

NITROGEN FIXING ALGAE FROM AGRICULTURE FIELDS OF SINDH*

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Abstract

28 species belonging to Nostocaceae, Scytonemataceae, Rivulariaceae, and Stigonemataceae of Cyanophyta are reported from agriculture fields of Sindh. Among them, two species of genus *Cylindrospermum*, six of *Anabaena*, six of *Nostoc*, one of *Nodularia*, one of *Aulosira*, four of *Scytonema*, one of *Tolypothrix*, one of *Rivularia*, five of *Gloeotrichia* and one of haplosiphon were found to be common in rice fields of Sindh.

Introduction

The members of blue green algae possess the capacity of fixing atmospheric nitrogen De (1939), Fogg (1942), Prasad (1949), Ali, et al (1956), Watanabe et al. (1951), Watanabe (1959) and Taha (1963). Although the members of Cyanophyta have a wide range of distribution, the climate of rice fields is an ideal condition for their growth; hence most of the findings regarding rate of nitrogen fixation pertain to rice fields. De (1939) have shown that nitrogen is fixed on the soils of Dacca Faridpur. Prasad (1949) has analysed 12.9 lbs/acre in the rice fields of Bihar. Mishigaki and Konishi (1957) observed a fixation of 20 lbs/acre. While an increased growth of rice, inoculated with nitrogen was reported by Watanabe (1949).

Banerji (1935) has reported 9 species from rice fields of Faridpur. De (1939) has reported 40 species from rice fields of Allahabad. Khan (1957) has described 45 species from rice field of Kashmir and Sirinagar. Watanabe (1959) out of his 815 samples found 16 species to be nitrogen fixing species.

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Material and Method

Soil samples were collected during the years 1976-79 from various districts of Sindh and were broken into powder form. The Soil suspension of each sample was prepared by adding 1.5 gram of soil in 25cc of distilled water in a conical flask. It was well shaken and allowed to settle. Cultures were prepared from each sample in petri dishes using Bold (1942) liquid medium.

An amount of 50 ml of medium adjusted to pH 7 was dispensed in 250 ml conical flasks plugged with cotton, Autoclaving was done at pressure of 15 lbs for 30 minutes. Incubation was carried out for 8 weeks at room temperature ranging between 25-30°C. The cultures were exposed to continuous light from 3 fluorescent lamps each of 40 watts at a distance of 10 inches from the lamps.

Unialgal cultures (of nitrogen fixing blue green algae isolated from various rice fields) were identified after Desikachary (1959). Out of these, six species i.e., *Anabaena iyengarii*, *Anabaena variabilis*, *Cylindrospermum muscicola*, *Nodularia spumigena*, *Nostoc commune* and *Nostoc paludosum* were selected for nitrogen estimation.

Results and Discussion

On the basis of the results obtained (Table 1 & 2) It has become possible to reach to the following conclusions:-

1. Algal dry weight g/l and total nitrogen mg/l increased gradually.
2. Maximum nitrogen fixation in all the species was attained after 8 weeks of incubation. On the basis of nitrogen fixation capacity, the species could be arranged in the following order:-
Anabaena iyengarii, *Anabaena variabilis*, *Cylindrospermum muscicola*, *Nodularia spumigena*, *Nostoc commune*, *Nostoc paludosum* where nitrogen fixation was found to be 124.5, 88.2, 66.2, 59.9, 49.5 and 54.0 mg/l respectively.
3. After 8 weeks incubation the strain of *Anabaena iyengarii*, having comparatively low dry weight about 0.14 g/l yielded highest amount of total nitrogen.

Table 1
AMOUNT IN DRY WEIGHT (G/L) OF NITROGEN FIXING ALGAL SPECIES

Weeks	<i>Anabaena iyengarii</i>	<i>A. variabilis</i>	<i>Cylindrospermum muscicola</i>	<i>Nodularia spumigena</i>	<i>Nostoc commune.</i>	<i>N. Paludosum</i>
2	0.14	0.12	0.07	0.10	0.12	0.21
3	0.22	0.23	0.13	0.20	0.24	0.23
4	0.40	0.66	0.30	0.52	0.45	0.36
5	0.87	1.45	0.73	0.10	0.80	0.67
6	1.54	2.34	1.62	2.12	1.30	1.15
7	1.71	2.80	2.64	2.80	2.40	1.60
8	1.73	2.98	2.72	2.93	2.52	1.68
9	1.65	2.80	2.60	2.75	2.35	1.56

Table 2
TOTAL NITROGEN (MG/L) IN THE NITROGEN FIXING SPECIES OF ALGAE

Weeks	<i>Anabaena iyengarii</i>	<i>A. variabilis</i>	<i>Cylindrospermum muscicola</i>	<i>Nodularia spumigena</i>	<i>Nostoc commune.</i>	<i>N. Paludosum</i>
2	10.8	7.10	1.3	6.5	3.4	5.6
3	13.2	9.2	9.0	16.6	5.1	6.4
4	25.1	18.2	9.0	14.6	10.3	10.8
5	53.2	37.1	21.1	21.2	16.9	16.2
6	107.3	74.6	42.1	46.1	27.8	30.2
7	120.3	84.5	63.2	53.2	54.8	45.3
8	124.6	88.2	66.2	54.0	59.6	49.5
9	121.2	83.9	63.5	53.3	53.9	45.0

4. The maximum growth of Cyanophycean species was found to be at temperature between 25–30°C. Below 25°C growth was found to be unsatisfactory.
5. It was also noted that continuous exposure to light or total darkness decreased the rate of growth and nitrogen fixation. For nitrogen fixing species, light period of 16 hours and 8 hours of darkness was found to be most suitable.
6. It was found that medium having pH 7 to 8 appeared to be favourable for growth of these species.

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