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Research Article

Measurement of Chlorophyll A and Optical Density by Increasing of Algae Biomass

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Abstract

This study was conducted in the botany laboratory department of biology Al-Farabi University College for determine the effects of the nutrient enrichment on growth of algae chroococcus in fresh water. The term enrichment normally has positive connotation nutrient enrichment in our rivers, estuaries and lakes causing economic problems and substantial ecological across the nation. Enrichment 'chlorophyll A. and optical density' were estimate quantitatively by using spectrophotometer device at the '650 nm' and '533 nm' respectively results were shows increasing the enrichment of chroococcus.

Key words: algae; chroococcus; chlorophyll; optical density

Introduction

Algae are aquatic 'plantlike' organisms; algae encompass many of simple structures 'from single celled phytoplankton floating' in the water to large seaweeds (macro algae) which attached the ocean floor (Russell, 2014). Algae could be find presenting in oceans, rivers, ponds, lakes and in snow or any area of the Earth. Therefore, only makes algae plantlike instead of plant due to algae were mostly called 'primitive plants' other term like (protists) would be used (Guiry, 2014). Term protist might be a high accurate particularly for a single celled phytoplankton (Chu, 2003). Although larger (more complex algae) including chara as well as kelp were mainly mistake for submerge plant. Differences between those submerged and seaweed plant are in their structures. Macro algae were simple and they attach themselves, instead of true roots, to the seabed with a holdfast (Guiry, 2014).

Aquatic plant either emergent or floating submerged (starting in the water and growing out) has special parts like roots, leaves or stems (Royce, 2014). In addition, maximum of plant has vascular structure (phloem and xylem) that carried nutrient throughout plants, while algae contains chlorophyll (as plants) but have not the special structure (Chu, 2003).

Algae are sometime, consider protist, but in other time are classify as plant or choromist. Phytoplankton were makeup of single-celled cyanobacteria and algae. Such as algae would be single-celled, filamentous 'stringlike' and plantlike, algae are usually difficult to classification. More organization (group algae) via their primary color (green, brown or red) though that create high problem than solves (Guiry, 2014). Different algae species were vast varies from each other not only in the pigmentation, but also in cellular-structure, chosen environment and complexity (Guiry, 2014 and National Taiwan Museum, 2006). Like, algae taxonomy was still under debates with the some organization classification of algae plant under various kingdom include (Plantae, Chromista or Protozoa) (Guiry, 2014). While overarching kingdoms classifying are not always agreed according to species, class, family, genus or phylum. For more complicate these nomenclatures single-celled, algae usually fall under phytoplankton broad categories (National Taiwan Museum, 2006).

Cyanobacteria (blue-green algae)

Blue - green algae are type of bacteria, although have ability for conduct photosynthesis for the energy. These mean which they are single - celled prokaryotic (or simple) organism. Prokaryotic mean that cyanobacteria have not the nucleus and other membrane - bound organelles within them wall of cells (National Taiwan Museum, 2006).

Cyanobacteria is an only bacteria contains chlorophyll A, which the chemical requirement for oxygenic photosynthesis (the same process) which uses via algae and plants (Allen, 2001 and Todar, 2012). For producing oxygen in addition to glucose sugars for energy, can be using water, carbon dioxides and the sunlight for this process. For capture the energy from sunlight, Chlorophyll A is used for helping these processes. Another bacterium shall be consider photosynthesizing organism after following various processes known as (bacterial photosynthesis and anoxygenic photosynthesis) (Todar, 2012). Instead of chlorophyll A, this process uses bacteriochlorophyll (Delwiche, 1998). These cells of bacteria, to manufacture sugars, are used carbon hydrogen sulfide and dioxide instead of water. Bacteria are not used oxygen in the photosynthesis but finally produces anaerobically energy without oxygen (John et al., 2013).

For use in cellular respiration, Cyanobacteria with another phytoplankton photosynthesize such as plants are producing same oxygen and sugar. As well as chlorophyll A, (blue - green algae) are contain a pigments phycocyanin and phycoerythrin, which give their bluish tints of bacteria hence name (blue - green algae) (Speer, 1997). The microorganism contains internal sac, although not having a nucleus, these called (gas vacuole) which help them to floating near surfaces of water (Zimmerman, 2014).

Cell Structure and Metabolism

Chroococcus cell is rod or ovoidal shape unicell with range of diameter between (0.4 - 40) µm (Ditty et al., 2003). As well as physical similarity, algae and cynaobacteria also share similar habitat normally grow together (Kirkwood et al., 2001). *Chroococcus*is are autotrophic organisms has the ability for survive without any oxygen source or freshwater. *Chroococcus* using sunlight as the catalyst to produce adenosine triphosphate and oxygen through methods of phtosynthetic (kerians, 2016).

Although has been identifying in the water source with high salinity, *Chroococcuses* are known for inhabiting areas of freshwater traditionally. *Chroococcus* also has been find in plankton inhabiting water reserves. *Chroococcuses* are usually incorrect identify for that outlining the true habitats patterns are difficulties (Guiry, 2017).

Material and Methods

The experiment was carried out in the glass pelvis filled with quarter volum of media (Chu-10) and compelet volum water, adding small quantity blue-green Chroococcus algae (was taken from lake in University of Baghdad), light and oxygen sources (figure 1).

After one week we noted the growth of green algae on bottom of the pelvis, during this period we taken three samples from water of the pelvis. Firstly after 7 days, secondly after 14 day and finally after 20 days to note the change in growth and biomass of algae and by using spectrophotometer device we determine the chlorophyll A and O.D. for the samples at 630nm and 533 nm wavelength respectively.

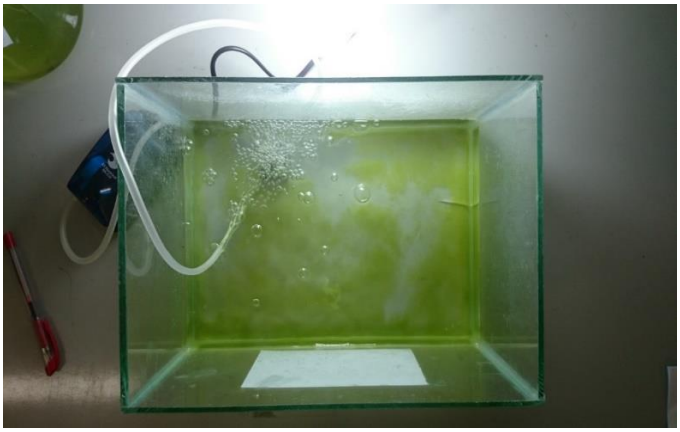

Figure 1: *Algae glass pelvis with oxygen and light sources*

Results

When measure the chlo. A, O.D. after two weeks, results (table 1) showed increasing value of chlo. A and O.D. in stationary phase was 1.5147, 1.7196 respectively and after twenty days, results, showed less than value of chlo. A, O.D. in death phase 0.1777, 0.1664 respectively (figure 2).

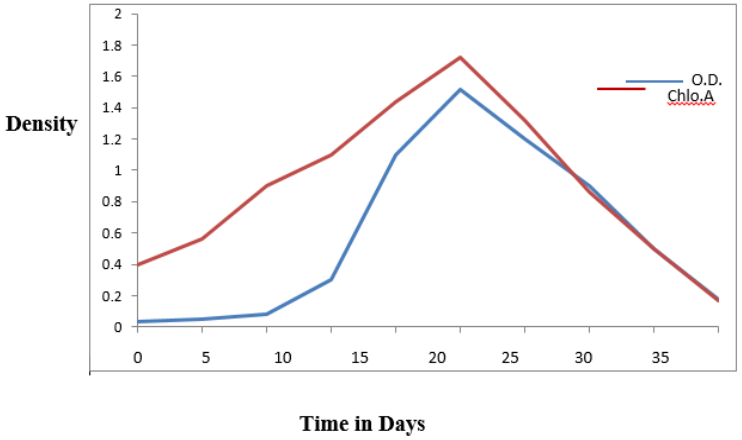

Figure 2: *The relation between time in the days and the density of chlo. A and O.D.*

NO.	O.D. at 533nm	Chlorophyll at 630nm
Cont.	0.0782	0.1321
1	1.5147	1.7196
2	0.1777	0.1664

Table 1: *Results of O.D and Chlo. A*

Discussion

Table 1, shows that the chlorophyll A concentration and O.D. were determined using spectrophotometer device at (630nm and 533nm) respectively because at these wavelengths we get a good absorbance to the UV lights. As shows from graph 1 the sample control represent the log phase when the algae rapidly growth because of high concentration of nutrients (media that used). Sample 1 represent stationary phase when the both growth and death are balanced, lastly the two sample was the death phase at the nutrient media was consumed in agreement with Todar, 2012 and Guiry, 2017.

Our results not agreement with Griffiths MJ et al., 2011, they find that high significant linear relationships between cell number and O.D. and, in the exponential growth phase, for actively growing cells, but not for a stationary phases cells. It is the most likely because a cells culture in a stationary phase is mixture of the growing in addition to senescing cell with high different pigmentations. Light limitation apparently does not affect the O.D. cell number relationships strength.

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