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RESEARCH ARTICLE

Blue- green algal biofertilizer and growth response of rice plants

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SUMMARY

Blue- green algae BGA also called Cyanobacteria are the only source of nitrogenous biofertilizers produced naturally with no energy cost of mankind. Biofertilizer are the micro-organism which are for soil enrichment. The main sources of biofertilizer are bacteria, Cynobacteria and Mycorrhizal fungi. Bacteria and Cynobacteria function as a biofertilizer due to the property of nitrogen fixation. (Conversion of molecular nitrogen into nitrogen compound). They are photoautotrophic microbes which utilize solar energy to reduced atmospheric dinitrogen to ammonia. They have a very simple inorganic requirement for growth and their mass production is much cheaper and easier than that of conventional chemical fertilizer. In India there are about 40 centers for production and multiplication of these blue - green algal Biofertilizer. The flakes of blue-green algae are now recommended at the rate of 10 kg/ ha ten day after transplantation of rice and their powdered packets are being sold in the Agriculture University. Agriculture Research Institute, New Delhi has reported that 20-30 kg/ ha nitrogen was fixed by them. Field experiment was conducted at Ranchi with rice IR36. The soil was acidic having PH 6.0.Two rice field 20 m^2 was prepared one with BGA and other without BGA acted as control rice seedlings were transplanted in the flooded field. Ten days after transplantation of rice plants BGA biofertilizer were inoculated in ratio of 0.04 : 0.05 kg/m^2. It was observed that the inoculates contained mixture of Gloeocapsa Plectonema, Oscillatoria, Anabaena, Nostoc, Cylindrospermum, Scytonema, Calothrix, Anabaeanopses, Aulosira, Fischerella etc. During the experiment it was observed that the field with algal inoculates showed the rice plant has bright –green thick fleshy having large number of leaves. The tillers were seen 80 days after the rice plants and number of food grains were thick elongated and healthy as compared with control plants. The grain yield was found to be increased to be in the tune of 10-30 per cent over the control. This observation clearly indicates that the application of BGA manure can replace the chemical fertilizers.

Key Words : Biofertilizer, BGA, Cynobacteria, Rice plant

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Blue-green algae (BGA) also called cyanobacteria are the source of nitrogenous biofertilizer produced naturally with no energy cost of mankind. Biofertilizr are the micro-organis which are for soil enrichment. The main source of biofertilizer are bacteria, Cyanobacteria and Mycorrizal fungi. Bacteria and

Cyanobacteria function as a biofertilizer due to the property of nitrogen fixation (Conversion of molecular nitrogen into nitrogen compound). Cyanobacteria have been reported to promote the nitrogen economy of the soil by converting atmospheric nitrogen into soluble form of ammonia with the help of enzyme nitrogenase complex contained within the specialized structure heterocyst (Ernst *et al*.,1992). Additionally,cyanobacteria contributed phosphorusto the soil by mobilizing the insoluble phosphate present in the soil with enzyme phosphatases (Mishra *et al*., 2005). Moreover, cyanobacteria enhanced the water holding capacity by adding polysaccharidic material to the soil (Choudhary *et al*., 2007) and increased the soil aggregation property. Cyanobacteria have also been reported to excrete growth promoting substances into the soil (Gupta and Shukla, 1969).

Rice is one of the main crops of Bihar and is cultivated in most part of the state. Rice fields favour the growth of cyanobacteria in terms of light, temperature, pH, humidity, water and nutrient availability (Mitra, 1951). Heterocystous forms of cyanobacteria have been extensively studied for their diversity in rice fields (Singh, 1961 and Choudhary, 1999). The agronomic potential of cyanobactarial N^2 fixation in rice field was first recognized in India during 1939 by De. They have a very simple inorganic requierment for growth and their mass production was much cheaper and easier then that of conventional chemical fertilizer. In India there are about 40 centres for production and multiplication of the blue green algal biofertilizer. The flakes of blue green algae are now recommended at the rate of 10 kg/ha ten days after transplantation of rice and their powdered packets are being sold in the Agriculture Universities. Agriculture Research Institute New Delhi has reported that 20-30 kg per nitrogen is fixed by them.

Cyanobacteria are geographically widsespread in fresh water and marine and terrestrial habitats. The distribution of cyanobacteria and their role in maintaining soil fertility has variously been studied throughout the World (Begum *et al*., 1993, 1996 and 2008; Khan *et al*., 1994 and Singh *et al*., 2001). The practice of using diazotrophic cyanobacteria as an efficient source of biofertilizer for rice crop has been adopted in many developing contries (Venkataraman, 1972). Rice is one

Table 1 : Effect of BGA on vegetative growth of rice plant

Days	Length of stem	
	Control	BGA
10	12 cm	16 cm
30	27 cm	32 cm
60	42 cm	48 cm
90	54 cm	63 cm
120	68 cm	78 cm

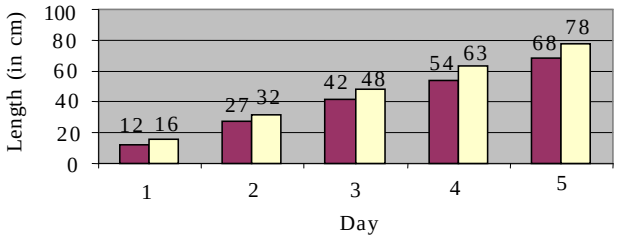

Table 2 : Effect of BGA on reproductive growth (no. of Tillers)

Division	Control			BGA		
	Min	Max	Diff	Min	Max	Diff
1	5	8	3	8	12	4
2	6	8	2	8	14	6
3	3	6	3	6	12	6
4	6	8	2	8	15	7
5	8	10	2	10	16	6
6	5	12	7	12	15	3
7	3	8	5	8	16	8
8	3	12	9	12	15	3
9	6	13	7	13	14	1
10	5	8	3	12	15	3
	Total diff		43	Total diff		47

of the main crop of Jharkhand and is cultivated in most part of state and rice field favour the growth of cyanobacteria.

MATERIAL AND METHODS

Field experiment was conducted at Ranchi with rice IR 36. The soil was acidic having PH 0.6 organic carbon 10.57 per cent, available P.29.4kg /ha and available K.15.0 kg/ha. Two rice field 20m² were prepared one with BGA biofertilizer and other without BGA acted as control rice seedlings were transplanted in the flooded field. Ten days after transplantation of rice plants BGA biofertilizer were inoculated in ratio of 0.041 to 0.05 kg/ m².

RESULTS AND DISCUSSION

It was observed that the BGA inoculated contained mixture of Gloeocapsa, Plectonema, Oscillatoria, Anabaena, Nostoc, Cylinddrospermum, Scytonema, Calothrix, Anabaeanopses, Aulosira, Fischerella etc. BGA multiplies very fast and double its biomas in 7 days after transplantation in a rice field and effect of BGA biofertizer on rice plants was seen by its rapid growth shown in Table 1 and 2.

The rice plant had bright green thick fleshy having large number of leaves. The tillers were seen 80 days after the plantation rice and number of food grains were large in number thick, elongated and healthy as compared to control plants. The grain yield was found to be increased in the tune of 10 -14 per cent over the control Roger and Kulasooriya (1980) and Roger *et al.* (1980) also revealed an average increase of 14 per cent in rice yield over the control. Which was equivalent to the application of 25-30 kg N/ha as a biofertilizer (Venkataraman, 1981). This observation clearly indicates that the application BGA manure can replace the chemical fertilizer (Agawin *et al*., 2007). After 3-4 consequent year of application of algal biofertilizer the algal inoculum is sufficient for growth and multiplication.

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