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INCIDENCE OF PESTS AND DISEASES IN RICE AS INFLUENCED BY FERTILIZER APPLICATION AND *IN SITU* GREEN MANURING

Realized yield of a crop is considered as the balance between management influences for productivity improvement and yield reducing influences of pests and diseases. Nutritional treatments, especially that of fertilizer nitrogen are known to increase the yield, but they also increase the vulnerability of the plant to the incidence of pests and diseases. Vulnerability of plants is known to be due to accumulation of soluble nitrogen (Ito and Sakamoto, 1942). The effect of the use of organic resources is not known. Thus, the present study was undertaken with the objective of understanding the effects of simultaneous *in situ* green manuring on the incidence of pests and diseases in dry-sown rice.

A field experiment was conducted at the Agricultural Research Station, Mannuthy, Thrissur using the rice variety Jyothi and green manure cowpea variety Kanakamony during the kharif season of 1993. The soil was sandy clay loam in texture and acidic in reaction with medium fertility. The experiment was laid out in randomized block design with three replications. The treatments consisted of factorial combinations of four levels of nitrogen (0, 35, 70 and 105 kg N ha^{-1}), two levels of phosphorus (0 and 35 kg P_2O_5 ha^{-1}), two seed rates for cowpea (15 and 30 kg ha^{-1}) and a control plot with normal package of practices (KAU, 1993). Cowpea was sown in the interspaces of rice planted at a spacing of 15 cm x 15 cm. Among the major insect pests and diseases, the serious ones observed were leaf roller (incidence expressed as percentage of infected leaves over the total number of leaves) and sheath blight (IRRI, 1980). The results obtained were statistically analyzed (Panse and Sukhatme, 1985).

Increasing levels of nitrogen significantly increased the incidence of sheath blight and the highest disease index was recorded at the

Table 1. Effect of treatments on NPK content and incidence of pest and disease in rice

Treatments	Nutrient content, %						Disease index (sheath blight)	% incidence of leaf roller
	50 DAS			75 DAS				
	N	P	K	N	P	K		
N (kg ha^{-1})								
0	1.49	0.20	2.28	1.41	0.21	2.02	24.00	6.69
35	2.13	0.21	2.27	1.70	0.20	2.15	28.56	7.95
70	2.08	0.21	2.46	1.88	0.21	2.25	33.51	10.42
105	2.00	0.20	2.48	1.91	0.21	2.34	38.29	10.25
SEm ±	0.18	0.01	0.08	0.13	0.01	0.06	2.47	0.97
CD (0.05)	0.36	NS	0.17	0.26	NS	0.11	5.04	1.97
P_2O_5 (kg ha^{-1})								
0	1.89	0.20	2.33	1.69	0.20	2.16	28.09	8.48
35	1.96	0.21	2.46	1.77	0.21	2.23	24.09	9.18
SEm ±	0.12	0.01	0.08	0.09	0.01	0.04	1.75	0.68
CD (0.05)	NS	NS	NS	NS	NS	NS	3.56	NS
Cowpea seed rate (kg ha^{-1})								
15	1.76	0.20	2.32	1.69	0.20	2.15	31.92	8.97
30	2.09	0.21	2.43	1.76	0.21	2.23	30.26	8.68
SEm ±	0.12	0.01	0.08	0.09	0.01	0.04	1.75	0.68
CD (0.05)	0.25	NS	NS	NS	NS	NS	NS	NS
Mean for seed rates	1.93	0.21	2.38	1.73	0.21	2.19	31.09	8.83
Control	1.83	0.21	2.33	1.59	0.18	2.17	24.30	3.27
SEm±	0.35	0.03	0.17	0.25	0.02	0.11	4.94	1.93
CD (0.05)	NS	NS	NS	NS	NS	NS	NS	NS

Table 2. Interaction effect of treatments on N content and incidence of pest and disease in rice

Levels of N	Cowpea seed rate	N content (%)				Disease index		% incidence of leaf roller	
		50 DAS		75 DAS					
		P_1	P_2	P_1	P_2	P_1	P_2	P_1	P_2
N_1	S_1	1.55	1.37	1.54	1.26	20.33	34.64	5.31	11.59
	S_2	1.50	1.50	1.40	1.45	16.00	25.13	3.45	6.42
N_2	S_1	2.24	1.87	1.54	1.63	36.27	23.32	7.91	6.24
	S_2	1.77	2.63	1.77	1.87	24.27	30.38	9.32	8.32
N_3	S_1	1.46	1.78	1.87	1.98	26.61	32.68	9.98	15.27
	S_2	2.29	2.77	1.73	2.01	20.57	54.19	9.83	6.58
N_4	S_1	2.29	1.55	1.87	1.91	46.27	35.35	8.60	6.89
	S_2	1.96	2.21	1.77	2.10	34.53	37.03	13.40	12.11
SEm ±		0.03		0.25		4.95		1.94	
CD (0.05)		0.06		0.51		10.08		3.95	

N_1 = 0 kg N ha^{-1}, N_2 = 35 kg N ha^{-1}, N_3 = 70 kg N ha^{-1}, N_4 = 105 kg N ha^{-1}
P_1 = 0 kg P_2O_5 ha^{-1}, P_2 = 35 kg P_2O_5 ha^{-1}, S_1 = 15 kg seed ha^{-1}, S_2 = 30 kg seed ha^{-1}

highest level of nitrogen (Table 1). Though 70 and 105 kg nitrogen levels were on par, enhancement in the rate of nitrogen application increased the disease index by 14 per cent. Krishnaswamy (1952), Padwick (1956) and Varughese and Padmakumari (1993) have also reported increased incidence of sheath blight with increased use of fertilizer nitrogen. Leaf roller incidence was increased significantly with increasing levels of nitrogen only up to 70 kg ha^{-1}. Ito and Sakamoto (1942) have reported that increased nitrogen supply stimulates early vegetative growth leading to mutual shading. This mutual shading reduces the photosynthetic activity and thus results in an unfavourable N/carbohydrate balance which leads to accumulation of soluble nitrogen and thereby ammonium toxicity which has been reported to be the basic cause of increased susceptibility of crop to leaf roller. Application of glyricidia leaves, which can release nitrogen immediately after its application, is also reported to increase the incidence of leaf roller (Anon., 1991). These findings really support the results of the present study as the application of higher doses of nitrogen has led to increased nitrogen content of the plant paving way for an unfavourable N/carbohydrate balance.

Application of phosphorus @ 35 kg P_2O_5 ha^{-1} reduced the incidence of sheath blight significantly and the reduction worked out to 14 per cent (Table 1). Application of P had shown an increase in potassium content of rice. This proportionate increase in potassium content might have led to a low disease index. These results are supported by the findings of Varughese and Padmakumari (1993). However, application of phosphorus had no significant effect on the incidence of leaf roller in rice. The data presented in Table 2 will show that though *in situ* intercropping by itself did not affect vulnerability of rice to sheath blight and leaf roller, interaction effect of *in situ* intercropping with N and P was highly significant. At 70 kg N ha^{-1} and 35 kg P_2O_5 ha^{-1} disease incidence was higher with higher seed rate while leaf roller attack was higher at lower seed rate. The results thus showed that *in situ* intercropping might increase the vulnerability of rice to pest and disease when the crop is manured especially with higher levels of N. This might be due to an increase in the N content of the plant, which has been supported by Ito and Sakamoto (1942), Krishanswamy (1952), Padwick (1956) and Varughese and Padmakumari (1993). These results indicate that *in situ* intercropping should be accompanied by proper plant protection measures.

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