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RESPONSE OF RAINFED UPLAND RICE TO AZOTOBACTER

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ABSTRACT

The experiment was conducted at the experimental field of College of Agriculture, Central Agricultural University, Imphal, during the "Kharif" season of 1993-1995. High yielding variety "Leimaphou" was used. Out of five treatments, inoculation of Azotobacter on seed and thrice top-dressings each during maximum tillering, booting and flowering gave significantly higher plant height (76.10 cm) and filled grain/panicle (78.60) than inoculation on seed with two top dressings each during maximum tillering and booting.

INTRODUCTION

Rice is the only staple food grain of Manipur. It needs high doses of nitrogen fertilizer for optimum growth and yield. Imbalanced and indiscriminate use of chemical fertilizers has badly affected the soil micro flora and soil health. Besides, the economical and ecological limitations to the use of heavy doses of chemical fertilizers, the reduction of ozone layer due to the formation of ammonia gas, the increasing cost of nitrogenous fertilizers coupled with high inflation rates and the widening gap between supply and demand have generated global interest in the biological nitrogen fixation or other alternatives to the use of chemical nitrogenous fertilizers. Rangaswami (1975) reported that the nitrogen requirement of paddy could be reduced by 20 to 40kg. N/ha by Azotobacter inoculations. Patil et al (1976) observed that Azotobacter inoculation alone gave higher yield than application of 50 kg N/ha. In the North-Eastern India, no work has so far been done with the Azotobacter application in the rainfed rice. Hence the present investigation on the response of rainfed upland rice to Azotobacter was taken up.

MATERIAL AND METHODS

The experiment was conducted during Kharif season of 1993 to 1995 at the experimental field of College of Agriculture, Central Agricultural University, Imphal (774.5m above mean sea level 93.54' E 2.46' N). The soil is clay loam with pH 5.5, available N (320 kg/ha), P_2O_5 (51.56 kg/ha) and K_2O (475.3 kg/ha). The experiment was laid out in RBD with 3 replications. Leimaphou, the most popular high yielding rice variety of Manipur was used during this investigation. Enough quantity of rice seeds were treated with Azotobacter inoculum @ 6 kg/ha seed dressing + one top dressing during maximum tillering stage @ 3kg each, seed dressing + two top dressings i.e. one during maximum tillering and booting stages of rice @ 2 kg each and seed dressing + 3 top dressings i.e. one at maximum tillering, 2nd one during booting and 3rd one just at flowering @ 1.5 kg each, respectively. In all the plots including control plot, the recommended P and K (60 : 40) only was applied at the final ploughing. Yield parameters such as plant height, productive tillers, panicle length, 1000 grain weight etc. were recorded.

RESULTS AND DISCUSSION

Leimaphou showed significant response to four Azotobacter inoculation methods on grain yield and yield components (Table 1). Inoculation of Azotobacter on seed and thrice. top-dressing each during maximum tillering, booting and flowering gave more plant height (76.10cm), effective tillers per hill (4.27),

panicle length (18.84), field grain per panicle (78.60), 1000 grain weight (27.94g) and grain yield (4.52 t/ ha) than other treatments. It was followed by inoculation of Azotobacter on seed and twice top-dressing each at maximum tillering and booting by giving the plant height (74.678 cm), effective tillers per hill (4.24), panicle length (18.36 cm), filled grain per panicle (77.76), 1000 grain weight (27.88 g) and grain yield (4.44 t/ha). Inoculation of Azotobacter on seed and thrice top-dressings each during maximum tillering, booting and flowering gave significantly higher plant height and filled grain per panicle than inoculation on seed with two top dressings each during maximum tillering and booting. However, grain yield and other yield components did not vary significantly amongst different treatments. All the four treatments showed significant response to Azotobacter inoculations with comparison to control.

The favourable effect of Azotobacter on yield attributes and yield might be due to the effect of nitrogen fixed by Azotobacter. The fixed nitrogen in Azotobacter cells is nitrified after its death and decay (Engel, 1931) and plants can utilize this nitrogen from Azotobacter plasma (Turchin, 1956). Nitrogen so obtained, encourages the vegetative growth, branching metabolic activity and cell division, which was responsible for significant increase in yield attributes. These results are conformity with the findings of Singh and Bhargava (1994). Azotobacter inoculation significantly increased seed yield. Increase in seed yield was attributed to different processes like enhancement of nitrogen fixation, production of growth regulators, protection against root pathogens and modification of nutrient uptake by the plant (Brown, 1975). Kannaiya et al. (1980) observed significant increase in grain and straw yield of rice when A. Chroococcum was sprayed as foliar on 15th, 30th and 45th day after transplanting.

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Table 1. Effect of Azotobacter application on rice grain yield and yield components under rainfed conditions (mean data of 1993 to 1995)

Variety	Method of inoculation	Plant height (cm)	Effective tillers/ hill (no.)	Non-effective tillers/ hill (no.)	Panicle length (no.)	Filled grain/ panicle (no.)	Chaffy grain/ panicle (no.)	1000 grain Wt.(g)	Grain yield (t/ha)
Leimaphou	Seed	69.14	3.97	0.17	17.80	72.53	29.20	27.52	4.00
	Seed + 1 top dressing at maximum tillering	71.83	4.12	0.16	18.14	74.26	27.25	27.65	4.38
	Seed + 2 top dressing at maximum tillering and booting	74.67	4.24	0.14	18.36	77.76	26.30	27.88	4.44
	Seed + 3 top dressing at maximum tillering, booting and flowering	76.10	4.27	0.12	18.84	78.60	24.00	27.94	4.52
	Control	66.00	3.88	0.21	16.88	66.85	29.23	26.02	3.47
	$CD_{0.05}$	1.35	0.48		0.63	0.50	1.44	0.70	0.98