Modern Agricultural Science and Technology, ISSN 2375-9402, USA
June 2022, Volume 8, No. 1-6, pp. 30-34
Doi: 10.15341/mast(2375-9402)/01.08.2022/005
Academic Star Publishing Company, 2022
www.academicstar.us

Applied Technology to Absorb CO_2 to Produce O_2 and Biomass Chlorella Using Dahril Bottle

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Abstract: The Covid-19 was first confirmed in Indonesia on 2 March 2020. The pandemic has spread to 34 provinces in country with Jakarta, West Java, East Java and Riau being the worst-hit. So far, Indonesia has 3,693,272, cases, the 6th highest in world behind America, India, Brazil, , and Turkey. So it is very important to increase the human body immunity to absorb CO_2 to produce O_2 in the surrounding area and biomass Chlorella as supplement food to prevent fatality of the human being. The Dahril Bottle is a place to culture Chlorella sp in a closed room to absorb CO_2 to produce O_2 in the surrounding area and biomass Chlorella that can be used as supplement food to increase the immunity of human body from COVID-19 illness. Based on the result of this study indicated, that Chlorella with Chlorophyll-a inside can grow well in the Dahril Bottle to absorb CO_2 to produce O_2 with a chemical reaction as follow, $6\ CO_2 + 6\ H_2O$ à $C_6H_{12}O_6 + O_2$↗. The high concentration of cell density was found 1.2×10^7 cells/ml, Chlorophyll-a concentration of 184.09 µg/l, and dry weight Chlorella, 1.25 g/l, and CO_2 decreased from 18.36 mg/l to 1.24 mg/l or 93.34%, O_2 increase from 3.76 mg/l to 6.21 mg/l or 65.15 %. The chemical compound of *Chlorella* powder was also high with a protein level of 45.09%, lipid 10.85%, and carbohydrate 12.77 %. They also contain, vitamin E, mineral, beta carotene, and antioxidant essence. Dry Chlorella that found in this study can be used as a supplement food to increase the immunity of the human body to prevent Covid-19 illness.

Key words: Dahril Bottle, CO_2, O_2, Dry weight Chlorella, covid 19 illness

1. Introduction

The Covid-19 pandemic is also known as the coronavirus pandemic is an ongoing pandemic of coronavirus diseases 2019 (Covid-19) caused by severe acute respiratory syndrome coronavirus-2 (SARS-2). The outbreak was first identified in Wuhan, China in early December 2019. So, the World Health Organization (WHO) declared the outbreak a public health emergency of the international concern on 30 January 2020 and a pandemic on m11 March 2020. As 10 May 2020 more than 4.02 million cases of Covid-19 have been reported in over 197 countries and territories, consulting in more than 279.000 deaths, more than 1.37 million peoples have recovered [1]. The virus is a primary spread between people during close contact. The droplets usually fill to the ground as onto the surface rather than traveling through air over long distances. Less commonly people may also become infected by touching a contaminated surface and then touching their face [2].

The COVID-19 was first confirmed in Indonesia on 2 March 2020 [3], when a dance instructor and her mother were infected by a Japanese national. The pandemic has spread to 34 provinces in country with Jakarta, West Java, East Java and Riau being the worst-hit. So far, Indonesia has 3,693,272,616 cases, the 6th highest in world behind America with 32.88 million cases, India 24,04 million cases, Brazil 15.43 million cases, Prance 5.90 million cases, and Turkey 5.09 million cases. In terms of death numbers, Indonesia fifth in Asia with 105,598 deaths [4]. Its fatality rate is also one of the highest in the world at around 7%. So it is very important to increase human body immunity by absorb CO_2, haze, dust, tiny particle, and Covid-19, and produce O_2 in the surrounding area

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and *Chlorella* powder as supplement food to prevent fatality of the human being.

Dahril Bottle [5] is a place to culture microalgae, *Chlorella* sp in a closed room to absorb CO_2, to produce O_2 in the surrounding area and dry weight Chlorella that can be used as supplement food to increase the immunity of human body from COVID-19 illness. *Chlorella* sp. is a potential supplement food source for the human being because it is high protein and other essential nutrients when dried; it's about 45% protein, 20% fat, 20% carbohydrate, 5% fiber, and 10% minerals [6]. It is also abundant in calories and vitamins [7]. *Chlorella* is also suggested as an inexpensive protein supplement to animal diet [8]. Under the certain growing condition, *Chlorella* yields oils that are high in poly saturated fats [9].

2. Materials and Methods

Dahril bottle is a container of the bottle that is used as a place to culture microalgae in an enclosed area in this study. Dahril bottle is made of glass jars equipped or modified with five main components namely a fluorescent lamp as a light source, air pump or water pump as a mean to supply carbon dioxide, distilled water as a culture medium, macro and micronutrients, and seed of microalgae (*Chlorella* sp) as a seed to be developed [10].

Two daylight fluorescent bulbs are placed on the top lid and in the bottom of the pedestal/base of the bottle. The light serves as a replacement of sunlight for the supply of energy for microalgae to photosynthesize by utilizing carbon dioxide (CO_2) and water (H_2O) which produce carbohydrate ($C_6H_{12}O_6$) and oxygen-free (O_2) [11]. They are also able to take advantage of macro and micronutrients dissolved in water as in-organic material which could be changed into organic matter in the form of protein, lipid, vitamins, and minerals that are needed in the lives of humans as a food supplement to increase the immunity of the human body [12].

The initial step in the use of the Dahril bottle is by cleaning the bottle well and then rinsed with hot water

Fig. 1 Dahril bottle.

Fig. 2 Two boxes with Dahril bottle inside.

(boiling), to kill bacteria and fungi. Then the Dahril bottle was filled with 3.5 liters of distilled water with the capacity size of the bottle 6-litres. The nutrients we use in this study were made by pure chemical composition that we call it (Dahril Solution 1. The Dahril Solution 1 made by Chemical fabricant namely: 1) KNO_3 1000 mg/l, 2) $MgSO_4$, 250 mg/l, 3) K_2HPO_4 250 mg/l, NaCl 100 mg/l, $CaCl_2.2\ H_2O$ 10 mg/l, then Fe-solution, 1 ml/l and trace metal solution 1 ml/l. Fe solution made by $FeSO_4.\ 7H_2O$ 2000 mg/l and Na_2EDTA as much as 189 mg/l per1 liter equates. Trace metal solutions made by 1) H_3BO_3 2860 gr/l, 2) $MnSO_4.7\ H_2O$ 2500 mg/l, $ZnSO_4.7H_2O$ 225 mg/l, $CuSO_4.5H_2O$ 71 mg/l and Na_2MoO_4 21 mg/l per 1 liter equates. All of these chemicals substances can be purchased from the local stores. The concentrations of this solution used in this study were 10% [13].

Into the water medium, we inoculated the seed of microalgae with an initial density of 500×10^3 cells/ml. After that, the Dahril bottle was ready to use in his studies. By connecting this bottle with an electric current, both lamps glowed once the air pump was functioning properly. Thus, the process of photosynthesis can take place continuously that will generate free oxygen, while absorbing carbon dioxide, haze, dust, tiny particle, and also Covid-19 from the surrounding air.

To know the effect of the Dahril bottle with *Chlorella* growing inside, to produce free oxygen, two boxes were used. The boxes were made by the glass with a size 50×50×60 cm. On the side of the two boxes was filled with artificial smoke by fire the coconut fiber. One of the boxes was put Dahril bottle with *Chlorella* growing inside, and one none. The concentration of free oxygen and temperature was measured in these two boxes, before and after artificial smoke was filled, and after a one-hour Dahril bottle was operated by oxygen meter brand Lutron DO-5510.

3. Results and Discussions

It was founded that *Chlorella*sp could grow well in the Dahril bottle with many parameters as shown in Table 1.

The effect of the Dahril bottle with Dahril Solution 1 with *Chlorella* growing will inside to produced free Oxygen and to eliminate haze, dust, tiny particle, and COVID 19 was shown in Table 2 below. Based on the Table 2 it could be known that *Chlorella* can supply oxygen in the closed room.

Table 1 Many parameters after *Chlorella* culture in Dahril Bottle.

Item	Initial	At days 12	Increased	Decreased
Cell density (Cell/ml)	500×10^3	1.5×10^7	1.5×10^7	
Biomass (g/l)	0.18	1.25	1.07	
Chlorophill-a (µg//)	8.36	184.09	175.73	
CO_2 (mg/l)	18.36	1.24		17.11 (91%)
O_2 (mg/l)	3.76	6.32	2.45 (65%)	
Nitrate (mg/l)	15.43	1.46		13.97 (95%)
Phosphate (mg/l)	45.82	4.98		48.84 (89%)
pH	7	8	1	

Table 2 Concentrations of O_2 with and without Dahril Bottle inside.

Treat	Parameter	Before Smoke	After Smoke	After Dahril Bottle Entered
P0	Temperature (°C)	32.54	34.72	33.20
	Oxygen concern (%)	20.40	16.76	18.54
P1	Temperature (°C)	32.56	34.66	33.16
	Oxygen concern (%)	20.40	16.74	19.38
P1	Temperature (°C)	0.02	-0.06	-0.08
	Oxygen concern (%)	0.00	-0.02	0.84

Oxygen is a chemical element with the symbol O and atomic number 8. It is a member of the halogen group on the periodic table and is a highly reactive nonmetal and oxidizing agent that readily forms oxides with most elements as well as other compounds. By mass [14], oxygen is the third-most abundant element in the universe, after the hydrogen and helium [15]. At standard temperature and pressure [16], two atoms of the element bind to form oxygen [17], a colourless and odorless diatomic gas with the formula O_2 [18]. This is an important part of the atmosphere and diatomic oxygen gas constitutes 20.8% of the Earth's atmosphere. Additionally, as oxides, the element also makes up almost half of the Earth's crust[1].

[1] Available online at: http://www.wikipedia.org.

Oxygen is necessary to sustain most terrestrial life, especially for a human [19]. Oxygen is used in cellular respiration [20] and many major classes of organic molecules in living organisms contain oxygen [21], such as proteins, nucleic acids, carbohydrates, and fats, as do the major constituent inorganic compounds of animal shells, teeth, and bones. Most of the mass of living organisms is oxygen as a component of water and carbon dioxide. Oxygen is too chemically reactive to remain a free element in air without being continuously replenished by the photosynthetic action of living organisms. Another form (allotrope) of oxygen, ozone (O_3), strongly absorbs ultraviolet UVB radiation and the high-altitude ozone layer helps protect the biosphere from ultraviolet radiation. But ozone is a pollutant near the surface where it is a by-product of smog. At low earth orbit altitudes, sufficient atomic oxygen is present to cause corrosion of space craft [21, 22]. Common use of oxygen includes residential heating, internal combustion engines, production of steel, plastics and textiles, brazing, welding and cutting of steels and other metals, rocket propellant, oxygen therapy, and life support system in aircraft, submarine, spaceflight, and diving. The high concentration of oxygen in the surrounding can be an increase of pH blood of human blood so it can be increased of immunity of the human body to cover illness by Covid-19.

Photosynthesis splits water to liberate O_2 and fixed CO_2 into sugar in what is called a Calvin cycle. In nature, free oxygen is produced by the light-driven splitting of water during oxygenic photosynthesis. According to some estimates, green algae and cyanobacteria in marine environments provide about 70% of the free oxygen produced on Earth, and the rest is produced by terrestrial plants. Other estimates of the oceanic contribution to atmospheric oxygen are higher, while some estimates are lower, suggesting oceans produced ~ 45% of Earth's atmospheric oxygen each year.

A simplified overall formula for photosynthesis is: $6\ CO_2 + 6\ H_2O \rightarrow C_6H_{12}O_6 + 6\ O_2\nearrow$
Or simply: carbon dioxide + water + Chlorophill-a + sunlight → glucose + oxygen free

During a wet season in March to May 2020, Covid-19 illness has been the main problem of the human being in the world, especially in Riau Province and also around Indonesia. The oxygen concentration of carbon dioxide and oxygen in the atmosphere is not balances. So the pH of human blood tent to decrease or low. It made human immunity tend to be decreased. Covid-19 has been the most common acute illness of the people in this condition. Many people were ill, especially old man and woman that have contaminated by Covid-19 cause heavy respiratory tract infection. Some of them died. In this situation, we can use a Dahril bottle with Chlorella growing inside to fresh air surrounding the people and to used dry weight Chlorella as supplement food for increase human body immunity for the battle of Covid-19.

4. Conclusions

Based on the result of this study indicated, that *Chlorella* with Chlorophyll-a in the side can grow well in Dahril Bottle to absorb CO_2 and produce O_2 with the chemical reaction as follow, $6\ CO_2 + 6\ H_2O$ à $C_6H_{12}O_6 + O_2\nearrow$. The high concentration of cell density was found 1.2 x 10^7 cells/ml, Chlorophyll-a concentration of 184.09 µg/l, and Chlorella powder, 1.25 g/l, and CO_2 decreased from 18.36 mg/l to 1.24 mg/l or 93.34%, O_2 increase from 3.76 mg/l to 6.21 mg/l or 65.15%. The chemical compound of Chlorella powder was also high with a protein level of 45.09%, lipid 10.85%, and carbohydrate 12.77%. They also contain, vitamin E, mineral, beta carotene, and antioxidant essence. *Chlorella* powder that is found in this study can be used as a supplement food to increase the immunity of the human body to prevent Covid-19 illness.

Acknowledgments

We wish to thanks the Departments of Research and Development Board, Ministry of Research, Technology and High Education, Research and Dedication to Society Board, the University of Riau for kindly supported this works. We also would like to thanks to Director of PT PTP 5, Chief of Palm Oil Industry, Sei Galuh, and some of our students for their dedication to supporting this study.

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