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Role of weather parameters on sheath blight incidence in rice caused by *Rhizoctonia solani,* Kuhn

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ABSTRACT

Influence of different weather parameters on the incidence of sheath blight in the rice variety 'Tapaswini' was studied under field condition. Significant role of maximum and minimum temperature and rate of evaporation were observed to contribute 9.03, 23.03 and 61.05 per cent, respectively. for sheath blight incidence.

Key words: *Weather parameters, Rhizoctonia solani, incidence*

Sheath blight disease of rice incited by *Rhizoctonia solani* Kuhn *(Thanatephorus cucumeris)* Frank (Donk) is a serious disease in many rice-growing regions and has become more prevalent on many improved varieties currently grown in India. The disease generally appears at the maximum tillering stage and affects all plant parts above water line. Relative humidity and temperature are reported to be the critical factors for sheath blight infection and therefore, the disease is more common in the wet season than in the dry season (Pasalu *et al.*, 2005). The present study was undertaken to study the role of different weather parameters on the incidence of sheath blight under field condition.

The study was conducted in the research farm of Central Rice Research Institute, Cuttack during wet season, 2005. Ten selected plants each from susceptible, medium duration rice variety 'Tapaswini' from three different plots were tagged. Different weather parameters namely temperature (maximum and minimum), relative humidity (at morning and afternoon), rainfall, number of rainy days, sun shine hours and evaporation rate were collected daily from June to November, 2005 (22^{nd} to 48^{th} standard meteorological weeks) from the Meteorological Observatory of CRRI, Cuttack and mean weekly observations were calculated. The disease incidence of sheath blight was recorded at weekly interval and correlated with the weather parameters with a view to determine the effect of different weather parameters on the incidence and spread of the sheath blight disease. The data revealed that the correlation between the percent disease incidence (PDI) with maximum temperature, minimum temperature and rate of evaporation were found to be statistically significant ($P<0.01$), where as the rest other parameters like morning relative humidity, afternoon relative humidity, rainfall, number of rainy days and sun shine hours were found to be non-significant (Table 1 and 2).

Multiple linear regression test was made between the percent disease incidence (PDI) and the weather parameters indicating the highest contribution (61.05%) of rate of evaporation, while the other two weather parameters namely maximum and minimum temperature contributed 9.03% and 23.03%, respectively. which corroborated the findings of Savary and Willocquet (1996), who suggested the involvement of secondary phase inciting leaf infection being interdependent on crowding of canopy and climatic factors such as leaf wetness, light and high relative humidity for its spread and multiplication. Similarly, Shilong and Cheng (1995) suggested the relative importance of high temperature for increased disease index. Hashiba *et al.* (1982) observed the lesion development under most favourable conditions of temperature (28°C), relative humidity (100%) and continuous low precipitation during the period of disease development.

Results obtained from the meteorological observations on sheath blight incidence from June to November 2005 revealed a significant positive

Table 1. Effect of different weather parameters on incidence of sheath blight in rice

SMW	Temperature (^{0}C)		Relative humidity (%)		Rainfall (mm)	No.of rainy days	SSH	Evap. (mm)	PDI
	Max.	Min.	RH I	RH II					
22	37.9	27.5	85	47	0	1	10.3	6.7	0
23	37.6	27.8	86	51	9.6	1	6.1	5.9	0
24	41.8	28.8	82	37	7.8	1	5.4	6.7	0
25	38.9	28.6	79	48	0.6	0	5.1	6	0
26	29.8	25.3	94	80	124.4	5	0.3	3	0
27	32.1	25.3	96	76	79.6	6	1.7	3.9	0
28	31.3	26.3	92	78	70.4	3	4.9	3.3	0
29	32.5	25.9	92	72	22.6	2	5.7	4.1	0
30	30.7	25.8	95	87	142.8	5	1.6	2.9	2.8
31	28.9	25.3	92	83	228.6	4	0.7	3.4	4.75
32	31.5	26.7	84	71	6.8	1	2.5	3.3	5.9
33	31.9	25.8	92	80	45.8	5	4	3.4	8.25
34	31.7	25.3	91	69	114	3	3.8	3.4	14.7
35	33.9	25.9	90	65	62.8	1	6.1	4.3	16.6
36	32.7	26.2	89	81	112.2	3	5.8	3.3	21.25
37	28.2	25.3	92	87	128.9	6	0.4	2.8	28.5
38	30.1	25.2	92	79	140.9	5	3.7	4.1	34
39	32.6	26.3	89	70	9.6	1	5.7	3.9	37.8
40	30.8	25.1	93	75	28	2	5.6	3.3	39.6
41	30.7	24.5	92	75	120	3	7.9	3.6	40.25
42	30	24.4	95	80	45.6	2	5.7	4.1	42.4
43	28.5	23.6	93	82	84.2	3	4.1	3.4	45.8
44	28.5	23.1	90	74	32.4	1	3.6	3.2	46.25
45	28.2	19.6	87	53	0	0	7.7	3.2	40.75
46	29.1	16.7	85	36	0	0	9.8	3.6	39.25
47	29.1	16.4	93	45	0	0	8.7	3.3	38.6
48	28	16.2	9	39	0	0	8.2	3.2	38

SMW – Standard Meteorological Week, SSH – Sunshine hour, PDI – Percent disease incidence

Table 2. Correlation regression studies on sheath blight disease in rice

Sheath blight	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Max.temp (X_1)	1.000	-	-	-	-	-	-	-
Min.Temp (X_2)	0.652**	1.000	-	-	-	-	-	-
RH I (X_3)	0.037	0.425*	1.000	-	-	-	-	-
RH II (X_4)	-0.426*	0.375*	0.514**	1.000	-	-	-	-
Rainfall (X_5)	-0.349	0.226	0.330	0.717**	1.000	-	-	-
Rainy Days (X_6)	-0.256	0.336	0.400*	0.781**	0.778**	1.000	-	-
SSH (X_7)	0.196	-0.430*	-0.324	-0.717**	-0.650**	-0.744**	1.000	-
Evap.(X_{8-})	0.908**	0.472*	-0.046	-0.556**	-0.405*	-0.368	0.360	1.000

Correlation half matrix on sheath blight disease incidence during the period of 22nd to 48th standardized meteorological week .
* Significant at P= 0.05 (=0.381), ** Significant at P=0.01 (= 0.487)

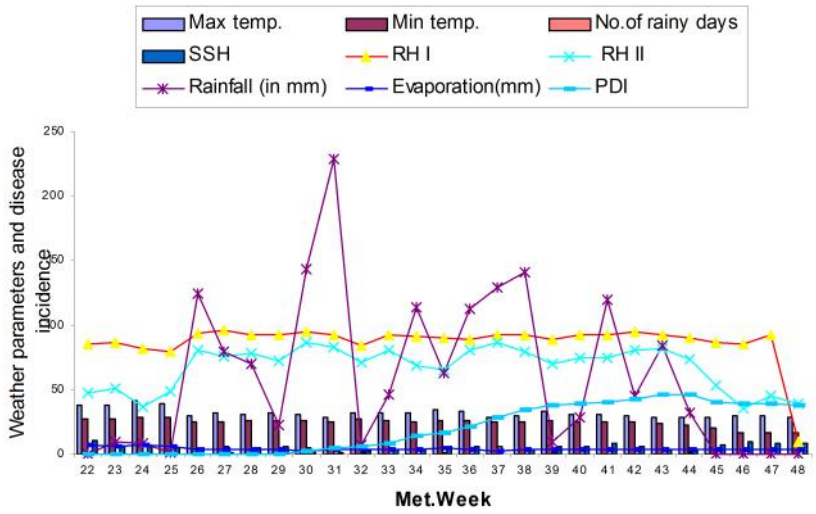

Fig. 1. Effect of different weather parameters on incidence of sheath blight disease in rice under field condition

correlation of disease incidence with the relative humidity and rainfall. The horizontal spread of the disease was found to be positively correlated with the relative humidity, while the vertical spread with the quantity of rainfall. The vertical spread of the disease was faster in early days of incidence particularly during August to September in the weeks of high rainfall coinciding with the boot leaf stage of the crop (Fig. 1). Such observations were more or less in confirmity with the earlier findings of Ou (1972), Nandi and Chakrabarti (1977) and Nandi (1980). The incidence of the disease was recorded within the weekly mean temperature range of 23.1 to 33.9°C and mean relative humidity of 65 to 93 per cent coinciding between 34th to 43rd week of the calendar year. Corresponding to the earlier observations of Yuno *et al.* (1978), the present study revealed a significant relation between maximum temperature, minimum temperature and rate of evaporation with that of per cent disease incidence (PDI). The prediction eqution developed for PDI was Y= 16.71+ 0.72 Max. Temperature.-1.14 Min. Temperature-1.86 Evaporation (R^2=0.931).

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