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The Effect of Water Quality on Growth of Microalgaes *Chlorella pyrenoidosa*

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Abstract

The diversity of microalgae on earth is very high, the high diversity of microalgae allows us to obtain microalgae that have the potential to produce large amounts of oil. In addition, the use of microalgae as a source of biodiesel does not interfere with the food supply. This is because microalgae do not compete with food. The results of the analysis showed that the parameters that passed the water quality standard were BOD in the range of 0.990-90.76 mg/l, COD in the range of 3.093 - 283 mg/l, and phosphate in the range of 0.01-0.21 mg/l. Judging from the color and smell, the waters that are closer to the cages will be greener in color accompanied by the smell of fish mixed with fishy feed and feel thick. COD content ranged from 3.093 mg/l-269.5 mg/l. This is caused by the high concentration of organic matter in the waters. The quality of the waters of Lake Toba which is classified as not good is the measurement of color, smell, taste, BOD, COD, and Phosphate in the waters. Which are classified as good temperature, turbidity, pH, Ammonia, and Nitrate. The level of fertility of the waters of Lake Toba in terms of the abundance of phytoplankton is included in the fertile category. If it is categorized at the level of pollution through the diversity index, then the waters are included in the moderately polluted category.

Keywords: *Water Quality, Microalgaes, Physical Chemical*

1. Introduction

1.1 Sub Introduction

Microalgae is a natural food for fish. The presence of abundant microalgae can increase the abundance of fish as well. The presence of microalgae can also minimize the number of production costs in fish farming because the feed used is low-priced feed and has a high level of protein content so that it can promote higher growth in these fish. Benefits of microalgae as (1) Ingredients for drugs or immune enhancers, and cosmetics; (2) Produce organic matter from carbon dioxide and water, because of its ability to photosynthesize; (3) Bioremediation is mainly to reduce the levels of 'N' and 'P' in a waste; (4) Basic materials for renewable energy.

Microalgae are low-growing plants that are very productive and can outperform other crops such as oil palm, jatropha, corn, and others as a source of biodiesel. The existence of microalgae does not require the availability of large cultivation land, because microalgae only require the availability of water as a growth medium. Microalgae can be mass cultured and their biomass processed into a renewable energy source, namely biodiesel. The lipid content of microalgae as a renewable alternative energy source has become the center of world attention and the technology is being developed continuously. The condition of Indonesia's waters which is very potential needs to be continuously developed to achieve people's welfare. One of them is by developing the potential of marine products such as fish. Fish is one of the marine animals that are heterotrophs (cannot make their own food), therefore fish obtain energy from other organisms, both animals and plants. Several previous studies regarding microalgae are still in the surrounding environmental factors, this is the background for conducting this research on "The Effect of Water Quality on the Growth of Microalgae *Chlorella pyrenoidosa*".

2. Section headings

Microalgae or algae are aquatic organisms better known as phytoplankton, which are generally unicellular species that can live solitarily and in colonies. Microalgae are aquatic plants and are at the bottom of the food chain structure because they are

primary producers. The growth of marine algae type Chlorella sp. very good in the pH range of 6 - 8 and the salinity range of 20 - 40 ppt (Sutomo, 1990).

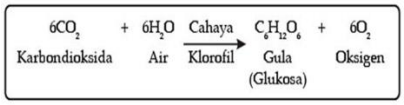
The diversity of microalgae in the world is estimated to be in the range of millions of species, most of which are not yet recognized and cannot be cultivated (*self-breeding*). It is estimated that 200,000-800,000 species live in nature, 35,000 species can be recognized, and 15,000 chemical components that make up biomass are known. Colman and Gehl (1983), stated that photosynthetic activity will decrease to a maximum of 33% when the pH drops to 5.0. The diversity of microalgae in the world is estimated to be in the range of millions of species, most of which are not yet recognized and cannot be cultivated (self-breeding). It is estimated that 200,000-800,000 species live in nature, 35,000 species can be recognized, and 15,000 chemical components that make up biomass are known (Hadiyanto et.al..2012).

Most species of microalgae are included in the autotroph group which is able to form organic compounds from inorganic compounds with the help of energy from light. Light plays an important role in the process of photosynthesis, where light energy is converted into chemical energy by chlorophyll activity.

Waters with a pH value of less than 4.0 are very acidic waters and can cause the death of aquatic organisms, while a pH of more than 9.5 is very alkaline waters and can reduce the productivity of aquatic organisms including algae (Wardoyo, 1982). Generally, photosynthesis increases with increasing light intensity until it reaches a certain optimum value. Above the optimum value, light is an inhibitor of photosynthesis, while the light below is a limiting light so that the presence of light determines the shape of the growth curve of microalgae that carry out photosynthesis.

3. Equations

Light plays an important role in the process of photosynthesis, where light energy is converted into chemical energy by chlorophyll activity. Photosynthesis is a reaction for life which is the conversion of light energy to other life carried out by plants that have chlorophyll. This event only takes place if there is chlorophyll and there is enough light.



The operationalitation of variabel

No	Variabel	Konsep variabel/ dimensi	Ukuran/skala
	A. Variabel Terikat		
1.	Oksigen terlarut (DO)	*Oxygen* (O2) adalah unsur kimia yang tidak berbau, tidak berwarna, tidak berasa, dan tidak terbakar namun dapat membantu pembakaran dan sangat diperlukan bagi makhluk hidup.	Mg/L
2.	Biological Oxygen Demand (BOD)	*Biological Oxygen Demand* (BOD) adalah analisis empiris untuk mengukur proses-proses biologis khususnya aktivitas mikroorganisme yang berlangsung di dalam air.	Mg/L
3.	Chemical Oxygen Demand (COD)	*Chemical Oxygen Demand* (COD) adalah jumlah oksigen yang dibutuhkan untuk mengoksidasi zat-zat organik yang terdapat di dalam air.	Mg/L
4.	Potensial Hidrogen	Potensial Hidrogen adalah ukuran konsentrasi ion hydrogen dari larutan.	Tingkat Keasaman
5.	Suhu	Suhu adalah besaran yang menyatakan derajat panas dinginnya suatu benda.	(0C)
6.	Intensitas cahaya	Intensitas cahaya dalah besaran pokok fisika untuk mengukur daya yang dipancarkan oleh suatu sumber cahaya pada arah tertentu per satuan sudut.	Banyaknya Cahaya
	Variabel Bebas		
1.	Kualitas Air	Suatu ukuran kondisi air dilihat dari karakteristik fisik, kimiawi. Kualitas air juga menunjukan ukuran kondisi air relatif terhadap kebutuhan biota air dan manusia	Parameter air yang diuji untuk menentukan kuaitas air.

Fig. 1 Map of the study area

4. Figures and Tables

4.1 General

Salinity and pH are important oceanographic parameters in the growth of organisms. Salinity is one of the factors that affect aquatic organisms in maintaining osmotic pressure in protoplasm with water as their living environment. According to Isnansetyo and Kurniastuty (1995), the algae *Phaeodactylum sp.* tolerates salt content of 20-700/00 and has optimal growth in the salinity range of 350/00. *Chaetoceros sp.* has a very high salinity range of 6-500/00, with a salinity range of 17-250/00 as the optimum salinity for its growth. While in Skletonema costatum the optimal salinity for the formation of auxospores is 20-350/00. According to Takagi et al. (2005), the addition of 0.5 M NaCl during the cultivation of marine microalgae Dunaliella gave an increase in growth and lipid content.

Loc. A Loc. B

Loc. C

Fig. 1 Documentation of researchers at several points of sampling locations for microalgae in the waters of Lake Toba

4.2 Tables

Table 1. Determination of Water Quality Status Based on the Storet Method

NO	Location	CONDITION	SCORE	INFROMATION
1	Location A	Very Well	0	Meet quality standards
2	Location B	Good	-1 s/d -10	Light pollution
3	Location C	Medium	-11 s/d 30	Moderately polluted

Table 2. Determination of *Disolved Oxygen* (DO), *Biochemical Oxygen Demand* (BOD) dan *Chemical Oxygen Demand* (COD).

No	Parameter	Location								
		1			2			3		
		1	2	3	1	2	3	1	2	3
1	DO	√			√				√	
2	BOD	√			√				√	
3	COD		√			√				√
4	pH		√			√				√
6	Suhu			√	√			√		
7	Intensitas Cahaya			√			√	√		

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