Journal of Experimental Agriculture International

Volume 46, Issue 8, Page 875-879, 2024; Article no.JEAI.121626
ISSN: 2457-0591
(Past name: American Journal of Experimental Agriculture, Past ISSN: 2231-0606)

Screening of Sesamum (*Sesamum indicum* L.) Genotypes Against Powdery Mildew Disease

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: https://doi.org/10.9734/jeai/2024/v46i82773

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/121626

Original Research Article

Received: 08/06/2024
Accepted: 10/08/2024
Published: 16/08/2024

ABSTRACT

An investigation was conducted to screen twentyseven genotypes to identify the source of resistance to powdery mildew disease. All the twenty seven genotypes were raised during summer 2024 at RARS, Jagtial under unprotected field conditions, following infector row technique with Swetha as susceptible check. After 50-60 DAS,the genotypes were scored for powdery mildew

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Cite as: *Soniya, K, K. Jhansi Rani, D. Padmaja, N. Balram, and Praduman Yadav. 2024. "Screening of Sesamum (Sesamum Indicum L.) Genotypes Against Powdery Mildew Disease". Journal of Experimental Agriculture International 46 (8):875-79. https://doi.org/10.9734/jeai/2024/v46i82773.*

using 0-9 scale. Among the genotypes screened,seven genotypes *viz*., BRT-04, JCS 2454 × BRT-04**,** JCS 1020 × BRT-04, Rajeshwari × JCS 1020, JCS 1020 × ES-139-2-84, Rajeshwari × ES-139-2-84, Swetha × ES-139-2-84 were found resistant with PDI score ranging from 1-30 %. Seventeen genotypes were found moderately resistant with PDI ranging from 30%-50% and two genotypes viz., Rajeshwari and JCS DT 26 exhibited PDI score between 50-100% was found to be susceptible. None of the genotypes were found to be immune in response.The identified resistant genotypes can be further utilized for development of resistant varieties and also aids in identification of marker through molecular breeding.

Keywords: Sesame; powdery mildew; PDI; resistance.

1. INTRODUCTION

Sesame (*Sesamum indicum* L.) is an age-old indigenous oilseed crop recognized as the queen of oil seeds owing to its high oil value and nutritional benefits. Sesame seeds, which store oil in their cotyledons, are known for having one of the highest oil contents among oil crops, reaching up to 55%. The sesame oil is colourless with distinct sweet flavour and contain balanced fatty acid composition with higher proportion of unsaturated fatty acid. It is majorly cultivated in tropical and sub-tropical regions and has excellent value for high quality edible oil and can be consumed directly for confectionary purpose.It is the fourth largest oilseed crop cultivated in India after soyabean, rapeseed & mustard and groundnut [1]. Owing to increasing market demand, the sesame is recognized to hold a significant place in international trade [2,3].

"In India, Sesame is being grown over an area of 15.23lakh hectares with production of 8.02 lakh tonnes and productivity of 527 kg ha^{-1}"[1]. "In Telangana, it is cultivated over an area of 0.14 lakh hectares with an annual production of 0.11 lakh tonnes and productivity of 756 $kgha^{-1}$"[1]. Sesame crop have a strong inherent ability to resist both biotic and abiotic stress, thrives well in drained soils and in various agro climatic regions. However, it can occasionally fail to cope with severe environmental and biotic stresses. Among major foliar diseases, powdery mildew is one of the devastating disease in sesamum cultivation. It is caused by many species of fungi *Erisiphe cichorecearum, Leveillula taurica, Oidium erysiphoides* and *Oidium sesame.*It causes yield loss up to 50%[4]. Unlike many other fungal diseases, powdery mildew does not require wet conditions to thrive. In fact, it often appears in dry, warm conditions with high humidity, making it distinguishable from other fungal pathogens that require free water on the leaf surface [5,6].

Powdery mildew first appears as small, cottony spots on the upper surface of the leaves starting from 45 days old plants to crop maturity stage. When the several spots are coalesce, the entire leaf surface may be covered with powdery coating. In several cases the infection may be seen on the flowers and young capsules, leading to premature shedding. These symptoms can vary slightly depending on the specific host plant and the powdery mildew species involved, but the presence of the characteristic powdery white or gray growth is the most reliable indicator of the disease.

Chemical control these of diseases is very costly and negatively impacts environmental,as well as posing risks to human health. Therefore, it is essential to find alternative methods to prevent damage from these diseases. Breeding for resistant cultivars is a viable option. An attempt was made to identify the source for resistance to powdery mildew in sesamum and to assist sesame breeders aimed at resistance breeding in future.

2.MATERIALS AND METHODS

In the present investigation, six lines namely Rajeshwari, Swetha, JCS 1020, JCS 3202, JCS 2454 and JCS DT 26 high yielding varieties but susceptible to powdery mildew and three testers, ES-139-2-84, JCS 4019 and BRT-04 tolerant to powdery mildew from RARS, Jagtial were chosen as parents for hybridization. F_1 was developed by conducting crossing programme during late *kharif* 2023 at RARS, Polasa, Jagtial. The parents, F_1 population was raised in 2 rows of 3 meter length with 30×15 cm spacing and replicated thrice. In addition, susceptible check was raised around the experimental plot for uniform infection. These population were screened under natural field conditions for powdery mildew resisitance.

"The crop was raised adopting the all recommended package of practices. The disease data was recorded at 50 to 60 days after sowing

(DAS) when the disease incidence was maximum on the susceptible check" [7]

"Observation on disease reaction was made on five randomly selected plants in each entry. Nine leaves were scored in each plant, three each from the apical, middle and basal regions, and all of them were graded. The disease intensity (PDI) was scored (Table 1) adopting the following 0-9 grade" (TNAU,1980). Level of resistance/susceptibility of the entries to the disease was determined by Percent Disease Index (PDI) following the formula of Mc Kinney [8].

3.RESULTS AND DISCUSSION

A set of 27 genotypes of sesame were screened for powdery mildew reaction under field conditions using infector row technique. Out of the 27 entries tested, 7 genotypes (BRT-04, JCS 2454 X BRT-04, JCS 1020 X BRT-04, Rajeshwari X JCS 4019, JCS 1020 X ES-139-2-84, Swetha X ES-139-2-84, Rajeshwari X ES-139-2-84) were found to be resistant to powdery mildew and their PDI varies from 22.22 to 27.03%. The most resistant genotype for powdery mildew was JCS 1020 X BRT-04 (22.22 %) while other genotypes were having good level of resistance like JCS 1020 X ES-139-2-84 (22.71%), Rajeshwari X JCS 4019 (22.96%), BRT-04 (23.54%) (Table 3).17 genotypes were moderately resistant (PDI 30.06 to 48.54%), while, two genotypes Rajeshwari and JCS DT 26 shown susceptible (50.24% and 50.61%) reaction against powdery mildew respectively. The similar result was reported from findings of Ashfaq et al. [9]. The level of resistance and susceptibility varied with the genotypes. Interestingly, none of the genotype was found immune depicting lack of strong sources of resistance to the disease. The variation of genotypes to disease may be due to different genotypes and species or race spectrum of the pathogen causing the disease. "It is also observed that duration of the crop influences the level of resistance or susceptibility. It was observed in the present study that early maturing genotypes were relatively more susceptible to the disease as compared to the late maturing ones and are in conformity with the earlier reports" by Rao et al. [4]. The disease reaction also influenced by some agro-botanical trait like leaf angle and leaf breathiness according to M Kabi et al. [10] in case of powdery mildew disease [11-13].

Table 1. Grading of powdery mildew disease intensity

Disease grade	Description
0	No lesions or specks
1	Small sized powdery specks infecting less than 1% leaf area
3	Enlarged irregular powdery growth covering 1-5% leaf area
5	Powdery growth to form big patches covering 5-25% leaf area
7	Powdery growth covering 25-50% leaf area followed by yellowing
9	100% leaf area covered with powdery growth, yellowing and dropping of infected leaves

Percent Disease Index (PDI) = Sum of grades / Total number of leaves analysed ×100 / Maximum disease grade

Table 2. The screened genotypes are classified based on Percent Disease Index [7]

PDI	Disease reaction
0	Immune (I)
1-30	Resistant (R)
31-50	Moderately Resistant (MR)/Tolerant (T)
≥ 50	Susceptible (S)

Table 3. Reaction of 27 genotypes to powdery mildew disease

Sl.No	Genotype	PDI %	Disease Reaction
1	Rajeshwari	50.24	Susceptible
2	Swetha (SC)	54	Susceptible
3	JCS 1020	39.63	Moderately Resistant / Tolerant
4	JCS 2454	39.26	Moderately Resistant / Tolerant

Sl.No	Genotype	PDI %	Disease Reaction
5	JCS 3202	30.61	Moderately Resistant / Tolerant
6	JCS DT 26	50.61	Susceptible
7	BRT-04	23.58	Resistant
8	JCS 4019	31.85	Moderately Resistant / Tolerant
9	ES-139-2-84	34.93	Moderately Resistant / Tolerant
10	JCS 3202 X BRT-04	42.22	Moderately Resistant / Tolerant
11	Swetha X BRT-04	41.11	Moderately Resistant / Tolerant
12	JCS 2454 X BRT-04	25.31	Resistant
13	JCS DT 26 X BRT-04	35.68	Moderately Resistant / Tolerant
14	Rajeshwari X BRT-04	41.35	Moderately Resistant / Tolerant
15	JCS 1020 X BRT-04	22.22	Resistant
16	Rajeshwari X JCS 4019	22.96	Resistant
17	JCS 2454 X JCS 4019	37.77	Moderately Resistant / Tolerant
18	JCS 3202 X JCS 4019	31.23	Moderately Resistant / Tolerant
19	JCS 1020 X JCS 4019	44.69	Moderately Resistant / Tolerant
20	JCS DT 26 X JCS 4019	39.13	Moderately Resistant / Tolerant
21	Swetha X JCS 4019	35.18	Moderately Resistant / Tolerant
22	JCS 3202 X ES-139-2-84	33.21	Moderately Resistant / Tolerant
23	JCS 1020 X ES-139-2-84	22.71	Resistant
24	Swetha X ES-139-2-84	25.55	Resistant
25	Rajeshwari X ES-139-2-84	27.03	Resistant
26	JCS 2454 X ES-139-2-84	31.11	Moderately Resistant / Tolerant
27	JCS DT 26 X ES-139-2-84	33.45	Moderately Resistant / Tolerant

4.CONCLUSION

The present investigation unveiled that out of twenty seven genotypes screened, JCS1020 X BRT-04 recorded resistant reaction to powdery mildew followed by JCS 1020 X139-2-84, Rajeshwari X JCS 4019, BRT-04, JCS 2454 X BRT-04, Swetha X ES-139-2-84 and Rajeshwari X ES-139-2-84. No genotype is found immune to disease. These genotypes can be further utilized in breeding programme to develop resistant varieties.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

ACKNOWLEDGEMENT

I sincerely extend my heartfelt gratitude and respect to the chairperson of my advisory committee, Dr. K. Jhansi Rani, Professor and Head, Department of Genetics and Plant Breeding, Agricultural College, Polasa, Jagtial, for her learned counsel and meticulous guidance on the work in all stages. I wish to offer my genuine thanks to Dr. D. Padmaja, Scientist (Plant Breeding) as a member of my advisory committee for her esteemed stewardship, charitable counseling and personal affection for which I am greatly indebted to her. I avail this opportunity expressing my sincere thanks to member of my advisory committee, Dr. N. Balram, Scientist (Plant Pathology) for providing the powdery mildew resistant testers and generous guidance and assisting me in every aspect of my research work. I deeply convey my thanks to Dr. Praduman Yadav, Scientist, Department of Biochemistry, IIOR, Hyd for his valuable suggestions. I would also like to thank Professor Jayashankar Telangana State Agricultural University (PJTSAU) for the generous funding support for the research work presented in the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/121626