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EFFECT OF PHOSPHORUS AND POTASSIUM ON LEAF SCALD DISEASE OF RICE CAUSED BY *GERLACHIA ORYZAE*

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The effect of application of phosphorus and potassium on the leaf scald disease of rice, caused by *Geriachia oryzae*, was studied in 5 different doses, namely 0,20,40,60 and 80 Kg/ha. The incidence and severity of the disease were higher with higher levels of P_2O_5 applied. Maximum yield, however, was obtained with 40 Kg of P_2O_5/ha.

In case of K_2O, on the other hand, incidence and severity of leaf scald of rice increased with increasing levels of applied K_2O only at lower doses of K_2O (0 to 40 Kg/ha). However, there was a gradual decline in the level of leaf scald infection when the levels of applied K_2O was increased to 60 and 80 Kg/ha. At these levels of K_2O, rice plants contracted significantly lower scald infection as compared to that at lower levels of K_2O. Maximum yield was recorded at 60 Kg of K_2O/ha.

INTRODUCTION

Widespread occurrence of leaf scald of rice caused by *Gerlachia oryzae* (Hashioka & Yokogi) W. Gams (=*Rhynchosporium oryzae* Hashioka & Yokogi) has been reported from Eastern and North eastern parts of India (Mukherjee, 1977 ; Roy, 1977 ; Singh, 1977 ; Maiti *et al.*, 1979). The severity of the disease has been reported to increase with the application of increased dose of nitrogen (Hashioka and Makino, 1956 ; Lamey and Williams, 1972 ; Shanmughom *et al.*, 1973 ; Bakr and Miah, 1975 ; Singh and Sen Gupta, 1983). Results of field experiments in Liberia showed that fertilizer application increased leaf scald incidence in both susceptible and resistant varieties (Virmani and Sumo, 1978). However, there is little information on the relationship between phosphorus and potassium nutrition of the host plant and leaf scald development. The present studies were, therefore, undertaken to assess the effect of application of different levels of phosphorus and potassium on the development of the disease.

MATERIAL AND METHODS

The experiments were conducted at the University Experimental Farm at Kalyani

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during the crop season of 1979. The effect of phosphorus and potassium was tested separately using 25 day old tranaplants of a susceptible cultivar "Jaya" grown at plant spacings of 15x20 cm in a randomized block design. The plot size was 3.5x2.5 m, and three replications were kept for each treatment. The calculated quantities of potassium and phosphorus were applied as pre plant at the time of land preparat on. Each plot, irrespective of the level of P_2O_5 and K_2O, was given 60 Kg of N/ha in the form of urea in two equal split doses, the first one at the time of final land puddling and the second one 25 days after transplanting, at the early tillering stage. Forty Kg of P_2O_5 or K_2O were applied in all the test levels of potassium and phosphorus respectively during final land puddling. All the cultural operations including seed bed and land preparation, weeding and irrigation followed normal agricultural practices.

The plots were inoculated by spraying a conidial suspension ($1x10^6$ conidia/ml of water) of a virulent isolate Di of the fungus multiplied in steamed rice medium in 150 ml Erlenmeyer flasks for 10 days at 25°C. Inoculation was done 6 weeks after transplanting. Disease assessment was started 5 weeks after inoculation and continued at weekly intervals. As the second and third leaves from the base of the plants were most susceptible to the disease (Singh, 1980), scoring of the disease was confined to these two leaves. Disease assessment was done *in situ* with 20 randomly selected tillers per replicate.

Disease incidence was assessed on the basis of infected leaves of 20 tillers per replicate, The plot infection levels were expressed as percentage of lesion, area as calculated from the formula $\frac{\Sigma i \times 100}{\Sigma a}$ where *a* is the area of leaf position and *i* is the infection level in terms of lesion area. The measurement of leaf area was made by the length-width method of the International Rice Research Institute (Anon., 1971). The leaf area was computed as : A=Klw, where K is the adjustment factor (a value of 0.75 was used at all stages of plant growth except harvest *l* is the length and *w* is the width of the leaf. The percent disease index (PDT) was calculated using the formula of McKinny (1923) as follows :

$$PDI = \frac{\text{Sum of all numerical ratings x 100}}{\text{No. of leaves examined x maximum infection scored}}$$

RESULTS AND DISCUSSION

The incidence of leaf scald disease and its severity tended to be higher levels of P_2O_5 applied. Addition of incremental levels P_2O_5, keeping levels K_2O same (60 Kg and 40 Kg respectively) in all the treatments, increased the disease significantly over the control (Table 1). Between the treatments receiving different levels of P_2O_5, however, the significance in the differences in the incidence and severity of the disease as estimated from the disease incidence, lesion area and

Table 1. *Effect of different levels of phosphorus on leaf scald development*

Levels of P_2O_5(Kg/ha)	Disease incidence at assessment I[1]	II[2]	Lesion area (%) at assessment I	II	Disease index (%)at assessment I	II	Yield (Kg/5m²)
0	19.17 (25.84)	45.83 (42.60)	1 42 (6.81)	3.02 (9.38)	7.68 (16.03)	19.17 (25.96)	1.48
20	30.00 (33.16)	60.00 (50.79)	2.10 (8.30)	4.95 (12.83)	12.78 (20.92)	26.94 (31.26)	1.62
40	32.50 (34.72)	65.83 (54.23)	3.32 (10.49)	8.16 (16.58)	13.98 (21.93)	33.43 (35.32)	1.70
60	34.17 (35.75)	72.50 (58.43)	3.88 (11.35)	9.59 (18.02)	16.02 (23.58)	38 24 (38.20)	1.65
80	37.50 (37.74)	75.00 (60.02)	4.01 (11.55)	10.30 (18.70)	18.42 (25.41)	39.81 (39 12)	1.57
CD(P=0 0)	6.07	4.24	1.41	1.88	2.62	2.01	0.13

[1]First assessment, [2]Second assessment, Figures in pareathesis are tranformed angular valves.

Table 2. *Effect of different levls of potassium on leaf scald development*

Levels of K_2O (Kg/ha)	Disease incidence at assessment I[1]	II[2]	Lesion area (%) at assessment I	II	Disease index (%)at assessment I	II	Yield (Kg/5m²)
0	30.00 (33.13)	45.00 (42.13)	1.70 (7.47)	3.34 (10.50)	12.59 (20.72)	20.55 (26.94)	1.50
20	48.33 (44 04)	64.17 (53.27)	3.35 (10.85)	8.31 (16.74)	20.19 (26.70)	33.79 (35.54)	1.59
40	50.00 (45.00)	65.83 (54.29)	3.61 (10.95)	8.64 (17.10)	23.89 (29.25)	35.64 (36.65)	1.68
60	45.83 (42.60)	55 83 (48.36)	3.19 (10.27)	7.32 (15.66)	19.54 (26.23)	28.79 (32.45)	1.74
80	44.17 (41.63)	55.00 (47.87)	2.90 (9.77)	6.40 (14.63)	18.61 (25.51)	27 78 (31 80)	1.71
CD(P=0.05)	5.85	5.77	1.34	1.93	3.06	2.29	0.09

disease index, was manifested mainly during the second assessment. Yield was, however, significantly higher in all the treatments receiving different levels of P_2O_5 as compared to the control (without P_2O_5) indicating the importance of phosphorus nutrition in better plant growth and yield. Highest yield was recorded

with 40 Kg of P_2O_5/ha. With increased levels of P_2O_5 yield gradually declined, apparently due to the effect of high disease incidence and severity.

As regards K_2O, the incidence and severity of leaf scald increased with a corresponding increase in the levels of K_2O, when applied in lower doses (0 to 40 Kg/ha) (Table-2). However, there was a gradual decline in the level of scald infection when the level of applied K_2O was increased from 40 Kg/ha to 60 and 80 Kg/ha. At the later stage of disease development (during the assessment) the plants receiving these two levels, i. e., 60 and 80 Kg/ha, contracted significantly lower scald infection as compared to that at 40 Kg K_2O/ha. Lesser disease was recorded in plants grown without potassium. Yield was, however, higher in plants receiving higher doses of K_2O. The differences in yields in plants receiving three higher levels were not statistically significant.

Earlier, results in field experiment in Liberia (Virmani and Sumo, 1978) indicated a higher infection of leaf scald disease at 40 Kg level of each of N, P and K per hectare than at 0-0-0=NPK/ha, in both resistant and susceptible cultivars. In the present study, the effect of P and K were studied separately. However, the level of leaf scald infection and its severity were significantly higher at 60-40-40 Kg NPK/ha than at 60-0-40 or 60-40-0 Kg NPK/ha, thus corroborating the results of Virmani and Sumo (1978).

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