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# STUDIES ON DIVERSITY AND DISTRIBUTION OF THE ALGAL FLORA IN THE MANJEERA RESERVIOUR SANGA REDDY DISTRICT, AND THEIR ROLE IN HUMAN WELFARE

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## ABSTRACT
Freshwater algae have shown an amazing tolerance to a wide range of environmental circumstances. Native communities, which may comprise a diverse variety of species and genera, are frequently where they flourish in their natural habitat. The identification of freshwater algae from Sangareddy, the majority of which belong to the Chlorophyceae family, is fully based on the Physico-chemical characteristics of the water bodies at different time intervals across time. It focuses on the dynamics of freshwater algae from the Manjeera Reservoir, which is around 7 kilometers away from the sangareddy district region under investigation in this communication. During the identification procedure, 59 new species were discovered, with 20 of them previously unknown. Around 59 species were documented during the research of this alga gathering Scientific botanical tour for UG Biotechnology third-year students with Dr. S. Vijaya Head & Asst. Prof of Botany Tara Autonomous College Sangareddy. Students participated in this algal collection expedition by collecting an algal mixture and soaking it in an Aceto-alcohol solution (1:3). A solution containing small bottles containing 59 different types of algal samples that were brought to college and stored the next day identified each algal sample under the Research Microscope and noted down the characters to identify the algal flora book finally confirmed the correct name to preserve such algal samples in the botany laboratory. Most of the reservoir water is used for drinking and agriculture.

**KEYWORDS:** Physico-chemical parameters, Manjeera dam, Phytoplankton and Diversity.

## INTRODUCTION
In the field of limnology, measuring the quality of the water in lakes, ponds, streams, and rivers in order to identify algae that contribute to primary productivity and acquire this continuity is extremely essential. This may be done. The diversity of phytoplankton is an indication of purity, and the use of community structure to assess pollution is conditioned by four assumptions: the natural community will evolve towards greater species complexity, which will eventually stabilize; this process will increase the functional complexity of the system; complex communities are more stable than simple communities; pollution stress simplifies a complex community by eliminating the more sensitive species; and complex communities are more stable than simple communities (Akbay*et al.,* 1999). The species composition, abundance, productivity, and physiological circumstances of aquatic creatures are all influenced by the physical and chemical features of the bodies of water in which they live. These ecologically fragile systems are responsible for maintaining an astonishingly high percentage of the world's biodiversity. One of the most significant indicators of the water quality in a reservoir is the phytoplankton. The importance of phytoplankton as bioindicators in the aquatic environment is well documented around the globe (Yakubu *et al.,* 2000). The phytoplankton community in an aquatic ecosystem is one of the most important factors in preserving the system's balance and providing a mechanism for adapting to any changes in the surrounding environment (Jayaraman *et al.,* 2003 Tiwari *et al.,* 2004). The relationship between diverse communities of living creatures and the environment is kept in a state of ecological equilibrium by the presence of water (Kumar *et al.,* 2009). The primary goals of the research were to ascertain the variety of phytoplankton and the quality of the water in Manjeera dam, as well as to investigate the influence that various physicochemical factors had on the phytoplankton diversity.

Algae play a vital role in all aquatic ecosystems by providing the food and energy base for all organisms

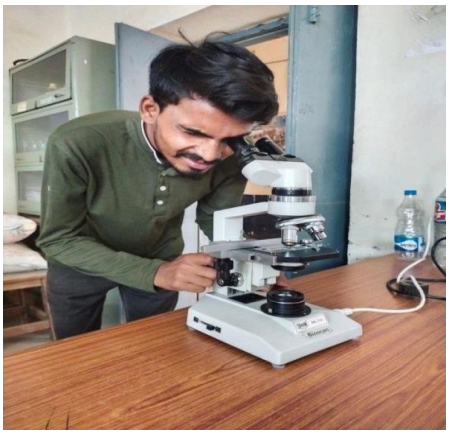
living in lakes, ponds, streams, and rivers (Addy and Green, 1966). They have a significant impact on determining water pollution and cleaning wastewater (Çolak and Kaya, 1988). A floristic study on the freshwater algal flora reveals the species composition and taxonomic diversity of biological communities in an ecosystem (Pfiester *et al.*, 1980; Oguni *et al.*, 1987; Fumanti *et al.*, 1995; Kolayli *et al.*, 1998; Sahin and Akar, 2004; El-Awamri *et al.*, 2007; Škaloud, 2009; Andrejic *et al.*, 2012). In addition, it reflects the seasonal variations (Sen and Sonmez, 2006; Kim *et al.*, 2008; Ezekiel *et al.*, 2011) , evolutionary processes, ecological functions, and stability of aquatic ecosystems (Komulaynen 2009). The most outstanding algal flora studies in Iran are those of Loffler, (1961); Hirano (1973); Moghaddam, (1976); Compere, (1981), Nejadsattari *et al.*, (2005); Zarei-Darki, (2009); Noroozi *et al.*, (2009). The present study deals with species, diversity, distribution, and the role of human welfare of algal flora in Manjeera Reservoir in Sangareddy District.

**A**

**B**

**C**

**D**



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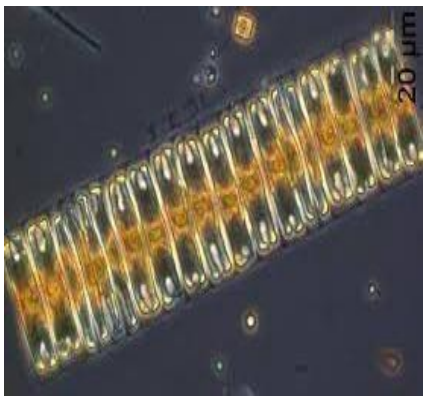


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**Fig. I: Studies on diversity and distribution of the algal flora in the Manjeera reservoir a) manjeera reservoir b.& c algal collection by students d & e Observation and identification of algal at the laboratory, f to I algal diagrams under the observation of Compound Microscope.**

## MATERIALS AND METHODS

The area under investigation The Manjeera Reservoir is considered to be one of the most important reservoirs in the state of Telangana. This reservoir is situated in a location that is seven kilometers away from Sanga Reddy. At this location, there is an Environmental Education Center where one may go to spend quality time with family or friends. The crocodile breeding pond, which was constructed with the purpose of providing a safe haven for rehabilitated crocodiles, is yet another of this location's primary points of interest. The Manjeera Reservoir does not experience seasonal changes, and summer is the time of year when the water flow is at its lowest.

The construction of a barrage on the Manjeera River close to Kalabgur Village in Sangareddy District resulted in the formation of one of the most significant reservoirs in the state of Telangana. This reservoir is known as Manjeera. The barrage was built to maintain enough water storage and to provide potable water to the twin cities of Hyderabad and Secunderabad, which are located around 50 kilometers to the southeast. Between the Singur and the Manjeera dams, the reservoir encompasses a land area of 32 kilometers squared (Prasad *et al.* 2018). Crocodiles and birds alike make use of the reservoir's nine islands, each of which is surrounded by vast marshy fringes. These marshy fringes not only provide habitat for submerged and emergent vegetation but also sustain submerged and emergent vegetation. In 1978, the area that is now known as the Manjeera Wildlife Sanctuary was designated as a protected area so that it may serve as a refuge for the natural population of endangered marsh crocodiles, in addition to several other species of avian, mammalian, and foral variety (Prasad *et al.* 2018). Since 2010, the first author and the senior author have been recording the many species that may be found in Manjeera Wildlife Sanctuary (Prasad *et al. 2014*, 2018). We give baseline information on the ichthyofauna of the Manjeera Wildlife Sanctuary Study Area by the help of this contribution, which is as follows:

The Manjeera water reservoir can be found in the Sanga Reddy District of Telangana State, India. Its coordinates are 17.62–17.750 North and 77.92–78.080 East (Fig. 1). A reservoir and the land on each side of the Manjeera River course are included in the protected area of the sanctuary, which spans a distance of 26 kilometers between the Singur and Manjeera dams. Additionally, the reservoir is home to both submerged and emergent flora, some of which includes species of Nymphaea, Nelumbo, Polygonum, Hydrilla, and Pista (Prasad *et al.* 2018). Cotton, rice, jowar, maize, and sugarcane are among the most important crops produced, and the soil may be described as either red loamy, sandy, or rich black. The average annual rainfall is somewhere between 1,000 and 1,100 millimeters, and the temperature fluctuates from 15 ºCelsius in the winter to 42 Celsius in the summer (Prasad *et al.* 2014).

### Sampling procedure

Beginning in December 2021 and continuing until November 2022, the samples were collected on a monthly basis between the hours of 10:00 AM and 13:30 PM. This practice continued until November 2022. In order to collect samples of phytoplankton, a phytoplankton net with a mesh size ranging from 5 to 10 micrometers was utilized. A little shovel with a flat edge was used to collect the samples of the algal mat, which were thereafter placed in sterile plastic bags and stored in the dark until they could be transferred to the laboratory. It was necessary to utilize forceps in order to collect filamentous algae from each of the various zones (e.g. old branches, basins, pools, stones, etc). Water samples were taken in 0.5 liters. In an effort to resolve the issue as quickly as possible, vials made of polyethylene and formalin 4% were employed. Identification of the algal flora was carried out with the help of the available literature (Anderson, 1966; Gomont, 1972; Kiyanmehr, 1994; Maosen, 1983; Prescott, 1954; Smith, 1920; 1924; West, 1904; Starmach, 1972), and the samples were

photographed using an Olympus Bx51 microscope. A mercury thermometer was used to take measurements of the temperature of the water while it was still in place. Additionally, in-situ measurements of the total hardness (German degree d°), nitrate, nitrite, phosphate, and pH of water samples were carried out with Aquaquant test kits in line with established methods (Adams, 2000; Alpha, 1986).

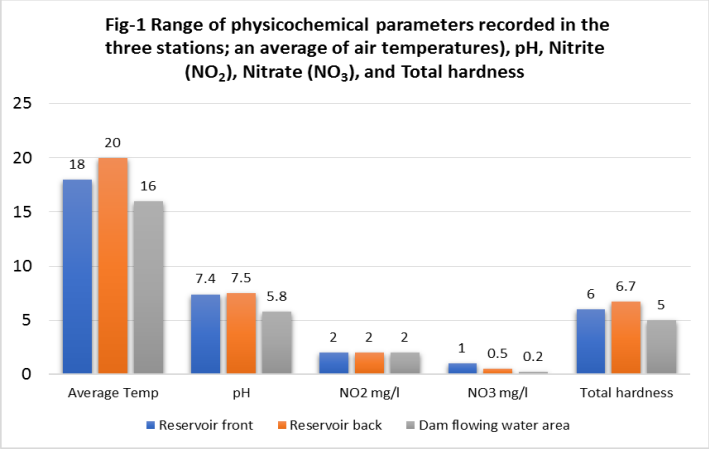
## RESULTS

The physicochemical component or variable (Table -1) presents the physicochemical characteristics that were measured in each of the three locations. The value of pH can range anywhere from 7.4 to 5.8 From the first to the third station, the values that were recorded for overall hardness ranged from their lowest point, which was 6.0 d°, to their highest point, which was 6.7 d°. Nitrate concentrations were found to be 0.2 to 1.0 mg/l, nitrite concentrations were found to be 2.0 mg/l (Table- 1). Temperature readings were taken from the air and the surface of the water at each of the three sites. At station I (Reservoir front), the average air temperature was $18^0$ C, and at stations II and III (Reservoir back and Dam flowing water area) $20^0$C and $16.^0$C, the water temperature was (Table 1).

**Table 1: Range of physicochemical parameters recorded in the three stations; an average of air temperatures), pH, Nitrite ($NO_2$), Nitrate ($NO_3$), and. total hardness (German degree d°) (T. H.).**

| Stations | Average Temp | pH | $NO_2$ mg/l | $NO_3$ mg/l | Total hardness |
|---|---|---|---|---|---|
| Reservoir front | 18 | 7.4 | 2.0 | 1.0 | 6.0 |
| Reservoir back | 20 | 7.5 | 2.0 | 0.5 | 6.7 |
| Dam flowing water area | 16 | 5.8 | 2.0 | 0.2 | 5.0 |

Taxonomical remarks in this study a total of 59 species of freshwater algae, belonging to 39 genera were identified (Fig. 2). Bacillariophyta (15genera/25 species); *Achanthes microcephala*, *Eunotia*, Amphora ovalis, Amphora ovalis, Cymbella affinis, Cymbellaaspera, *Cyclotellam eneghiniana*, *Cyclotell astelligera*, *Cymbella helvetica*, *Cyclotella stelligera*, *Cymbella Helvetica*, *Cocconei splacentula*, *Cymato pleurasolea*, *Gomphonema intricatum*, *Gomphonema lancepolata*, *Gomphonema montanum*, *Gomphonema lanceolatum*, *Melosira granulate*, *Melosira varians*, *Navicula rhynocephala*, *Navicula cuspidate*, *Nitzschia denticule*, *Mastoglo easmithii*, Rhopalodiagibba, Rhopalodiagibba var.ventricosa, *Synedra ulna*.




Chlorophyta with 15 genera/ 21 species was the most abundant phylum followed by Bacillariophyta (15 genera/ 26 species); *Ankistrodesmus falcatus*, *Arthospira*, *Closterium turgidum*, *Cosmarium margaritatum*, *Cosmarium pseudonitidulum*, *Cosmarium varilatum*, *Cosmarium subroomii*, *Cosmarium granatum*, *Chrorococcu sturgidis*, *Chrorococcu sminutes*, *Coelastrum cambricum*, *Euastrum inspinlosum*, *Oedogonium globosum*, *Pediastrum simplex*, *Pediastrum duplex*, *Scenedesmus quadricauda*, *Staurastrum tetracerum*, *Spirogyra*, *Sururella*, *Scenedesmus armatus*, *Tetraedron regulare.*

Cyanophyta with 8 Genera and 09 species *Oscillatoria quadripunctulata*, *Oocystis elliptica*, *Pleurotaenium*, *Rivularia aquatic*, *Oscillatoria Formosa*, *Gleotrichia raciborskii*, *Gomphosph ariaaponia*, *Merismopedia glauc*, *and Anabaena* lastly *Euglenophyta* with 1 Genara three species were collected and identified.

**Table 2: The taxonomic composition of taxa found in the studied area phytoplankton in Manjeera Freshwater.**

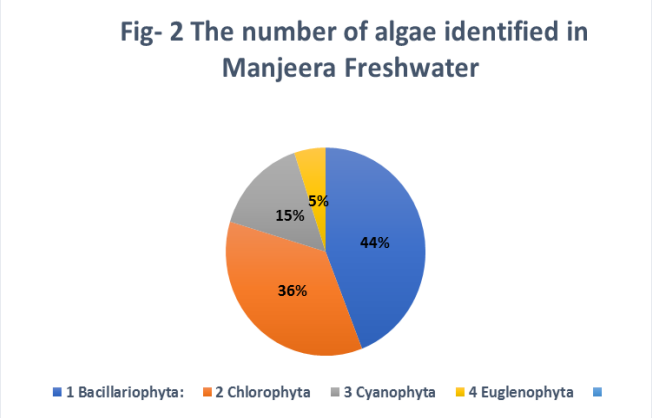
| Sl. No. | Name of algal flora |
|---|---|
| | Bacillariophyta |
| 1 | *Achanthes microcephala* |

| | |
|---|---|
| 2 | *Eunotia* |
| 3 | Amphora ovalis |
| 4 | Amphora Spp |
| 5 | Cymbella affinis |
| 6 | Cymbella aspera |
| 7 | *Cyclotellam eneghiniana* |
| 8 | *Cyclotell astelligera* |
| 9 | *Cymbella Helvetica* |
| 10 | *Cyclotella stelligera* |
| 11 | *Cymbella Helvetica* |
| 12 | *Cocconei splacentula* |
| 13 | *Cymato pleurasolea* |
| 14 | *Gomphonema intricatum* |
| 15 | *Gomphonema lancepolata* |
| 16 | *Gomphonema montanum* |
| 17 | *Gomphonema lanceolatum* |
| 18 | *Melosira granulate* |
| 19 | *Melosira varians* |
| 20 | *Navicula rhynocephala* |
| 21 | *Navicula cuspidate* |
| 22 | *Nitzschia denticule* |
| 23 | *Mastoglo easmithii* |
| 24 | Rhopalodiagibba |
| 25 | Rhopalodiagibba var.ventricosa |
| 26 | *Synedra ulna* |
| | Chlorophyta |
| 27 | *Ankistrodesmus falcatus* |
| 28 | *Arthospira* |
| 29 | *Closterium turgidum* |
| 30 | *Cosmarium margaritatum* |
| 31 | *Cosmarium pseudonitidulum* |
| 32 | *Cosmarium varilatum* |
| 33 | *Cosmarium subroomii* |
| 34 | *Cosmarium granatum* |
| 35 | *Chrorococcu sturgidis* |
| 36 | *Chrorococcu sminutes* |
| 37 | *Coelastrum cambricum* |
| 38 | *Euastrum inspinlosum* |
| 39 | *Oedogonium globosum* |
| 40 | *Pediastrum simplex* |
| 41 | *Pediastrum duplex* |
| 42 | *Scenedesmus quadricauda* |
| 43 | *Staurastrum tetracerum* |
| 44 | *Spirogyra* |
| 45 | *Sururella* |
| 46 | *Scenedesmus armatus* |
| 47 | *Tetraedron regulare* |
| | Cyanophyta |
| 48 | *Oscillatoria quadripunctulata* |
| 49 | *Oocystis elliptica* |
| 50 | *Pleurotaenium* |
| 51 | *Rivularia aquatic* |
| 52 | *Oscillatoria Formosa* |
| 53 | *Gleotrichia raciborskii* |
| 54 | *Gomphosph ariaaponia* |
| 55 | *Merismopedia glauc* |
| 56 | *Anabaena* |
| | Euglenophyta |

| | |
|---|---|
| 57 | *Euglena acus* |
| 58 | *Euglena minuta* |
| 59 | *Euglena polymarpha* |

1. Bacillariophyta: 26
2. Chlorophyta: 21
3. Cyanophyta: 09
4. Euglenophyta: 03

| Sl. No | Name of the Class | The number of algae identified |
|---|---|---|
| 1 | Bacillariophyta: | 26 |
| 2 | Chlorophyta | 21 |
| 3 | Cyanophyta | 09 |
| 4 | Euglenophyta | 03 |



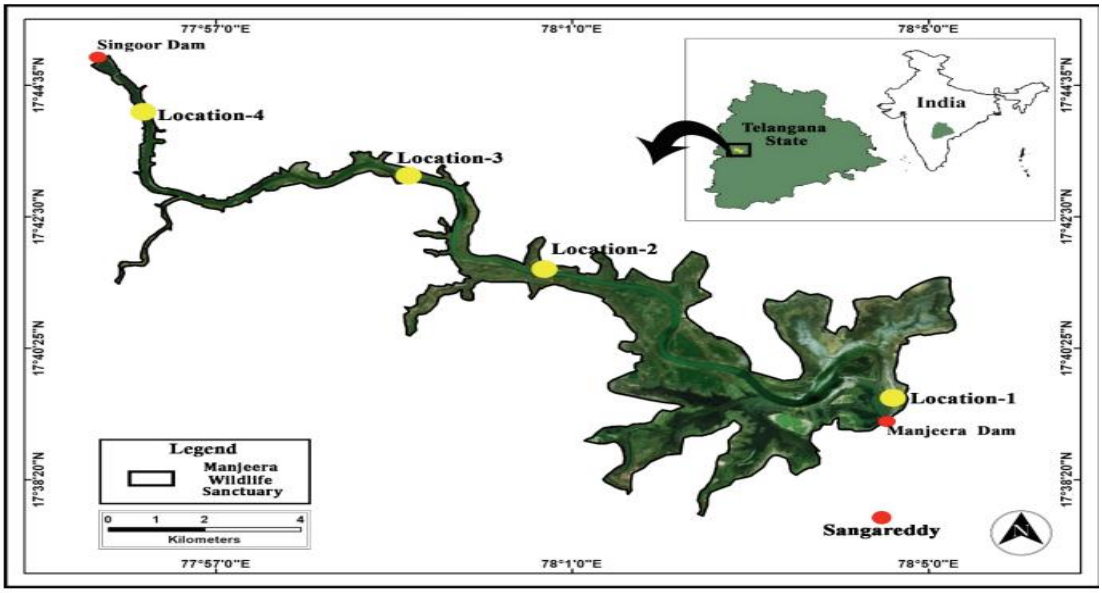




**Figure 3: Algal Sampling collected locations in Manjeera reservoir, Sangareddy District, Telangana State, India (India and Telangana State are shown for indicative Purposes and Are not to scale).**

**Role of algae in human welfare**

It's general knowledge that algae thrive in bodies of water, but they're also widespread in terrestrial ecosystems and can even be discovered in unexpected places like snow and ice. Seaweeds are most commonly seen growing in marine waters that are shallower than 100 meters (330 feet); nevertheless, there have been reports of some growing as deep as 360 meters (1,200 ft). The numerous types of algae each contribute significantly to the ecology of aquatic environments. The phytoplankton, which is microscopic forms of algae that reside floating in the water column, are the primary food source for the majority of marine food chains. When present in extremely high numbers, sometimes known as algal blooms, these algae can cause the water to become discolored and can outcompete, poison, or suffocate

other types of life. Because algae are sensitive to a wide variety of environmental conditions, scientists have found a use for them as biological markers.

**Agar agar:** It is a polysaccharide that can turn practically any liquid into a solid, it is a chemical that is derived from algae, and it has a lot of applications in commercial settings. Because of this, it is utilized both as a thickener and for the water-holding capacity it possesses. Agar was initially used in China in the 17th century, and now it is manufactured in Japan, Korea, Australia, New Zealand, and Morocco. The earliest known usage of agar was in China. The use of agar as a gelatin-like medium for the cultivation of organisms in the service of scientific and medical research is now its most significant application around the globe. The most significant contributor is a kind of red algae. *Chondrous crispus*

**Alginates:** For the production of alginic acid, huge beds of kelp (*Macrocystis pyrifera*) are collected all around the coast of the Pacific Ocean. In addition to being derived from the cell walls, this chemical is put to use in a wide variety of goods either as a stabiliser or an emulsifier. Macrocystis is harvested in California on an annual basis in quantities ranging from 100,000 to 170,000 wet tonnes for the purposes of alginate extraction and abalone feed. Carrageenan: This material, which is derived from the cell walls of brown algae, is a colloid that may also function as a stabiliser or emulsifier.

It can be found in Dairy and Pastry goods with a high frequency.

**Earth composed by diatoms:** This product originates from extensive fossil deposits of a kind of planktonic algae known as diatoms. Lompoc, in the state of California, is home to one of the nation's largest diatomaceous earth mines. This substance is really the silica cell walls of these protists; because these cell walls have very small holes, it may be utilized either as a filtering agent or as an abrasive. There are several products on the market that include diatomaceous earth.

**Earth is composed by diatoms:** Large fossil deposits of the planktonic algae known as diatoms are where this product originates. Lompoc, in the state of California, is home to one of the nation's largest diatomaceous earth mines. This substance is really the silica cell walls of these protists; because these cell walls have very small holes, it may be utilized either as a filtering agent or as an abrasive. There are several products on the market that include diatomaceous earth.

The processing of algae to produce a variety of chemical fuels provides a source of energy. Algae fuel sometimes termed algal fuel, algae, algaeoleum, or third-generation biofuel, is a biofuel from algae.

Interest in algaculture (the cultivation of algae) for the production of vegetable oil has been sparked as a result of the record rises in the price of oil that have occurred since 2003, the conflicting needs for food and alternative biofuel sources, and the global food crisis. biofuels such as biodiesel, bioethanol, biogasoline, biomethanol, and biobutanol, along with others. In addition to not having an impact on freshwater resources, producing algal fuels with ocean effluent may be done, and the fuels themselves are biodegradable and do only minimal damage to the surrounding ecosystem if they are accidentally released into the environment. Although it is more expensive per pound, algae has the potential to produce almost 30 times the amount of energy per acre as other second-generation biofuel crops.

**Biodiesel:** At the moment, the majority of research into effective algal-oil production is being done in the private sector. On the other hand, predictions from small-scale production experiments bear out that using algae to produce biodiesel may be the only viable method by which to produce enough automotive fuel to replace the current global diesel usage. This is due to the fact that algae is a renewable resource.

The growth rates of microalgae are far higher than those of terrestrial crops. The annual production of algae is predicted to range from 4.6 to 18.4 tonnes per acre (5,000 to 20,000 gallons per acre), which is seven to thirty times more than the production of Chinese tallow, which is the crop that currently holds the position of second best (899 gallons).

According to certain studies, algae are capable of producing up to sixty percent of their biomass in the form of oil. Because the cells develop in an aqueous solution, where they have better access to water and may thus expand more quickly. CO2 as well as nutrients that have dissolved.

In high-rate algal ponds or photobioreactors, microalgae have the potential to produce significant quantities of biomass as well as oil that may be put to practical use. After that, this oil may be converted into biodiesel, which is then able to be marketed and used in vehicles. The more effectiveness with which this procedure is carried out, the greater the profit that is generated by the organization. Economic advantages will accrue to rural areas as a result of the regional production of microalgae and its subsequent processing into biofuels.

**Biobutanol:** It is possible to produce butanol from diatoms or algae using simply a biorefinery that is driven by the sun. This fuel has an energy density that is comparable to that of gasoline, and it is greater than that of either ethanol or methanol. In most gasoline engines, butanol can be used in place of gasoline with no modifications required. In a number of tests, butanol consumption was comparable to that of gasoline. When blended with gasoline, butanol provides superior

performance and corrosion resistance to that of E85 or ethanol. Butanol may be made from the leftover green waste that was left over after the extraction of algal oil.

Seaweed may be utilized in the production of fertilizer. As a form of fertilizer, seaweed has been utilized for many years. Today Algae are used by humans in many ways; for example, as fertilizers, soil conditioners, and livestock feed Aquatic and microscopic species are cultured in clear tanks or ponds and are either harvested or used to treat effluents pumped through the ponds Algaculture on a large scale is an important type of aquaculture in some places. Maine is commonly used as a soil conditioner Nutrition: Naturally growing seaweeds are an important source of food, especially in Asia. They provide many vitamins including A, B1, B2, B6, niacin, and C, and are rich in iodine, potassium, iron, magnesium and calcium. In addition commercially cultivated microalgae, including both Algae and Cyanobacteria, are marketed as nutritional supplements, such as Spirulina, Chlorella, and the Vitamin-C supplement, *Dunaliella* high in beta-carotene

**Algae are the national foods of many nations:** China consumes more than 70 species, including fat choy, a cyanobacterium considered a vegetable Japan, over 20 species; Ireland, dulse, Chile, cochayuyo. Laver is used to making "laver bread in the British Isles, in Korea, gim; in Japan, nor and aonori. It is also used along the west coast of North America from California to British Columbia, in Hawaii and by the Maoris of New Zealand, Sea lettuce and worse locks are salad ingredients in Scotland and Ireland. Greenland and Iceland The oils from some Algae have high levels of unsaturated fatty acids For example, Arachidonic acid is very high in Parietochloris incisa, where it reaches up to 47% of the triglyceride pool. Some varieties of Algas favored by vegetarianism and veganism contain the long-chain, essential omega-3 fatty acids, Algae are national foods of many nations: China consumes more than 70 species, including fat choy, a cyanobacterium considered a vegetable, Japan, over 20 species, Ireland, dulse, Chile, cochayuyo Laver is used to make "laver bread" in the British Isles in Korea, gim, in Japan, nori and aonori. It is also used along the west coast of North America from California to British Columbia, in Hawaii and by the Maoris of New Zealand Sea lettuce and badderlocks is a salad ingredients in Scotland, Ireland, Greenland, and Iceland.The oils from some Algae have high levels of unsaturated fatty acids. For example, Arachidonic acid is very high in *Pariefochloris incisa*, where it reaches up to 47% of the triglyceride pool. Some varieties of Algae. favored by vegetarianism and veganism contain long-chain, essential omega-3 fatty acids. Docosahexaenoic acid (DHA) and Eicosapentaenoic acid (EPA), in addition to vitamin B12 Fish oil contains omega-3 fatty acids, but the original source is algae, which are eaten by marine life such as copepods and are passed up the food chain.

**Pollution control**
Sewage can be treated with algae, reducing the need for greater amounts of toxic chemicals that are already used. Algae can be used to capture fertilizers in runoff from farms. When subsequently harvested, the enriched algae itself can be used as fertilizer.

Algae Bioreactors are used by some power plants to reduce CO, emissions. Pigments: The natural pigments produced by algae can be used as an alternative to chemical dyes and coloring agents.

**Stabilizing substances:** Carrageenan, from the red alga Chondrus crispus, is used as a stabilizer in milk.

**REFERENCES**


1. Abbasi, K., Moraadkha, S. and Sarpanah, A Identification and distribution of fish fauna in Siahdarvishan River (Anzali Wetland basin*). Pajouhesh and Sazandegi Journal*, 2006; 74: 27-39
2. Adams, V.D Water and waste-water examination manual. Department of the Environment, 2000; 260.
3. Addy, K. and Green, L Algae in Aquatic Ecosystems. University of Rhode Island College of Resource Development Department of Natural Resources Science. Cooperative Extension. Fact Sheet, 1966; 96: 1-4.
4. Anderson, J.B A Guide to the Common Diatoms at Water Pollution Surveillance System Stations. U.S. *Department of Interior Federal Water Pollution Control Administration*, 1966; 1-98.
5. Apha Standard method for the examination of water and wastewater American Public Health Association, Washington, 1986; 1265: 17.
6. Çolak, Ö. and Kaya, Z Alglerin atık suların biyolojik arıtılmasında kullanılma olanakları, Doğa Bilimleri Dergisi, 1988; 12: 18-29.
7. Compere, P Algues des desers d, Iran. Bulletin du Jardin botanique national de Belgique, Belgium, 1981; 51: 3-40
8. Ezekiel, E.N., Ogamba, E.N. and Abowei, J.F.N The Distribution and Seasonality of Phytoplankton in Sombreiro River, Niger Delta, Nigeria Asian Journal. of Agriculture Science, 2011; 3: 192-199.
9. Fumanti, B., Alfinito, S. and Cavacini, P Dipartimento di Biologia Vegetale, Universitd di Roma `La Sapienza', Floristic studies on freshwater algae of Lake Gondwana, Northern Victoria Land (Antarctica) Hydrobiologia, 1995; 316: 81-90.
10. Gomont, M Monographie des Oscillariees (Nostocacees Homocystees, Deuxieume partieLyngbyees. Edi: Weinheim, J. Cramer, 1972; 92-256.
11. Hirano, M Freshwater algae from Mesopotamia. Control Biolgy Laboratory. Kyoto. Univ, 1973; 24: 105-119.
12. Kim,Y. S., Choi, H. G. and Nam K. M Seasonal variations of marine algal in the community vicinity of Uljin nuclear power plant, Korea Journal of Environmental Biology, 2008; 29: 493-499.

13. Kiyanmehr, H Identification of fresh water algae of Mashhad provinces, Ferdosi Universiy, 1994.
14. Kolayli, S., Baysal, A. and Shahin, B Study on the Epipelic and Epilithic Algae of Sana River (Trabzon/Turkey), Turkish Journal of Botany, 1998; 22: 163-170.
15. Komulaynen, S Diatoms of periphyton assemblages in small rivers in Northwestern Russia, Studi trentini di scienze naturali, 2009; 84: 153-160.
16. Löffler, H Beitrage zur Kenntnis der Iranischen Binnengewasser. Int. Rev. Ges. Hydrobiol, 1961; 46: 309-406.
17. Maosen, H Illustration of fresh water plankton. Agriculture press, 1983; 1-44.
18. Moghadam, F Diatoms as indicator of pollution Zayandeh Rive, Iran. -Proceeding of the Academy of Natural Science of Philadelphia, 1976; 127: 281-297.
19. Nejadsattari, T., Noroozi, M. and Fallahi M The composition and seasonal distribution of epiphytic algae in Anzali lagoon, Iran. Cryptogamie. Algal, 2005; 26: 387-39
20. Noroozi, M., Naqinezhad, A. and Mehrvarz, S. Sh Algal flora in first Iranian landmarine the Boujagh National Park. International Journal on Algae, 2009; 11: 276-288.
21. Noroozi, M., Naqinezhad, A. and Mehrvarz, S. Sh Algal flora in first Iranian landmarine the Boujagh National Park. International Journal on Algae, 2009; 11: 276-288.
22. Oguni, A., Tanaka, Y., Uemura, M., Yamamoto, M. and Takahashi, E Floristic Studies on Algae from inland waters of Ongul islands and Vicinity, Antarctica: East Ongul island Proc. NIPR Symp. Polar Biolgy, 1987; 1: 233-254.
23. Oguni, A., Tanaka, Y., Uemura, M., Yamamoto, M. and Takahashi, E Floristic Studies on Algae from inland waters of Ongul islands and Vicinity, Antarctica: East Ongul island Proc. NIPR Symp. Polar Biolgy, 1987; 1: 233-254.
24. Pfiester, L. A., Lynch, R. and Wright, T.L Species composition and diversity of Phytoplankton in the Grand River Dam area, Oklahoma. Proceedings of the Oklahoma Academy of Science, 1980; 60: 63-68.
25. Prescott, G.W. How to know fresh water algae. WM. G Brown Company Publishers, 1945; 1-217.
26. Sen, B. and Sonmez, F A Study on the Algae in Fish Ponds and Their Seasonal Variations. Intnational Journalof Science and Technology, 2006; 1: 25-33.
27. Smith, G.M Phytoplankton of the Inland Lakes of Wisconsin Part I Myxophyceae, Phaeophyceae, Heterokonteae, and Chlorophyceae exclusive of the Desmidiaceae. Published by The state, 1920; 1-243.
28. Smith, G.M Phytoplankton of the Inland Lakes of Wisconsin Part II Desmidiaceae Madison. Published by the University, 1924; 1-227.
29. Starmach, K. Flora Slodkowodna Polski, Freshwater Biological Association, Windermere.UK, 1972; 10: 227-263.
30. West, G.S. Cambridge biological series, The British freshwater algae. Cambridge University Press, 1904; 372.
31. Zarei-Darki, B Marine Species in the Algal Flora of the Anzali Swamp (Iran). Russian Journal of Marine Biology, 2009; 35: 200–205.