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STUDIES ON THE EPIDEMIOLOGY OF LEAF AND SHEATH BLIGHT OF MAIZE

BY

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Study on the epidemiology of leaf and sheath blight caused by *Rhizoctonia solani* f. *sp. sasakii* of maize revealed that the disease development and spread are highly favoured by high rainfall and relative humidity apart from other weather elements and soil factor.

INTRODUCTION

Leaf and sheath blight caused by *Rizoctonia solani* f. *sp. sasakii* causes considerable damages of crops under warm humid condition. A preliminary 4-year survey revealed that the incidence of this disease caused by this pathogen in maize grown intensively in the hilly areas of Kalimpong, West Bengal, was 31.63 to 52.72 (Das and Chattopadhayay, 1984). Though the disease has been reported to be occuring in India in 1960 by Ullstrup (Ullstrup, 1960) and distributed in all the major maize growing regions of India, nothing is known regarding the epidemiology of this disease. However, from the geographical distribution of this disease it can be assumed that the disease may be favoured by high precipetation apart from other associated factors.

Accordingly an experiment was carried out in the University Reseerch Station, Kalimpong situated at an altitude of 1070 meter in kharif season. The main objective was to have some pertinent information on the role of different we ther elements in the spread of leaf and sheath blight disease along the stalk through the leaf sheath upwards from the soil level. Normally, the pathogen infects the leaf sheath at the soil level and spreads upwards along the stalk of enclosed leaf-sheath and ultimately infects the leaf, ears, and even the tassel of maize plant under favourable weather conditions. Thus, measurement of length of infection of the stalk with enclosed leaf-sheath from the soil level is expected to give an index of rate of progress with reference to weather conditiens prevalent during the period of infection.

MATERIALS AND METHODS

To study the rate of progress of the disease, observations were made on cultivar Kisan, composite, a moderatively susceptable variety planted in sick soil.

Eighteen replications with 10-15 plants per replication were used for the purpose. Data were recorded at 7-8 days' interval from the initiation of disease upto the period when no further spread of the disease could be noted, which covered approximately a period of 2 months. Data were also recorded of the weather elements namely maximum relative humidity, minimum relative humidity, rainfall, maximum temperature, minimum temperature. Correlation coefficients were worked out in respect of these elements with daily linear increase in infection over the period of spread of the disease.

To find out the relationship between different weather elements which are normally presumed to have an effect on the spread of the disease, correlation coefficients were worked out in respect of each factor with that of average per-day increase of the linear spread of disease according to the following formula :-

$$\text{"r"} \text{ (correlation coefficient)} = \frac{SP\ (XY)}{\sqrt{SSX \times SSY}}$$

$$SSX = \Sigma x^2 - \frac{(\Sigma x)^2}{N}$$

$$SSY = \Sigma y^2 - \frac{(\Sigma y)^2}{N}$$

$$SP\ (xy) = \Sigma xy - \frac{\Sigma x\ \Sigma y}{N}$$

Where

N=Number of observation, where correlation has to be worked our between two factors x and y.

x= Linear spread per day

y= Wheather factor.

RESULTS

Values of correlation coefficients in relation to different weather factors are given below :

Sl. No.	Weather factor	Degrees of freedom	'r' value
1.	Maximum relative humidity	6	0.8165 highly significant
2.	Minimum relative humidity	6	0.5034 not significant
3.	Rainfall in m. m.	6	0.93568 highly significant
4.	Maximum temperature	6	0.3385 not significant
5.	Minimum temperature	6	—0.5144 not significant

Table 1. *Measurement af linear spread of leaf and sheath blight of maize*

No. of Replication		Affected length in cm								
	Age of plant in days	41	48	55	66	71	78	86	93	100
	Day's interval of recording		7	7	8	8	7	8	7	7
(1)	Pedigree (2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1	Kisan composite	15.00	21.80	26.00	37.50	52.50	60.50	68.16	74.16	76.00
2	,,	17.66	25.77	36.22	47.30	61.20	70 60	80.90	87.30	89.20
3	,,	13.00	20.77	29.33	36.66	58.14	65.85	74.85	81.11	81.11
4	,,	18.71	27.28	32.83	44.00	54.40	62.40	66.00	68.00	68.40
5	,,	26.77	30.00	41.44	50.22	61.00	68.77	74.77	77.33	78.44
6	,,	20.66	29.00	42.50	54.20	66.80	73.40	79.90	80.30	80.80
7	,,	16.55	27.11	38.28	56.50	74.66	77.25	89.75	94.00	94.50
8	,,	11.60	20.80	31.00	45.60	56.60	64.75	67.75	70.75	71.50
9	,,	11.66	21.88	38.75	50.87	61.14	68.00	71.14	76.85	76.85
10	,,	15.90	25.00	33.50	52.37	66.87	74.00	80.50	83.12	83.75
11	,,	13.00	23.66	26.25	43.00	53.25	63.50	74.50	85.00	85.00
12	,,	11.42	20.83	30.66	42.00	50.50	62.33	64.50	67.83	69.33
13	,,	11.37	19.10	31.30	47.30	60.60	69.50	78.70	83.88	86.11
14	,,	10.00	20.40	25.80	35.60	45.00	52.66	61.66	70.83	72 50
15	,,	12.50	18.62	24.74	37.00	50.37	58.75	62.75	63.62	63.75
16	,,	11.16	17.71	26.66	41.50	51.66	62.00	64.50	64.50	64.66
17	,,	21.00	29.57	42.14	59.00	69.00	77.14	88.57	94.00	95.85
18	,,	14.87	24.25	33.42	47.00	58.42	71.14	80.16	83.00	84.00
	Total	272.83	423.55	590.82	827.62	1051.91	1202.54	1329.06	1405.58	1421.75
	Average	15.15	23.53	32.82	45.97	58.43	66.80	73.80	78.08	78.98
Disease spread for 7 or 8 days interval			8.38	9.28	13 15	12.46	8.37	7.03	4.25	0.90
Average per day disease spread			1.19	1.32	1.64	1.55	1.19	0.87	0.60	0.12
Average rainfall per day (mm)			25.00	23.00	30.50	25.00	16.00	14.00	12.00	8.00
Average maximum r. h. per day			92.00	92 50	95.00	92.00	91.00	80.00	78.00	77.00
Average minimum r. h. per day			70.12	70.85	73.75	72.37	70.85	70.14	70.85	71.14
Average maximum Tcmp. °C per day			24.50	25.25	26.00	24.88	24.33	24.44	24.85	25.00
Average minimum Temp. °C per day			21.18	21.19	21.45	20.27	21.66	21.38	21.58	21.74

Maximum relative humidity :

From the highly positive correlation coefficient between average maximum relative humidity and linear spread of disease it may be conciuded that maximum relative humidity had a great role in the increase of disease intensity for the specific period. From the Table I, it is clear that maximum disease spread of 1.64 mm per day was obtained when maximum relative humidity was 95%. Maximum rise of disease intensity was obtained at this stage.

Minimum relative humidity :

Correlation coefficient of average minimum relative humidity and linear spread of disease was not significant indicating a little or no rule in the disease spread though a positive insignificant value of 0.5034 was obtained.

Rainfall :

Rainfall was found to play a major role. A significantly positive correlation was obtained between average rainfall and linear spread of the disease for the specific period. A linear spread of 1.32 cm and 1.64 cm were obtained as against average per day rainfall of 30.5 mm and 25 mm respectively though an average increase of linear disease spread were found 0.60 cm and 0.12 cm as against 12.0 mm and 8.00 mm (average per day) respectively in last two observation when plant age was 93 and 100 days respectively. The minimum disease increase per day in the last two observations might be attributed due to over age of plant.

Maximum temperature :

The variation of among the average maximum temperature throughout the observation period was only 1.67°C the heighest being 26°C and lowest one was 24.33°C. A non-significant 'r' value of 0.3385 was obtained due to very little temperature fluctuation. So rule of maximum temperature in the linear spread of disease can not be explained.

Minimum tempetature :

Correlation coefficient of minimum temperature and linear spread was not significant ; on the other hand indicated a negative relationship. The variation among the average minimum temperature during the observation period was only 1.47°C the maximum being 21.74°C and minimum 20.27°C.

DISCUSSION

From the data presented in Table I, together with statistical analysis, it would be evident that spread of leaf and sheath blight caused by *Rhizoctonia solani* f. *sp.*

sasakii was largely influenced by maximum relative humidity and rainfall. Role of rainfall in this context appeared to be related to the maintenance of high relative humidity. Temperature during the period of study did not show much fluctuation. It may be concluded that maximum and minimum temperatures do not appear to have any direct effect on spread of the disease. Linear spread of the disease, as studied six weeks (41 days) after sowing and continued upto 100 days showed that in the initial stage of observation, spread was fairly rapid and it reached peak value between 55 and 71 days after sowing and gradually declined and virtually ceased at the end of 13 weeks.

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