

EFFECT OF FERTILIZER NITROGEN AND ALGAL INOCULATION ON RICE CROP

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Application of 60 kg N/ha through fertilizer nitrogen with blue green algal inoculation was better than 60 kg N/ha with no blue green algal inoculation, both in terms of total production and net profit. Treatment 60 kg N/ha plus inoculation with blue green algae gave the highest grain yield of rice (4.05 t/ha) and also, a maximum net profit of Rs. 917.00. The highest content of total N in plants at the panicle initiation stage and crude protein content in paddy grain were also recorded under 60 kg N/ha with blue green algal inoculation.

Nitrogen is mostly supplied through chemical fertilizers, farm yard manure, compost and green manure through legumes for crops. There are few micro organisms that bind the inert nitrogen of atmosphere and make it available to the plants, blue-green algae is one of them. Venkataraman (1977) reported that 30 to 60 kgN/ha can be saved by the use of algal biofertilizer. Algal inoculation to rice crop is known to increase the rice yield (Kannaian *et al.*, 1981). The percentage of nitrogen, protein and free amino acid contents in the rice has been reported to increase by algal inoculation (Venkataraman, 1977).

MATERIALS AND METHODS

The experiments were conducted at J. N. K.V. V. Regional Research Sta-

tion, Bagwai (Gwalior) on clay loam soil containing 0.41 and 0.52 percent organic carbon, 60 and 90 kg available N/ha with pH 8.3 and 8.0 during 1979 and 1980 Kharif seasons, respectively. Treatments compared two levels of blue-green algae (0 and 10 kg/ha) and four levels of nitrogen (0, 20, 40 and 60 kg/ha) under randomised block design with four replications. Half of the levels of fertilizer nitrogen and a uniform dose of 40 kg P₂O₅ and 15 kg K₂O/ha was applied as basal through urea, single superphosphate and muriate of potash, respectively and remaining half was top dressed in two splits after 30 and 60 (D. A. T.) days of transplanting. The calculated quantity of blue-green algae was thoroughly mixed with one litre of water

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Table 1. Effect of different levels of nitrogen and algal inoculation on yield attributes of paddy

Treatments	No. of tillers/hill			Panicle-length (cm)			Panicle-Number/m ²		
	1979	1980	Mean	1979	1980	Mean	1979	1980	Mean
Nitrogen levels (kg/ha)									
0	11.2	9.1	10.1	20.5	22.5	21.5	292	287	289
20	12.1	9.8	10.9	21.5	22.7	22.1	318	302	310
40	13.1	11.0	12.0	22.1	23.1	22.6	342	314	328
60	14.2	12.6	13.4	22.9	23.2	23.2	356	340	348
C.D. at 5%	0.61	1.00	—	0.58	0.30	—	11.3	14.1	—
Blue green algae									
Untreated	10.7	9.2	9.9	21.5	22.6	22.0	321	296	308
Treated	14.6	12.2	13.4	23.0	23.3	23.1	333	325	329
C.D. at 5%	0.43	0.71	—	0.41	0.21	—	8	10.5	—

and applied. The total rainfall received from June to November was 563 and 710 mm and total rainy days were 19 and 43 in 1979 and 1980, respectively. The whole plant samples and grain samples from each treatment were collected at ear-emergence and harvesting stages, respectively and dried in a hot air at 70°C for 24 hours. Nitrogen was estimated by Micro-Kjeldahl method (Jackson, 1967) and multiplied by 6.25 to get crude protein.

RESULTS AND DISCUSSION

The data (Table 1) revealed that yield attributes of paddy were significantly affected due to application of nitrogen both through chemical fertilizer and bio fertilizer in the

form of blue-green algae. The maximum length of panicle and the maximum number of tillers were recorded with the highest nitrogen level and with algal inoculation treatments during both the years. Similar trends were observed in case of panicle number/m². These observations are in conformity with those of Aiyer (1972).

The application of nitrogen through both sources had the significant effect on yield and net profit (Table 2). The application of 20, 40 and 60 kg N/ha through chemical fertilizer enhanced the grain yield by 0.21, 0.58 and 1.06 t/ha as compared to control, while blue green algal inoculation augmented the grain yield

Table 2. Effect of different levels of nitrogen and algal inoculation on yield and economics of rice

Treatments	Grain yield (t/ha)			Straw yield (t/ha)			Average of two years	
	1979	1980	Mean	1979	1980	Mean	Total expenditure (Rs/ha)	Net income (Rs/ha)
Nitrogen levels (kg/ha)								
0	3.92	2.72	2.82	3.65	3.73	3.69	1500	1786
20	3.14	2.93	3.03	3.87	4.18	4.02	1640	1894
40	4.34	3.37	3.40	4.18	4.48	4.33	1760	2196
60	4.14	3.62	3.88	4.71	4.85	4.78	1880	2627
C.D. at 5%	0.158	0.199	—	0.20	0.368	—	—	—
Blue green algae								
Untreated	3.30	2.98	3.14	3.86	4.02	3.94	1500	2151
Treated	3.67	3.33	3.50	4.35	4.60	4.47	1675	2398
C.D. at 5%	0.112	0.143	—	0.142	0.270	—	—	—

by 0.35 t/ha. This reveals the fact that response of rice to algal inoculation was equivalent to 20 to 40 kg N/ha applied through fertilizer nitrogen. These findings corroborate the results obtained earlier by Venkatraman (1977) and Kannaiyan *et al.*, (1981).

The interaction effect between algal supplementation and fertilizer nitrogen was not found to be significant, 60 kg N/ha plus algae produced 4.34 t/ha of paddy grain in 1979 and 3.83 t/ha in 1980, while the corresponding yield under 60 kg N/ha without algae were 3.94 and 3.43 t/ha. The grain yield was com-

paratively higher in the year 1979 when the rainfall was comparatively less and was lower in the year 1980 when the rainfall was heavier. The reduction in yield during 1980, may be due to reduction in the number of sunny days, which reduced the rate of photo-synthesis as advocated sources had the significant effect on yield and net profit (Table 2). The application of 20, 40 and 60 kg N/ha through fertilizer nitrogen enhanced the grain yield by 0.21, 0.58 and 1.06 t/ha over control (no nitrogen), while the application of nitrogen through algae augmented the grain yield by 0.36 t/ha. This indicates that by adding 10kg algae/ha

Table 3. Effect of different levels of nitrogen and algal inoculation on total N in plants and crude protein in seed of paddy

Treatments	Total N in plants (%) at panicle initiation			Crude protein (%) in unhulled seed		
	1979	1980	Mean	1979	1980	Mean
<u>Nitrogen levels (kg/ha)</u>						
0	1.29	1.33	1.31	7.03	6.80	6.91
20	1.48	1.58	1.53	7.11	7.05	7.08
40	1.63	1.68	1.65	7.26	7.36	7.31
60	1.88	1.86	1.87	7.93	7.48	7.70
C.D. at 5%	0.058	0.042	—	0.068	0.122	—
<u>Blue green algae</u>						
Untreated	1.48	1.53	1.50	7.12	7.05	7.08
Treated	1.66	1.69	1.67	7.28	7.30	7.29
C.D. at 5%	0.041	0.030	—	0.048	0.086	—

one can save up to 34 kg N/ha. These findings corroborate the results obtained by Kannaiyan and Govindarajan (1982). Grain yield was higher during 1979 as compared to the year 1981. This may be ascribed to the fact that there was uniform distribution of rains during its growth period. This finding is similar to that of the findings earlier reported by Aiyer *et al.*, (1972). The interaction effect between algal inoculation and nitrogen was not found significant.

The enhancement of straw yield due to the various treatments was almost similar to the grain yield.

The study of grain and straw ratio revealed that this was increased with the increase in nitrogen levels up to 40 kg/ha and remained the same under inoculated and un inoculated conditions.

The total N in plants at the panicle initiation stage, ranged from 1.29 to 1.33% under no nitrogen and 1.86 to 1.88% under the highest level of nitrogen (60 kg/ha). Similarly the total N in the algal inoculated crop was also higher than the uninoculated crop in both the years (Table 3).

Increasing level of nitrogen gave the significant higher percentage of protein in the grain. The highest content of protein 7.7 per cent was recorded in 60 kg N/ha. Similarly the application of blue green algae had also, enhanced the protein significantly over uninoculated one, in both the years. However, interaction effect was not found to be significant Venkataraman and Goyal (1965) also obtained similar results suggesting that application of blue green algae with nitrogenous fertilizers not only increased the yield but also improved the quality of the grain in rice.

Application of the increasing levels of nitrogen to the paddy up to 60 kg N/ha increased the net-profit by Rs. 841/ha over no nitrogen. Similarly inoculation of blue green algae resulted in higher net profit by Rs. 247/ha over un-inoculated one. The interaction effect between the two factors was not significant and therefore, the maximum net profit of Rs. 917/ha was obtained when 60 kg N/ha was applied in combination with blue green algae (Table 2).

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