PERSPECTIVES IN PHYCOLOGY
(Prof. M.O.P. Iyenger centenary celebration volume) Ed. V.N. Rajarao (1990): 379-381
Today & Tomorrow's Printers & Publishers, New Delhi 110005, India

RESIDUAL EFECT OF BLUE-GREEN ALGE ON THE GROWTH AND YIELDS OF RICE

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ABSTRACT

The residual effect of blue-green algae (*Anabaena variabilis, Aulosira fertilissima, Scytonema* sp., *Calothrix javanica* and *Westiellopsis prolifica*) on the growth and yield of BR-3 rice (*Oryza sativa* L. var *indica*) grown in three consecutive seasons was studied. Plant height, tiller and panicle numbers, and yield and No content of straw and grain, increased significantly. Algalization increased the grain yield by 34 to 84% over the control Soil N was also improved significantly.

INTRODUCTION

It is now established that many blue-green algae (BGA) play an important role in crop production through fixation of atmospheric N to soil[1]. Jaganathan *et al* [2] stated that application of BGA for consecutive years provides sufficient inoculum for subsequent crops. However, in Bangladesh, very little information is available regarding the importance of BGA on the fertility of paddy soils [3,4] and so far there is no report of residual effect of algal inoculation on rice yield. Hence, an attempt was made to evaluate the relative efficiency of BGA inoculum and urea on growth and yield of rice.

MATERIALS AND METHODS

Soil sample (0-15 cm) collected from a rice field was air-dried and grounded to 2mm size. A basal dose of K (KCI) and P (TSP) was applied @ 36 and 27 kg/ha respectively. Lime was added to raise to pH to about 7.5 to 8.0. The treated soil was then potted (11 kg/pot) in 16 earthen ware pots (30 cm x 25 cm size). Split application of N was made at 24 hours prior to transplantation and before panicle initiation in equal proportion.

Two seedlings (BR-3, *Oryza sativa* L. var *indica*) (28 days old) were transplanted in each pot. Seven days after transplantation, 2.0 g of algal inoculum (a mixture of *Anabaena variabilis, Aulosira fertilissima, Scytonema* sp. *Calothrix javanica* and *Westiellopsis prolifica*) was inoculated in each pot. Four treatments (No, control ; UN, 45 kg urea N/ha; AN, 2g algae/pot; UN + AN) were arranged in a completely randomized design in four blocks. The soil was kept submerged (2-3 cm) with distilled water until the grain matured. Weeds were removed as they appeared.

Plant height, numbers of tillers and panicles, yield and N content of straw and grain were recorded during three consecutive seasons. Soil and plant N was determined by Kjeldahl method[5].

RESULTS AND DISCUSSION

The number of tillers and panicle increased significantly. However, both in Boro and t. Aman seasons, highest number of tillers was recorded in algal inoculated plants (Table 1). The contribution of algal inoculum might be the cause of such increase[6,7]. Algalization increased grain yield significantly. The increase was about

Table 1. Effect of BGA and urea on growth of rice.

Trt.	Height (cm)				Tiller number/hill				Panicale number/hill		
	Boro (1981)	Boro (1982)			Boro (1981)		Boro (1982)		Boro (1981)	Boro (1982)	t. aman
	c	a	b	c	c	a	b	c	c	c	
N_0	58.3	63.0	64.5	78.3	7.0	7.5	9.0	10.8	6.1	9.5	13.5
		(41.5)	(74.8)	(88.0)		(8.5)	(10.8)	(14.0)			
UN	56.3	61.4	64.0	79.5	13.5	8.3	11.3	12.8	10.0	12.0	16.0
		(40.6)	74.7)	79.9)		(11.0)	(13.0)	(17.5)			
AN	56.3	55.5	63.5	74.7	13.8	9.8	12.8	13.3	10.4	13.0	18.0
		(53.6)	(79.6)	(88.0)		(12.0)	(15.0)	(18.3)			
UN + AN	55.5	59.0	61.3	75.1	13.6	11.8	13.0	18.3	11.8	18.0	21.0
		(47.8)	(77.2)	(89.0)		(16.0)	(19.0)	(22.0)			
LSD (5%)	4.74	3.91	2.18	NS	4.21	2.56	3.83	3.44	3.12	2.94	3.19
		(3.11)	(4.47)	(4.0)		(3.18)	(4.53)	(3.42)			

a - maximum tillering ; b - flowering ; c- harvesting.

Figure in the parenthesis represents values for t. Aman (1982).

Table 2. Effect of BGA and urea on yield and quality of straw and grainof rice.

Trt.	Grain (g/pot) Boro (1981)	Straw (g/pot) Boro	t.Aman (1982)	Grain sterility(%) Boro	t.Aman (1982)	Grain/Straw ratio Boro	t.Aman (1982)	Straw N (%) Boro	t.Aman (1982)	Grain N (%) Boro	t.Aman (1982)	Soil N (%) Boro	t.Aman (1982)
N_0	15.2	19.8	23.5	16.1	17.7	0.9	1.0	0.68	0.67	1.26	1.25	0.07	0.03
		(18.5)	(23.4)							(7.87)	(7.81)		
UN	22.9	26.4	30.2	15.6	15.7	1.3	0.70	0.67	1.42	1.40	0.10	0.06	
		(24.5)	(39.5)							(8.87)	(8.75)		
AN	25.6	26.9	30.6	11.1	12.0	1.0	1.4	0.69	0.96	1.32	1.77	0.11	0.15
		(27.1)	(43.1)							(8.25)	(10.18)		
UN +AN	32.3	29.3	32.2	12.1	13.7	1.2	1.6	1.03	1.07	1.44	1.65	0.13	0.15
		(35.9)	(50.3)							(9.00)	(10.31)		
LSD (5%)	4.33	5.39	2.96					0.01	0.03	0.02	0.01	0.01	0.01
		(3.62)	(0.63)							(0.03)	(0.02)		

Figure in the parenthesis indicates grain yield.

Figure in the parenthesis indicates % grain protein.

56,94% and 115% over the control in Boro (1981, 1982) and t. Aman (1982) seasons respectively. This might be due to the stimulatory role played by the biologically potent substances produced by these organisms [6,8,9,10]. Arora[11] reported that excretion of organic acids by *Anabaena* sp. and *Tolypothrix tenuis* reported the increase in the availability of P to rice plants and thereby yield.

Algalization reduced sterility of grain (Table 2). Rao and Pattnaik[12] observed that plants

treated with *Nostoc commune* produced increased number of fertile grain. Yield of straw increased significantly with algal inoculum alone in the subsequent years (Table 2). Grain/straw ratio was maximum with algal inoculum. N content of grain and straw increased significantly and was comparatively more in t. Aman than Boro season treated with algae. Algalization improved protein content of grain too. This increment in the subsequent crop might be due to the release of N either from extracellular products of BGA added or the docomposition of the later (BGA).

N content of soil varied significantly and was more in algal treated soil[13] than non algal treated one (Table 2).

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