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Isolation and Identification of Microalgae from Fresh water Sources

Nwaubani, D. A. & Inyang,M.P.
Department of Microbiology , Michael Okpara University of Agriculture, Umudike , P.M.B. 7267, Umuahia , Abia state , Nigeria
Corresponding author: Nwaubani , Daniel A.
E-mail : info2danny96@gmail.com, 07036494628

Abstract:

Isolation and characterization of microalgae was carried from pond and freshwater samples from Michael Okpara University of Agriculture umudike and Amafor isingwu Umuahia respectively ., all located in Abia state , The samples were collected bimonthly for three months. Samples were cultured using media prepared from a fresh water base supplemented with growth factors essential for algal growth for incubation at 25-30˚C for about 7-14days in the presence of light source.Algae were isolated from the sampled ponds but samples from the freshwater stream (Amafor stream) did not yield algal colonial colonies. Four different algal species were isolated from sites (Pond A&B), both sites showed the presence of Rhizosolenia longiseta zach and Cyclotella bodancia eulenst. Site A had the highest number of algal species (four), while site B had only three different algal types. However, the physiochemical analysis of the pond and the stream values were gotten. The study concluded the presence of microalgae in ponds.

Key words:microalgae, *Rhizosolenia longiseta zach* , *Cyclotella bodancia eulenst*

Introduction

Microalgae also called phytoplankton by biologists are very small plant-like organisms between 1-50 micrometers in diameter without roots or leaves. Together with seaweeds (microalgae or large aquatic plants), microalgae are part of the so- called aquatic biomass.

Microalgae are very common (hundreds of thousand species exist) and occur both in fresh water and sea water where they form basis for most food chain (workers *et. al.,* 2011). Most species contains chlorophyll, use sunlight as an energy source and convert carbon (iv) oxide into biomass. Algae can be divided into Microalgae (e.g. seaweed) and Microalgae (e.g. phytoplankton). There are about nine phyla of microalgae based on molecular sequence information, Graham and Wilcox, (2000).

This study is focused on microalgae alone and not macroalgae. It is estimated that between 200,000 and several million species exist .They grow rapidly and can live in a harsh condition. Normally, microalgae are not visible by the naked eye butt if water is eutrophic, massive algal blooms occur , changing the water in a green, brown, blue or orange liquid mass. Only a few tens of thousands, out of a total of 200,000 to 800,000 different species, have been describe in literature (Metting, 1996). With so many unknown algae species an almost inexhaustible source of possibilities exist. The genetic analysis and ranking of all types of microalgae is still in progress and there is not yet a complete and consistent classification.

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Importance of algae in an aquatic environment and its uses

The rapid growth of algae makes it easy to be harvested daily and that makes it to have potential to produce a volume of biomass and biofuel many times greater than that of our most productive crops. It stores energy in the form of oils and carbohydrates, which, combined with their high productivity, means they can produce from 2,000 to as many as 5,000 gallons of biofuel per acre per year (Chisti, 2007). It can be said that the vast collection of microalgae species provides the nutritional needs of all animals that live in the aquatic environment. This is because they help in the sustenance of the aquatic ecosystem by the provision of nutrients to the base organisms in the aquatic food chain.

This study therefore is carried out for the purpose of isolating microalgae from ponds and freshwater, identifying the isolated microalgae.

Materials and methods

Study area

Samples were collected from fish ponds and Amafor stream, a fresh water body, both located in Michael Okpara University of Agriculture(MOUAU), Umudike and Amafor stream Isingwu Umuahia respectively in Abia state, Nigeria.

Sample and sampling Techniques

Samples were collected from ponds in the Department of Fisheries(MOUAU) and Amafor stream located in Amafor Isiagwu Umuahia. The upstream and downstream were taken.

Culturing and culture Media

A freshwater base which is supplemented by essential growth factor for algal growth such as nutrients,trace elements, vitamins and soil extract was compounded according to Bold and spolaore *et. al.,* (2006). The growth medium was then solidified with 1-1.5% agar powder. This was poured into Petri dishes to a depth of 1/2- 2/3 after sterilization and cooling to ambient temperature.

The samples were first diluted to aid in the isolation process. The diluted sample exactly 0.1ml was transfered to a media plate and spread evenly across the surface. Inoculated plates were placed at room temperature (25 - 30℃) for about 7 -14days, in a window facing a light source. Cultures were re-isolated from grown algae culture to another. Set of media plates were incubated (Ifeanyi *et.al*, 2016). This streaking method was repeated until isolation into axenic unialgal cultures was achieved.

Morphological identification

The isolates identification to genus level was based on the morphology of the individual cells following microscopic examination. However , the strains were identified using microscope and atlas by Mulluer , (1998) for identification of fresh water algae species.

Results

Algae were isolated from the sampled ponds but samples from the freshwater stream (Amafor stream) did not yield algal colonial colonies . Four different algal species were isolated from sites (Pond A&B), both sites showed the presence of *Rhizosolenia longiseta zach* and *Cyclotella bodancia eulenst*. Site A had the highest number of algal species (four), while site B had only three different algal types .However , the

physiochemical analysis of the pond and the stream values were gotten.

Table 1: The isolated and identification algae from sampled ponds

Sampling site	Range	Algae isolated
Pond A	3.7×10^3 cells/cfu	*Rhizosolenia longissta zach, cyclotella bodancia bodancia eulenst, Melosira varians*
Pond B	2.9×10^3 cells/cfu	*Diatoma elongatum agardh,Rhizosolemia longiseta zach, Melosira varians*
Freshwater C (Amafor stream upstream)	Nil	No growth
Freshwater D (Amafor stream dov	Nil	No growth

Table 2: Physicochemical mean parameters of the stream and pond water

Sampling site	Temp℃	p H	TDS mg/l	Conductivityμmhos/cm	Colour HU	Turbidity NTU	Alkalinity mg/l	Hardness
Pond A	29.58	5.53	1115.88	87.00	5.8	3.93	73.6	98.6
Pond B	28.96	5.81	99.73	112.42	7.4	2.93	81.4	89.5
Freshwater C (Amafor stream upstream)	28.5	6.02	100.2	179.98	2.6	1.56	82.5	56.9
Freshwater D (Amafor stream upstream)	28.7	6.34	99.9	113.2	3.78	1.68	76.40	89.9

Discussion

From the result, it was observed that there was growth in the ponds (staitionary) water and none in the stream water sample. This result does not contradict the opinion of Grobbelaar , (2004) who reported that open ponds are the oldest and simplest systems for mass cultivation of microalgae . However , Zimmerman (1998) further stated that the water circulation pattern are vital in establishing the balance between light level and nutrient availability necessary to maintain high productivity rates in marine system .

The isolated species are in agreement with the species isolated by Ifeanyi *et.al*.,(2016) and Stoermer *et al*.(1999).

Conclusion

The isolation of microalgae can be done rapidly in an established area such as pond. The requirement for growth islight, water, carbon (iv) oxide,nutrient, trace elements and Molisch's solution. The algae will be able to synthesize all biochemical compounds necessary for growth by means of photosynthesis. As a recommendation, further studies should be carried out on microalgae growth in ponds so as to help in bioremediation and greenhouse gases. Also this will be of importance in algal growth for several purposes such as agricultural uses as feeds to animals , biofertilizer for soil enhancement , biofuel , nutritional supplement as protein alternative and for cosmetic purposes.

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