

Effect of pH on Growth and Biochemical composition of Microalgae

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Abstract

This project isolated microalgae from natural sources and studied the effect of different pH on growth and biochemical composition of freshwater microalgae. Green algae and cyanobacteria culture in different pH under growth condition. The number of cell was count in every day. The results showed that *Scenedesmus* sp. had highest number of cell and protein content at pH 7.0 and 7.5 respectively. *Pediastrum* sp. had highest number of cell and protein content at pH 8.5 and 8.0 respectively. *Arthrospira* sp. had highest number of cell and protein content at pH 8.0 and 9.0 respectively.

Introduction

Microalgae are photoautotrophic microorganisms which can be found in freshwater ecosystems. It has many advantages such as it can double their numbers every few hours and it has the potential to produce a volume of biomass many times Micro-algae are used by human for a long decade as a food, feed, therapeutics and fertilizers (Vymazal,1995) These microorganisms are rich in the quantity of nutritious compounds as proteins, carbohydrates, lipids, vitamins, pigments, minerals and other nutraceuticals. From the nutritional point

of view, it is well established that many freshwater microalgae play vital role in supplying energy, essential nutrients for proper development of organisms (Vymazal,1995; Habib *et al.*, 2003) Nowadays, microalgae cultivation is gaining importance for its application as a food source in aquaculture, human food supplements, fertilizer, and pharmaceuticals. There has been an increasing interest in using of green freshwater micro-algae as *Chlorella* sp., *Scenedesmus* sp. and *cyanobacterium* as *Spirulina* sp. for producing protein products

sold as health food and food supplements. The chemical composition of microalgae is influenced by environmental conditions, including temperature and light (Richmond, 1986). High growth temperature has been related to significant decrease in protein content, together with increases in lipids and carbohydrates. However, other studies have found that the response of microalgal chemical composition to high and low growth temperatures varies from species to species. High growth temperature has been associated with increases in protein content and decreases in carbohydrate, and lipid in some species, but these workers found no overall trend in gross biochemical composition for all species under study.

Therefore, determination of the optimum culture condition of micro algal cultivation for producing some potential product is very important. Especially, pH is very important for the character of metabolism of microorganisms and hence for the biosynthesis of the bioactive products as secondary metabolites and drastically effect on the growth of algae populations.

The aim of the present study was to examine effect pH on the growth of algae populations and chemical production in microalgae.

Materials and methods

1. Microalgae isolation

Microalgae was isolation from fresh water using the single cell technique. All algae used in this study was cultured in erlenmeyer flask and constant temperature of $25 \pm 2^\circ\text{C}$, 12:12 hours light : dark cycle at light intensity of $54 \mu\text{mol photon m}^{-2}\text{s}^{-1}$.

2. Effect of different pH on microalgae growth

Pure culture of the organism was cultured in 250 ml of erlenmeyer flask containing 200 ml of the growth medium. The start inoculum density is adjusted to an arbitrary standard cell number $1 \times 10^{-6} \text{ ml}^{-1}$ Green algae (*Pediastrum* sp. and *Scenedesmus* sp.) was cultured in various pH at 6.5, 7.0, 7.5, 8.0, and 8.5 for Blue green algae (*Arthrospira* sp.) was cultured in various pH at 7, 8, 9, 10 and 11 and used HCL and NaOH to adjust the pH. Each cultured was done in triplicate. The cultured cells was collected and count number of cell everyday by used hemocytometer for monitoring cell density.

3. Effect of different pH on biochemical composition of microalgae. Three optimum pH were selected to upscale of microalgae culture in plastic tank for 20 day. After

microalgae completely treated in optimum pH, microalgae cells were centrifuged at 10,000 rpm and lyophilized at -46 oC for drying cells. Protein analysis content by lowry's method.

Result and Discussion

Table 1 Number of cell in different pH of

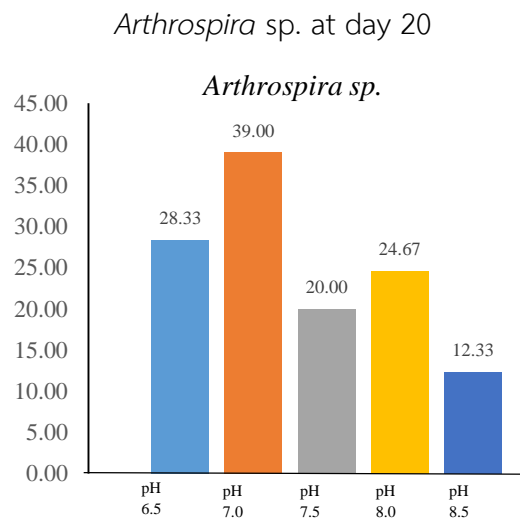


Table 2 Number of cell in different pH of

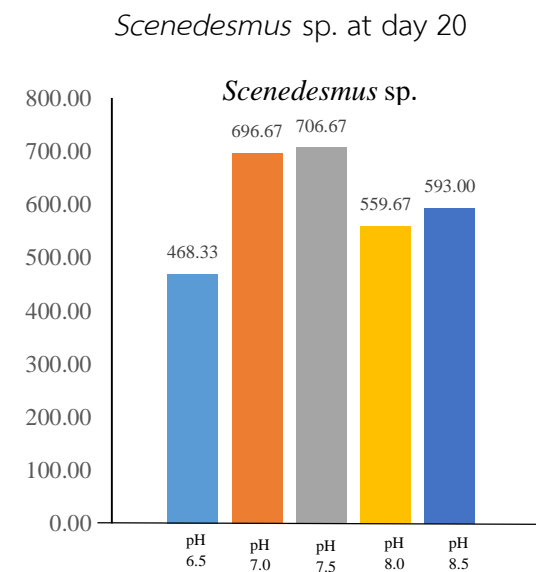


Table 3 Number of cell in different pH of

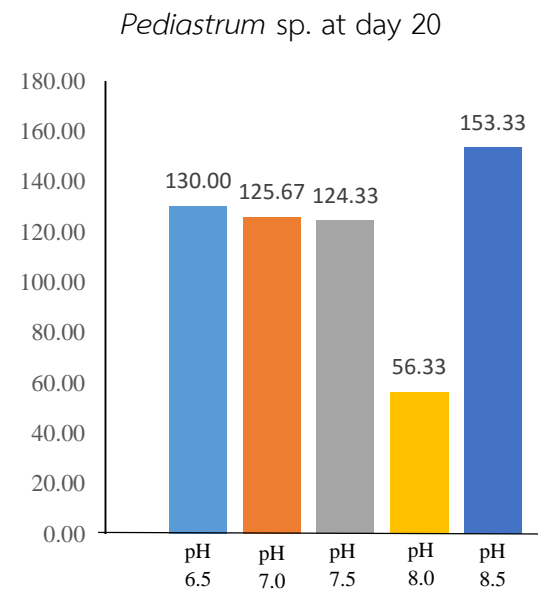
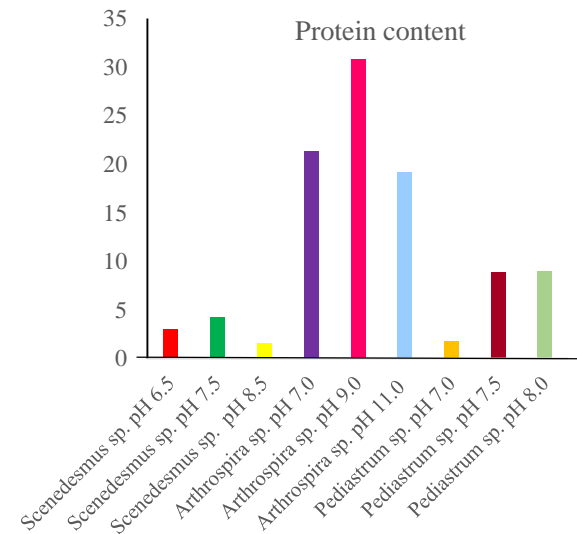


Table 4 protein content of microalgae under optimum pH at day 20



From table 1, 2, 3, and 4 found that *Scenedesmus sp.* grown well at pH 7.0 and 7.5 and had highest cell number at pH 7.5 and at pH 7.5 has highest protein content at 4.236 mg/ml which correlation result with Hodaifa et al., (2009) studied on

influence of pH on the culture of *Scenedesmus obliquus*. It was found that at pH 7.0 showed the highest specific growth rate and maximum value of protein and chlorophyll contents in *S. obliquus*. And Wang, *et al.*, found that *Scenedesmus obliquus* was cultivated in a photobioreactor at pH 7.5 showed the highest total lipid content was 36.5%. *Pediastrum* sp. highest cell number at pH 8.5 and pH 8.0 has highest protein content at 9.03 mg/ml consistent with Mathew and

Chowdary (1981) stated that pH at 8.5 had effect on the best growth of *Pediastrum duplex* Meyen after culturing on 30 days. *Arthrospira* sp. growth well at pH 8, 9, and 10 has highest cell number at pH 8.0 and at pH 9 has highest protein content at 30.79 mg/ml consistent with Pandey *et al.*, (2010) showed that at pH 11, *Spirulina platensis* had the lowest of protein content at 48% and dry weight at 0.22 g because high alkalinity (bicarbonate) has effect on morphology and their growth.

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