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BIOCHEMICAL COMPOSITION OF *SPIRULINA FUSIFORMIS* CULTIVATED UNDER OUTDOOR CONDITIONS

ANURADHA DUBEY
Department of Botany, School of Science & Technology, Vardhman Mahaveer Open University, Kota, Rajasthan.

In the present research work *Spirulina fusiformis* was cultivated in outdoor conditions in extreme conditions of Rajasthan and its biochemical composition was analyzed in order to find its nutritional value. Results of the present study reveals that under these growing conditions nutritional value of the cyanobacterium *Spirulina fusiformis* was maintained suitably.

Keywords: Biochemical Composition; *Spirulina*; Temperature.

Introduction

Spirulina is a cyanobacterium, found in fresh water having spiral filamentous structure. These filaments harvest energy of sun and grow as a treasure of bio-available nutrients. This microalga is identified as novel protein source to prevent malnutrition[1]. It is declared as the best food for tomorrow[2]. It has higher food value than any other conventional crop plant. Looking to its nutritional value it is popularized as protein substitute[3]. Leading to its growing demand in food sector its mass cultivation encouraged in all over world and commercial production tends toward its cultivation in natural environment. Due to its high nutritional value, its bio-available nutrients and simple production method it is suggested as a most promising alga for using in unconventional sources[4, 5].

In the present work *Spirulina fusiformis* is cultivated in outdoor extreme conditions of Rajasthan and its biochemical composition was analyzed in the reference of its nutritional value.

Methods and Materials

Spirulina fusiformis was cultivated in outdoor conditions of Rajasthan. The range of temperature was 32-35.5^{0}C and light intensity range was 48-51.35 Klux. Biochemical composition of outdoor cultivated cyanobacterium was estimated by following suitable protocols for the particular constituent.

Chlorohpyll-a was estimated by the method of Mickiney[6]. Estimation of carotenoid was performed with the help of method proposed by Jensen[7]. Phycobiliproteins were estimated with the method suggested by Zhang and Chen[8] & calculated by the series of equation given by Bennett and Bogorad [9].

Pure protein was estimated by the method of Lowry *et al.*[10]. Estimation of total carbohydrates was carried out by Anthrone Method suggested by Roe[11]. Lipids were estimated by the method given by Dittmur

Table-1 Biochemical Composition of *Spirulina fusiformis* cultivated in outdoor conditions

S. No.	Parameters/Biochemical Constituents	Amount
1	Biomass	0.370 g/l
2	Chlorophyll a	0.768%
3	Caretenoids	0.197%
4	Total Phycobiliproteins	7.865%
5	Phycocyanin	4.430%
6	Allophycocyanin	2.095%
7	Phycoerythrin	1.34%
8	Lipid	7.0 %
9	Carbohydrates	10.5 %
10	Protein	58%
11	Amino acids	0.92%
12	Total nucleic acids	2.159%
13	DNA	0.684%
14	RNA	1.475%
15	Calcium	0.901 %
16	Magnesium	0.426 %
17	Sodium	0.88%
18	Potassium	1.1 %

and Wells[12]. Quantitative estimation of free amino acids was performed by the Method of Lee and Takahashi[13]. DNA and RNA were quantitatively estimated colorimetrically by the method of Jensen[14].

Calcium and Magnesium were estimated titrimetrically by the method proposed by Golterman and Clymo[15]. Sodium and Potassium was determined with the help of method suggested by Trivedy and Goel [16].

Results and Discussion

Outdoor cultivation of cyanobacterium performed and analyzed to study biochemical constituents. Data collected in present study revealed that on an average outdoor cultivation of *Spirulina fusiformis* yielded 0.370 g/l of biomass. Pigments were 0.768% Chlorophyll-a, 0.197% Caretenoids and 7.865% Biliproteins, out of which 4.430% was phycocyanin, 2.095% Allophycocyanin and 1.34% Phycoerythrin.

Lipid contents of the cyanobacterium ranged between 7.0%. Carbohydrates were detected to be 10.5 %. Protein contents of the cyanobacterium were recorded to be 58%. Aminoacids were 0.92%. Total nucleic acids recorded were 2.159%, which included 0.684 % DNA, while RNA was 1.475%, 0.901% Calcium, 0.426% Magnesium, 0.88% Sodium and 1.1% Potassium were registered in the cyanobacterium.

Biochemical composition proves that nutritional value of *Spirulina fusiformis* was maintained suitably in high temperature conditions of Rajasthan. As per findings of Vonshak[17], different strain of *Spirulina* may differ for their optimal growth in different ranges of temperature in which it was exposed. Findings of Richmond[18] are also in consonant, he suggested the optimal temperature for growth of different strains of *Spirulina* was 35-37^{0}C. In present work *Spirulina fusiformis* strain was successfully

cultivated in 35^0C temperature with good biochemical constituents' levels. Findings of Rafiqul *et al.*[19] revealed that *Spirulina fusiformis* at temperature between 25-37^0C indicates high and stable protein content that establishes its more usefulness over other stains of *Spirulina* . These report favours outcome of present research work.

It may be concluded that outdoor cultivation of *Spirulina fusiformis* successfully carried out in the semi-arid environmental conditions of Rajasthan, where light intensity and temperature were controlled with the help of various simple means. Under these growing conditions nutritional value of the cyanobacterium *Spirulina fusiformis* was maintained suitably.

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