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Culture of Efficient Marine Microalgae, Their Biochemical Composition and its Antibacterial Activity against Human Pathogens

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Abstract

Marine microalgae have been used for a long time as food for humans such as *Chlorella vulgaris, Spirulina platensis* and *Nannochloropsis bacillaris* and for animals in aquaculture. The biomass of these microalgae and the compounds they produce have been shown to possess several biological applications with numerous health benefits. The three marine microalgae (*Chlorella vulgaris, Spirulina platensis* and *Nannochloropsis bacillaris*) were collected from Vellar estuary, South east coast of India. These three microalgae were cultivated in respective media (BG11, Conway, and Zarrouk) and estimated their biochemical composition (Protein content, Carbohydrate (CHO) analysis, Total lipids, Chlorophyll, Carotenoids and antibacterial activity. Simultaneously, these cultures were cultivated in flask containing 500 ml of respective media at lab condition for a period of one month and their growth, pH, biomass, CO_2 fixation and carbon content were determined. Based on the growth rate, the pH of three microalgae in media was observed at lab condition. During maximum growth and biomass, the pH was found to be ranged between 9 and 11 for *Spirulina platensis*; 7 and 9 for *Chlorella vulgaris*; 8 and 9 for *Nannochloropsis bacillaris*. The *Spirulina platensis* and *Chlorella vulgaris* reached maximum growth rate and produced maximum biomass. Further, *Chlorella vulgaris* and *Spirulina platensis* attained maximum biomass in media at lab condition, also fixed highest level of carbon dioxide in media but they did not produce maximum biomass, though the growth of *Nannochloropsis bacillaris* were found high in media at lab condition. Among the three microalgae, *Chlorella vulgaris* and *Spirulina platensis* produced highest biochemical (Protein estimation) compounds. Hence, *Chlorella vulgaris* and *Spirulina platensis* were selected as efficient microalgae for antibacterial activity against human pathogen. This study revealed that certain green algae and blue green microalgae having high growth, pH, CO_2 fixation, carbon content and biochemical composition paves the way for pharmaceutical activity. Antibacterial activity against human pathogen (*Klebsiella pneumoniae, Proteus mirabilis, Vibrio cholera, Salmonella typhi* and *Escherichia coli*) was evaluated. The crude and fractionated extraction of *Chlorella* and *Spirulina* were dissolved in different solvents like ethanol, methanol, chloroform and diethyl ether. The extracts were applied to 6 mm dry sterile disc in aliquots of 30 µL of solvent, allowed to dry at room temperature and placed on agar plates seeded with microorganisms. The bacteria were maintained on nutrient agar plates and incubated at 37° C for 24 hrs. Zones of growth inhibition were measured after incubation from all the extracts and tested twice at a concentration of 30 mg disc^{-1} was evaluated for *Chlorella* and *Spirulina* with their potential health benefits.

Keywords: *Chlorella vulgaris*, *Spirulina platensis*, *Nannochloropsis bacillaris*, CO_2 fixation, Biochemical composition, Pharmaceutical activity

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