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Effect of temperature and humidity on lesion development of sheath blight of rice

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High temperature and humidity favoured lesion enlargement, both lengthwise and breadthwise, of sheath blight of rice caused by *Rhizoctonia solani* Kuhn. This was observed on both healthy inoculated sheaths, as well as previously infected sheaths. Lesion development was faster in sheaths inoculated with sclerotia than that in already infected sheaths.

Key words : Sheath blight of rice, *Rhizcotonia solani,* effects of temperature, humidity

INTRODUCTION

Sheath blight, caused by *Rhizoctonia solani* Kuhn., is a serious and destructive disease of rice, particularly the high yielding cultivars, and has been reported from all the rice growing countries of the world having different agro-climatic conditions. Ou (1985) has reported the disease to be more serious under conditions of high temperature and humidity. An experiment was undertaken in the laboratory to study the effect of temperature and humidity on the development and expansion of lesions of rice sheaths inoculated with a rice isolate of *R. solani* as well as in already infected sheaths. The results of these studies are presented in this paper.

MATERIALS AND METHODS

For both the experiments healthy 3rd and 4th leaf sheaths from the top, which are reported to be most susceptible to sheath blight (Sarkar *et al.,* 1993), were collected from a rice field (cv. Ratna) of University Experiment Farm, Kalyani, and cut into pieces of about 6 cm. The leaf sheath pieces were placed on sterilized glass slides (two sheaths per slide) and tied at both the ends with rubber girders for preventing rolling of the sheaths. Each of the leaf sheaths was inoculated at the middle position with a sclerotium of a 7 days old culture of a rice isolate of *R. solani* (isolate R-2) grown on PDA. The glass slides with the inoculated leaf sheaths were placed on sterilized glass rods in moist chambers prepared by lining sterilized petridishes with moistened filter papers. For studies on the effect of temperature the filter papers were moistened with sterile distilled water and placed at different temperatures (10°, 20° and 30°C respectably) in incubators for different periods. For studies on the effect of humidity the filter papers were moistened with different concentrations of glycerol for getting relative humidity upto 90% and with sterile distilled water for 100% R.H. The moist chambers were incubated at 28°C for different periods.

The experiments were also conducted using sheaths with very small naturally developed lesions of more or less equal size (average length 5 mm, breadth 4 mm) in the early stage of disease. Healthy uninoculated sheath pieces, kept under identical conditions, served as control. For inoculated sheaths, at certain intervals the lesion size, both lengthwise and breadthwise (at the point of maximum expansion), in different treatments was measured in mm and the average was worked out. For already infected sheaths, the size of the lesions, minus the original lesion size, was regarded as the actual expansion of the lesions. Five replications were maintained for each treatment.

RESULTS AND DISCUSSION

Both temperature and humidity were found to affect lesion development of sheath blight of rice caused by *R. solani*. Starting from a temperature of 10°C, lesion development, both lengthwise and breadthwise, increased with an increase in temperatures and lesion size at temperature of 20°C and 30°C was significantly higher than that at 10°C (Table 1). Lengthwise lesion expansion was greater than that of breadthwise. Increase in sheath blight incidence with increase in temperature was reported by Hashiba *et al.* (1974). Like wise, lesion development due to sheath blight increased with increasing relative humidity (Table 2). Lesion enlargement was quite slow at 40% and 60% relative humidity. With further increase in relative humidity lesion enlargement significantly increased both lengthwise and breadthwise. Although the lesion size at 90% R.H. was greater than that at 100% R.H. and the difference was not significant.

As in case of temperature, in all the treatments with R.H, lengthwise lesion increase was greater than that of breadthwise. Further, lesion enlargement was greater during the first three days of growth than between 3rd and 6th days of growth with different temperature also.

Table 1 : Effect of temperature on lesion expansion of sheath blight of rice.

Temp. (%C)	Lesion size (mm at different intervals (days)				Av. lesion enlargement/ day between (days)			
	3		6		0-3		3-6	
	L	B	L	B	L	B	L	B
10 I	4.2	3.0	7.1	5.0	1.4	1.0	0.9	0.7
20	6.5	4.0	12.4	7.2	2.2	1.6	1.9	1.6
30	7.2	4.8	13.0	9.0	2.4	1.6	1.9	1.4
10 Inf	3.7	2.8	6.8	4.5	1.2	0.9	1.0	0.7
20	5.8	3.8	11.0	7.4	1.9	1.2	1.7	0.9
30	6.4	4.7	12.0	8.5	2.1	1.6	1.7	1.4
CD (P = 0.05)	1.3	0.9	1.2	1.1				

L = Length, B = Breadth, I = Inoculated, Inf = Infected

In all the treatments of both temperature and R.H, lesion growth was faster on the sheaths inoculated with fungal sclerotia than those on naturally infected sheaths, probably due to higher inoculum potential of the sclerotia taken from an actively growing culture of *R. solani* constantly attached to the host after inoculation.

Table 2 : Effect of humidity on lesion expansion of sheath blight of rice.

Relative humidity (%)	Lesion size (mm at different intervals (days)				Av. lesion enlargement/ day between (days)			
	3		6		0-3		3-6	
	L	B	L	B	L	B	L	B
40 I	1.5	1.1	3.0	1.8	0.5	0.3	0.5	0.2
60	2.5	2.1	3.8	3.1	0.8	0.7	0.4	0.3
70	6.5	3.7	12.0	7.2	2.2	1.2	1.8	1.2
90	8.0	2.7	1.4	2.3	1.3	8.0	4.2	15.0
100	7.5	4.0	14.2	7.6	2.5	1.3	2.2	1.2
40 Inf	0.9	0.6	1.2	1.0	0.3	0.2	0.1	0.1
60	2.0	1.7	3.2	2.8	0.7	0.6	0.4	0.3
70	5.4	2.8	8.6	4.2	1.8	0.9	1.1	0.5
90	6.8	3.4	13.0	6.2	2.3	1.1	2.1	0.9
100	6.5	3.0	12.0	5.8	2.2	1.0	1.6	0.9
CD (P = 0.05)	1.6	1.2	1.8	1.1				

L = Length, B = Breadth, I = Inoculated, Inf = Infected

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