International Journal of Advanced Research in Engineering Technology & Science
ISSN: 2349-2819
Email: editor@ijarets.org Volume-7, Issue-3 March- 2020 www.ijarets.org

CYANOBACTERIAL GROUPS TO HELP IMPROVE PADDY SOIL AND YIELD

Mohd.Rehan Khan & S.N.Tiwari

Biological research lab

Kutir Post Graduate college chakkey jaunpur 22146

ABSTRACT

The rise in the number of people living on the planet over the last several decades has led to an increase in the demand for food, which may be satisfied to a greater extent by increasing agricultural output. In addition, farming practises need to become more sustainable because the use of chemical fertilisers, pesticides, and growth stimulants can lead to serious environmental issues and lead to the depletion of limited resources such as phosphorus and potash, which in turn leads to an increase in fertiliser quotas. These issues can be avoided by switching to methods that do not rely on these substances. The use of substances originating from biological sources that are known to have action in plant nutrition, safety, and stimulation is one possibility that may be considered practical for the creation of a more sustainable and evidently more productive agriculture. When it comes to these goods, the biomass of microalgae and cyanobacteria (or the extracts of these organisms) receives a lot of attention since it may give vital nutrients and metabolites that have extraordinary bioactivities and can greatly boost the amount of vegetative production.

Keywords: Cyanobacterial, Paddy Soil and Yield

INTRODUCTION

Cyanobacteria are the most common type of organism that may be found across the whole cosmos. They are capable of producing their own food and may be discovered in a broad variety of habitats, but they are most frequently found in saltwater and freshwater environments. Cyanobacteria may obtain the largest quantity of the nutrients essential to their development from the saltwater in which they live. They are quite small and virtually totally composed of a single cell; nonetheless, they regularly form in the form of enormous colonies. Cyanobacteria are made up of a broad variety of bacteria that range in size and species, and it is possible that they comprise all 150 genera of bacteria that have been identified up to this point in time. They possess characteristics that are similar to those of the oldest fossils, which date back more than 3.5 billion years. They are to blame for the oxygen-dense environment that prevails on the day of the dose, which is still another reason why they are significant to the process of evolution.

In 1985, a categorization scheme for cyanobacteria was first put up for consideration. Under this classification scheme, the orders Chroococcales, Nostocales, Oscilatoriales, and Stigonematales of microorganisms were recognized, along with the respective phyla Chroococcales, Gloeobacterales, and Pleurocapsales of each of those orders. There is a close relationship between cyanobacteria and a wide array of natural plant groups.

Throughout the course of Earth's history, cyanobacteria have played a part that has been incredibly crucial in determining the trajectory that ecological alterations and the process of evolution have followed.

Endosymbiosis is the term given to the process through which cyanobacteria began to colonize positive eukaryotic cells after the advent of eukaryotes. This process came to be known as endosymbiosis. During the late Proterozoic or early Cambrian time period, this process took occurred. They have the ability to convert nitrogen taken from the air into a form that may be utilized as a biofertilizer, which might then be put to use in the production of crops of major economic importance, such as rice and beans. The outermost layers of cyanobacteria are composed of a mucus layer, a moveable wall, and the plasma membrane that is located most inside. To the overall structure of the cyanobacteria, each of these levels brings something distinctively different to the table. There are no plastids present in the cytoplasm since it is composed of colored layers that cannot be separated out. Pigments can take many forms and some common examples are chlorophylls, carotenoids, xanthophylls, c-phycoerythrin, and c-phycocyanin. There is a possibility that blue-green algae include the other two pigments.

THE RISING ROLE OF CYANOBACTERIA AS A FUNCTIONAL FOOD

Functional ingredients are those that include considerable quantities of many vital elements, including proteins, carbohydrates, vitamins, fatty acids, and minerals. These nutrients can be found in functional ingredients. In addition, they may include bioactive molecules, which are sometimes referred to as plant-derived chemicals, animal-derived chemicals, or microorganism-derived chemicals. These are compounds that are helpful to human health and are derived from plants, animals, or microbes. Because of the beneficial, therapeutic, and nutritional properties that cyanobacteria possess, there is a possibility that they might one day be utilised in the food business as dietary supplements. Cyanobacteria is an attractive alternative for the production of sustainable food because of its worldwide distribution, nutrient-rich material that requires little water to grow and thrive (saline water can also be used), less land that can be barren and messy when other plants are present, digestion product stability over a wide pH and temperature range, etc., without any problems. These characteristics make cyanobacteria an ideal candidate for this type of production. It is added to meals such as snack foods, pastas, sweets or chewing gums and drinks with the intention of boosting the nutritional value of these items. In addition to functioning as a natural source of food coloring, it also provides an antioxidant.

USE OF CYANOBACTERIA AS ORGANIC FERTILIZER

The current population is expanding at a consistent rate, and it is estimated that in the next 30 years it will reach around 9.7 billion people. It's conceivable that most of the folks here are from India (DESA UN, 2015). In order for population growth to take place, there is an urgent and tedious need to fulfill the need for food that is both nutrient-dense and virus-free. By the year 2029, the World Health Organization's forecasts indicate that the overall quantity of food that the world produces will have increased by fifty percent from its current level. The practices that emerged as a direct result of the Green Revolution assisted in increasing agricultural output while simultaneously lowering the dangers that were posed to human health and the environment by primarily chemical fertilizers. These dangers were caused by the use of chemical fertilizers. As a result of this, the researchers used microorganisms as a component of their "green technology" in order to produce an environment that was friendlier to the environment. The book "The Green Generation" digs into the variety of circumstances that led to the development of cyanobacteria as a way of enhancing agricultural yields and improving soil quality. One of these causes was the adoption of cyanobacteria as a means of improving soil quality. Cyanobacteria have the capacity to digest a broad variety of pollutants and conduct a number of tasks in the environment of the soil to help protect its fertility. Cyanobacteria also have the ability to execute these functions in a variety of environments.

Cyanobacteria are a type of novel microorganism that has the potential to contribute to the sustainable development of agriculture. a hypothetical scenario that serves as an instance of the potential role that cyanobacteria may play in ecologically friendly agriculture and in the protection of the environment. Cyanobacteria that are known as diazotrophs are helpful in this day and age since ecologically acceptable biological fertilizers can now be bought at a low cost and are very easy to get your hands on. They are able to increase the aeration of the soil, the water holding capacity of the soil, and the B12 load nutrition in the soil. Also, they are able to adjust the nitrogen deficiency that is present in the flora. The green cyanobacteria known as Nostoc linka, Anabaena variabilis, Aulosira fertilisima, Calothrix sp., Tolypothrix sp., and Scytonema sp. are responsible for the production of cyanotoxins. has the highest nitrogen solubility of any of the species that is currently known. They can fix up to 25 kg/ha of nitrogen from the air, they live in soils and rocks with a shallow depth, and they are found naturally in agricultural zones where Anabaena and Nostoc rice crops are cultivated. Anabaena has the capacity to fix sixty kilograms of nitrogen per hectare per season, and it also has the power to populate the soil with natural counts of cyanobacteria, which do not need to be counted for their growth, development, or the formation of significant organic matter. An example of a symbiotic interaction that leads to nitrogen fixation and nutritional enrichment may be seen in the rice field association between Azolla and Anabaena. They were able to demonstrate that the lignin in the cell wall was destroyed, which led to the release of phenolic compounds that triggered abundant sporulation in the organism. This was accomplished thanks to the fact that the lignin was degraded. There have been reports of these biofertilizers being used successfully in the growth of barley, oats, tomatoes, radishes, cotton, sugarcane, maize, peppers, and lettuce. These crops have all received positive feedback.

NITROGEN FIXING

Blue-green algae, also known as cyanobacteria, have the ability to convert nitrogen dioxide (N2) in the air into organic forms of nitrogen that are easier for plants to assimilate. This process allows blue-green algae to contribute to the replenishment of nitrogen in the atmosphere. Nitrification is the name given to this process. When there are more vigorous blooms present, the likelihood of this technique being successful is greatly increased. Because of this, the incorporation of cyanobacteria into the ground causes an increase in the amount of nitrogen that is easily available to plants. Nitrogen is a nutrient that is vital to the growth of plants and is classified as a vitamin. Plants cannot grow without it. It has been demonstrated in the past that the presence of cyanobacteria in agricultural soils is linked to a number of benefits, one of which is the production of a greater variety of crops. Another benefit that has been linked to the presence of cyanobacteria in agricultural soils is an increase in crop yield. One of the advantages that has been connected to the presence of cyanobacteria is this particular benefit.

For instance, Jha and Prasad arrived at the conclusion that the application of a cyanobacterial inoculum to a rice scoop resulted in an increase in the grain and straw yields as well as an improvement in the amount of nitrogen that was supplied to the soil. This was discovered by observing what happened when the inoculum was applied to the rice scoop. They arrived at this verdict after noting an increase in the quantity of nitrogen that was added to the soil during the course of their research. In a manner that is analogous, Singh and Datta demonstrated that the spurs used increased the development of normal rice harvests by utilizing Anabaena variabilis lines in a rice discipline. This was done to ensure that the spurs were effective. This was done in order to maintain the discipline associated with rice. This comprises a rise in plant height in addition to an increase in the duration of leaves as well as an increase in the development of leaves. This also includes an

increase in the number of leaves produced by the plant. In addition to this, the spurs were responsible for the increased production of seeds, grains, and straw during this time period. Rice was used as the subject of the research that was conducted who found that the inclusion of Nostoc sp. When compared to the results obtained while only utilizing a nitrogen-based primary chemical fertilizer, the grain yield that was achieved by employing vegetative cells was much greater. After carrying out an investigation, they reached this realization as a result of their findings. Even though the majority of people who took part in the study believed that cyanobacteria should be utilized in rice fields, more recent studies have shown the positive benefits that cyanobacteria may have on a wider range of crops. This is despite the fact that the majority of people who took part in the study believed that cyanobacteria should be utilized in rice fields. This is despite the fact that the vast majority of respondents who participated in the study held the opinion that rice fields ought to make use of cyanobacteria in some capacity.

OBJECTIVES

1. Analysis of soil physico-chemical parameters and nutritional status of selected paddy fields.

2. Isolation and identification of the diversity of cyanobacteria found in rice fields.

NUTRITIONAL AVAILABILITY IN THE SOIL

There is a possibility that the availability of a variety of vital plant nutrients can be improved by the introduction of microalgae and cyanobacteria into the soil. Microalgae and cyanobacteria, both of which are photosynthetic microorganisms, have the ability to take up nitrogen and phosphorus from certain environments (even those in which these vitamins are in limited supply) and store them in their biomass. This allows them to take up nitrogen and phosphorus from environments in which these vitamins are in limited supply. This is due to the fact that both of these bacteria include chlorophyll, which enables them to transform the energy from light into the energy that can be used chemically. There is a possibility that the byproducts of cyanobacteria and microalgae should be regarded as the principal source of these vitamins. This occurs as a result of the fact that the growth of plant life need certain vitamins in order to be successful. As a result of this, it is feasible to do away with the usage of the traditional artificial fertilizers altogether. It is conceivable for the biomass of microalgae and cyanobacteria to contain trace levels of other elements including potassium, magnesium, sulphur, and iron. This is because these organisms are complex and diverse. All of these components are essential for the formation and expansion of plant life in order for it to exist. These components are commonly involved in redox reactions and serve a very major purpose in the metabolic processes of plants. They also play a role in oxidation and reduction reactions. They also play an essential part in the metabolic processes of animals.

Because of this, the incorporation of microalgae and cyanobacteria into the soil has the potential to boost the availability of both macro- and micronutrients, which is beneficial to the development of plant life. In the past, there have been reports on this shift in the availability of nutrients that have been discovered in the scientific literature. Microalgae, bacterial flocs, and nitrogen all had a role. oculata biomass were all transplanted into a tomato lifeform in order to carry out this study's objectives. After that, the researchers analyzed the effects of various treatments on the makeup of the soil as well as the growth of the fruit. Researchers came to the conclusion that the presence of photosynthetic organisms accelerates the availability of nitrogen, phosphate, and potassium in the soil, and it also stimulates the creation of high-quality fruits by increasing the amount of

sugar and the carotenoid content. Both of these benefits can be attributed to the fact that the presence of photosynthetic organisms increases the amount of sugar and the carotenoid content. Both of these advantages may be traced back to the fact that the presence of photosynthetic organisms quickens the rate at which these components become available in the soil. Tomato output was lower when organic fertilizer was utilized as contrasted to when artificial fertilizer was administered, despite the fact that this was the case.

PHYSICAL AND CHEMICAL CHANGES IN THE SOIL

Because microalgae and cyanobacteria are able to I adjust the pH of the soil, (ii) remove heavy metals and other pollutants from the soil, and (iii) manage the amount of salinity in the soil, they are able to play a significant role in the rehabilitation of damaged soils. When it comes to the regulation of pH, a number of studies have shown that the introduction of material composed of microalgal or cyanobacterial organisms into soil either raises or lowers the pH of the soil, depending on the direction in which the shift occurs. Yet, it is essential to emphasize the positive impact that this substance has on controlling the acidic or alkaline features of a wide range of soils. This influence may be seen as both useful and crucial. Its impact may be found in a variety of different soils around the world. When looking at the salinity of the soil, a significant number of studies have indicated that higher levels of salinity are associated with greater rates of plant growth. It was determined that there was a significant connection between the two. Either by I lowering the soil's saltiness (by increasing the soil's ability to retain water), which in turn makes plants more tolerant of high concentrations of salt, or by (ii) reducing the soil's saltiness overall, this improvement either I makes plants more tolerant of high concentrations of salt. (this may be accomplished by using gibberellic acid, which is a phytohormone that is often discovered in cyanobacteria and microalgae). In conclusion, microalgae and cyanobacteria have the ability to form bonds with a wide variety of substances, including hydrocarbons, heavy metals (such as cadmium, lead, and chromium), trace elements (such as iron, zinc, copper, and manganese), and other substances (such as cadmium, lead, and chromium). Because of this, the addition of phytoplankton and cyanobacteria to the soil might potentially assist enhance the quality of the soil and the nutrients it contains, in addition to making a contribution to the overall growth of the soil.

We conducted research to see whether or not diesel and biodiesel polluted soils might be decontaminated using sleeping cells obtained from Spirulina platensis and phycocyanin formulations derived from the same species. As compared to the control, it was shown that extracts of phycocyanin and dormant cells were equally effective at removing hydrocarbons from soils that had been polluted. The removal of biodiesel was accomplished with the greatest success (88.8%) by phycocyanin extracts, whereas S. platensis latent cells were shown to be the most effective in diesel removal (63.9%). Not only are microalgae and cyanobacteria important for replenishing the soil with essential nutrients and restoring its properties, but they can also improve certain soil properties such as aggregation, porosity, permeability, aeration, and moisture. This is because microalgae and cyanobacteria are symbiotic organisms that depend on each other for their survival. In addition to this, it is important for them to contribute to the enrichment of the soil with necessary nutrients. The majority of the time, the enhancement of these traits is related to the polysaccharides that are released by a wide variety of species of microalgae and cyanobacteria. When these polysaccharides are injected into the soil, they have a propensity to form a covering that is sticky and gel-like. This often occurs within a short period of time. Its layer prevents erosion while also assisting in the formation of the soil. These polysaccharides also play an important part in the aeration of the soil and the capacity of the soil to retain water, both of which are necessary for the maintenance of the temperature, pH, and salinity of the soil. Because it supports the formation of roots

and enhances the degree of microbial activity in the soil, enhancing the features of the soil in this manner generates a large increase in the amount of plant output that is achieved. As a direct consequence of this, microalgae and cyanobacteria have come to be utilized in an extensive manner in the process of restoring deteriorated soil characteristics and increasing soil fertility. Researchers from Microcoleus vaginatus, Phormidium tenu, Scytonema javanicum, Nostoc sp., and Desmococcus olivaceus came to the conclusion that this rise was connected with stronger crustal cohesiveness in the samples that were treated with algae from the species that were previously described. This conclusion was reached by researchers from Microcoleus vaginatus, Phormidium tenu, and Scytonema javanicum. Issa and colleagues did something quite similar when they introduced Nostoc bacteria into poorly aggregated medium. Because of this, there was a larger degree of aggregation in the media that had been infected as opposed to the medium that had not been inoculated.

PROTECTION OF PLANTS

The maintenance of plant life definitely necessitates an expansion of agricultural production that is generated from both biotic and abiotic sources. Even though certain plant species have defense mechanisms and resilience mechanisms that are built in, external security is necessary for the bulk of food items in order to attain high production targets. This is because certain plant species have these mechanisms built in. The application of microalgae and cyanobacteria (or formulations generated from these microorganisms) can induce appropriate plant protection against biotic and abiotic stressors. This is due to the large diversity of medicinal compounds that are found within these microbes.

PROTECTION FROM BIOTIC FACTORS

A decline in plant output can be caused by a variety of biological reasons, and each of these variables can play a unique role. The presence of creatures such as insects, nematodes, bacteria, and fungus is one of these elements that might contribute to the problem. Polysaccharides are the primary factor in determining whether or not an organism will be protected against these harmful microbes. This is due to the fact that polysaccharides are able to differentiate between the signalling molecules that are situated in the cell wall of the pathogenic organism, which in turn causes a number of defensive responses to be activated. The activation of particular biochemical processes, the translation of genes, and the transmission of signals is a typical method of self-defense. This process, in most circumstances, leads in the synthesis of secondary metabolites such as phenols, terpenoids, and other chemicals that exhibit antioxidant, antibacterial, and antifungal characteristics. These metabolites are produced as a byproduct of the primary metabolic pathway. Microalgae and cyanobacteria, both of which contain a considerable quantity of polysaccharides, can be utilized to improve the natural resilience of agricultural plants. This is possible due to the fact that both of these microorganisms contain polysaccharides. In point of fact, it has previously been shown in the scientific literature that microalgae and cyanobacteria have the ability to trigger plant defence systems. The -1,3-endoglucanase enzyme, which destroys cellular pathogen compounds, was greatly enhanced in the development of branches and roots in the experiment after the seeds from spice cultures were inoculated with cyanobacteria Anabaena laxa and Calothrix elenkinii. This enzyme is in charge of breaking down cellular components that are produced by pathogens. In addition to this, the scientists discovered that there was an increase in plant dry weight, stalk length, root length, and increased interest in fungicidal treatments.

CONCLUSION

Rice cultivation is one of the world's most important grain crops in terms of the staple food supply for more than 50% of the industry's population. In Asia, where 90% of rice is grown and consumed, especially in countries such as China, India, Indonesia, Bangladesh, Vietnam and Japan. Paddy rice (hard rice), the staple crop of Asian regions, is an indispensable staple food for most of the population, including the region's fearsome millions of people. India is the second largest rice producer in the northeastern and southern regions where rice is grown more than two to three times and forms the bulk of the daily diet in these regions. It depends on specific rainfall to produce good crops, but rice production can pose a significant risk of water scarcity due to global warming. . Rice cultivation is also affected by various pests including insects, diseases and weeds; It affects rice production in many ways in terms of yield and quality loss.

REFERENCES

[1] Bodeker W, Dümmler C (1993) Pesticides and health, 2nd edition, Verlag CF miller, Karlsruhe

[2] Bornet E, Flahault C (1886-1887) Revision of the preserved heterocystat Nostocaceae dance Them Beginning transfer Delaware France (second piece). annuals Fromscience naturally, botanical, 7 Series 4: 343-373.

[3] Bornet É, Flahault C (1886-1888) Revision of the preserved heterocystat Nostocaceae dance Them Beginning transfer Delaware France (fourth AND end piece). annuals science natural, botanical, seventh series 7:177-262 .

[4] brady etc NORTH, Ok (2002) Nature and features from plans 13 to change apprentice Record.

[5] Brady NC (1996) Nature and properties of soils, 11th edition, McMillan: New York, Page 621.

[6] Briviba K, Klotz LO, Sies H (1997) Reporting of toxic effects and photochemical effects oSinglet oxygen produced chemically in biological systems. JBiol Chemistry 378: 1259-65.

[7] Büyüksönmez F, Hess TF, Crawford RL, Watts RJ (1998) Toxic effects Fenton reactions *in Xanthobacter flavus FB71* . Environ Microbiol 64 Application: 3759-3764.

[8] caceres JP, megaharaj METRE, naidu R (2008) biodegradation from HE pesticide Fenamiphos from ten different species of green algae and cyanobacteria. flow germ 57(6):643-646 .

[9] coachman Ladies (2002) floor Quality For sustainable world To manage. Agron J 94:38-47.

[10] Chandra S, Mahindrakar AN, Shinde LP (2010) Cypermethrin and chlorpyrifos in vegetables For GCECD. International I chemical technology Fig.2:908-911.

[11] Chen S, Liu C, Peng C, Liu H, Hu M et al. (2012) Biodegradation of Chlorpyrifos AND East hydrolysis Product 3,5,6-trichloro-2-pyridinol For For New Mushroom put under tension *cladosporium cladosporioids* Hu-01. Please A 7(10):e47205.

[12] Choudhary KK (2009) idea from Croococaceae During rice cultivated Insidenorth Burma, India. Bangladesh J Plant Taxon 16: 57-63.

[13] Choudhary CC, bimal R (2010) distribution from Nitrogen fixation cyanobacteria (Nostocaceae) in rice cultivation in fertilized and non-fertilized paddy fields. fields. Scandinavian J Boots, 28:100-103.

[14] Choudhary M, Jetley UK, Khan MA, Zutshi S, Fatma T (2007) Heavy metal effect Highlight the activity of proline, malondialdehyde and superoxide dismutase. cyanobacteria *Spirulina Plate* -S5. ecotoxic environment Safety 66: 204-209.

[15] Choudhury ATMA, Kennedy IR (2005) Rice and Control of pollution problems. Joint Soil Science Plan 36:1625–1639.

[16] Danaboyina KSB, Sivakumar K (2013) Diversity of cyanobacteria in rice fieldsGuntur District, Andhra Pradesh. J Chem Bio Phy Sci Part B 3(3): 1942– 1952

[17] We want B, chakraborti D, singh vk, Ahmet METRE, singh ALASKA, barman FOR (2016) Evaluation of the effects of fertilization on soil physical properties using soil quality analysis index one A busy Rice Wheat to cut System. pedosphere 26(6): 887-894.

[18] We want MK extension (2008) differential reply from cyanobacteria For A organophosphate Pesticide, Rogor (Dimethoate 30 CE). Natural Environmental Pollution Technology 7(1): 139-143

[19] Defoer T, Budelman A, Toulimin C, Carter SE (2000) Soil fertility management tropical zone. noble tropical Institute, Kit Press, UK.

[20] De Neve S, Van De Steene J, Hartman R, Hoffman G. (2000) use of time domain reflectometry For tracing mineralization from Nitrogen from floor biological To agree. AB J floor Science 51: 295-304.