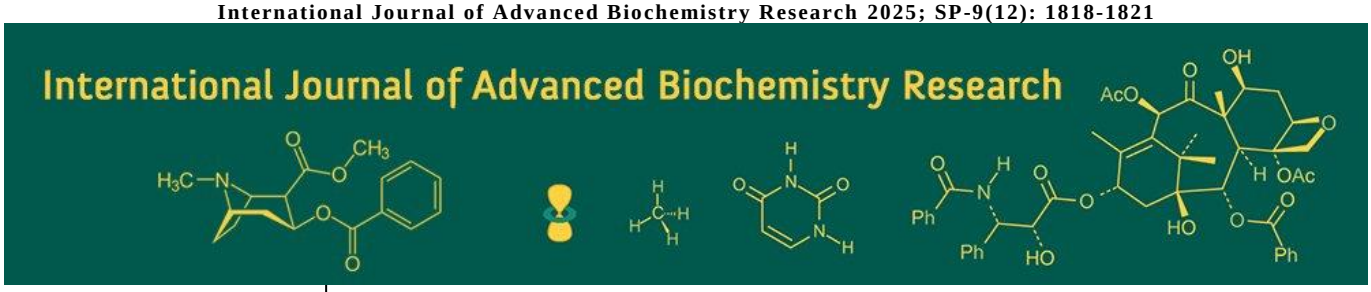

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Screening of rice varieties for resistance against sheath blight disease caused by *Rhizoctonia solani* in Konkan region of Maharashtra, India

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Abstract
The field experiment was conducted during *Kharif*, 2024 and *Rabi*, 2024-25 at Agricultural Research Station, Shirgaon, Dist. Ratnagiri to assess the reactions of thirty-one rice varieties against sheath blight disease under natural epiphytotic conditions. The results revealed that, amongst thirty-one rice varieties screened against sheath blight disease, twenty-one rice varieties were found moderately resistant, ten rice varieties *viz.*, Ratnagiri 5 (52.59% and 47.28%), Ratnagiri 7 (54.07% and 49.34%), Karjat 3 (49.34% and 47.68%), Karjat 4 (50.65% and 46.32%), Karjat 5 (55.27% and 49.94%), Karjat 6 (51.89% and 47.63%), Karjat Shatabdi (58.39% and 52.06%), Panvel 1 (53.17% and 49.44%), Panvel 2 (50.18% and 47.39%), Panvel 3 (52.64% and 49.28%) were found susceptible to sheath blight disease during *Kharif*, 2024 and *Rabi*, 2024-25, respectively. However, none of the rice variety exhibited immune, highly resistant, resistant and highly susceptible reaction against sheath blight disease during *Kharif*, 2024 and *Rabi*, 2024-25.

Keywords: Sheath blight, *Rhizoctonia solani*, screening, rice, resistance

Introduction
Rice (*Oryza sativa* L.) is one of the world's most important cereal crops. It is a highly nutritious, easily digestible and palatable food, often regarded as a complete meal staple. Beyond its nutritional value, rice carries deep cultural and economic importance, it serves as a key source of food security for billions, sustains the livelihoods of millions of small-scale farmers, symbolizes prosperity and tradition in numerous Asian ceremonies. The crop tenants a significant position in the culture and heritage of many Asian countries. In India, particularly in the eastern states, it is apart of almost every ritual. The crop has been referred in the Vedas, Ramayana, Mahabharata, Buddhist and other ancient literature (Pathak *et al.*, 2018) [7]. Rice is a highly nutritious, easily digestible and palatable cereal, making it an excellent staple for daily meals. It's packed with 80% carbohydrates, 7-8% protein, 3% fat and 3% fiber, along with essential minerals like iron, zinc, potassium, manganese and copper. It also provides crucial essential amino acids such as tryptophan, histidine, methionine, cysteine and arginine. Beyond its direct consumption, rice has diverse applications. It can be processed into various food products like ice cream, gel, bread, snacks, cookies and biscuits. Industrially, it's used to produce edible oil, cosmetics, synthetic fibers, detergents, emulsifiers, soap and fatty acids.

A variety of biotic and abiotic stresses act as significant constraints on rice cultivation across diverse agro-climatic regions and ecological systems. Among these diseases, sheath blight caused by *Rhizoctonia solani* is considered one of the most severe fungal infections, posing a major threat to rice cultivation in all production areas. In recent years, sheath blight has emerged as a significant disease of rice in the Konkan region of Maharashtra, leading to substantial yield losses.

In rice, *R. solani* mainly attacks the leaf sheath and leaf blades and in severe cases, the whole plant including the emerging panicles may be affected. The disease can occur at any stage of crop growth, rice crop is most vulnerable at the tillering phase. A characteristic early symptom is the formation of greenish-gray water-soaked lesions on the leaf sheath near the

water level. These lesions may be circular, oblong or elliptical, initially about 1 cm in size, later expanding into irregular shapes with grayish-white centers and brown margins. Under favorable conditions, the infection spread to upper leaf sheaths and leaf blades, which ultimately results in the rotting of leaf sheath and drying up of the whole leaf. In severe cases, the infection spreads to the panicle affecting grain filling and leading to the discoloration of seeds with brownish black spots or black to ashy gray patches. In acute cases, the disease causes the death of the whole leaf, tiller and even the whole plant. At the field level, the infection usually affects the plants in a circular pattern referred to as 'bird's nest' (Ou *et al.*, 1973; Singh *et al.*, 1988; Hollier *et al.*, 2009; Singh *et al.*, 2016) [6, 10, 5, 11].

Considering economic importance of the crop as well as destructive nature of the disease, varietal screening was undertaken in field conditions to find out resistant varieties against the sheath blight disease.

2. Materials and Methods

The field experiment was conducted during *Kharif*, 2024 and *Rabi*, 2024-25 at Agricultural Research Station, Shirgaon, Dist. Ratnagiri under natural epiphytotic conditions. Thirty-one rice varieties were screened to assess their reactions against sheath blight of rice caused by *R. solani*.

Observations on vertical disease spread were recorded on five randomly selected plants from each variety, by using 0-9 scale (IRRI, 2014), starting first at initiation of the disease symptoms and continued upto physiological maturity of the crop.

Standard evaluation system (SES), IRRI (2014)

Scale grade	Description	Response
0	No infection	Immune
1	Lesion limited to the lower 20% of plant height	Highly Resistant
3	Lesion limited to the lower 20-30% of the plant height	Resistant
5	Lesion limited to the lower 31-45% of the plant height	Moderately Resistant
7	Lesion limited to the lower 46-65% of the plant height	Susceptible
9	Lesion more than 65% of the plant height	Highly Susceptible

Further the per cent disease index (PDI) were calculated using the formula given by Wheeler (1969) [12].

$$\text{Percent Disease Index (PDI)} = \frac{\text{Sum of individual disease numerical ratings}}{\text{Total number of tillers observed x Maximum disease grade}} \times 100$$

3. Results and Discussion

Result presented in Table 1, Plate I and Fig. 1 revealed that, amongst thirty-one rice varieties screened against sheath blight disease, twenty-one rice varieties *viz.*, Ratnagiri 1 (39.76% and 34.11%), Ratnagiri 2 (43.15% and 41.47%), Ratnagiri 3 (37.04% and 32.93%), Ratnagiri 4 (36.82% and 33.76%), Ratnagiri 6 (33.61% and 31.09%), Ratnagiri 8 (32.68% and 31.56%), Ratnagiri 24 (36.17% and 33.89%), Ratnagiri 73 (34.62% and 31.91%), Ratnagiri 711 (38.43% and 35.37%), Karjat 1(33.70% and 32.29%), Karjat 2 (35.27% and 34.36%), Karjat 7 (35.56% and 31.87%), Karjat 8 (39.04% and 33.58%), Karjat 9 (43.37% and 38.44%), Karjat 10 (40.28% and 34.19%), Karjat 184 (36.22% and 32.37%), Karjat Kolam (38.55% and 33.73%), Palghar 1 (37.05% and 33.56%), Palghar 2(34.32% and 31.67%), Konkan Sanjay (36.61% and 32.78%) and Konkan Suhas (41.37% and 38.14%) were found moderately resistant to sheath blight disease during *Kharif*, 2024 and *Rabi*, 2024-25, respectively.

While, ten rice varieties *viz.*, Ratnagiri 5 (52.59% and 47.28%), Ratnagiri 7 (54.07% and 49.34%), Karjat 3 (49.34% and 47.68%), Karjat 4 (50.65% and 46.32%), Karjat 5 (55.27% and 49.94%), Karjat 6 (51.89% and 47.63%), Karjat Shatabdi (58.39% and 52.06%), Panvel 1 (53.17% and 49.44%), Panvel 2 (50.18% and 47.39%), Panvel 3 (52.64% and 49.28%) were found susceptible to sheath blight disease during *Kharif*, 2024 and *Rabi*, 2024-25 respectively.

Table 1: Screening of rice varieties against sheath blight disease during *Kharif*, 2024 and *Rabi*, 2024-25

Sr. No.	Variety	PDI		Reaction
		***Kharif*, 2024**	***Rabi*, 2024-25**	
1.	Ratnagiri 1	39.76 (39.09)*	34.11 (35.74)	Moderately Resistant
2.	Ratnagiri 2	43.15 (41.06)	41.47(40.09)	Moderately Resistant
3.	Ratnagiri 3	37.04 (37.49)	32.93 (35.02)	Moderately Resistant
4.	Ratnagiri 4	36.82 (37.36)	33.76 (35.52)	Moderately Resistant
5.	Ratnagiri 5	52.59 (46.48)	47.28 (43.44)	Susceptible
6.	Ratnagiri 6	33.61(35.43)	31.09 (33.89)	Moderately Resistant
7.	Ratnagiri 7	54.07 (47.33)	49.34 (44.62)	Susceptible
8.	Ratnagiri 8	32.68 (34.87)	31.56 (34.18)	Moderately Resistant
9.	Ratnagiri 24	36.17 (36.97)	33.89 (35.60)	Moderately Resistant
10.	Ratnagiri 73	34.62 (36.04)	31.91 (3.39)	Moderately Resistant
11.	Ratnagiri 711	38.43 (38.31)	35.37 (36.49)	Moderately Resistant
12.	Karjat 1	33.70 (35.48)	32.29 (34.62)	Moderately Resistant
13.	Karjat 2	35.27 (36.43)	34.36 (35.88)	Moderately Resistant
14.	Karjat 3	49.34 (44.62)	47.68 (43.67)	Susceptible
15.	Karjat 4	50.65 (45.37)	46.32 (42.88)	Susceptible
16.	Karjat 5	55.27 (48.02)	49.94 (44.96)	Susceptible
17.	Karjat 6	51.89 (46.08)	47.63 (43.64)	Susceptible
18.	Karjat 7	35.56 (36.60)	31.87 (34.37)	Moderately Resistant

19.	Karjat 8	39.04 (38.66)	33.58 (35.41)	Moderately Resistant
20.	Karjat 9	43.37 (41.19)	38.44 (38.31)	Moderately Resistant
21.	Karjat 10	40.28 (39.39)	34.19 (35.78)	Moderately Resistant
22.	Karjat 184	36.22 (37.00)	32.37 (34.67)	Moderately Resistant
23.	Karjat Shatabdi	58.39 (49.82)	52.06 (46.18)	Susceptible
24.	Karjat Kolam	38.55 (38.38)	33.73 (35.50)	Moderately Resistant
25.	Panvel 1	53.17 (46.81)	49.44 (44.67)	Susceptible
26.	Panvel 2	50.18 (45.10)	47.39 (43.50)	Susceptible
27.	Panvel 3	52.64 (46.51)	49.28 (44.58)	Susceptible
28.	Palghar 1	37.05 (37.49)	33.56 (35.40)	Moderately Resistant
29.	Palghar 2	34.32 (35.86)	31.67 (34.24)	Moderately Resistant
30.	Konkan Sanjay	36.61 (37.23)	32.78 (34.92)	Moderately Resistant
31.	Konkan Suhas	41.37 (40.03)	38.14 (38.13)	Moderately Resistant

* Values in parentheses are arc-sine transformed values

However, none of the rice variety exhibited immune, highly resistant, resistant and highly susceptible reaction against sheath blight disease during *Kharif*, 2024 and *Rabi*, 2024-25.

Table 2: Reaction of rice varieties against sheath blight disease

Sr. No.	Reaction	Total No. of varieties	Name of varieties
1.	Immune	0	Nil
2.	Highly Resistant	0	Nil
3.	Resistant	0	Nil
4.	Moderately Resistant	21	Ratnagiri 1, Ratnagiri 2, Ratnagiri 3, Ratnagiri 4, Ratnagiri 6, Ratnagiri 8, Ratnagiri 24, Ratnagiri 73, Ratnagiri 711, Karjat 1, Karjat 2, Karjat 7, Karjat 8, Karjat 9, Karjat 10, Karjat 184, Karjat Kolam, Palghar 1, Palghar 2, Konkan Sanjay, Konkan Suhas
5.	Susceptible	10	Ratnagiri 5, Ratnagiri 7, Karjat 3, Karjat 4, Karjat 5, Karjat 6, Karjat Shatabdi, Panvel 1, Panvel 2, Panvel 3
6.	Highly Susceptible	0	Nil

The results of present study are on the same line with the findings of several earlier workers. Pavani *et al.* (2018) [8] screened 196 germplasm lines of rice under natural conditions against *R. solani*, causing rice sheath blight (ShB) disease and reported that none of the entries showed immune or resistant reaction against the disease, 57 entries were moderately resistant, 109 entries were moderately susceptible and rest of 22 entries were highly susceptible. Similarly, Prasad *et al.* (2020) [9] screened 31 entries of rice against sheath blight and reported that that 21 entries showed resistant reaction to the disease. Nine entries showed moderately resistant reaction and only single entry recorded as susceptible reactions against the disease. Akter *et al.* (2021) [1] screened seven varities of rice against sheath blight (*R. solani*) and reported that, the test varieties *viz.*, BR3, BR14, BR21, BR24, BR16, BR26, resulted as resistant to disease and the variety BRRI dhan 27 appeared as moderately susceptible to the disease. Gupt *et al.* (2021) [4] tested 42 rice genotypes against sheath blight under artificial epiphytotic condition and reported that three genotypes *viz.*, Sabitri, GSR 310 and Hardinath-3 found moderately resistant to disease. Four genotypes *viz.*, IR 15D 110, Pant-1, NR 2152-23-1-2-1-1-1-1 and IR 82635-B-B-114-3 found moderately susceptible. 33 genotypes were found susceptible, whereas two genotypes *viz.*, Pant-2 and Sukha dhan-4 showed highly susceptible response to sheath blight disease. While screening 17 rice entries against sheath blight (R. *solani*), Amit *et al.* (2023) [2] reported that, among all the tested entries of rice no any entry was resulted immune or highly resistant response to sheath blight of rice. Fourteen entries were recorded as resistant. Arpitha *et al.* (2025) [3] screened 240 landraces against sheath blight disease (*R. solani*) and reported that none landraces exhibited an immune response. However, seven genotypes showed a resistant reaction, 72 genotypes were showed as moderately susceptible reaction, 70 genotypes were classified as susceptible and 31 genotypes were identified as highly susceptible to sheath blight.

Plate I: Screening of rice varieties for resistance against sheath blight disease

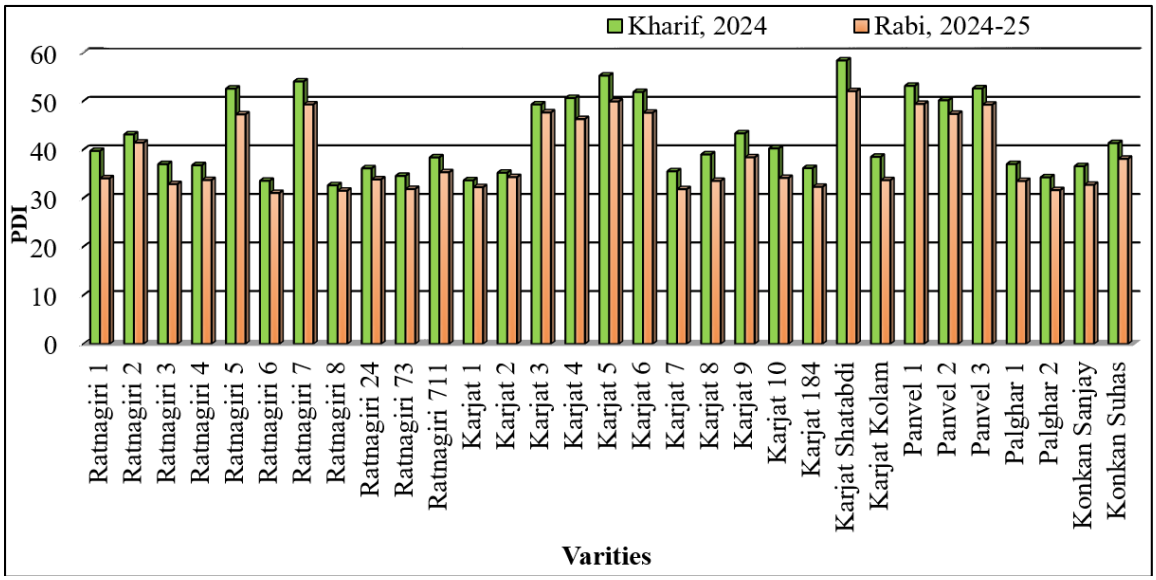

Fig 1: Screening of rice varieties for resistance against sheath blight disease

4. Conclusion

From two consecutive screening trials, it is concluded that amongst thirty-one rice varieties screened against sheath blight disease, twenty-one rice varieties were found moderately resistant, ten varieties were susceptible, whereas, none of the rice variety exhibited immune, highly resistant, resistant and highly susceptible reaction against sheath blight disease, during *Kharif*, 2024 and *Rabi*, 2024-25.

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