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Cyanobacteria in Degradation of Sugar Mill Wastes

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ABSTRACT

Microorganisms growing naturally in fresh and salt water conditions includes microbes like bacteria,algae, rotifers, protozoa and cyanobacteria which are unicellular in organization. These are necessary in the food chain that construction the basis of life in water. The photoautotrophic cyanobacteria are utilized N and P compounds for their growth. Generally, cyanobacteria act as a 'bio remediators', these types of blue green algae play an important role in biodegradation and bioremediation process of some several contaminants like heavy metals, organic and some inorganic compounds, crude oils, pesticides, naphthalene and phenol. Bioremediation process used to degrade or removing the contaminants from the water source, which are industrial effluent. In the present study, sugar mill wastewater for bioremediation process by Cyanobacteria Species was carried out. Physical parameters like TDS, EC, Turbidity, pH, Odor, Color and Temperature were analyzed and, in these analysis, control's turbidity was lower than others (5th and 15th day), the sugar mill wastewater contains odor only in initial stage. Chemical parameters like Calcium, Magnesium, Chloride, Sodium, Potassium, Dissolved O2, Dissolved CO2, Nitrate, Sulphate, Phosphorus and COD test were determined and these results shown that the taken effluent contain free sulphate and magnesium. Biological parameters such as BOD value were calculated for parametric analysis using GraphPad prism 6 software. Finally reuse of sugar mill water for the process of irrigation of plant was checked by using Black chickpeas and found to be highly efficient.

Keywords:*Biodegradation, Cyanobacterial Species, Physical, Chemical and BiologicalParameters, Irrigation.*

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INTRODUCTION

Biodegradation is the degradation process of materials into environmentally sustainable products and the degradation, chemical compounds are removed or transformed by some biological actions of living microorganisms [1]. Basically, organic matter (carbon based) is converted from complex molecules to simple molecules by chemical processes, eventually returning the molecules to the environment. Mainly aerobic condition Microbes are used for the decomposition of organic substances. Some specific microorganisms, such as Fungi, Bacteria and Yeasts are play a major role in biodegradation and some aerobic Algae like Phytoplankton and Cyanobacteria Sp involved in degradation process. Biodiversity and its application, Cyanobacteria are used to treat domestic and industrial waste has been received more attention in recent years[2]. Cyanobacteria are capable of utilizing nitrogen compounds, ammonia and phosphate; In addition, they cumulate metal ions comparatively Cr, Co, Cu and Zn very efficiently. Since 1980, the pace at which cyanobacteria have been used for increased wastewater treatment and many more documents thereafter has been appeared. It has great potential to absorb outward nutrients like ammonium, nitrate, orthophosphate and some heavy metals, so it would be an ideal aspirant for tertiary treatment in urban areas, agricultural, industrial waste, in turn, it helps to solve eutrophication and the problem of metal toxicity in aquatic ecosystems. Therefore, to understand the process of biodegradation, and comprehension of the microorganisms that carry out the process is required. Microorganisms substitute the materials by way of metabolic or enzymatic processes. It is based on two important processes; development and metabolism. In development, an organic pollutant is utilized as the only source of carbon and energy molecules. This process results in complete decomposition (Mineralization) of the organic pollutants. Metabolism is explained as the metabolism of an organic substances in the presence of the growth substrate used as the primary carbon and energy source. Biodegradable material

is usually organic matter such as plant and animal products and other substances derived from organisms or synthetic such as plant and animal products used by microorganisms.Pollution is the result of undesirable changes in our surroundings, and lead harmful effect on plants, animals and humans. This only happens when there are short-term economic gains at the cost of long-term environmental benefits for mankind. No natural phenomenon led bigger environmental changes than ever before made by mankind. Solid, liquid *or* gaseous additives in pollutants, positions that are higher than natural-dance created due to human activity, that harmful to our environment. The nature and concentration of a pollutant, determines the severity of a adverse effects on human health. What the average man needs about 12kg of air per day, which is about 12 to 15 times more than the amount of food we eat. The sugar industry is an agro based industry that relies on sugarcane and sugarcane production. These industries make a significant contribution to the socio-economic development of countries as they meet one of the basic requirements for human survival. However, the sugar industry is often targeted for polluting the environment, like freshwater resources[3]. The major units in the sugar mill, such as the house, processing plant, boilers and cooling towers, are responsible for the production of waste. These wastes include suspended solids, oxygen-depleted wastewater, molasses, press-mud, and chemicals. Various governments, regulatory authorities and researchers around the world are involved in solving these environmental problems through research and effective management. Industrial waste management includes segregation, land use (composting), garbage filling and recycling. Segregation or extraction involves sorting waste by kind for constructive disposal. Land use or composting is the process of purifying waste and adding it to the soil through composting, which improves the quality of soil by adding more organic matter. The landfill is a waste landfill that cannot be recycled or composed- it is the preferred method of waste management because it releases waste directly into the environment.Recyclingis the recycling or reuse of waste products to make less the amount of waste produced. All of these processes also utilize the various waste management technologies available within the waste management facilities. Pollution prevention, as clarified by the Federal Government of Canada, is the applied of processes, practices, materials or energy to reduce the global risk to the environment or human health from the formation of pollutants and wastes. Recycling helps to greatly reduce greenhouse gas emissions and landscape. Energy is saved when waste products are used to make new products and some essential methods used for pollution prevention or pollution control especially for industrial waste.Biological method of pollutant control, Cyanobacteria play a crucial role, in the name of bioremediation. Use of environmental contaminants or pollutants by microbes, it's called bioremediation. Cyanobacteria are a rich source of biochemical compounds with antibacterial, antifungal, antiviral, anticancer and antiprotozoal activities. Many species of Cyanobacteria have the ability to accumulate polyhydroxyalkalonoids, which are used as bioplastics. In addition to this application, Cyanobacteria can be used in agricultural practices as bio-fertilizers, to improve wastewater biodegradation, as food, and in the production of hydrogen fuel, as well as enzymes such as protease inhibitors and neurotoxic membrane channel regulators and odorless compounds. Based on the cell type and reproduction systems and morphological characters, it classified in different types and also based on the character of pollution control, suitable species are used for the purpose. Some species are well expert in all type of pollutant degradation and some unique species are only target to the particular contaminants like, Cr, Mn, NH4 etc. Water quality testing is a necessary part of environmental management. When water quality is not well, it affects not only aquatic organisms but also the surroundings ecosystems. These sections describe all the parameters that affect the characteristics of water in the environment. These properties may be physical, chemical and biological parameters. Physical parameters of water include temperature, odor, turbidity, pH, color etc. Chemical parameters include such as Ca, Mn, dissolved oxygen, dissolved CO2 etc. Biological parameters of water quality include BOD. These properties apply not only to surface water surveys of oceans, lakes and rivers, but also to groundwater and industrial process. In this review, investigated that, comparison level of physical, chemical and biological parameters (used good and industrial polluted water for this study) with before and after treatment of polluted effluent with suitable concentrations. Water quality determining can help researchers for predict and study natural processes in the ecosystems and determine human impacts on the environment. These calculation efforts may assist in restoration projects or ensure that environmental standards are met. Based on mechanism of action in Cyanobacteria of biodegradation process, these species are widely used, as well as, the Cyanobacteria gives good results in the bioremediation process. The mechanisms suitable for soil improvement and wastewater treatment by the process of biodegradation. In future, pollution prevention, pollution control by biodegradation, decrease contaminated levels in the natural source, act on specific contaminants are the main platform of Cyanobacteria for biodegradation and bioremediation process. Cyanoremediation is an eco-friendly and cost-effective technique and this simple, harmless methods followed in future with additional level for the purpose of degradation.

REVIEW OF LITERATURE

Bioremediation

In 1930 Tausz and Donath proposed the use of microorganisms to clean soil contaminant or waste by petroleum derivatives, which led to biodegradable processes. Today, bioremediation is the most commonly used method to restore the natural and effective values of sites contaminated by microorganisms that can decompose, modify or heterocyclic various toxic compounds[4]. Microbes can break down organic pollutants using carbon and energy as a source or through cometabolism. Heavy metals cannot be biologically decomposed or destroyed and cannot be transferred from one oxidizing state or another to an organic compound. This changes their water solubility and reduces their toxicity. Bioremediation is environmentally friendly, non-invasive, non-expensive than conventional methods, and is a permanent solution that converts degradation or environmental pollutants into harmless or less toxic [5].Based on the strategies applied, it will be classified into two types: 1. In situ and 2.Ex situ bioremediation. According to organisms used, it will be classified into three types: 1. Microbial bioremediation, 2. Phytoremediation, and 3. Mycoremediation.

Pollution And Their Types And Causes

Pollution is the environmental related process, in this process, the chemical substance or harmful products or toxic materials are introduced into the environment that causes adverse changes. Contaminants such as volcanic ash may be natural. They can also be generated by human activity, such as garbage or waste generated by factories, these Pollutants will cause damages in air, water and land quality. Pollution is a global problem. Although urban areas are generally more polluted than rural areas [6]. Soil pollution, Radioactive pollution, Chemical pollution, Water and food pollution, Biological pollution are the major kinds of pollution, usually it has been classified by environment. The modern world concerned about some specific types of pollutions, such as Noise pollution or Sound pollution, Thermal pollution, Light pollution and Plastic pollution. Deforestation, Global warming, Acid rain, Industrialization and their waste, Mining activities, Marine dumping, Used more pesticides and harmful substances to the land or water source are the major kind of causes for the pollution.

Industrial Pollution

Industrial pollution is pollution that can be directly connect with industries, this type of pollution is leads to cause high pollution in worldwide. There are many farms of industrial pollution and it can affect air quality and it can penetrate into the soil and cause widespread environmental issues. Industrial pollution or industrial activities are the major source for air, land, and water pollution[7]. With the approach of the industrial revolution, humans were able to advance further into the 21st century. Technology grew rapidly, science became advanced, and the age of production came into view. In all of this came one more effect, industrial pollution. Previously factories were small industries that produce primary pollutant like smoke. However, due to the small number of factories and the limited number of working hours per day, the level of pollution did not increase significantly. But as these factories became full-fledged industries and units of production, the issue of industrial pollution began to gain more prominence. Various industries that pollute the mining and metal industries, power plants, manufacturing plants, processing industries.Major pollutants in industrial pollution are, Nitrous oxide, Sulphur dioxide, Nitrogen dioxide, Sulphureous oxide, Chlorine gas, Carbon dioxide, Mercury, Particulate matter, Smoke coal dust, Fly ash, Fluorine, Inorganic waste pigments, Alkalis, Phenols, Chromates, Organic wastes, Heavy metals and Even hot waste.

Types Of Industrial Pollution

Depends on the industry and their waste product, its leads to cause pollution. Example, Caustic soda industry produced mercury and chlorine gas as a waste product. Dye industry produced inorganic waste pigments. Iron and steel industry produced smoke, gases, coal dust, fly ash, fluorine. Oil refineries produced toxic gases and organic waste. Nuclear power station produced radioactive waste material. In food processing, alkalis, phenols, chromates, and organic waste are produced. Textiles industry produced organic waste in water or dye farm and in particular, Sugar mill produced molasses and some organic waste and this pollution is called sugar industry pollution. Based on the waste products, it will be classified by water, soil, noise or air pollution. Water from tannery industry, sugar mill industry, food industry, distillery organic waste are the types of industrial water pollution, Smoke from the industries like toxic gases, fly ash, coal dust, cement dust and other particular matter are the kind of air pollution, Fertilizer like ammonia and cyanide components, pesticides, and other chemical waste and their process, inorganic waste pigments(dye) from industries are pollute the soil nature and farm a land pollution[8]

Sugar Industry Pollution

The sugar industry plays a crucial role in the economic development of India. However, the wastewater generated from these factories bears a heavy load of pollution[9]. Sugar factories in India produce about 1000 liters of wastewater per ton of cane crushing. Wastewater from the sugar industry, if discharged

untreated, can cause pollution problems in aquatic and terrestrial ecosystems. The sources, characteristic, latest developments in aerobic and anaerobic, physical and chemical purification technologies and areas in need of further future research are explored in the sugar industry. The possibility of reusing treated wastewater was also explored [10].Most of the research work for sugar factory wastewater treatment is carried out by anaerobic treatment processes. However, oil and grease do not decompose easily by anaerobic processes. Furthermore, the anaerobic process decomposes nutrients to some extent, while aerobic processes use more energy. Anaerobic -aerobic combined systems completely remove organic matter. Unfortunately, there are very few studies of anaerobic-aerobic integrated systems, and more work is needed in this area[11]. Effluent from sugar factory have high amount of biological oxygen demand, Chemical oxygen demand, Total suspended solids (TSS), Sulphate, and so many pollutants. The sugar industry generated some farm of wastes such as, Press mud, Bagasse, Bagasse fly ash, Sugar cane trash, Sugar beet mud, Sugar beet pulp, Molasses andContaminated heavy material wastewater, etc…

Methods Used For Pollution Control In Industrial Waste

Pollution prevention, as defined by the federal government of Canada, is the use of processes, practices, materials or energy to reduce the overall risk to the environment or human health from the formation of pollutants and wastes. The pollution prevention Act has been done in 1990 deals with P2 methods of source reduction, recycling, subsequent energy recovery, purification and release of chemical waste into the environment in an environmentally safe manner, source reduction and much less disposal in the environment[12]. The benefits of implementing the methods mentioned above are beyond government requirements and obedience. Large auto companies, comparatively General Motors, have raised $ 1 billion by recycling waste and reducing waste by trying to become landless. The three methods used for pollution prevention or pollution control in relation to industrial impurities management [13]. include,Source reduction or controlRecycling and Proper treatment of industrial waste.

Cyanobacteria

Cyanobacteria is a single cellular, gram-negative bacterium, which is also known as Cyanophyta, that obtain energy through photosynthesis process, that has the ability to install in a wide variety of environments, from primitive hot springs to eutrophic aquifers. Their dominance and survival in these adverse habitats are due to the plasticity of their morphology and metabolisms, as well as the secretion of allele/biochemicals or the mucosal envelop[14]. Their growth in polluted areas also improves the water quality of these polluted habitats. This is because Cyanobacteria have high N and P requirements; Sewage (Sewage / municipal mixed water) with high loads will act as a cultural medium to enhance their growth and indirectly reduce the nutrient load, which will be useful for other uses. Apart from this, they are found to be effective in removing heavy metals and other contaminants such as minerals and organic contaminants from various effluents. This chapter is an attempt to summarize reports on the biodiversity of Cyanobacteria and their role in repairing wastewater in various aquatic water around the world and in India. Some Cyanobacteria are rich in proteins and vitamins that are used as food. The potential uses of Cyanobacteria in various fields are Anti-bacterial, Fungal, Viral, Algal, Cancer compounds producing, Protease inhibitors, Cyanobacterial bioplastics, Odor producing metabolites, producing biofertilizers, source of renewable energy and the process of Bioremediation [15].

Physical, Chemical And Biological Properties Of Good And Industrial Waste Water

Water quality is determined by physical, chemical and biological parameters Of water. The quality characteristic of this water are worldwide with wide variation. Hence the quality of natural water resources used for various purposes, should be installed based on specific water quality parameters that affect the most possible use of water.

Mechanisms Of Action In Cyanobacteria Of Biodegradation

As bioremediating agents, Cyanobacteria have some advantages over other organisms because they are capable of self-sufficiency for growth and survival in extreme conditions due to trophic freedom for nitrogen. Cyanobacteria are widely used as low cost remedies for phosphorus (P) and (N) rich domestic wastewater, adding these nutrients to the organism. In addition, they are efficient insurgents for the removal of large amounds of metals from the environment due to their high metal absorption and good growth. Cyanobacteria paly a key role in the degradation of various industrial wastes from sugar mills, paper mills, distilleries and oil refineries, dyes and pharmaceuticals. Some Cyanobacterial a species, including *Synechococcus Sp, Cyanothece Sp, Nodularia Sp, Oscillatoria Sp* are the dominant plants in industrial waste. Many species, such as *Synococcus, Microcystis, Oscillatoria, Noduleria, Anaphena* have the ability to decompose linden residues [16]. They can also be used for tertiary treatment of agro -industrial and urban wastes, which helps to reduce eutrophication and bio-accumulation from aquatic and terrestrial ecosystems. In another study, *Anacystis nidulans, Microcystis aeruginosa, Synechococcus elongatus, Nostoc Sp, Anabaena Sp* and *Lingbya Sp* . Growing Cyanobacteria in sewage has the potential to reduce contaminants, which can help alleviate the burden of pollution. The bacterio-cyanobacterial

association of phormidium chorium and microglial cyanoblasts has successfully corrected isolation from the oil-rich atmosphere of the Arabian gulf, and has shown great potential for decomposing n-alkanes in oil-contaminated water and soil.

Reuse Of Sugar Mill Water For Irrigation

Irrigation is the agricultural related process of applying a limited amount of water to the land to support the production of crops, as well as the cultivation of terrestrial plants and meadows, which can be called irrigation. Agriculture that relies solely on direct rainfall without the use of irrigation is referred to as rainfed. Irrigation has been a central feature of agriculture for over 5000 years and was developed independently by many cultures around the world [17]. Irrigation helps to grow agricultural crops, maintain landscapes, and cultivate disturbed soils in arid areas and during periods of below average rainfall. Irrigation also has other uses in crop production, including frost protection, suppressing weed growth in grain fields, and preventing soil consolidation . Human impact on the water bodies has become relevant, especially for agriculture, as rivers, lakes and water bodies are increasingly exploited. In most countries agriculture represents the largest use of water and globally it accounts for 70% of total returns and 90% of water consumption. Sewage reuse has been proven as an alternative to mitigate anthropological impacts to address this problem [18]. In addition, the reuse of raw wastewater in agriculture is a valuable tool available to developing countries to control pollution and address the challenge of increasing or reach high food production in water-scarce areas. Population growth and economic growth in emerging American countries have encouraged the implementation of a number of agricultural recycling programs, some of which are summarized below. In Mendoza, Argentina, an area known as Combo Espezo is irrigated by source wastewater (2000 ha), but currently produces 129,600 m3\d of stabilization ponds for 1900 ha of irrigation. Chile has a number of successful recycling project, including the 130,000-hectare irrigated Mybo and Mybocho areas; Antofagasta produces about 20,000 m3\d of purified water and irrigates 65 hectares; and the 110,000-hectare Santiago de Chile uses reclaimed water with first use water.

Future Scope Of Cyanobacteria In Bioremediation

Genetically engineered Cyanobacteria can improve the degradation of organic pollutants, but more in-depth research is needed to explore new genes that contribute to the degradation of various compounds. Current systems for introducing organisms for biological treatment of contaminated areas are restricted to activating biodegradable microorganisms from the soil. Cyanobacteria- based technologies show many benefits in conventional wastewater treatment, including energy consumption reduction, biological sorting of industrial flue gas and biofeedback for valuable products. Nevertheless, many research gaps need to be filled before Cyanobacteria-based technologies can be implemented on a large scale [19]. The new dry inoculum of Cyanobacteria is effective in improving soil fertility and restoring saline affected soil. The relevant mechanisms are not fully understood, but are necessary to improve the effectiveness of salt-affected soil adjustment. Cyanobacteria used bioremediation are widely cost-effective and eco-friendly method. In environmental detoxification, biodegradations, bioremediations are the prevention methods of pollutants and these methods, Cyanobacteria play a major role in past and future.

MATERIALS AND METHODS

Sample collection

Test samples (Fresh water- Cyanobacteria) were collected from Trichy Research Institute Biotechnology, Trichy. Tamil Nadu. (Lattitude 10.7905° Nand Longitude 78.7047E).Sugar mill wastewater were collected from Perambalur district.The fresh water Cyanobacteria collected to view under the microscope in 100X.

Physical Parameters

pH of the sample was measured by an electronic portable pH meter.Total dissolved solid levels of sample were analyzed using digital TDS meter. The results were noted in triplicates. The electrical conductive ability of sample from was assessed using a digital conductivity meter. The results were tabulated.The thermometers ability of sample from was assessed using a digital meter. The results were tabulated.The photo colorimetric ability of sample from was assessed using a digital meter. The results were tabulated.. Bacteria is the most common problems that cause odor in water. To appraise the cause, put a small amount of water (H_2O and Sugar mill wastewater) in a narrow glass, step away from the sink, swirl the water on every side inside the glass, and smell it and the results were tabulated.Color is eliminated to make water suitable for general and industrial applications and is determined by visual comparison of the sample with distilled water.Chemical parameters were also asessed by standard procedures and expressed in graph .

Biological Parameter

The sample having a pH of 7 is determined for first day D.O. different dilutions (at least 3) are prepared to obtain about 50% depletion of D.O. using sample and dilution water. The samples are incubated at 20 ^{o}C

for 5 days and the 5th day D.O is noted using the oximeter. A reagent blank is also prepared in a similar manner.

Reuse Of Sugar Mill Water For Irrigation

The treated sugar mill water used for the irrigation process and also Black chickpeas used as a sample material for the irrigation of plant. The black chickpeas was socked for 5 to 6 hours. Taking a soil, its contains treated water for the alternation of good water source. The socked sample material (Black chickpeas) was spreaded or put into the soil. Used only treated water for moisturization of the plant from 0th day to 15th day. Analysed the 15th day results of irrigation.

RESULTS AND DISCUSSION

Under the microscope, Cyanobacterial Species were confirmed by morphological charecters [Fig 1]and found, and collected polluted water from the sugar mill was tested [Fig 2] before treatment as 0th day reports revealed that the findings of Physical and Chemical parameters and the results indicate the low level of p^H which means, the water was more polluted with contaminants[Fig 3A, Fig 3B & Fig 3C]. The outcomes of the 5th day treatment of contaminated treated water by Cyanobacterial Species were visualized inafter treatment, the water contain alkaline minerals because the value of p^H was higher. parameter analysis was used to test the 15th day results of treated water. In addition, presented the H2O parameter analysis reports. The Bod and Cod values of the treated water, as well as their findings, were visualized after the parameter analysis. The treated water was used for plant irrigation after degradation [Fig 4].Hussein El-Sayed Touliabah *et al.,* 2022 suggested that, the degradation for wastewater treatment is highly ecofriendly and environmentally more stable than other methods with other Bacteria. New biological technology using algae and Cyanobacteria are reasonable and for the removal of a wide range of organic contaminants great ability. The spread of organic contaminants in aquatic habitats poses a risk to health and the well- being of many sea creatures. Agriculture, industry and household waste are some of the sources of organic pollution caused by humans, which pollute waterways around the world. Before discharging pollutant into aquifers, it must be cleaned. Algae based pollutant treatment systems are becoming increasingly popular due to their environmental sustainability and absence of secondary pollutants[20].

Solomon Ofori *et al*., 2021 suggested that, the exact nature of the use of treated wastewater for crop or agricultural irrigation is controversial among experts and policymakers. It begins by highlighting the growing water insufficiency, the history of wastewater reuse in agriculture by irrigation, and the obstruction of existing studies [21]. Environmental impacts, public health influence and economic determination, based on environmental impacts, the effects of soil quality, water resources , plant growth and further soil microbial communities are analyzed. For each subgroup, the positive effects are demonstrated before the negative ones. The same mode is applied to public health hazards, whose focus on the human conversance with heavy metals and pathogens and the economic impacts, particularly on investment costs, financial benefits for wastewater treatment plants, and farms. Innovative measures are proposed to weigh the advantages and disadvantages of each area and to improve the advantages of using degraded wastewater for crop irrigation. Special attention was paid to the contaminants of the known or comprehend environmental and health hazards associated with these contaminants.

CONCLUSION

The results of bioremediation by Cyanobacteria Species, used to degrade or removing the contaminants from the water source, which are industrial effluent (Sugar mill wastewater). After treatment, the parameter analysis (Physical, Chemical and Biological) reports shown that, the sugar mill wastewater contains odor and color only in initial stages and the turbidity values was lower in control than others (5th and 15th day). Chemical parameters like calcium, magnesium, chloride, sodium, potassium, Dissolved O2, Dissolved CO2, nitrate, sulphate, phosphorus and COD and BOD test were determined and these results shown that the taken effluent contain free sulphate and magnesium. Some chemical compounds were degraded by bioremediation. And finally, confirmation of the bioremediation is done by the method of 'Irrigation', reuse of sugar mill water for the process of irrigation of plant by using Black chickpeas and the final day irrigation reports were analyzed.This researchreported the studies presented drinking water and sugar-mill waste water. Contaminated water mixed with drinking water is predominant and primary contaminant due to poor quality and pollution, poor hygiene and contaminated systems. The Second source of pollution is chemical pollution from toxic materials from the industrial waste, textile dyes, pesticides, nitrogenous fertilizers, arsenic, and other chemicals. There is a need to maintain and improve the routine inspection of existing refineries. Degradation is the best method for breakdown the chemical compounds presented in polluted sources. The results showed that, treated polluted water by using Cyanobacteria Species, helps to reuse of irrigation process.

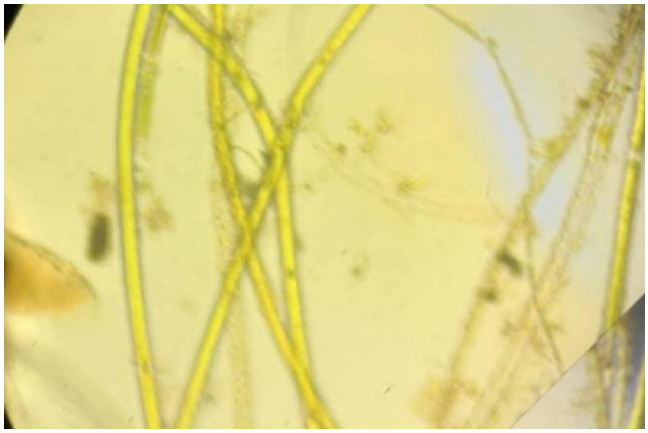
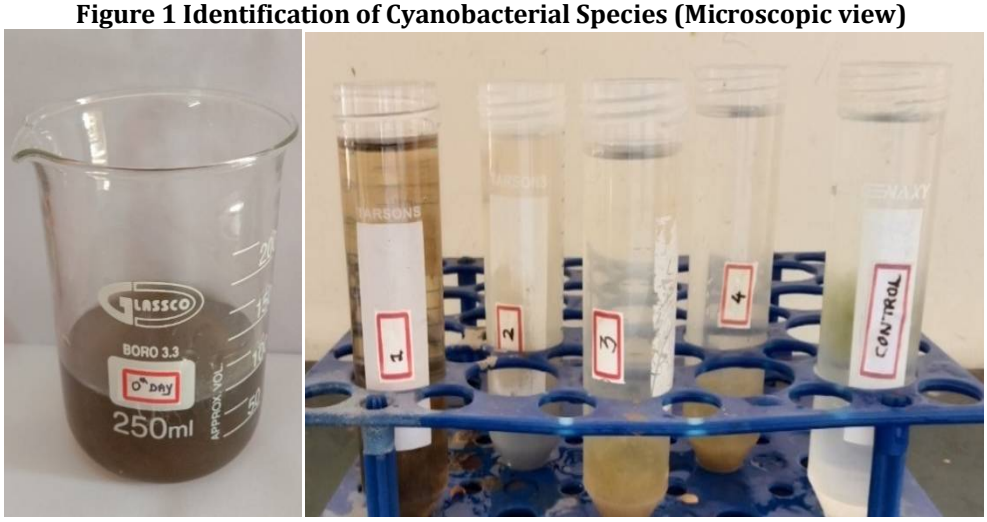


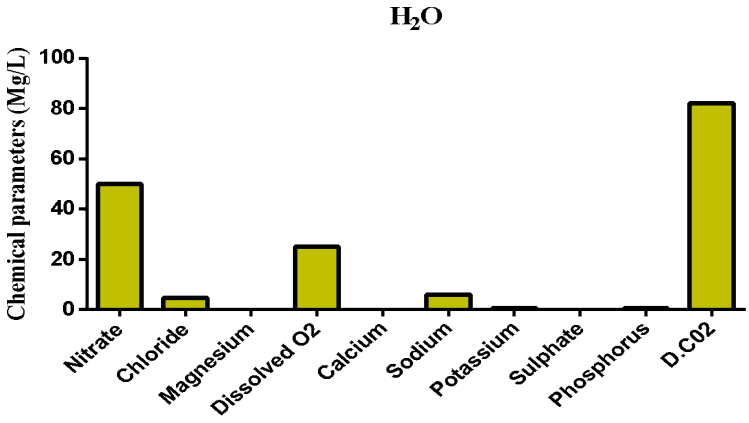
Figure 1 Identification of Cyanobacterial Species (Microscopic view)



Before treatment **After treatment**

Figure 2 Parameters Analysis

Analysed Physical, Chemical and Biological parameters of$H_2O$and polluted water from 0th day, 5th day and 15th day.



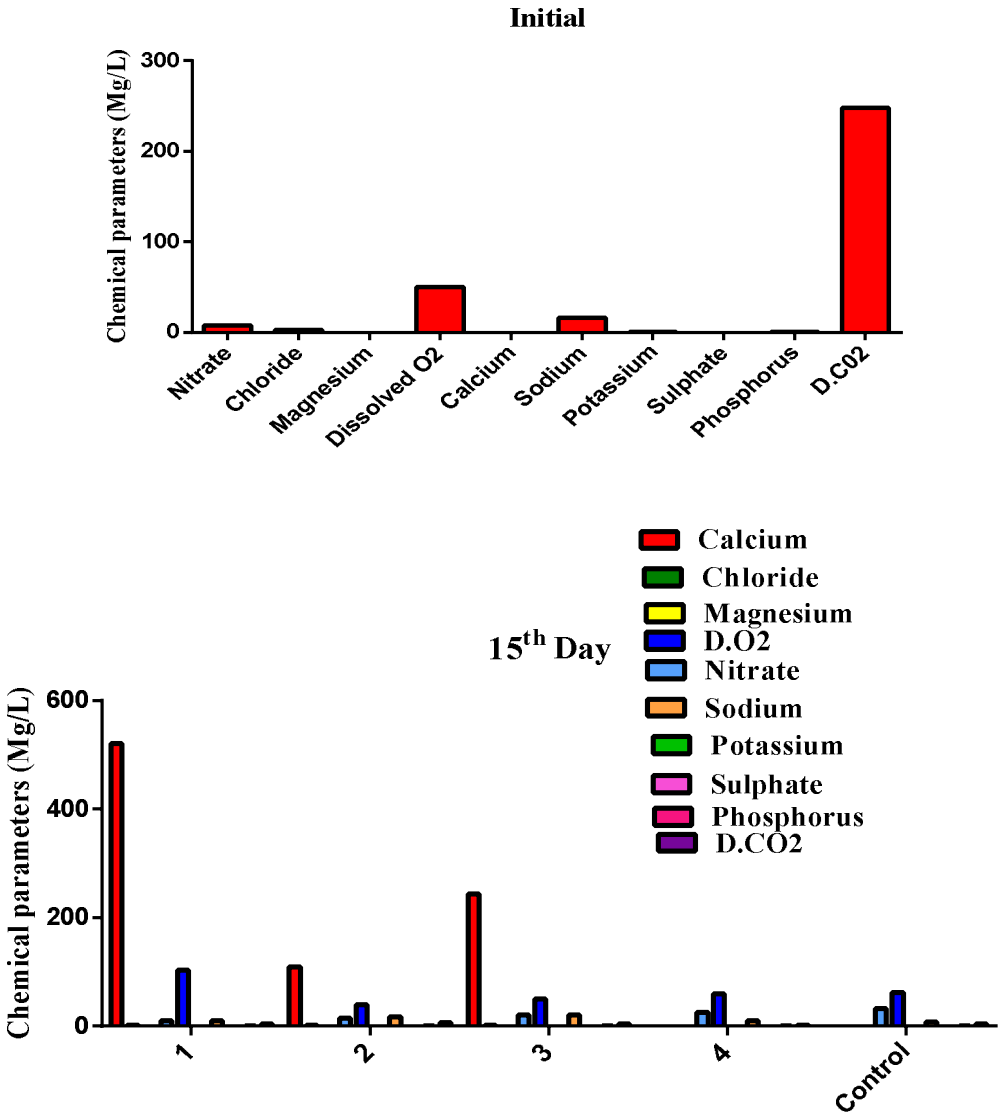


Figure 3A, 3B and 3C Physiochemical parameters

Figure 4 Reuse Of Sugar Mill Water For Irrigation

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CONFLICT OF INTEREST
The authors declare that they have no conflict of interest.

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