

Chlorophyll-a Concentration From Phytoplankton In Ketawai, Bangka Tengah, Bangka Belitung

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ABSTRAK

Fitoplankton mempunyai peranan yang sangat penting sebagai produsen di laut dan menggunakan klorofil untuk memerangkap energy cahaya yang dibutuhkan dalam proses fotosintesis. Proses ini berguna untuk mengabsorpsi energi cahaya matahari yang bersama air dan karbondioksida untuk menghasilkan oksigen dan karbohidrat, dengan kata lain proses ini untuk mengubah energy matahari menjadi energy kimia. Peran klorofil sangat penting untuk proses tersebut. Tujuan dari penelitian ini adalah untuk mengetahui konsentrasi klorofil a fitoplankton dan mengetahui factor fisika-kimia perairan. Penelitian ini dilakukan di perairan Pulau Ketawai, Bangka tengah pada bulan Maret 2017. Hasil penelitian memperlihatkan bahwa nilai konsentrasi klorofil pada masing-masing stasiun pengambilan sampel berbeda. Parameter lingkungan yang terukur masih dalam batas ideal untuk pertumbuhan fitoplankton.

Kata kunci : klorofil a, mikroalga, parameter lingkungan

ABSTRACT

Phytoplankton has important role as a primary producer in oceans and use chlorophyll to trap light needed for photosynthesis. This process which uses to harvested light energy together with water and carbon dioxide to produce oxygen and carbohydrates; as such, it converts solar energy into chemical energy. Chlorophyll is vital for photosynthesis as well, which help phytoplankton get energy from light. The aim of this study is to find out chlorophyll a concentration from microalgae and physicochemical water parameters. The research had been done on March 2017 in Ketawai Island, Bangka Tengah, Bangka Belitung. Result showed that value of chlorophyll a concentrations were different each site research which are Eastern coastal waters, Sothern coastal waters, Western coastal waters and Northern coastal waters were 4.128 mg/L, 0.19 mg/L, 0.15 mg/L, and 0.824 mg/L, respectively. The characteristic of water quality measured were found to be within the ideal range for phytoplankton.

Keywords : chlorophyll a, microalgae, physicochemical parameters

INTRODUCTION

Phytoplankton are microscopic unicellular organisms capable to convert solar energy to chemical energy through photosynthesis. These microorganisms exist individually or in chains or group (Hosikian *et al.*, 2010). The products from this chemical process reflect its significance, with carbohydrates being the primary building block for plants and oxygen being necessary for the survival of animal kingdom. The importance of photosynthesis for life on earth is further highlighted by plants forming the basis of all food chains. Ocean primary production is an important factor for determining the ocean's role in global carbon cycle. Primary production is the process whereby inorganic carbon is fixed in the sunlit (euphotic) zone of the upper ocean and forms

the base of the marine food pyramid. It occurs when marine phytoplankton use sunlight energy and dissolved nutrients to convert inorganic carbon to organic material, thereby releasing oxygen (Jenkins, 2001). The tendency would be for primary production to increase with chlorophyll-a concentration, though the rate of increase would vary depending on other factors (Sathyendranath & Platt). However, exposure of chlorophyll molecule to weak acids, oxygen or light accelerated their oxidation and result in the formulation of numerous degradation product (Humphrey, 1980; Humphrey, 2004; Scheer *et al.*, 2004; Cubas *et al.*, 2008). Chlorophyll is crucial to the process of photosynthesis, which is responsible for sustaining the light process of green plants. Chlorophyll-containing organisms are the first step of production in

the most food chains, and the health and abundance of these primary producers affect the integrity of the other tropic levels (Jamshidi and Abu Bakar, 2011). Moreover, chlorophyll is one of the useful bioactive compounds that can be extracted from biomass of microalgae. Therefore, determining concentration of chlorophyll a is important to reveal water quality in aquatic ecosystem. The aim of this study is to find out chlorophyll a concentration from microalgae and physicochemical water parameters.

METHODOLOGY

Description of Study Area

The studies were carried out in Ketawai Island, Bangka Tengah on March 2017. Ketawai Island is part of small islands which laid in Desa Kurau, Bangka Belitung Province. Map of Ketawai Island has been taken from Google and four location site research around that island have been determined using GPS. Site research divided into four research stations which are: station 1 (2°15'51,852" LS and 106°19'28,209" BT; Western coastal waters of Ketawai Island), station 2 (2°16'11,144" LS and 106°19'35,249" BT; Sothern coastal waters of Ketawai Island), station 3 (2°15'41,331" LS and 106°19'39,675" BT; Northern coastal waters of Ketawai Island), station 4 (2°15'50,11" LS and 106°19'49,104" BT; Eastern coastal waters of Ketawai Island). This island is one of fishing ground in Bangka Belitung Province.

Water samples were collected by placing in 1.5 L bottle. These samples were then immediately transported to the laboratory for analysis. However, when the water samples could not be analyzed immediately, the samples were stored in the refrigerator below 4°C. The concentrations of chlorophyll a in microalgae were measured by spectrophotometer.

Physicochemical Water Parameters

The characteristics of water parameters of site research chosen were recorded for all stations. A set of basic physicochemical water parameter variable including temperature, pH, total suspended solid, salinity, sea current, depth and The characteristics of water parameters of site research chosen were recorded for all stations. A set of basic physicochemical water parameter variable

including temperature, pH, total suspended solid, salinity, sea current, depth and dissolved oxygen.

RESULTS AND DISCUSSION

Chlorophyll a Concentration

Overall, sampling revealed that chlorophyll a concentration had different value in each part of Ketawai Island. The chlorophyll a concentrations value in Eastern coastal waters, Sothern coastal waters, Western coastal waters and Northern coastal waters were 4.128 mg/L, 0.19 mg/L, 0.15 mg/L, and 0.824 mg/L, respectively (Table 1). It is natural for concentration of chlorophyll a to fluctuate over the different part of aquatic ecosystem.

Chlorophyll a concentrations are reflection of the biomass of phytoplankton in an aquatic system (Onyema, 2008). Pigments are regarded as one of the most potential product in microalgae (Rao *et al.*, 2007; Forjan *et al.*, 2007; Granado-Lorencio *et al.*, 2009). The significant pigment groups are found in microalgae that is chlorophylls, carotenoids and phycobilins. Chlorophyll is vital component of photosynthesis which is how phytoplankton obtains their energy. Furthermore, photosynthesis is not just important to phytoplankton, it is also essential to most other living things on Earth. Through photosynthesis, phytoplankton takes in carbon dioxide and release oxygen. Moreover, photosynthesis is important as well since many aquatic animal organisms eat phytoplankton through food chains and use the energy that has been converted from the sun to fuel their own bodies. However, very low and high levels of concentration of chlorophyll a can be harmful to marine biota. Chlorophyll concentration is one of the key indices in the study of the health status of any natural marine ecosystem. Variability of chlorophyll a concentrations determines the ecological conditions of marine systems such as the changes in the physical and chemical characteristics of the environment (Jamshidi and Abu Bakar, 2011).

Table 1. Chlorophyll a Concentration

| Location | Chlorophyll a Concentration |
|---------------|-----------------------------|
| Eastern part | 4.128 mg/L |
| Southern part | 0.19 mg/L |
| Western part | 0.15 mg/L |
| Northern part | 0.824 mg/L |

Physicochemical Water Parameters

There are many physicochemical water parameters that influence the chlorophyll concentration. Water temperature is one of factors that potentially influence the biomass of the phytoplankton. The value of water temperature in this research was $28.75 \pm 1.29^\circ\text{C}$, which was suitable for phytoplankton growth because temperature was high to enhance abundance of phytoplankton. In general, the pH value of Ketawai Island waters was neutral to alkaline (7.5 ± 0.5). Previous researchers have also reported that chlorophyll a concentration is closely linked to environmental factors such as pH and temperature (Li *et al.*, 2012). Salinity value was 29.5 ± 0.5 ‰ and total suspended solid value was 15 ± 5 mg/L. Furthermore, means value of water current, depth and dissolved oxygen were 0.027 ± 0.009 m, 0.53 ± 0.066 m and 8.1 ± 0.30 mg/L (Table 2).

Phytoplankton are the key in aquatic primary production and provide food for organisms that are higher in the trophic levels. Changing hydro-environmental characteristics are the determinants of the phytoplankton standing crop at any time (Onyema, 2013). Generally, the characteristic of water quality measured were found to be within the ideal range for phytoplankton.

Table 2. Mean of Physicochemical Water Parameters of Ketawai Island

| Parameters | Mean |
|----------------------------------|-------------------|
| Temperature ($^\circ\text{C}$) | 28.75 ± 1.29 |
| Salinity (‰) | 29.5 ± 0.5 |
| pH | 7.5 ± 0.5 |
| TSS (mg/L) | 15 ± 5 |
| Sea Current (m/s) | 0.027 ± 0.009 |
| Depth (m) | 0.53 ± 0.066 |
| DO (mg/L) | 8.1 ± 0.30 |

CONCLUSION

This study was to determine the chlorophyll a concentration and physicochemical water parameters in the coastal waters of Ketawai Island. The results showed that the chlorophyll a concentration had different value in each sampling station in Ketawai Island with value between 0.15–4.128 mg/L. Chlorophyll a concentration was influenced by physicochemical water parameters. The characteristic of physicochemical water parameters measured

in Ketawai Island were found to be within the ideal range for microalgae.

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