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Evaluation of sesame genotypes for resistance to leafhopper (*Hishimonus phycitis* and *Orosius albicinctus*) infestation

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Abstract
Leafhoppers, particularly *Hishimonus phycitis* and *Orosius albicinctus*, are important vectors of sesame phyllody, a phytoplasma-induced disease that severely reduces productivity by transforming floral structures into vegetative forms. Although several leafhopper species are reported on sesame, only a few act as efficient vectors of phyllody. The use of resistant genotypes is considered the most economical and sustainable strategy for phyllody management. In this study, 60 advanced sesame breeding lines, along with a resistant check (GT-10) and a susceptible check (RJR-170), were screened under open field conditions during two seasons (2023 and 2024). Leafhopper incidence was recorded at weekly intervals, and genotypes were categorized based on a 0-5 rating scale. Considerable variation in leafhopper population was observed. Two genotypes (SES-K-20-1052 and SES-K-20-1064) exhibited consistent high resistance across both seasons, while one genotype remained highly susceptible. These resistant entries may serve as valuable sources for future breeding and integrated pest management programs.

Keywords: Sesame, *Hishimonus phycitis, Orosius albicinctus,* phyllody, resistance screening, breeding lines, vector incidence, field evaluation

Introduction

Sesame (*Sesamum indicum* L.), a major oilseed crop belonging to the family Pedaliaceae, is widely recognized as the "Queen of Oilseeds" due to its high-quality polyunsaturated fatty acids and natural antioxidants that prevent oxidative rancidity. Originating from East Africa and India, sesame seeds contain 46-54% oil and 12-20% protein. In India, nearly 78% of sesame production is used for oil extraction (Alhassan *et al.*, 2025) [1]. Seed colour varies across genotypes, with white seeds being preferred globally for their oil content and lower rancidity (Wacal *et al.*, 2024) [3]. Sesame also serves as a rich source of minerals such as potassium, phosphorus, iron, and zinc (Mohammed & Pattan, 2022) [4].

More than 29 insect pests have been reported on sesame at different crop stages (Biswas *et al.*, 2001; Thangjam & Vastrad, 2018) [5, 6]. Among them, sesame leafhoppers—*Hishimonus phycitis* and *Orosius albicinctus*—are major pests responsible for transmitting sesame phyllody, a devastating phytoplasma disease capable of causing yield losses up to 90% (Boopathi *et al.*, 2023) [7]. The leafhoppers acquire phytoplasma from infected plants and transmit it to healthy ones through feeding.

Conventional management practices such as vector suppression using systemic insecticides and destruction of alternate weed hosts have provided limited success. Host plant resistance, which requires no additional cost to farmers, offers a stable and environmentally friendly management strategy (Painter, 1951) [10]. Increased incidence of leafhoppers in Telangana sesame fields has highlighted the urgent need to identify resistant sources. Hence, the present study was undertaken to screen advanced sesame breeding lines under field conditions to identify stable sources of resistance.

Materials and Methods

Sixty advanced sesame breeding lines, along with a resistant check (GT-10) and a susceptible check (RJR-170), were obtained from ICAR-IIOR, Hyderabad.

Field screening was conducted at ICAR-IIOR, Rajendranagar, during two seasons: August-October 2023 (Season 1) and December 2023-February 2024 (Season 2).

The experiment was laid out in a Randomized Block Design (RBD) with three replications using an infester row technique (one infester row after every five test rows). Each plot measured 2 × 5 m with a spacing of 40 × 15 cm. No insecticidal applications were made to ensure natural vector buildup.

Leafhopper populations were recorded weekly from three leaves (top, middle, bottom) of three randomly selected plants in each genotype. Mean leafhopper population per leaf was used to categorize resistance using a 0-5 rating scale (Table 1).

Table 1: Rating scale for categorization of genotypes based on leafhopper incidence.

Rating	Number of leafhoppers/leaf	Disease Reaction
0	0-1	Highly resistant
1	1-2	Resistant
2	2-3	Moderately resistant
3	3-4	Moderately susceptible
4	4-5	Susceptible
5	>5	Highly susceptible

Results and Discussion

Significant variation in leafhopper incidence was observed among the 60 breeding lines across both seasons. During Season 1 (2023), leafhopper numbers ranged from 1.17 to 4.83 per leaf. The resistant check GT-10 recorded 2.50 leafhoppers per leaf, while the susceptible check RJR-170 recorded 3.83. Based on the rating scale, 9 entries were resistant and 27 moderately resistant, while 4 were susceptible. During Season 2 (2024), leafhopper incidence ranged from 0.50 to 6.87 per leaf. GT-10 recorded a much lower incidence (0.83), confirming its resistance, while RJR-170 exhibited 6.87 leafhoppers per leaf. In this season, 5 genotypes were categorized as highly resistant, 40 as resistant, and only one as highly susceptible. Combined analysis revealed two genotypes—SES-K-20-1052 and SES-K-20-1064—that consistently showed high resistance across both seasons. One genotype remained highly susceptible (RJR-170).

The results corroborate earlier findings. Magar *et al.* (2022) [8] and Kumar *et al.* (2022) [9] documented variation in leafhopper populations among sesame genotypes, with several entries showing stable resistance. Yadav *et al.* (2023) [11] also identified genotypes with significantly lower leafhopper incidence. The present study reaffirms the existence of genetic resistance within sesame germplasm.

Identification of stable resistant genotypes provides opportunities for breeding leafhopper-resistant cultivars. These entries may also be explored for underlying resistance mechanisms such as antixenosis or antibiosis. Multi-season and multi-location trials would further help validate their performance. Integration of host plant resistance with cultural and biological methods could significantly enhance sustainable management of sesame leafhoppers.

Field screening of 60 advanced sesame breeding lines across two seasons identified two genotypes—SES-K-20-1052 and SES-K-20-1064—as highly resistant to leafhopper infestation. These genotypes represent strong candidates for resistance breeding programs. The study highlights the importance of host plant resistance as an eco-friendly and cost-effective strategy for managing leafhopper vectors of sesame phyllody.

Table 2: Mean leafhopper population per leaf among advanced sesame breeding lines during Season 1 (2023) and Season 2 (2024).

Genotype	Season 1 (2023)		Season 2 (2024)		Overall Mean
	Mean no. of leafhoppers/leaf	Category	Mean no. of leafhoppers/leaf	Category	
ISWG-20-05	1.33	R	0.67	HR	1.00
IIOS-1103	2.50	MR	1.00	R	1.75
IIOS-1101	4.00	MS	1.17	R	2.59
IIOS-1102	2.67	MR	1.50	R	2.09
RT-372	4.33	S	2.00	MR	3.17
SEL-S-2018-1002	2.33	MR	1.17	R	1.75
SEL-S-2018-1003	4.00	MS	1.17	R	2.59
SEL-S-2018-1010	2.50	MR	1.33	R	1.92
SES-S-19-1013	2.50	MR	1.83	R	2.17
SES-S-19-1037	1.50	R	2.17	MR	1.84
SES-K-20-1050	2.33	MR	1.50	R	1.92
SES-K-20-1051	3.50	MS	1.83	R	2.67
SES-K-20-1052	1.33	R	0.50	HR	0.92
SES-K-20-1054	2.33	MR	2.50	MR	2.42
SES-K-20-1055	3.17	MS	1.83	R	2.5
SES-K-20-1056	2.50	MR	2.33	MR	2.42
SES-K-20-1057	2.83	MR	1.83	R	2.33
SES-K-20-1058	2.50	MR	1.50	R	2.00
SES-K-20-1059	3.83	MS	1.17	R	2.50
SES-K-20-1060	3.67	MS	1.67	R	2.67
SES-K-20-2001	2.83	MR	1.67	R	2.25
SES-K-20-2008	3.83	MS	1.33	R	2.58
SES-K-20-2011	2.33	MR	2.17	MR	2.25
SES-K-20-2012	2.50	MR	2.67	MR	2.59
SES-K-20-2014	3.33	MS	2.50	MR	2.92
SES-K-20-2015	2.00	R	2.50	MR	2.25
SES-K-20-2016	2.00	R	1.17	R	1.59
SES-K-20-2017	3.67	MS	1.17	R	2.42
SES-K-20-2018	1.83	R	1.33	R	1.58

SES-K-20-2019	3.50	MS	2.83	MR	3.17
SES-K-20-2020	3.33	MS	1.50	R	2.42
SES-3-19-3014	4.83	S	1.83	R	3.33
IIOS-20-3013	4.83	S	1.83	R	3.33
Julang sesame	2.33	MR	1.17	R	1.75
Long knog-1	2.83	MR	1.67	R	2.25
Long knog-2	4.33	S	1.5	R	2.92
CT-23	2.50	MR	1.33	R	1.92
CT-51	3.00	MS	2.67	MR	2.84
CT-55	3.00	MS	1.00	R	2.00
IC-16239	3.33	MS	1.33	R	2.33
SES-K-20-1045	2.67	MR	1.33	R	2.00
Lathur local	2.17	MR	1.17	R	1.67
SES-K-20-2009	1.17	R	1.67	R	1.42
SES-K-20-1072	2.33	MR	1.67	R	2.00
SES-K-20-3007	2.67	MR	2.00	MR	2.34
SES-K-20-2010	1.17	R	1.67	R	1.42
SES-K-20-2013	3.33	MS	1.17	R	2.25
SES-K-20-2021	2.17	MR	2.00	MR	2.09
SES-K-20-3002	3.17	MS	1.50	R	2.34
SES-K-20-1061	2.33	MR	1.83	R	2.08
SES-K-20-1063	2.50	MR	2.00	MR	2.25
SES-K-20-1062	2.33	MR	1.33	R	1.83
SES-K-20-1064	1.33	R	0.50	HR	0.92
SES-K-20-2022	2.50	MR	2.00	MR	2.25
SES-K-20-2023	3.17	MS	0.50	HR	1.84
SES-K-20-2024	3.33	MS	0.83	HR	2.08
SES-K-20-2025	3.00	MS	1.17	R	2.09
SES-K-20-2026	3.17	MS	1.00	R	2.09
SES-K-20-2027	2.50	MR	1.00	R	1.75
GT-10 (RC)	2.50	MR	0.83	HR	1.67
RJR-170 (SC)	3.83	MS	6.17	HS	5.00
Df	122		122		
F value	0.89		4.125		
P value	>0.05		<0.05		

Table 3: Categorization of genotypes based on combined mean leafhopper population across two seasons.

Category	Mean no. of leafhoppers/leaf	No. of genotype	Name of the genotype
Highly Resistant	0-1	2	SES-K-20-1052, SES-K-20-1064
Resistant	1-2	17	ISWG-20-05, IIOS-1103, SEL-S-2018-1002, SEL-S-2018-1010, SEL-S-2018-1037, SEL-S-2018-1050, SES-K-20-2016, SES-K-20-2018, julang sesame, CT-23, Lathur local, SES-K-20-1-2009, SES-K-20-2010, SES-K-20-1062, SES-K-20-2023, SES-K-20-2027, GT-10
Moderately Resistant	2-3	37	IIOS-1101, IIOS-1102, IIOS-1003, SES-S-19-1013, SES-K-20-1051, SES-K-20-1054, SES-K-20-1055, SES-K-20-1055, SES-K-20-1056, SES-K-20-1057, SES-K-20-1058, SES-K-20-1059, SES-K-20-1060, SES-K-20-2001, SES-K-20-2008, SES-K-20-2011, SES-K-20-2012, SES-K-20-2014, SES-K-20-2015, SES-K-20-2017, SES-K-20-2020, Long kong-1, Long kong-2, CT-51, CT-55, IC-16239, SES-K-20-1045, SES-K-20-1072, SES-K-20-3007, SES-K-20-2013, SES-K-20-2021, SES-K-20-3002, SES-K-20-1061, SES-K-2022, SES-K-20-2024, SES-K-20-2025, SES-K-20-2026
Moderately Susceptible	3-4	4	RT-372, SES-K-20-2019, SES-3-19-3014, IIOS-20-3013
Susceptible	4-5	0	-
Highly Susceptible	>5	1	RJR-170

Authorship Contribution Statement

T. Boopathi conceived and designed the research. K. Swathi conducted the experiments and contributed to data interpretation. K.T. Ramya supplied the breeding material. T. Boopathi, K. Swathi, and S.R. Koteswara Rao analysed data and prepared the manuscript. All authors reviewed and approved the final version.

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