



Research Article

Implication of blue green algae on yield attributes and economics of rice cultivation

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Received: 2017-05-11; Revised: 2017-05-15; Accepted: 2017-05-25

Available online: 1st June 2017

Abstract: Indian agriculture is presently at cross roads as it has to increase output at one hand and has to take care of environmental aspects on the other hand. Rice cultivation is also facing the same dilemma. Use of blue green algae as bio fertilizer is one possible way to minimize application of synthetic fertilizers which have far reaching implications on environment and health. Present research study was formulated to screen most suitable combination of different species of cyanobacteria on yield attribute of Vandana variety of rice grown in Hazaribagh district. Three species of cyanobacteria, Anabaena + Nostoc + Gloeotrichia was studied and was compared with controlled condition and condition with conventional fertilization. It was observed that combination of biofertilizer gives better result on all parameters when compared to conventional fertilizer.

Key words: Anabaena; Gloeotrichia; Blue green algae; Nostoc; Vandana Variety of Rice

Introduction

Rice is the major food crops of more than 55% of world's population. In our country, India, rice is cultivated on about 76% of total agricultural land and thousands of varieties of this staple grain is propagated throughout the year. Presently, agriculture in general and rice cultivation in particular is facing multi-pronged problems. Ever increasing population is enhancing demand of food grains and shrinking land area under agricultural system is aggravating situation further. This has led to unabated use of chemical fertilizer in fields. Although use of synthetic fertilizers has paid dividend in initial years, studies have confirmed far reaching adverse consequences of such chemicals. Population of soil microorganism is receding fast leading to reduced fertility of land. Both, surface as well underground water resources are getting polluted. Agricultural products are carrying toxic elements and incorporation of them in food chain as posing serious health threats. All these have led to advocacy of organic farming and more and more use of biofertilizers. Blue green algae are one good alternative of chemical fertilizer and its use in paddy fields is not new in tropical countries including India (Shiner *et al.*, 1990 and Warriar and Sridhar 1995). Nostoc, Anabaena, Cylandrospermum, Gloetrichia and Aphanotheca are some of the genera and blue green algae are common in rice field and they have been playing vital role in maintaining Nitrogen balance for paddy. Experimentally it has been proved that application of blue green algae can enhance rice productivity from 15% to 38% over control. The

present study was undertaken to assess efficacy of some blue green algae on yield attribute and economics of paddy cultivation.

Material and Methods

Rice seeds of Vandana variety were procured from Central Rain fed upland Rice/Research station, Hazaribagh & seedlings were grown. Three test plots of 10m x 2m were prepared for rice cultivation. 30 days old seedlings were transplanted 3 in a bunch in different plots at a distance of 10m. All experimental studies were carried out at Hazaribag district of Jharkhand.

A mixture of Nostoc, Anabaena & Gloeotrichia Genera of Blue Green Algae were utilized to study their effect on rice productivity.

A mixture of Cyanobacterial cakes of Anabaena + Nostoc + Gloeotrichia were applied after seven days at the rate of 10 kg/ ha.

Readings for evaluating yield attribute of Vandana Variety of rice were estimated on "Black Box" technique i.e. only data after maturation was taken and intermediate data were ignored. Three square meters of harvest were cut in each plot. The grains were thrashed, air dried & weighed. Each experiment was run in triplicate. Parameters selected for this study include grain yield, husk yield, number of panicle per plant, number of grains per panicle.

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Weight of 100 grains. To substantiate changes if any, parameters like agronomic efficiency & nitrogen recovery was also calculated. Economic parameters like cost of cultivation gross return, net return & benefit cost ratio was also calculated.

Agronomic Efficiency =

Grain yield in fertilizer plot – Grain yield without fertilizer

Quantity of fertilizers applied.

Apparent Nitrogen recovery = $\frac{Y - Z}{N} \times 100$

Where

Y = Uptake of nitrogen in treated condition.

Z = Uptake of nitrogen in untreated condition.

N = Quantity of nitrogen applied.

Cost benefit ratio was calculated by assessing market price of rice, husk, N, P, K and cost incurred on preparation of biofertilizer.

Results and Discussions

Results obtained during this experiment have been presented in Table 1. Grain yield in control condition was 2100 whereas test plot with normal applications of NPK produced 2610 kg in one hectare. Application of mixture of biofertilizers (Anabaena + Nostoc + Gloeotrichia) increased productivity of grain up to 3355 kg/ ha.

Table 1: Effect of blue green algae bio fertilizer on yield attributes of rice and economic of rice cultivation

Parameters	Control	Normal dose of NPK, 1:0.5:0.5	Anabaena + Nostoc + Gloeotrichia
Grain Yield Kg. per ha.	2100	2610	3355
Husk yield Kg. per ha.	2630	3130	3295
Panicle per plant	4	6	6
Weight of 1000 Grains	24.8 gm	29.3 gm	32.7 gm
Agronomic Efficiency Per Kg N applied	-	27.5	34.8
Apparent N recovery %	-	41	62.5
Cost of cultivation Rs. per ha.	12175	14430	15850
Gross return Rs. per ha.	20100	32650	45725
Net return Rs. Per ha	7925	18220	29875
Benefit cost ratio	1.6	2.2	2.9

Level of significance for grain yield, husk yield and weight of 1000 grains is $p < 0.01$. For other parameter $p < 0.05$.

Husk yield was 2630 kg and 3130 kg every hectare respectively in control & NPK treated plots. Mixture of Anabaena + Nostoc + Gloeotrichia enhanced husk yield up 3295 kg /ha. Number of panicles per plant was recorded as 4, 6 & 6 in three conditions taken for research. Weight of 1000 grains was 24.8 gm in control condition which increased to 29.3 gm after NPK application. Application of (Anabaena + Nostoc + Gloeotrichia) had positive effect & weight increased to 32.7gm.

Agronomic efficiency of nitrogen application was recorded to be 27.5 which increased to 34.8 when plot was supplemented with (Anabaena + Nostoc + Gloeotrichia) mix. Apparent nitrogen recovery was 41% when NPK was applied. Supplementation of Anabaena + Nostoc + Gloeotrichia mixture increased it to 62.5%.

Economic considerations also showed positive results in test plot with application, gross return & net return per ha, benefit cost ratio was calculated. The benefit cost ratio in control condition was 1.6 whereas it increased to 2.2 when NPK was applied. Anabaena + Nostoc + Gloeotrichia combination enhanced it to 2.9.

The results clearly indicate that a combination of Blue green algae bio fertilizer can effectively enhance yield attributes of Vandana variety of rice in Hazaribag district. Sinha and Mishra (2010) have also found that combination of biofertilizers show

better results as compared to single genus impact of Cyanobacteria. Bio fertilizer is positive on economic feasibility as well as benefit cost ratio which is in favor of biofertilizer.

The present investigation has convincingly proved that application of blue green algae is almost equally beneficial as compared to application of conventional fertilizers. The economic analysis of cultivation practices has clearly underlined that biofertilizers are cost effective as well. It has been experienced that positive impact of green revolution has been restricted to big and affluent farmers only and marginal farmers have hardly tasted fruit of technological innovations. On the other hand, the ill effects like pollution and health hazards have affected them much.

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Cite this article as:

Ranjana Sinha. Implication of blue green algae on yield attributes and economics of rice cultivation. *International Journal of Bioassays 6.6 (2017) pp. 5386-5388.*

DOI: <http://dx.doi.org/10.21746/ijbio.2017.06.001>

Source of support: Nil.

Conflict of interest: None Declared