids per 3 leaves were observed. The highest whiteflypopulation was recorded in JS 20-116 variety (5.47 and 4.78 whiteflies/ 3 leaves). The highest population of jassids was recorded in JS 20-116 variety (3.23 and 3.04 jassids/ 3 leaves) during *Kharif* 2022 and 2023, respectively. The varieties JS 20-34, JS 20-98 and JS 21-72 showed high resistance to whitefly and jassid during both years of observation. Varieties like RVS 2011-10, RKS-113, and RKS-45 were moderately resistant. However, varieties such as RKS-18, JS 97-52, JS-335, RSC 10-46, NRC-152, and JS 20-116 were found to be less resistant against these pests.

Key words: *Soybean, Golden Bean, Sucking pests, Varieties, JS 20-116, Resistance, Screening*

Introduction

Soybean [*Glycine max* (L.) Merrill], also designated as ''Golden bean'' or ''Yellow jewel'', is a major oilseed crop in India. Soybean originated in China or Eastern Asia and subsequently spread to other parts of the world (Amrate, 2024). It was introduced to India across the Himalayan Mountains many years ago. Soybean is a legume crop mainly, but seeds are widely used as oilseed. The plant is classified as an oilseed and is considered a pulse by the Food and Agriculture Organization (FAO). It is a unique crop with high nutritional value. Thus, it is also known as the "Miracle bean, Golden bean and Crop of the planet" of the 20th Century. It contains 40% protein, well balanced in essential amino acids; 20% oil, rich in polyunsaturated fats, especially Omega 6 and Omega 5 fatty acids; 6-7% total minerals; 5-6% crude fibre and 17-19% carbohydrates (Uikey *et al*., 2022).

Soybean can be grown in varied agroclimatic conditions and is mainly cultivated in Madhya Pradesh, Maharashtra, Rajasthan, Chhattisgarh, Jharkhand, Uttarakhand and North East States of the country. Madhya Pradesh, Maharashtra and Rajasthan cover 52.4, 39.3, and 9.3 lakh ha, respectively. The Rajasthan state stands third, occupying the soybean area, and second in productivity (1244 kg/ha). In India, the soybean crop is cultivated over 12.09 Mha

with a total production of about 11.22 MT (Directorate of Economics and Statistics, 2022). In India major production of soybean comes from Madhya Pradesh of which Madhya Pradesh covers 53% of the cultivated area and delivers 60% of the total production (Rao *et al.,* 2023). A number of insect pests cause damage to soybeans in various parts of Rajasthan in different stages of the crop, and damage due to these insect pests is one of the major constraints for soybean production. The incidence of these insect pests causes the reduction in yield in different ways in soybean crops due to sap-sucking, foliage feeding and boring.Among sucking pests, the whiteflies and jassids are the predominant one (Park *et al.,* 2023; Bueno *et al.,* 2023; Aruna *et al.,* 2024; Mahendra *et al.,* 2024 and Anil *et al.,* 2024).

By developing high-yielding genotypes with sustained productivity even in the face of biotic and abiotic challenges, soybean specialists are working hard to close the enormous gap between production and consumption (El-Hamidi *et al*., 2020). Understanding the variety of defensive responses is crucial for the development of insect-resistant genotypes.

Materials and Methods

A field experiment conducted at Agronomy farm, Rajasthan College of Agriculture, MPUAT, Udaipur during *Kharif* 2022 and 2023. This region falls under the agroclimatic zone "Sub-humid Southern Plain and Aravalli Hills of Rajasthan" at an altitude of 582.17 meters above mean sea level, at 24^35' N latitude and 74º42' E longitude. The soybean crop was sown during *Kharif* 2022 and 2023. The total twelve varieties *viz.,* JS-335, JS 20-34 , JS 97-52 , JS 20-98 , JS 20-116, JS 21-72, RVS 2011-10, RKS-18, RKS -113, RKS -45, NRC-152 and RSC 10-46 were used for screening laid out as RBD with 3 replications.The number of sucking insect-pests (nymphs and adults) on 3 leaves per plant (upper, middle and lower) in five randomly selected plants was recorded by using the sudden trapping petri plate method (Murrey *et al.,* 2018).

Results and Discussion

Screening of soybean varieties against insect pests

In the present study, during *Kharif* 2022 & 2023 and pooled, the incidence of major insect pestsagainst soybean verities have been presented in Table 1.

Whitefly, *Bemisiatabaci*

The data in Table 1showed that none of the soybean varieties was completely free from the infestation of whiteflies during *Kharif* 2022. The incidence of whiteflies observed during *Kharif* 2022 ranged from 1.61 to 5.47 (whiteflies/ 3 leaves). The incidence of whiteflies gradually increased with the advancement of crop growth. The highest whitefly population was recorded in JS 20-116 variety (5.47 whiteflies/ 3 leaves) followed by NRC-152 (5.26) > RSC 10-46 (5.08) > JS-335 (4.76) > JS 97-52 (4.29) > RKS-18(3.96) > RVS 2011-10(3.56) > RKS-45 (2.72) > JS 20-34(2.24) > JS 21-72 (1.85). The lowest mean population was observed in the JS 20-98 variety (1.61 whiteflies/ 3 leaves). While the incidence of whiteflies observed during *Kharif* 2023 ranged from 1.58 to 4.78 whiteflies/ 3 leaves. The incidence of whiteflies gradually increased with the advancement of crop growth. The highest whitefly population was recorded in JS 20-116 variety (4.78 whiteflies/ 3 leaves) followed by RSC 10-46(4.55) > NRC-152(4.48) > JS-335(4.16) > JS 97-52 (3.80) > RKS-18 (3.67) > RVS 2011-10 (3.38) > RKS -113 (2.89) RKS -45 (2.58) > JS 20-34 (2.13) > JS 21-72 (1.69). While lowest mean population was observed in JS 20-98 variety (1.58 whiteflies/3 leaves). The pooled mean presented in Table 1 shows that the highest population of whitefly 5.13/ 3 leaves was found in variety JS 20-116.

Jassid, *Empoascakerri*

The incidence of jassids observed during *Kharif* 2022 ranged from 0.73 to 3.23 (jassids/ 3 leaves). The incidence of Jassids gradually increased with the advancement of crop growth. The highest population of jassids was recorded in JS 20-116 variety (3.23 jassids/ 3 leaves) followed by NRC-152(2.89) > RSC 10-46(2.59) > JS-335(2.27) > JS 97-52(1.96) > RKS-18(1.73) > RVS 2011-10(1.48) > RKS-45(1.16) > JS 20-34(1.01) > JS 21-72 (0.87). While lowest mean population was observed in JS 20-98 variety (0.73 jassids/ 3 leaves).

The data presented in Table 1 showed that no one variety of soybean wasfound completely free from the infestation of jassids during *Kharif* 2023. The incidence of jassids gradually increased with the advancement of crop growth. Based on overall incidence of jassids the highest mean population/ mrl was observed in JS 20-116 variety (3.04) followed by NRC-152(2.79) > RSC 10-46(2.50) > JS 97-52(2.08)>

Table 1. Pooled mean of varietal screening of whitefly and Jassid population on soybean of 2022 and 2023

Variety	Population of whitefly/ three leaves			Population of Jassid/ three leaves		
	2022	2023	Pooled Mean	2022	2023	Pooled Mean
JS-335	4.76(2.18)	4.16(2.04)	4.46(2.11)	2.27(1.51)	2.06(1.44)	2.17(1.47)
JS 20-34	2.24(1.50)	2.13(1.46)	2.18(1.47)	1.01(1.00)	1.22(1.10)	1.12(1.05)
JS 97-52	4.29(2.07)	3.80(1.95)	4.05(2.01)	1.96(1.40)	2.08(1.44)	2.02(1.42)
JS 20-98	1.61(1.27)	1.58(1.26)	1.60(1.26)	0.73(0.85)	0.92(0.96)	0.83(0.91)
JS 20-116	5.47(2.34)	4.78(2.19)	5.13(2.26)	3.23(1.80)	3.04(1.74)	3.14(1.77)
JS 21-72	1.85(1.36)	1.69(1.30)	1.77(1.33)	0.87(0.93)	0.98(0.99)	0.93(0.96)
RVS 2011-10	3.56(1.89)	3.38(1.84)	3.47(1.86)	1.48(1.22)	1.59(1.26)	1.54(1.24)
RKS-18	3.96(1.99)	3.67(1.92)	3.82(1.95)	1.73(1.32)	1.82(1.35)	1.78(1.33)
RKS -113	3.04(1.74)	2.89(1.70)	2.97(1.72)	1.31(1.14)	1.53(1.24)	1.42(1.19)
RKS -45	2.72(1.65)	2.58(1.61)	2.65(1.63)	1.16(1.08)	1.36(1.17)	1.26(1.12)
NRC-152	5.26(2.29)	4.48(2.12)	4.87(2.21)	2.89(1.70)	2.79(1.67)	2.84(1.69)
RSC 10-46	5.08(2.25)	4.55(2.13)	4.82(2.19)	2.59(1.61)	2.50(1.58)	2.55(1.60)
SEm±	0.08	0.07	0.05	0.04	0.04	0.03
CD 5%	0.26	0.22	0.16	0.12	0.13	0.08

JS-335(2.06) > RKS-18(1.82) > RVS 2011-10 (1.59) > RKS- 113> RKS -45 (1.36) > JS 20-34 (1.22) > JS 21-72 (0.98). While the lowest mean population was observed in the JS 20-98 variety (0.92 jassids/3 leaves). The pooled mean given in Table 1 shows that the highest population of jassid 3.14/ 3 leaves was found in variety JS 20-116.

Based on the degree of resistance varieties, JS 20-98 and JS 21-72 were observed to be highly resistant. Varieties JS 20-34, RVS 2011-10, RKS-113, RKS-45, RKS-18, JS 97-52 and JS-335 were recorded as moderately resistance, while RSC 10-46, NRC-152 and JS 20-116 varieties were found as less resistant against whiteflies and jassids. Similarly, Murry *et al.* (2018) experimented on 35 soybean genotypes and three check varieties to identify the major insect pests. The significant pests were whiteflies, leaf webbers, flea beetles, and stink bugs. Insect pests were recorded at 15-day intervals from germination to harvest. The highest infestation was found in genotype DS 3105 (17.25 ten plants^{-1}) and BAU 100 (5.25 ten plants^{-1}) by whitefly, while the lowest was in genotype JS 21-08 (0.32 pmrl). The highest infestation was found in genotypes RSC 1052 and NRC 124. These findings are closely associated with the findings of Ghosalya (2021), who evaluated twenty-three soybean genotypes/varieties to investigate the screening and relative resistance of soybean genotypes/varieties to insect pests, as well as the relative percentage yield loss of different genotypes/varieties.

Conclusion

The highest population of whitefly, jassid, semilooper, tobacco caterpillar, girdle beetle, stem fly was recorded in JS 20-116 variety during both years and JS 20-34, JS 20-98 and JS 21-72 varieties were observed highly resistant. Varieties RVS 2011-10, RKS-113 and RKS-45 were recorded as moderately resistant while RKS-18, JS 97-52, JS-335, RSC 10-46, NRC-152 and JS 20-116 varieties were found as less resistant against major insect -pests of soybean during both years. While the maximum grain yield was recorded from variety JS 20-98 during *Kharif* 2022 and *Kharif* 2023.

Conflict of Interest- None

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