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Md. Mijan Hossain
Department of Plant Pathology, College of Agriculture, Chiplima, Sambalpur, Odisha University of Agriculture & Technology (OUAT), Odisha, India

Corresponding Author:
Md. Mijan Hossain
Department of Plant Pathology, College of Agriculture, Chiplima, Sambalpur, Odisha University of Agriculture & Technology (OUAT), Odisha, India

Survey for the incidence of false smut of rice in different districts of Odisha

Md. Mijan Hossain

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Abstract
Rice (*Oryza sativa* L.) is the staple food crop of Odisha. False smut disease of rice caused by *Ustilaginoidea virens* is gaining importance in Odisha due to its widespread distribution. The disease causes significant yield loss to rice. So, roving method of survey was carried out during *kharif*, 2024 in six districts of Odisha to assess disease incidence and severity of false smut disease in those areas. The data revealed that both the disease incidence and severity were in low to high level in the areas surveyed. Among all the districts surveyed, maximum disease incidence and severity were noticed in Bhadrak district followed by Sundargarh district.

Keywords: False smut, *Ustilaginoidea virens*, survey, disease incidence, severity

Introduction
Rice (*Oryza sativa* L.) is one of the most important cereal crops and belongs to family poaceae. It is a staple food crop of 60 percent of world's population. It is one of the important staple food crops of India, which stands second with regard to production amongst the rice growing countries in the world.. The major rice growing states in India are West Bengal, Bihar, Madhya Pradesh, Odisha, Andra Pradesh and Uttar Pradesh. Rice suffers from many fungal diseases such as blast of rice (*Pyricularia grisea*), sheath blight of rice (*Rhizoctonia solani*), brown spot of rice (*Helmithosporium oryzae*), baceterial diseases such as bacterial leaf blight of rice (*Xanthomonas oryzae* pv *oryzae*), bacterial leaf streak (*Xanthomonas oryzae* pv *oryzicola*), viral diseases such as rice tungro disease. False smut of rice, a fungal disease caused by *Ustilaginoidea virens* (Cooke) Takahashi. was first reported from Tirunelveli in Tamilnadu in 1978 by Cooke (Ou,1972) [5]. This disease was considered earlier as minor disease due to its sporadic nature. The disease is considered as a symbol of bumper harvest and regarded as Laxmi. False smut disease appears only after grain formation in the panicles where individual grains are transformed into large spore balls, which initially yellowish in colour, later turn to greening black as they mature. But now the disease is gaining importance due to its wide spread distribution and its destructiveness under favourable conditions. Since 2001 disease started occurring in severe form in majority of rice growing states of India (Mandhane *et al.*, 2008; Ladhalakshmi *et al.*, 2012) [4, 3]. Yield loss due to false smut of rice was estimated to the extent of 50 percent. (Rashmi and Gokulapalan, 2014) [6]. On different varieties in different regions of India, yield loss due to false smut was estimated to the range of 0.2 to 49 percent (Singh *et al.*, 1992 ; Biswas 2001) [8, 2]. Only limited literature is available on the occurrence of false smut of rice in Odisha, hence survey for the incidence of false smut of rice is considered to be essential. This information would be useful for locating 'hot spots' and also for assessment of loss in yield.

Materials and Methods
Rice is one of the main *Kharif* crops of Odisha and is grown mainly under rainfed conditions. Roving method of survey was conducted during Kharif (August to November), 2024 to assess the incidence and severity of false smut of rice in six districts of Odisha. Rice fields of six selected districts of Odisha viz., Bhadrak, Sambalpur, Sundagarh, Ganjam, Balasore and Kendrapara were surveyed. In each district three villages were selected randomly for survey and in each village five fields were selected.

In each field, five spots of one square meter area were selected randomly. Number of infected tillers and infected grains in the panicles were recorded. Survey was done for assessing percent disease incidence (PDI), average smutted balls per panicle and disease severity of false smut of rice. The disease parameters were worked out as per the following formula given by Singh and Dube (1978) [7].

$$\text{Percent disease incidence (PDI)} = \frac{\text{Number of infected tillers/m}^2}{\text{Total number of tillers/m}^2} \times 100$$

$$\text{Percent infected grains} = \frac{\text{Total number of infected grains/ panicle}}{\text{Total number of grains /panicle}} \text{X } 100$$

Disease severity = Percent infected tillers X Percent infected grains

Results and Discussions

Roving method of survey was conducted during *kharif*, 2024 in six selected districts of Odisha viz., Bhadrak, Sundargarh, Sambalpur, Kendrapara, Ganjam and Balasore to know the incidence and severity of false smut disease in farmers' fields. The data pertaining to this study are given in Table 1. The survey indicated that, the disease incidence recorded in different localities was low to high level. The disease incidence was found to vary between 3.64% to 14.10% in different villages. Among eighteen villages surveyed, higher disease incidence (above 10%) was observed in Talanga (14.10%), Ambaroli (12.23%), Sundarpur (11.05%) villages under Bhadrak district, Tangarpali (10.14%) village under Sundargarh district. Moderate disease incidence (ranged between 7-10%) was noticed at Tudalaga (9.53%), Dandaharipur (8.12%), Balani (7.5%) localities and lower disease incidence (below 7%) was observed at Gurupali (3.64%),,Dhumkapada (3.7%), Kalamati (4.51%) and Naladhalia (4.6%), Deogaon (5.12%), Kakharuni (5.3%) villages. Maximum disease incidence was recorded in Bhadrak district (12.46%), followed by Sundargarh (9.05%), Balasore (7.08%), Ganjam (5.55%) and Kendrapara (5.33%) district. Highest smutted ball percentage was recorded in Bhadrak district (3.74%). Lowest smutted ball percentage was recorded in Sambalpur district (1.33%). Among eighteen villages surveyed, disease severity varied to the range of 4.11% to 50.90% in different localities. It was observed that disease severity was higher (above 30.96%) in Bhadrak district. The disease severity was moderate (ranged between 16.23-30.96%) in Sundargarh and Balasore districts. Disease severity was low (below 16.23%) in Ganjam, Kendrapara and Sambalpur district (Fig.1).

Baite *et al.*, (2017) [1] had undertaken a survey to assess the disease incidence and severity of false smut of rice in the fields of Kisan nagar village and National Rice Research Institute, Cuttack in Odisha for 15 paddy varieties. They observed that mean disease incidence and severity of 15 rice varieties were 17.64% and 43.79%, respectively**.** Soodamani and Vaikuntavasan (2023) [9] conducted roving survey to assess disease incidence and severity of false smut of rice in Tamil Nadu. They recorded maximum disease incidence in Erode district (40%). Our survey data revealed that the incidence and severity of the disease varied from locality to locality which might be due to type of variety, inoculum load, environmental conditions and amount of fertilizers applied.

Table 1: Survey for the incidence and severity of false smut of rice caused by *Ustilaginoidea virens*

District	Village	Disease incidence (%)	Smutted balls (%)	Disease severity (%)
Bhadrak	Sundarpur	11.05	3.70	40.89
	Talanga	14.10	3.61	50.90
	Ambaroli	12.23	3.91	47.82
Mean		12.46	3.74	46.54
Ganjam	Adapada	5.31	2.00	10.62
	Dhumkapada	3.70	1.11	4.11
	Baragam	7.63	2.52	19.23
Mean		5.55	1.88	11.32
Sundargarh	Balani	7.50	3.10	23.25
	Tudalaga	9.53	3.57	34.02
	Tangarpali	10.14	3.51	35.60
Mean		9.05	3.39	30.96
Kendrapada	Aradapalli	6.1	1.45	8.85
	Kakharuni	5.3	1.32	7.00
	Naladhalia	4.6	1.80	8.28
Mean		5.33	1.52	8.04
Balasore	Pratappur	6.1	1.71	10.43
	Odasal	7.01	2.7	18.93
	Dandaharipur	8.12	2.38	19.33
Mean		7.08	2.26	16.23
Sambalpur	Kalamati	4.51	1.7	7.67
	Gurupali	3.64	1.3	4.73
	Deogaon	5.12	1.0	5.12
Mean		4.42	1.33	5.84

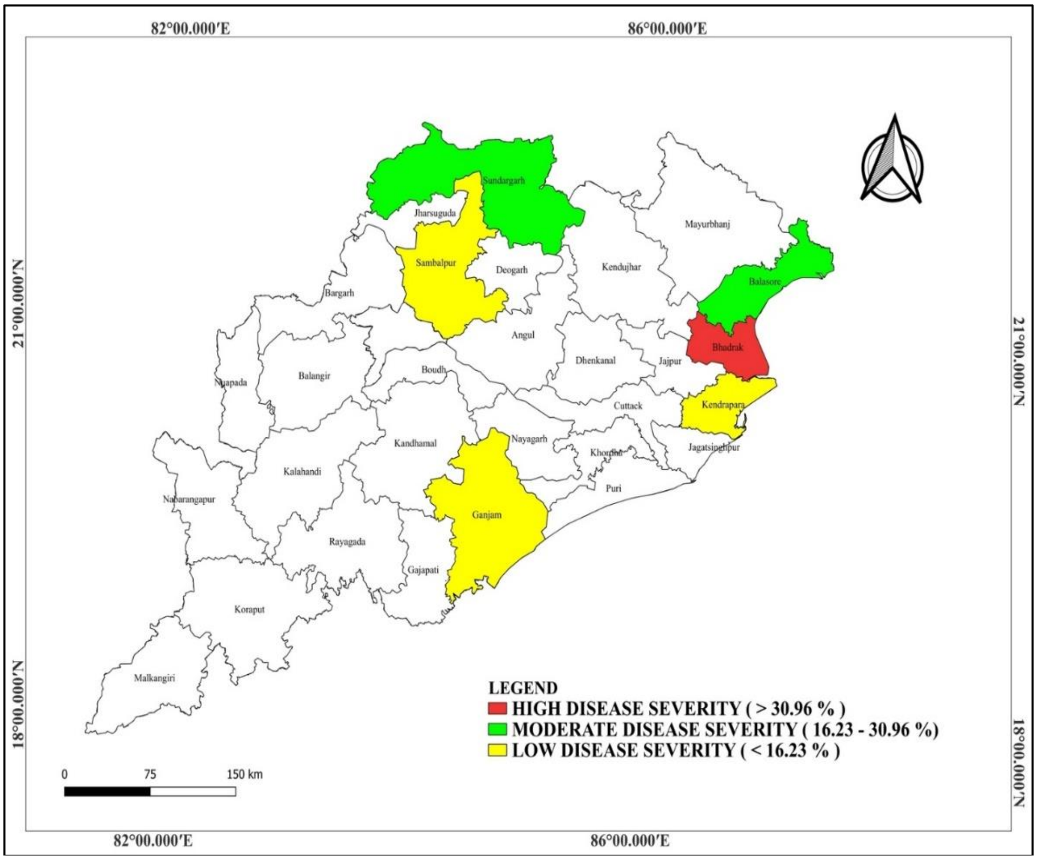

Fig 1: Districts surveyed for disease severity of false smut of rice in Odisha

Conclusion

Roving method of survey was conducted in six districts of Odisha during Kharif, 2024 to know the disease incidence and severity of false smut of rice. The data revealed that disease was not severe in the districts surveyed except Bhadrak district. In the present study, survey was conducted only in six districts of Odisha. In future, more survey work may be undertaken in the remaining districts of Odisha to draw more precise conclusion about occurrence of false smut of rice in Odisha and for developing management strategies to combat the disease effectively.

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