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Extensive Survey of Sheath Blight of Rice (*Rhizoctonia solani*) in Different Geographical Area of Chhattisgarh, India

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Authors' contributions

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

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ABSTRACT

The present investigation was carried out in the department of Plant Pathology, College of Agriculture, I.G.K.V., Raipur (C.G) during the year 2022-23. Across the world, rice is cultivated as a significant cereal crop, but mostly in Southeast Asian countries. Six rice growing districts of Chhattisgarh were surveyed for sheath blight of rice disease viz. Dhamtari, Balod, Raipur, Kanker, Ambikapur and Kawardha. The disease incidence at the time of survey ranged from 25.82 % to 70 %. The highest percent disease incidence (70%) was recorded at village Mujgahan, districts Dhamtari and lowest PDI was 25.82% at Kawardha districts.

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Keywords: Rice; sheath blight; survey; perecent disease incidence.

1. INTRODUCTION

Rice (Oryza sativa L) is the staple food crop of majority of the India population. Rice is an imperative cereal crop all over the world, but it is grown mostly in Southeast asian countries. The crop is grown in the Himalayas between 6 feet below sea level and 2700 feet above sea level (Pathak et al., 2020). Over the next 20 years, it is estimated that demand for rice will increase by 2.5 percent annually [1].

Chhattisgarh, West Bengal, Uttar Pradesh, Andhra Pradesh, Tamil Nadu, Punjab, Orissa, and Bihar are the top leading rice producer states in India. Over 75% of rice production in India is produced by these regions, which keeps around 72% of India's total rice producing region. West Bengal has the highest production. In 2020-21, production of rice in West Bengal was 16.65 million tonnes. Uttar Pradesh is second in this list of India's largest paddy rice producer in 2020-21. Uttar Pradesh's rice production was 15.66 million tonnes. Rice cultivation area in India is 47.07 million hectares and rice production in India 122.27 million tonnes. Chhattisgarh also called as 'rice bowl of India'. Rice cultivation area in Chhattisgarh 3.79 million hectares and rice production in Chhattisgarh 7.16 million tonnes. (Anonymous,2021).

Rice sheath blight caused by *Rhizoctonia solani* [Teleomorph: *Thanatephorus cucumeris* (Frank) Donk] is one of the most important biotic constraints in India [2,3]. Miyake first described *Rhizoctonia solani* in Japan in 1910 [4]. In India, Chahal [5] first reported it from Gurdaspur in Punjab. Sheath blight of rice is second most economically important disease after blast. Inoculum from the sheath blight infected field also becomes major Source of primary inoculums.

2. MATERIALS AND METHODS

An extensive survey of rice field was carried out to find out the incidence and severity of sheath blight caused by *R.solani* in Kharif- 2022-23 and transplanting to harvesting period of the crop in different rice growing districts of Chhattisgarh viz., Dhamtari, Balod, Raipur, kanker, Ambikapur and Kawardha In each district, two to five villages were selected. In each field, three random plots of $1m^2$ were selected and observed.

The Perecent disease incidence (PDI) was calculated by using following formula:

$$\text{Disease incidence PDI} = \frac{\text{Number of infected hills Percent}}{\text{Total number of hills}} \times 100$$

Naturally infected leaves and others plants parts showing characteristics symptoms of sheath blight were collected from each surveyed rice field and brought to the laboratory for symptoms description and isolation.

For the isolation of *Rhizoctonia solani*, infected rice plant parts, cut with the help of sterilized blade having typical symptoms along with healthy tissues were. Pieces were washed carefully with the tap water and placed into 1.0 % sodium hypochloride solution for 30 seconds followed by washing thrice with the sterilized water thoroughly. Excess water was removed by placing on the folds of sterilized blotting paper. Dried pieces were aseptically transferred into sterilized petridishes containing potato dextrose agar medium with the help of a sterilized forceps. Inoculated petridishes incubated at 25±20 C in B.O.D. incubator. After two days of isolation the fungus growth was checked in the Petridishes.

3. RESULTS AND DISCUSSION

Extensive survey of six districts of Chhattisgarh were survey was conducted in the months of October, November, and December. There districts were Dhamtari, Balod, Raipur, kanker, Ambikapur and Kawardha and were PDI of sheath blight disease of rice recorded during Kharif 2022-23. The results obtained after survey were presented in Table 1 The disease incidence at the time of survey ranged from 25.82 % to 70 %. The highest percent disease incidence was recorded (70%) at village Mujgahan, districts Dhamtari followed by 65.49 % at village Perpar belongs to dist. Balod. In kanker district highest PDI was 40.17 % at kanker followed by 30.30% at matwada village. In Ambikapur district the PDI was recorded 54.13 % and in Raipur district the highest PDI was recorded 45.10 % at research farm IGKV followed by bhendri-2 34.64 %. The lowest PDI was 25.82% at kawardha districts.

Similar findings were reported by Rathor et al. [6]. They observed highest disease incidence (76%) at gariyaband followed by raipur (47.5%), and kawardha had the lowest (30%) disease incidence. Thera et al. (2013) reported similar findings.

The investigation conducted within the ambit of the Department of Plant Pathology at the College of Agriculture, I.G.K.V., Raipur, during the years 2022-23, represents a comprehensive examination into the prevalence and distribution of sheath blight of rice (*Rhizoctonia solani*) across various regions of Chhattisgarh, India. Rice, a staple cereal crop globally, occupies a paramount position in agricultural landscapes, particularly within Southeast Asian nations. The survey encompassed six distinct rice-growing districts within Chhattisgarh, namely Dhamtari, Balod, Raipur, Kanker, Ambikapur, and Kawardha.

The incidence of sheath blight disease was meticulously assessed during the survey period. The findings revealed a considerable range in disease incidence, varying from 25.82% to 70% across the surveyed districts. Notably, the village of Mujgahan in the Dhamtari district exhibited the highest recorded disease incidence, reaching 70%, while the lowest incidence was observed in Kawardha district at 25.82%. Such fluctuations in disease incidence underscore the complex interplay of diverse environmental factors influencing disease dynamics.

Soil quality emerges as a critical determinant of disease prevalence [7,8,9], with variations in soil composition and fertility exerting pronounced effects on pathogen survival and proliferation [10,11,12]. Furthermore, precipitation patterns [13,14], temperature regimes [15], relative humidity levels [16], and broader climatic shifts constitute pivotal drivers shaping disease epidemiology [17,18,19]. Variability in these environmental parameters across geographical locations can significantly modulate the prevalence and severity of sheath blight in rice cultivation regions [20,21].

Agronomic management practices also play a pivotal role in mitigating disease incidence. Effective crop management strategies, including proper irrigation techniques [22,23], judicious fertilizer application, and timely cultural practices, are imperative for minimizing disease outbreaks [24,25,26]. Moreover, the adoption of resistant rice varieties and integrated disease management approaches can bolster crop resilience against sheath blight [27,28].

The observed disparities in disease incidence underscore the multifaceted nature of sheath blight epidemiology, necessitating tailored intervention strategies that account for the intricate interplay of environmental [29,30], agronomic [31,32], and pathogenic factors. Such insights are crucial for devising targeted measures to enhance crop productivity and mitigate the detrimental impacts of sheath blight on rice cultivation in Chhattisgarh and beyond [33].

Fig. 1. Extensive survey of six districts of Chhattisgarh

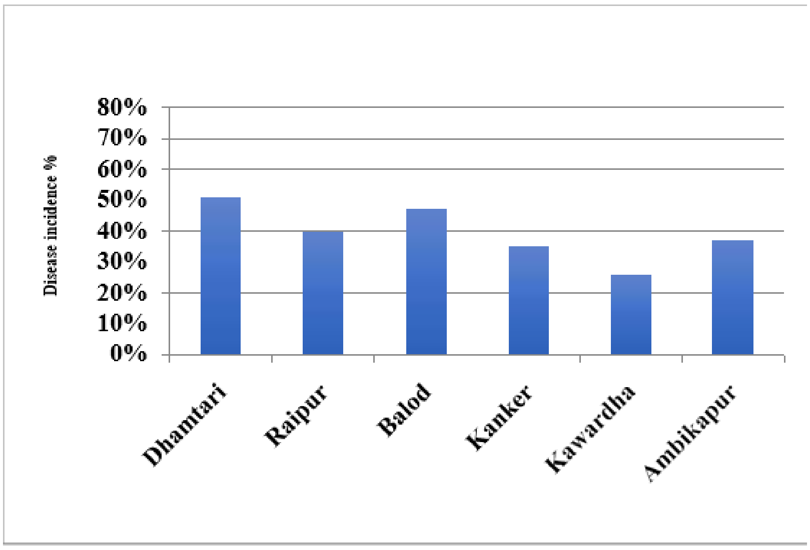

Fig. 2. Graphical representation of PDI % district wise

Table 1. Extensive survey of six districts of Chhattisgarh

S.No	Location			Latituide/ Longitude	Crop stage	Sowing method	DI %
	District	Block / Tehsil	Village				
1	Dhamtari	Dhamtari	Mujgahan	20.724519˚ 81.527756˚	Tillering	Transplanting	70
		Magarlod	Hasda	20.833617˚ 81.869153˚	Tillering	Transplanting	43.55
		Nagri	Siyadehi	20.643548˚ 81.620936˚	Booting	Transplanting	40.39
2	Raipur	Raipur	IGKV	21.234894˚ 81.700203˚	Milky satage	Transplanting	45.10
		Abhanpur	Bendri-2	21.123967˚ 81.738461˚	Milky satage	Transplanting	34.64
3	Balod	Gurur	Khundani	20.746079˚ 81.443531˚	Tillering	Transplanting	40.43
		Gurur	Perpar	20.752556˚ 81.482764˚	Tillering	Transplanting	65.49
		Gurur	Basin	20.791869˚ 81.424964˚	Flowering	Transplanting	35.75
4	Kanker	Kanker	kanker	20.237906˚ 81.509482˚	Heading	Transplanting	40.17
		Kanker	Matwada	20.26236˚ 81.516677˚	Booting	Transplanting	30.30
5	Kawardha	Kawardha	Kawardha	22.143941˚ 81.33655˚	Panical initiation	Transplanting	25.82
6	Ambikapur	Ambikapur	Ambikapur	23.154176˚ 83.14269˚	Tillering	Transplanting	54.13

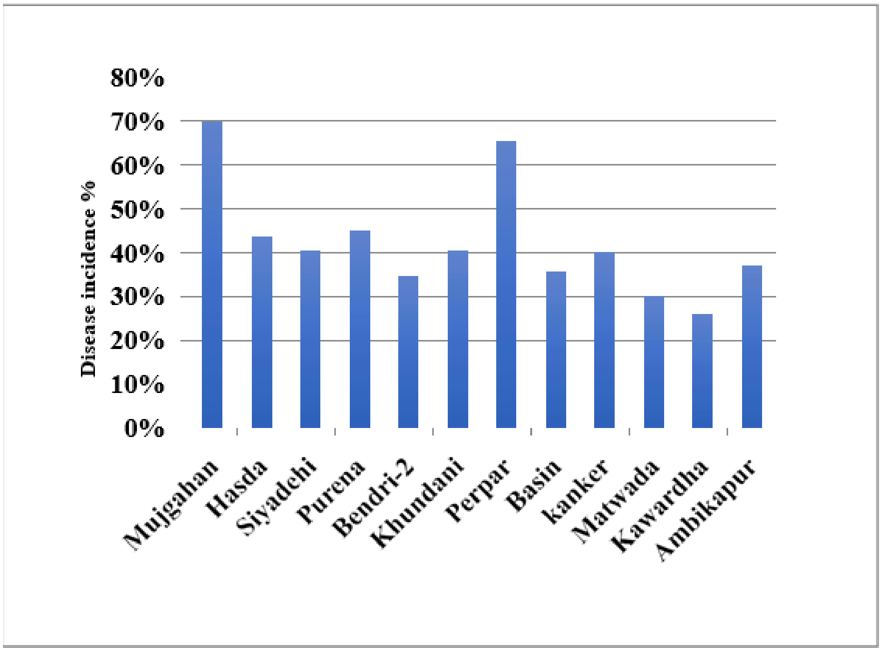

Fig. 3. Graphical representation of PDI % village wise

4. CONCLUSION

Sheath blight of rice is second most economically important disease after blast. Inoculum from the sheath blight infected field also becomes major Source of primary inoculums.

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.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Hobbs PR. Tillage and crop establishment in South Asian rice. 2001;46:12- 17.
2. Sharma S, Tripathi SK, Kashyap VK, Rajput B, Kumar B. Cultural characteristics of Rhizoctonia solani causing sheath blight of rice. International Journal of Environment and Climate Change. 2023; 13(11):2622–2627. Available:https://doi.org/10.9734/ijecc/2023/v13i113430
3. Toorray NK. Cultural and morphological variabilty in Rhizoctonia solani isolates of different rice growing areas of Chhattisgarh, India. International Journal of Environment and Climate Change. 2023; 13(11):209–220. Available:https://doi.org/10.9734/ijecc/2023/v13i113160
4. Ou SH. Rice disease.2nd Edition Common wealth Mycological Institute, Kew, Surrey, England. 1985;379.
5. Chahal KKS, Sokhi SS, Rattan GS. Investigation on sheath blight of rice in Punjab. Ind. Phytopath. 2003;56(1):22-26.
6. Rathod P, Yadav SC , Awadhiya GK, Awadhiya, Prasad MS, Prakasam V. Survey and occurrence of sheath blight of rice in major rice growing areas of Chhattisgarh int. J. Pure App. Biosci. 2017;5(4):838-845.
7. Araya-Alman M, Olivares B, Acevedo-Opazo C, et al. Relationship between soil properties and banana productivity in the two main cultivation areas in Venezuela. J Soil Sci Plant Nutr. 2020;20(3):2512-2524. Available:https://doi.org/10.1007/s42729-020-00317-8
8. Olivares BO, Vega A, Calderón MAR, Rey JC, Lobo D, Gómez JA, Landa BB. Identification of soil properties associated with the incidence of banana wilt using supervised methods. Plants. 2022c;11: 2070. Available:https://doi.org/10.3390/plants11152070

9. Campos BO. Banana production in Venezuela: Novel solutions to productivity and plant health. Springer Nature; 2023. Available:https://doi.org/10.1007/978-3-031-34475-6
10. Calero J, Olivares BO, Rey JC, Lobo D, Landa BB, Gómez JA. Correlation of banana productivity levels and soil morphological properties using regularized optimal scaling regression. Catena. 2022; 208:105718. Available:https://doi.org/10.1016/j.catena.2021.105718
11. Olivares B, Rey JC, Lobo D, Navas-Cortés JA, Gómez JA, Landa BB. Machine learning and the new sustainable agriculture: applications in banana production systems of Venezuela. Agricultural Research Updates. Nova Science Publishers, Inc. 2022a;42:133 - 157.
12. Olivares BO, Rey JC, Perichi G, Lobo D. Relationship of microbial activity with soil properties in banana plantations in Venezuela. Sustainability. 2022b;14: 13531. Available:https://doi.org/10.3390/su142013531
13. Cortez A, Olivares B, Parra R, Lobo D, Rodríguez MFY, Rey JC. Description of meteorological drought events in localities of the central mountain range, Venezuela.Ciencia, Ingenieríasy Aplicaciones. 2018;1(1):22-44. Available:http://dx.doi.org/10.22206/cyap.2018.vlil.pp23-45
14. Hernández R, Olivares B, Arias A, Molina JC, Pereira Y. Agroclimatic zoning of corn crop for sustainable agricultural production in Carabobo, Venezuela. Revista Universitaria de Geografía. 2018a;27(2): 139-159. Available:https://n9.cl/l2m83
15. Guevara E, Olivares B, Oliveros Y, López L. Estimation of thermal comfort index as an indicator of heat stress in livestock production in the Guanipa plateau, Anzoátegui, Venezuela. Revista Zootecnia Tropical. 2013;31(3):209-223. Available:https://n9.cl/ovcu9
16. Campos-Olivares B, Hernández R, Coelho R, Molina JC, Pereira Y. Análisis espacial del índice hídrico: Un avance en la adopción de decisiones sostenibles en los territorios agrícolas de Carabobo, Venezuela. Revista Geográfica de América Central. 2018;60(1):277-299. Available:https://doi.org/10.15359/rgac.60-1.10
17. Cortez A, Olivares B, Muñetones AY, Casana S. Strategic elements of organizational knowledge management for innovation. case: Agrometeorology network. Revista Digital de Investigación en Docencia Universitaria. 2016;10(1):68-81. Available:http://dx.doi.org/10.19083/ridu.10.446
18. Olivares B, Rey JC, Lobo D, Navas-Cortés JA, Gómez JA, Landa BB. Fusarium Wilt of Bananas: A Review of Agro-Environmental Factors in the Venezuelan Production System Affecting Its Development. Agronomy. 2021a;11(5):986. Available:https://doi.org/10.3390/agronomy11050986
19. Olivares B, Paredes F, Rey J, Lobo D, Galvis-Causil S. The relationship between the normalized difference vegetation index, rainfall, and potential evapotranspiration in a banana plantation of Venezuela. SAINS TANAH - Journal of Soil Science and Agroclimatology. 2021b;18(1): 58-64. Available:http://dx.doi.org/10.20961/stjssa.v18i1.50379
20. Hernández R, Olivares B, Arias A, Molina JC, Pereira Y. Identification of potential agroclimatic zones for the production of onion *(Allium cepa L.)* in Carabobo, Venezuela. Journal of the Selva Andina Biosphere. 2018b;6(2):70-82. Available:http://www.scielo.org.bo/pdf/jsab/v6n2/v6n2_a03.pdf
21. Hernández R, Olivares B. Application of multivariate techniques in the agricultural land's aptitude in Carabobo, Venezuela. Tropical and Subtropical Agroecosystems. 2020;23(2):1-12. Available:https://n9.cl/zeedh
22. Hernández R, Olivares B. Ecoterritorial sectorization for the sustainable agricultural production of potato (*Solanum tuberosum L.)* in Carabobo, Venezuela. Agricultural Science and Technology. 2019;20(2):339-354. Available:https://doi.org/10.21930/rcta.vol20_num2_art:1462
23. Montenegro E, Pitti J, Olivares B. Adaptation to climate change in indigenous food systems of the Teribe in Panama: A training based on CRISTAL 2.0. Luna Azul. 2021;51(2):182 – 197. Available:https://n9.cl/qwvw

24. Hernández R, Pereira Y, Molina JC, Coelho R, Olivares B, Rodríguez K. Calendario de siembra para las zonas agrícolas del estado carabobo en la república bolivariana de venezuela. Sevilla, Spain, Editorial Universidad Internacional de Andalucía. 2017;247. Available:https://n9.cl/sjbvk
25. Hernandez R, Olivares B, Arias A, Molina JC, Pereira Y. Eco-territorial adaptability of tomato crops for sustainable agricultural production in Carabobo, Venezuela. Idesia. 2020;38(2):95-102. Available:http://dx.doi.org/10.4067/S071834292020000200095
26. Montenegro E, Pitti J, Olivares B. Identification of the main subsistence crops of Teribe: A case study based on multivariate techniques. Idesia. 2021;39 (3):83 - 94. Available:http://dx.doi.org/10.4067/S0718-34292021000300083
27. Olivares B, Parra R, Cortez AY, Rodríguez MF. Patterns of rainfall homogeneity in climatic stations of the Anzoátegui state, Venezuela. Revista Multiciencias. 2012;12: 11-17. Available:https://n9.cl/xbslq
28. Olivares B, Torrealba JY, Caraballo L. Variability of the precipitation regime in the period 1990-2009 in the location of El Tigre, Anzoátegui state, Venezuela. Rev. Fac. Agron. (LUZ). 2013;30(1): 19-32. Available:https://n9.cl/mic0l
29. Olivares B, Zingaretti ML. Analysis of the meteorological drought in four agricultural locations of Venezuela by the combination of multivariate methods. UNED Research Journal. 2018;10(1):181-192. Available:http://dx.doi.org/10.22458/urj.v10i1.2026
30. Olivares B, Hernández R, Coelho R, Molina JC, Pereira Y. Spatial analysis of the water index: advances in sustainable decision-making in Carabobo agricultural territories, Venezuela Revista Geográfica de América Central. 2018;60(1):277-299. Available:https://doi.org/10.15359/rgac.60-1.10
31. Rodríguez MF, Cortez A, Olivares B, Rey JC, Parra RY, Lobo D. Análisis espacio temporal de la precipitación del estado Anzoátegui y sus alrededores. Agronomía Tropical. 2013;63(1-2):57-65. Available:https://n9.cl/14iow
32. Rodríguez MF, Olivares B, Cortez A, Rey JC, Lobo D. Caracterización físico natural de la comunidad indígena de Kashaama con fines de manejo sostenible de la tierra. Acta Nova. 2015; 7(2):143-164. Available:https://n9.cl/hakdx
33. Prasad N, Singh N, Avinash P, Tiwari PK. Efficacy of botanical plant product and extracts against *Rhizoctonia solani* Kuhn causing sheath blight disease of rice under *In vitro* Condition. Journal of Pharmacognosy and Phytochemistry. 2020;9(3):312-315.

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