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Short Communication

Formulation of organic medium for the cultivation of *spirulina* using agro-wastes

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Abstract

In the present study, attempt was made to cultivate Spirulina using agricultural wastes. Spirulina mass cultivated in the Zarrouk's medium and morphology observed under microscope. The growth performance, biomass concentration, Chlorophyll content, Carotenoids and Phycocyanin pigments studied using skin peel of beet root (Beta vulgaris), grape leaves (Vitis vignifera), extract of rice bran and rice husk and root of Casuarina (Casuarina equisetifola). Growth of Spirulina improved 2 folds on 21st day in organic medium than control. Hence, this organic medium can be recommended for the domestic and commercial production of Spirulina.

Keywords: *Spirulina*, Zarrouk's medium, organic medium, Phycocyanin, Carotenoids.

Introduction

Spirulina are multicellular filamentous blue green algae seeking high attention in food industry because of its high macro and micro nutrients. It acts as a protein and vitamin supplement. *Spirulina* can easily be cultivated in water and harvested.

Zarrouk's medium formulated for *Spirulina* cultivation[1] served as the standard medium (SM). It is a challenge for the researchers to develop a low cost medium for the mass production of *Spirulina*. In this study, organic medium used and growth performance of *Spirulina* was studied based on the microscopic observation, biomass concentration, Chlorophyll content, Carotenoids and Phycocyanin pigments of slurry formed.

Materials and methods

The *Spirulina* culture was maintained by using the Zarrouk's medium at pH 10 under photoautotrophic condition by continuous illumination using white fluorescent tubes and shaking thrice a day by hand for 15 days. The organic materials were selected based on its nutritional value such as, skin peel of *Beta vulgaris* (Beet root), leaves of *Vitis vignifera* (Grapes), root of *Casuarina equisetifolia* (Casuarina), rice bran and rice husk for the cultivation of *Spirulina*. All the organic materials were dried and powdered separately.

Each material (except *Casuarina equisetifolia*) was taken as mentioned in the table below (Table-1) and separately boiled with 10 ml of sterile distilled water and filtered. The filtrate was made up to 240 ml using sterile distilled water. Then the powdered root of *Casuarina* was mixed with 10 ml of sterile distilled water and added to the previously prepared solution. Medium was then supplemented with 4.2 g of Sodium bicarbonate (Baking soda) as Carbon source. The 250ml of organic medium was used for the cultivation of *Spirulina.*

Table-1: Composition of Organic Medium.

S.No	Organic Material	Concentration
1.	*Beta vulgaris* (Beetroot)	1.5 g
2.	Leaves of *Vitis vignifera* (Grapes)	1.5 g
3.	Root of *Casuarina equisetifolia* (Casuarina)	1.5 g
4.	Rice bran	1.5 g
5.	Rice husk	3 g

The prepared organic medium was taken in sterile container and 12.5 ml of *Spirulina* was inoculated. The parameters such as microscopic observation, Dried biomass level[2], Chlorophyll content[3], Carotenoids[4] and Phycocyanin[2] pigments of the slurry were checked at different time intervals (7th day, 14th day and 21st day) to study the growth performance of *Spirulina*.

Results and discussion

Morphological identification: The growth and state of *Spirulina* was observed under microscope everyday and it was found to be better than control (Zarrouk's) medium on 21st day (Figure-1).

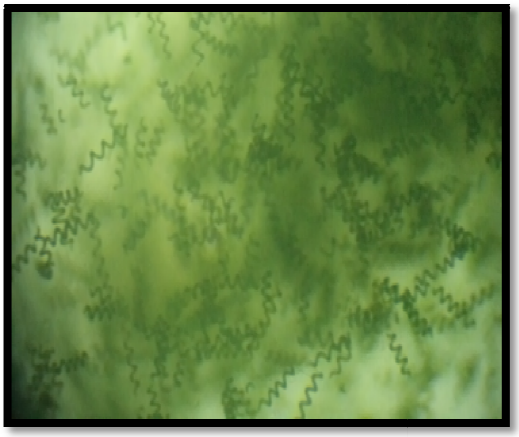

Figure-1: *Spirulina* in Organic Medium – (Under 45X).

Results of various parameters: Along with the Biomass concentration, three major pigments viz. Chlorophyll (Chlorophyll a, Chlorophyll b, Total Chlorophyll), Carotenoids and Phycocyanin were estimated in the harvested biomass to check the quality of *Spirulina* slurry formed (Table-2).

The observations indicated that, pH of the medium was maintained in alkaline condition by sodium bicarbonate and it supported the growth of *Spirulina*. In earlier studies, pretreated liquid wastes such as, rice mill effluent[2], hatchery waste water[5] and sea water were used as substitution medium[6,7] or enhanced with definite nutrients[8,9,10] were used for the cultivation of *Spirulina*. This newly formulated organic medium using agricultural and vegetable wastes will be an alternate, low-cost medium for the cultivation of *Spirulina.*

Table-2: Growth performance of *Spirulina* in Organic Medium (OM).

S.No.	Parameters	Time Interval	Control	OM
1.	Biomass (Dried) (mg/l)	7th Day	59	77
		14th Day	93	125
		21st Day	189	320
2.	Chlorophyll a (mg)	7th Day	0.020	0.012
		14th Day	0.023	0.029
		21st Day	0.050	0.068
3.	Chlorophyll b (mg)	7th Day	0.014	0.028
		14th Day	0.028	0.034
		21st Day	0.029	0.038
4.	Total Chlorophyll (mg)	7th Day	0.035	0.041
		14th Day	0.051	0.064
		21st Day	0.081	0.111
5.	Carotenoids (µg/ml)	7th Day	4.20×10^{-5}	5.85×10^{-5}
		14th Day	7.40×10^{-5}	9.10×10^{-5}
		21st Day	14.10×10^{-5}	25.21×10^{-5}
6.	Phycocyanin (mg/ml)	7th Day	0.0212	0.0937
		14th Day	0.251	0.324
		21st Day	0.380	0.563

Conclusion

The alternate medium was made to reduce the cost by using agricultural and vegetable wastes for the cultivation of *Spirulina*. The *Spirulina* showed the better growth rate and high level of pigment production in organic medium. In comparison with Control, the growth performance of *Spirulina* was better in organic medium. Hence, this organic medium can be suggested for the domestic and commercial production of *Spirulina.*

References

1. Zarrouk C. (1966). Contribution a l'etude d'une cyanophycee. Influence de divers facteurs physiques et chimiques sur la croissance et la photosynthese de *Spirulina maxima* (Setch. *et* Gardner). Geitler, Doctorate thesis. University of Paris, Paris, France.

2. Usharani G., Srinivasan G. and Sivasakthi S. (2014). Analysis of biochemical constituents in *Spirulina platensis* cultivated using rice mill effluent supplementation. *International Journal of Recent Scientific Research*, 5(12), 2183-2187.

3. Thimmaiah S.K. (2006). Standard methods of Biochemical analysis. Kalyani Publishers, Ludhiana, 534.

4. Saleha A.M., Dhar D.W. and Singh P.K. (2011). Comparative pigment profiles of different Spirulina strains. *Research in Biotechnology*, 2(2), 67-74

5. Sandeep K.P., Shukla S.P., Vennila A, Purushothaman C.S. and Manjulekshmi N. (2015). Cultivation of *Spirulina (Arthrospira) platensis* in low cost seawater based medium for extraction of value added pigments. *Indian Journal of Geo-Marine Sciences,* 44(3), 384-393.

6. Leema J.M., Kirubagaran R., Vinithkumar N.V., Dheeran P.S. and Karthikayulu S. (2010). High value pigment from *Arthrospira (Spirulina) platensis* cultured in seawater. *Bioresource Technology,* 101(23), 9221-9227.

7. Faucher O., Coupal B. and Leduy A. (1979). Utilization of seawater and urea as a culture medium for *Spirulina maxima*. *Canadian Journal of Microbiology*, 25(6), 752-759.

8. Materassi R., Tredici M. and Balloni W. (1984). *Spirulina* culture in sea water. *Applied Microbiology and Biotechnology*, 19(6), 384-386.

9. Tredici M.R., Papuzzo T. and Tomaselli L. (1986). Outdoor mass culture of Spirulina maxima in sea water. *Applied Microbiology and Biotechnology*, 24(1), 47-50.

10. Wu B., Tseng C.K. and Xiang W. (1993). Large-scale cultivation of Spirulina in seawater based culture medium. *Botanica Marina*, 36(2), 99-102.