Journal for Research in Applied Sciences and Biotechnology

www.jrasb.com

ISSN: 2583-4053

Volume-2 Issue-1 || February 2023 || PP. 142-144

https://doi.org/10.55544/jrasb.2.1.19

A Review on Commercial Utility of Some Cultivable Algal Species Naturally Inhabiting in Water Bodies of Kota, Rajasthan

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www.jrasb.com || Vol. 2 No. 1 (2023): February Issue

Received: 21-01-2023	**Revised:** 10-02-2023	**Accepted:** 21-02-2023

ABSTRACT

Algae, not only one of the most significant organism of the planet, but also acclaimed as major photosynthetic autotrophs and responsibly contributing in sustainability of the planet by their unique yet significant ecological interactions. Along with production of biofuel and biomass, metabolic products of different species of algae are most commonly cultivated and used for pharmaceuticals, nutraceuticals, phytoremediation, wastewater treatment, antibiotics, dyes, food industry and so on. Apart from that, some members serve as bio indicator, provides specific information about the habitats they inhabit in, and thus serves as an effective tool for bio monitoring, and also helps in efficient management of the aquatic ecosystem. This study looks into the value of some naturally occurring chlorophycean and cyanophycean members which are intentionally cultivated and utilized at several parts of the world. For this study, samples were collected and identified for the presence of cultivable species of chlorophyceae and cyanophyceae, their known applications and commercial status so that further need of study for highest possibilities could be estimate in the field of algal cultivation for future prospective for aquatic algal habitats of Kota, Rajasthan.

Keywords- algal farming, phytoremediation, aquatic habitats.

I. INTRODUCTION

Most of algae are photoautotrophs, ranges from unicellular microalgae to multicellular macroalgae, furnishes significant contribution in life of aquatic ecosystem. The necessity of using phytoplankton as effective and appropriate method of bio monitoring for evaluation of river water quality has been emphasized (Annalakshmi & Amsath 2012). Based upon the utility of species, algal cultivation is one of the extensively utilized yet effectual way, includes commercial cultivation for gain of maximum economically significant products and to fulfill the current demands. Cultivation methods has a wide range varies with the species organization, factors and nature of metabolites which need to be harvested. The phytoplanktonic study is a very useful tool for the assessment of water quality in any type of water body and also contribute to understanding of the basic nature of lake. (Pawar et al. 2006)

Utility analysis helps in sorting of species and to differentiate cultivable and non-cultivable species with the requirements of species to grow with highest efficiency. Algal farming is going viral all over the world to reach nutritional demands for which commercial production of algal metabolites is being done at several parts of World. cultivation in native habitat is comparatively easy and requires comparatively less efforts, as in natural habitats greater adaptability and favorable growth conditions are naturally available so it can reduce the expenditure for setting up conditions to cultivate other than natural environment. Cultivation in

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presence of natural resources is Hassel less and efficient method. Anyone with less or no experience in handling equipment's like photo bioreactors could commercially cultivate these micoflora.

Open pond systems are the most common system of algae cultivation, already used commercially in the United States to produce nutritional products and treat wastewater. Open pond systems for the production of biofuels are under development. For example, Sapphire Energy is developing a commercial-scale open pond production facility in southern New Mexico and is aiming to produce millions of gallons of fuel annually. Photobioreactors can prevent, or at least reduce, invasion by weed algae, zooplankton grazers and other organisms that could affect the cultures. BioProcess Algae, is utilizing a closed photobioreactor system for a facility in Iowa. San Francisco-based company Solazyme, the pioneer of fermentation method, has already produced tens of thousands of gallons of algae-based fuels as part of their research and development agreement. Hybrid system's objective is to maximize the individual advantages of each process. Phycal, an Ohio-based company with operations in Hawaii, uses this type of system. Accelergy Corporation has developed a proprietary biological carbon capture and recycle technology, which passes CO2 (from a source like a coal power plant) through a photo bioreactor that is growing concentrated algae. Once the growth cycle is complete, the algae is blended with proprietary additives to produce a bio-fertilizer which is then used on crops, which then continuing to capture CO2 from the atmosphere as it grows.Excretion method is, instead of storing oils in the biomass, the algae would excrete useful chemical into the culture, or medium in which they are grown. San Diego-based Synthetic Genomics is working with Exxon on this type of approach.

Present study comprehended knowledge about some cultivable algal species found in water bodies of Kota and analysis for their utility to favors the idea towards expand the approaches like aquaculture and bioremediation for natural aquatic habitats.

II. STUDY AREA

Kota is a part of Rajasthan State falls in South east area with the north latitude and east longitude of 23°45' to 25°53' and 75°9' to 77°27' respectively. Some significant Aquatic habitats of Kota district includes Kishore Sagar Lake, Abheda Lake, Kota Barrage, Khade Ganesh Ji temple pond and a length of Chambal river as well. These aquatic ecosystems has significant species richness of algal flora, from which differentiation of species of interest is done.

III. MATERIALS AND METHODS

Collection of samples was done from different locations of water bodies for analysis of particular cultivable chlorophyceae and cyanophyceae members. Collection by use of plankton nets in air tight bottles or polythene was done on time intervals followed by study of samples in their native form and for detailed study samples are further preserved in different chemicals commonly used as preservatives like 4 % formaldehyde, lugol's solution etc.

Species identification and measurement of their utility is done by algal literatures.

IV. RESULTS AND DISCUSSION

Sample study witnesses the presence of several species belonging to different algal classes. Here are cultivable species of class chlorophyceae is tabulated in table 1 along with their commercial utility. From all the species reported *Scenedesmus*, *Ankistrodesmus*, *Pediastrum*, and *Staurastrum* were abundant.

Another table 2 representing the members of cyanophyceae found in samples collected from the study area and their utilities are also mentioned. *Merismopedia*, *Oscillatoria* species were frequent among cyanophyceae. Among all members of chlorophyceae reported, *Chlorella* is most significant and widely used species with unbeatable utilities.

Similarly, various species of cyanophycean genera were reported and are sorted on the basis of utilities. Among all, *Spirulina* is extensively utilized species and cultivated intentionally at various parts of the world for various purposes. (genera with more than one species are represented with sp. suffix in the tables.)

Finding suggests the possibility to take initiatives in the field of algal farming for aquatic bodies of Kota, Rajasthan on the basis of potent utility. Results also indicate about favorable environment for the growth of tabulated species so with little alterations, culture conditions can also be generated (if wanted).

Table 1: Cultivable Members of Chlorophyceae.

Species	Utility/Application
Caracium angustum	Carotenoids, protein, lipids
Cladophora sp.	Animal feed, fertilizer, paper making and strengthening (in Korea), pharmaceutics
Chlamydomonas sp.	Food supplements
Coelastrum microsporum	Single cell protein, essential amino acids
Cosmerium sp.	Biofuel, biodiesel and ethanol
Chlorella sp.	Supplement Food, cosmetics, biofuels, pigments, pharmaceutics
Closterium sp.	Ideal for toxicity testing
Hydrodictyon raticulatum	Potent food source, as mulch and fertilizer
Monoraphidium sp.	Additional source of alpha linoleic acid, nutritional supplements

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Mougeotia sp.	Food production, carotenoid
Oedogonium sp.	Biomass production, cellulose, oxygen production
Pediastrum sp.	Food supplements
Scenedesmus sp.	Biodiesel, industrial use, food supplements, sewage purification
Spirogyra sp.	Biomass, bioethanol, therapeutic applications, silver nanoparticles
Staurastrum sp.	Biodiesel
Stigeocloneum tennue	Phytochelatin production

Table 2: Cultivable Members of Cyanophyceae

Species	**Utility/Application**
Anabaena sp.	Nitrogenous bio fertilizers
Calothrix sp.	Bio fertilizers, calothrixamides
Chroococcus sp.	Pigments, vitamins, biomass
Gleocapsa sp.	Organic compounds
Lyngbya sp.	Antibiotics, biomolecules
Merismopedia sp.	Biomass, metabolites
Nostoc sp.	Bio fertilizers
Oscillatoria sp.	Nutraceuticals, antibiotics, anticancerous compounds
Spirulina sp.	Mineral nutrition, antioxidants, unsaturated fatty acids, biomass production, anticancerous compounds, food and feed

V. CONCLUSION

Finding suggests the possibility to take initiatives in the field of algal farming for aquatic bodies of Kota, Rajasthan on the basis of potent utility. Results also indicate about favorable environment for the growth of tabulated species so with little alterations, culture conditions can also be generated (if wanted).

Presence and knowledge about this significant flora could prove as milestone for implement initiatives towards more reliable and greener approaches like algal resources for problems like waste water treatment, nutritional and medical demands, industrial waste sorting, and ion toxicity and so on. Study suggests some effective approaches to be adopt for Kota based on algal flora utility. Actions need to be taken in the direction of:

- Phytoremediation
- Bioremediation
- Soil treatment by microalga approach
- Nutrient recovery from waste water
- Algal farming for food resource

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