

ORIGINAL ARTICLE

STUDIES ON BIOCHEMICAL ANALYSIS OF *ANABAENA* AND *OSCILLATORIA*
(CYANOBACTERIA)

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ABSTRACT

Cyanobacteria are present abundantly in rice fields and are important in helping to maintain rice fields fertility through nitrogen fixation and involved in the photosynthesis. The present study is aimed to analyse biochemical parameters such as Total carbohydrates, Total Proteins, Free amino acids and Total Lipids in blue green algae were isolated from the paddy field of the Nalanthethu, Bhuvanagiri Taluk and Srinedunchery, Sirmushnam Taluk, Cuddalore District and the isolated blue green algae of *Anabaena* and *Oscillatoria* were maintained in BG11 medium for 10 days. The present study shows the level of total carbohydrates were more in *Anabaena* than *Oscillatoria* mean while Total proteins were more in *Oscillatoria* than *Anabaena* sp.

Keywords: : Biochemical Parameters, *Anabaena* sp, *Oscillatoria* sp.

1. INTRODUCTION

Cyanobacteria (blue-green) algae are chemical change prokaryotes, gram negative bacteria and diversity ranges from monocellular to multicellular, branched filamentous, slight to penetrating coloration, amyotrophic to autotrophic to heterotrophic, free living to symbiotic, water to terrestrial, acidophilic to alkaliphilic, psychrophilic to thermophilic, planktonic to epiphytic, freshwater to marine including hyper saline (Alam *et al.*, 1989).

Cyanobacteria are a large collection of photo respiration, micro organisms with highly variable morphological features (Schopf, 2000). Eu bacterial lineages are the single of the principal encompass of cyanobacteria. The assortment within ancestry together with both that of morphology (akinets, branching filaments, single cells, etc.) and physiology (motility, heterotrophy, nitrogen fixation, etc.) has fascinated micro biologists (Bryant, 1994).

The rice field's live agronomically managed atmosphere, healthy identified aimed at the amusing collection about cyanobacteria. Rice fields establish characters of the favourable ecologist for the progress with propagation about cyanobacteria meeting their requirements for sunlight, water and high temperature.

2. MATERIALS AND METHODS

PHYSIOGRAPHY OF THE RESEARCH REGION

The study zone (Station I: Nalanthethu 11.47N 79.63 E) which is selected for the current research investigation were situated trendy the Bhuvanagiri Taluk and Station II Srinedunchery: 11 45 '0' Latitude N and 79 45 '0' Longitude) which is located in Taluk of Srimushnam, District of Cuddalore, Tamilnadu, India. Station-I (Nalanthethu) is a small Village/hamlet amid Bhuvanagiri Taluk among the Cuddalore Region about Tamil Nadu State in India. The situation comes under Azhichikudi Panchayath. It's situated 45 KM from state capital from District headquarters Cuddalore. Four kilometers from Melbhuvanagiri, 227 kilometers from state capital Chennai. Station-II (Srinedunchery) as a village trendy Srimushnam Taluk in Cuddalore and Chidambaram is located slightly arresting

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Srinedunchery remains a township in Srimushnam Taluk in District of Cuddalore, TamilNadu State, India. It is situated 60 Km towards South as of District headquarters Cuddalore, 7 Km from Srimushnam and 238 KM from state capital Chennai. Srinedunchery remains nearby Kammapuram Brick to South, Andimadam Block towards North, Kattumannarkoil Brick just before West and Melbhuvangiri Block towards East. Neyveli, Virudhachalam, Sethiyathope, Andimadam exist the neighboring Towns towards Srinedunchery. Here area is trendy the border about the Cuddalore and Ariyalur District.

CULTURE ABOUT CYANOBACTERIAL SPECIES

The *Anabeana fertilissima* and *Oscillatoria princeps* inaccessible as per of the rice fields of Cuddalore District. The filamentous cyanobacterium *Anabeana fertilissima* and *Oscillatoria princeps* were established in culture conical flask at 30°C ± 2°C trendy the nitrogen-free form of GG-11 liquid and nitrogen average respectively (Rippika et al., 1979) and pH existed attuned to 7.0 *Anabeana sp.* was established trendy BG-11 middling deprived of nitrogen source (Stanier et al., 1971). Their cultures were maintained in laboratory situations in sunshine fluorescent ducts for 16 h a day for 10 days. The cultured cyanobacterial species were used for the estimation of biochemical analysis.

Estimation of carbohydrates in selected cyanobacteria

The approximation of carbohydrates was complete by the technique of Dubois et al., (1956). The cultures existed centrifuged at 7000×g for 10 minutes. The floating was discarded and 20mg pellets were engaged trendy an experiment conical flask. Then it was hydrolyzed with 2 ml developed and leisurely at 490nm using Spectronic 20 against glucose as blank.

Estimation of total proteins in selected cyanobacteria

The assessment of total proteins was done the technique of Lowry et al., (1951). The Culture was centrifuged at 7000×g for 10 minutes. From the pellet 20 mg was treated with reagent A and centrifuged by 10,000×g as 10 minutes. The following capsule was resuspended in reagent B and boiled for 30 min; cooled and then recentrifuged to eliminate light scattering materials. The supernatant was invented to a known volume. To 0.1 mL about the bouncy 0.09 mL of purified mL of distilled water and 5 mL about reagent F was added. The absorbance live restrained after half hour on 750 nm in spectrophotometer (Spectronic 20) against the reagent as blank. The quantities of proteins existed premeditated using a usual curve prepared by utilize slow serum Albumin (BSA).

Estimation of free amino acids in selected cyanobacteria

The calculation of allowed amino acids existed done by the system of Jayaraman (1981). The culture live centrifuged on 7,000 ×g for 10 minutes. From the pellet, 20mg was homogenized with 80% of ethanol in a pestle and mortar. The homeogenized was centrifuged at 7,000×g. The clear supernatant was constructing until known volume. From this 1 mL existed cylinder available within a test tube besides diluted to 4 mL through distilled water. To this 1 mL about ninhydrin substance was added and kept in hot aquatic immersion for 15min. The tubes were then cooled besides about 50% ethanol was added. The purple colour developed

existed rhythmic now spectronic 20 at 540 nm. Standard graph was build utilize a mixture of alanine, aspartic acid, tryptophan, proline and lysine.

Estimation of total lipids in selected cyanobacteria

The estimation of total lipids was done by the method about Sato (1988). Culture was centrifuged at 7,000×g being 10 mintues. From the pellet 20 mg was tekan; homogenized in a pointing and implement with extraction solvent (*chloroform: methanol 12:1 V/V*) and filtered through filter paper. The filtrate was vortexed with sodium to remove moisture. Then it was occupied in an evaluated and the dried by a steam of nitrogen. The desiccated extracts were considered besides the total lipids existed estimated by subtracting the initial from the final weight. The quantity about total lipid was expressed as mg g⁻¹ dry weight.

3.RESULTS

The level of carbohydrates in *Anabeana fertilissima* and *Oscillatoria princeps*

Table.1 shows the equal of carbohydrates witnessed in the *Anabeana fertilissima* then *Oscillatoria princeps* refined at 10th day. The carbohydrates was high (3.20 ± 0.14) in *Anabeana fertilissima* and lower (1.56 ± 0.17) in *Oscillatoria princeps*

The level total protein trendy *Anabeana fertilissima* and *Oscillatoria princeps*

Table 1 shows the extent about total protein witnessed in the *Anabeana fertilissima* besides *Oscillatoria princeps* cultivated at 10th day. The total protein existed high (2.47 ± 0.12) in *Anabeana fertilissima* besides low (2.04 ± 0.92) in *Oscillatoria princeps* (Table 1).

Table . 1. The extent about total carbohydrates, total lipids, total protein and total at liberty amino acids content in *Anabeana fertilissima* besides *Oscillatoria princeps*

Parameters	<i>Anabeana fertilissima</i>	<i>Oscillatoria princeps</i>
Total carbohydrates (mg/mL)	3.20±0.14	1.56±0.17
Total protein (mg/mL)	2.47±0.12	2.04±0.92
Free amino acids (mg/mL)	1.12±0.11	0.92±0.74
Total lipids (mg/mL)	1.97±0.72	1.92±0.92

Values expressed as mean ± SE of three individual observations
Significant of 0.05 levels

The level of amino acids in *Anabeana fertilissima* and *Oscillatoria princeps*

Table.1 shows the total the extent of free amino acids witnessed in the *Anabeana fertilissima* and *Oscillatoria princeps* cultured at 10th day. The free amino acids was high

(1.12 ± 0.11) in *Anabaena fertilissima* and low (0.92 ± 0.77) in *Oscillatoria princeps* in (Table 1).

The level of total lipids in *Anabaena fertilissima* and *Oscillatoria princeps*

The level of total lipids was presented in Table.1. The level of total lipids witnessed in the *Anabaena fertilissima* and *Oscillatoria princeps* cultivated at 10th day. The total lipids existed high (1.97 ± 0.72) in *Anabaena fertilissima* and low (1.92 ± 0.92) in *Oscillatoria princeps* (Table 1).

4.DISCUSSION

Carbohydrate, protein and lipids are naturally occurring nutrients present in almost all foods in different quantities. Carbohydrates are sugar or polymers of sugars such as starch that can be hydrolyzed to simple sugars. Proteins are needed for growth, maintenance and repair of tissue. Lipids are very wide spread in nature among all micro organisms (Srilakshmi, 2002).

Lipid biomarker studies have been used widely to characterize complex microbial societies from an assortment of environments, as well as marine, fresh water, hydrothermal, hypersaline and cold habitats (Fang *et al.*, 2006, Zhang *et al.*, 2007). Lipids are an essential part of membranes, as well as structural and storage compounds in all prokaryotes and eukaryotes. Certain lipids pinpointing of specific organism classes have been identified, such as the mid-chain methyl heptadecanes diagnostic of cyanobacteria (Shiea *et al.*, 1990;; Koster *et al.*, 1999).

In the contemporary study, the level of carbohydrate, protein, free amino acids and lipids was observed in *Anabaena fertilissima* and *Oscillatoria princeps*. The present study shows that level of protein was more than carbohydrates, free amino acids lipids this may be due to normal soil fecundity in the paddy fields. Yandigeri *et al.*, (2010) suggested that the results on total soluble proteins and total carbohydrates increased due to addition of phosphate. They also stated that the higher amounts of total soluble protein may be accredited to high amount of available phosphate content, which is present at higher concentration. Li *et al.*,(2009) reported that the reducing sugars increased rapidly within hours after development began, suggesting that this stage may be the critical phase for the synthesis of carbohydrates and the fast growth of the cyanobacterium. This suggests that carbohydrates, especially non-reducing sugars, were the main constituents of the sheath.

Dunhai *et al.*, (2009) stated that the reducing sugars augmented rapidly within hours after development began and suggesting that this stage may be the critical phase for the synthesis of carbohydrates and the fast progression of the cyanobacterium. They also told that the developmental phase of *N. sphaeroides*, after the scabbard became dense and ripe the gratified of reducing sugars in gatherings diminished whereas the gratified of total carbohydrates increased. This suggests that carbohydrates, especially non-reducing sugars, were the main constituents of the sheath. Watanabe (1986)

recorded in the free amino acids are presented in the culture solutions of *Calothrix brevissima*.

The extant study put forward that carbohydrates has a regulatory effect on cyanobacterial cell metabolism (apparently including hexokinase-mediated pathway) that results not only in the inhibition of photosynthetic processes but also in the quantitative redistribution of membrane glycerolipids in favour of the cyanobacterial phospholipid. (Murata *et al.*, 1992) proposed that the composition of fatty acids are exist, this composition contain four types of fatty acid in cyanobacteria and demonstrated some correlations with morphological properties. Kruger *et al.*, (1995) estimated the taxonomic prominence of fatty acid opus at the genus and subgenus level by examining the fatty acid opus of diverse *Microcystis* isolates and other members of the order Chroococcales. Similarly Thamizhselvi and Sivakumar, (2012) suggests that the results on total soluble proteins and total carbohydrates increased. The protein gratified was more than the carbohydrates in *A. aconstricta*. But in *O. curviceps*, the level of total carbohydrates was high when matched with total protein. (Gribovskaya *et al.*, 2009) described that the protein and carbohydrates were found in the *Oscillatoria* sp. Mishra *et al.*, (2004) reported that the protein and carbohydrates were present in the *Anabaena* sp. and *Calothrix* sp. in the soil cyanobacteria.

Kenyon *et al.*, (1972) proposed that four types of fatty acid composition exist in Cyanobacteria and demonstrated some correlations with morphological properties. Caudales and Wells (1992) probed the cellular fattyacids of benthic Cyanobacteria have its place to the species *Anabaena* and *Nostoc* and establish noteworthy dissimilarities between those genera. (Kruger *et al.*, 1995) assessed the taxonomic prominence of fatty acid opus at the sort and subsort level by scrutinizing the fatty acid opus of diverse *Microcystis* isolates and further members of the order Chroococcales.

Algal protein either as a supplement or as an alternative source has received worldwide attention. Some strains of *Anabaena* and *Nostoc* are disbursed as human food in Chile, Mexico, Peru and Philippines. *N. commune* with great amount of fibre and moderate protein is of potential use as a new dietary fibre source and can play a significant physiological and nutritional role in human diet (Jeraci and Vansoest, 1986).

Malathi *et al.*, (2018) studied the level of protein and carbohydrates were perceived in *A. circinalis*, *N. punctiforme*, and *O.princeps* and *P. mucosum*. From the study, maximum protein content was observed in *N. punctiforme*. Similarly Thamizh and Sivakumar, (2012) suggests that the results on total soluble proteins and total carbohydrates increased. The protein gratified was more than the carbohydrates in *A. aconstricta*. But in *O.curviceps*, the level of total carbohydrates was high when compared with total protein. (Gribovskaya *et al.*, 2009) stated that the protein and carbohydrates were found in the *Oscillatoria* sp. (Mishra *et al.*, 2004) reported that the protein and carbohydrates were contemporary in the *Anabaena* sp. and *Calothrix* sp. in the soil cyanobacteria.

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