Pak. J. Bot., 10 (1): 83—87, 1978.

EFFECT OF NITROGEN ON THE DEVELOPMENT OF BLIGHT OF RICE

ATA MUHAMMAD KAUSAR AND ABDUL GHAFOOR KAUSAR

Department of Plant Pathology, Faculty of Agriculture, University of Agriculture, Faisalabad.

Abstract

The incidence of blight of rice was significantly higher on seedlings growing in Hoagland's solution containing 105 and 329 ppm. nitrogen than those with 161 and 217 ppm. nitrogen. The incidence of blight was significantly lower in 370 Basmati than the other varieties 349 Jhona, 278 Sathra and Irri Pak. Similar results were obtained in a field experiment. The incidence of blight was significantly higher in unfertilized rice plants than those fertilized. Four nitrogenous fertilizers used in this study were equally effective in this respect.

Introduction

Nutrition in relation to the development of *Helminthosporium* blight of rice has not received adequate attention in Pakistan Mallamaire (1949) and Mullor (1950) suggested the possible relationship between the form of nitrogen and the development of blight. Hashioka & Makino (1956) observed that the number and size of lesions of blight on leaves of a susceptible paddy variety decreased with increasing levels of ammonium sulphate. Chattopadhyay & Dickson (1960) studied the effect of nitrogen on the development of blight in rice seedlings and reported that the deficiency or an excess of ammonium nitrogen increased brown spot development.

The influence of nutrition on the development of blight in Pakistan has been studied (Kahloon & Kausar, 1968). The incidence of blight was reported to increase with an increase or decrease in the concentration of nutrients in Hoagland's solution. Different nitrogenous, potassic and phosphatic fertilizers did not decrease the seedling mortality. However, these fertilizers increased the number of tillers and yield of grain. The present paper reports the influence of four nitrogenous fertilizers on thedevelopment of blight on four varieties of rice.

Materials and Methods

The effect of different sources and levels of nitrogen on the development of blight of rice was studied in pot and field experiments.

The experiment in pots was carried out in crocks in quartz sand treated with hydrochloric acid and 40% formalin to eliminate major elements of nutrition and soil organisms. The experiment was designed in four repeats with four varieties of rice including 370 Basmati, 349 Jhona, 278 Sathra and Irri Pak. The four levels of nitrogen comprised 105, 161, 217 and 329 ppm nitrogen in Hoagland solution. Ten seeds were sown in each crock after disinfesting them with 0.1 per cent mercuric chloride.

The basa' nutrient solution was N/2 Hoagland's solution with 105 ppm nitrate nitrogen only (Hoagland & Arnon. 1938). Ammonium nitrate was added to increase the nitrogen concentration in solution to the desired levels. The seedlings were sprayed with conidial-mycelial suspension of *H. oryzae*, 18 to 20 days after sowing. The incidence of blight on diseased leaves one week after spraying was noted and the data were statistically analysed.

The effect of different sources of nitrogen on the development of blight of rice was also studied in a field experiment laid out in split plot design, with four replications. Three varieties of paddy including 370 Basmati, 349 Jhona and 278 Sathra formed the main plots, whereas four fertilizers comprising ammonium sulphate,ammonium nitrate urea and potassium nitrate and an untreated check formed the sub-plots. In each sub-plot, four rows of paddy were spaced one foot apart,keeping an interplant distance of nine inches. The number of transplanted seedlings in each sub-plot was 100. The fertilizers were applied at the rate of 60 lbs. nitrogen per acre in two (split) fortnightly applications,. Half of the fertilizer was applied fourteen days after transp.anting and the remaining after another fortnight. The conidial-mycelial suspension of *H. oryzae* was sprayed twice on the crop in the field to induce blight; once a month after trans-planting and once after emergence of the ears.

Results

Pot Experiment:

F values in respect of incidence of blight on leaves of four varieties of rice as influenced by four levels of nitrogen are given in Table 1. The F values for varieties and levels of nitrogen were significant, whereas those in respect of interaction between varieties and levels of nitrogen were non-significant. The number of blight affected leaves receiving 105 and 329 ppm. nitrogen was significantly higher as compared to those receiving 161 and 217 ppm. nitrogen. The incidence of blight on rice plants receiving 105 and 329 ppm. nitrogen and 161 and 217 ppm. nitrogen did not differ significantly among themselves.

TABLE 1. F values for the incidence of blight on four varieties of rice as influenced by levels of nitrogen.

Variation due to	Degrees of freedom	Sum of square	Mean squares	
Varieties	3	797.72	265.91	16.94**
Levels of Nitrogen	3	858.68	286.23	18.24**
Varieties x Levels of Nitrogen	9	114.37	12.71	0.81NS
Error	48	753.12	15.69	
Total:	63			

**Significant at 1 per cent level; NS, Non significant.

TABLE 2. Effect of different levels of nitrogen in Hoagland's nutrient solution on the incidence of blight on the leaves of four varieties of rice.

Levels of nitrogen (ppm)	Incidence of blight on leaves of varieties (per cent) 370 Basmati	278 Sathra	Irri Pak	349 Jhona	Average
105	64.12	64.95	65.80	71.62	66.62 a
161	53.40	59.95	59.95	64.12	59.35 b
217	51.55	59.15	61.62	61.72	58.1 b
329	59.12	67.47	66.62	69.97	65.80 a
Average	57.02 x	62.88 y	63.50 y	66.86 z	

Values followed by different letters are significantly different at five per cent level.

The number of blight affected leaves of 370 Basmati was significantly lower than that of the other three varieties, which did not differ significantly among themselves. The incidence of blight was the highest on 349 Jhona, followed by Irri Pak. and 278 Sathra under the conditions of the experiment (Table 2). Non-significant interaction between varieties and levels of nitrogen indicated that the response of varieties to the levels of nitrogen was similar.

Field Experiment:

F values for varieties (22.18) and fertilizers (8.37) in respect of incidence of blight on leaves were significant. However, F value for interaction between varieties and fertilizers was non-significant, indicating that the influence of four fertilizers on the incidence of blight on leaves of three varieties of rice was similar (Table 3).

The incidence of blight on leaves of three varietes of rice was significantly lower on plants receiving the application of fertilizers than the untreated check. Four fertilizers under trial did not differ significantly among themselves in this respect (Table 4).

TABLE 3. F values for the incidence of blight on three varieties of rice as influenced by nitrogenous fertilizers in field experiment.

Variation due to	Degrees of freedom	Sum of squares	Mean square	F
Replications	3			
Varieties	2	900.36	450.18	22.18**
Error a	6	121.78	20.29	
Fertilizer Treatments	4	72.77	18.19	8.37**
Varieties x Fertilizer Treatments	8	32.85	4.11	1.89NS
Error b	36	78.24	2.17	
Total	59			

**Significant at 1 per cent level
NS Non significant.

TABLE 4. Influence of different sources of nitrogen on the incidence of blight on the leaves of three varieties of rice.

Sources of Nitrogen	Incidence of blight on leaves of varieties (per cent)			
	370 Basmati	278 Sathra	349 Jhona	Average
Urea	9.45	15.17	19.57	14.73 a
Ammonium nitrate	9.85	15.10	19.42	14.79 a
Potassium nitrate	9.77	16.17	18.75	14.89 a
Ammonium sulphate	9.97	17.07	17.70	14.91 a
Untreated check	11.47	20.27	21.00	17.58 b
Average	10.10 x	16.76 y	19.29 y	

Values followed by different letters are significantly different at five per cent level.

Three varieties of rice differed significantly in their susceptibility to blight. The incidence of blight was significantly lower on Basmati 370 than Sathra 278 and Jhona 349, the difference between the latter two varieties being non-significant.

Discussion

The incidence of blight was significantly reduced on the seedlings of four varieties of rice growing in Hoagland's solution containing 161 and 217 ppm. nitrogen including ammonium nitrogen in addition to 105 ppm. of nitrate nitrogen as compared to the Hoagland's solution containing 329 ppm. nitrogen including ammonium nitrogen in addition 105 ppm of nitrate nitrogen and Hoagland's solution without ammonium nitrogen. These results are in conformity with the results of Chattopadhyay & Dickson (1960). Out of the four varieties used in the experiment in the present study, 349 Jhona proved to be the most susceptible to blight followed by Irri Pak., 278 Sathra and 370 Basmati.

The results of field experiment show that the application of ammonium sulphate, ammonium nitrate, urea and potassium nitrate at the rate of 60 lbs. nitrogen per acre do not increase the incidence of blight. These results are in general conformity with those reported by Kanjoo & Kausar (1963). The application of these fertilizers at this rate can, therefore, be taken up for increasing rice production without likely deleterious effect in so far as the development of blight of rice is concerned.

References

Chattopadhyay, S.B., and J.G. Dickson. 1960. Relation of nitrogen to disease development in rice seedlings infested with *H. oryzae*. Phytopath., **50: 434-438.**

Hashioka, Y., and M. Makino. 1956. Relation of nitrogen nutrients of rice plants to the susceptibility of four foliage diseases. Res. Bull. Fac. Agri. Gifu. Univ. **6:** 58-66.

Hoagland, D.R., and D.I. Arnon. 1938. The water culture method of growing plants without soil. Calif. Univ. Agr. Expt. Sta. Cir. 347-36-39

Kahloon, Z.I., and A.G. Kausar. 1968. Influence of nutrition on the development of *Helminthosporium* blight of rice. Pak. Jour. Agr. Sci. **5:** 38-43.

Mallamaire, A. 1949. Maladies plants parasites et plants infestances des riz cultives on Afrique Cocidentale. Agron. trop. Nogent-sur-Marne **4:** 77-80.

Mullor, A.S. 1950. Report on a seedling rice disease at Tiquisate, Guatemala. Plant Disease Reptr. **34:** 156.