

Media Optimization for the Enhanced Growth and Yield of *Spirulina platensis* Biomass and Determination of Generation Time

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ABSTRACT

The cyanobacterium *Spirulina platensis*, a photoautotroph, is a good food supplement because of its high protein content. It is also an excellent source of pigments like phycocyanin, vitamins and lipids. The present study was carried out to obtain enhanced yield of *Spirulina* biomass and the pigment C-phycocyanin. Modified Zarrouk's medium was used as the basal medium (it also served as control), in which four different supplements (Multivitamin tablets, Tender coconut water, Cow dung extract and Cow urine) at 4 different concentration *i.e.*, 250mg, 500mg, 750mg and 1000mg/l for multivitamin tablets and 1ml, 10ml, 50ml and 100ml for tender coconut water, cow dung extract and cow urine were added. The cultivation was carried out in a 1000ml Erlenmeyer flask's for a period of 20 days at room temperature with artificial aeration and lighting. The growth was monitored by direct microscopic count (DMC), optical density (OD) and dry biomass on daily basis till 20th day. It was observed that, the first two concentrations of all the four media promoted the growth whereas the last two did not favour the growth. Multivitamin at 250mg/l was found to be very good enhancer for biomass (2.84g/l) whereas, the cow urine at the concentration 10ml/l was the least enhancer (1.40g/l) when compared to control (2.46g/l). In terms of C-phycocyanin yield, the multivitamin at the concentration of 500mg/l showed the highest concentration (0.524mg/g (5.24%) of biomass mass).

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T. Murugan and Radhamadhavan (2010). Media optimization for the enhanced growth and yield of *Spirulina platensis* biomass and determination of generation time. *Internat. J. Med. Sci.*, 3(1 & 2): 34-39

Key words :

Spirulina platensis, Zarrouk's medium, C-phycocyanin, DMC, OD, Bio-mass.

Many studies have been developed for protein production by microorganisms for food and feed purposes. Among these, the micro alga, *Spirulina platensis* presents advantages due to the high protein content (60 to 70%) with low nucleic acids concentration and the amino acids content similar to the FAO's recommendation (Ciferri and Tiboni, 1985; Richmond, 1988). In addition, there is a possibility of obtaining other products like pigments such as carotenoids, phycocyanin and chlorophyll, vitamins and polyunsaturated fatty acids including omega-3 fatty acids (Aaronson *et al.*, 1980; Sassano, 1999). The cyanobacteria *Spirulina platensis* is an excellent source of phycocyanin. The protein fraction may contain up to 20% of phycocyanin (Vonshak, 1997). It is a powerful water soluble antioxidant. Scientists in Spain showed that an extract of *Spirulina* containing phycocyanin is a potent free radical scavenger and inhibits microsomal lipid peroxidation (Pinero *et al.*, 2001). High cost involved in production is the main factor which makes this unaffordable for its daily

intake by general public. Zarrouk medium has successfully served as a common culture medium for spirulina culture for years (Zarrouk, 1966). But, it is necessary to define an optimum composition of medium derived from low cost resources in order to obtain high biomass and C-phycocyanin. This study is in search to find out cheap resources for the enhanced yield of *Spirulina platensis* biomass and thus to define media composition for enhanced growth.

MATERIALS AND METHODS

Culture collection and maintenance:

The mother culture of *S. platensis* was obtained from Centre for advanced studies, Department of Botany, University of Madras, Chennai, Tamilnadu, India. The culture was maintained in the laboratory on Zarrouk's medium (modified-1966) in a 1000 Erlenmeyer flask. The pH of the medium was 9.2. white fluorescent lamp (40 watts) served as light source (7000 lux) and an aquarium aerator was used to provide aeration. The sub culturing was

Accepted :
September, 2010