International Journal of Advanced Research in Engineering Technology & Science

ISSN: 2349-2819

Email: editor@ijarets.org Volume-7, Issue-9 September- 2020 www.ijarets.org

CYANOBACTERIAL CONSORTIA FOR QUALITY IMPROVEMENT OF PADDY SOIL AND CROP YIELD

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ABSTRACT

In the first experiment, a total of ten different species of blue-green algae that belonged to the Chroococaceae, Oscillatoriaaceae, Nostocaceae, Scytonemataceae, and Stigonemataceae families were found to be unicellular and either non-heterocyst or heterocyst in structure. Among each of the different locations that were investigated in Dayalbagh, the distribution of cyanobacteria varied from 0.33 0.57 to 2.66 0.57 and from 1 1.22 to 30 7.31, respectively. This was also the case between the other sites. It was discovered that the Nostocaceae family included the highest number of cyanobacteria out of any other family. This particular species of Aulosira (93.33 percent), Anabaena (86.66 percent), and Cylindrospermum (100 percent) (66.66 percent). The following frequency distributions were reported for isolated genera' distribution throughout all locales that were part of the study: Nostoc species (30%) > Aulosira species (28%); Anabaena species (21%); Chrococcus turgitus and Cylindrospermum species (4%); Aphanothece species and Oscillator species (3%); Goethean rupee.. Cyanobacteria have lately come to light as potential candidates that may fulfil the aforementioned requirements. Cyanobacteria are able to make effective use of solar energy and convert it into biomass in a straightforward manner by using CO2, water, and several vitamins. These organic structures generate oxygen as a byproduct during the process of transforming radiant power into chemical energy. The biomass of cyanobacteria has the potential to be used in the manufacture of secondary metabolites that have applications in the fields of food, power, biofertilizers, nutrition, cosmetics, and medicine.

Keywords: *Paddy Soil, Crop Yield, Cyanobacterial*

INTRODUCTION

1. Cyanobacteria have a huge number of inclusion bodies, which form on their own own and are capable of exerting a wide variety of qualities that are exclusive to themselves. Included in the category of inclusion bodies are light-gathering antennae, phycobilisomes, polyphosphate-bodied cyanophycin granules, polyhydroxyalkanoate (PHA) granules, carboxysomes/polyhedra, our body, lipid bodies, thylakoid centers, DNA-containing regions, and ribosomes. As cyanophycin granules are broken down, large polypeptides are generated, and these polypeptides have approximately the same number of amino acids per molecule as arginine and aspartic acid. When seen under a soft microscope, these granules give the impression of being bigger and contain a higher percentage of nitrogen than other similar samples. There is evidence to suggest that nitrifying bacteria and thiobacilli both have carboxysomes in their genomes.

Carboxysomes have the form of polyhedra and have a diameter of around 100 nanometers. This is a list of ribulose-1,5-bisphosphate carboxylase (RuBisCo) that was obtained from a source on the internet that is associated with the paracrystalline CO2 scavenging organization. Red naive photosynthetic bacteria like as Halobacterium and Thiothrix include natural inclusion structures that are referred to as fuel vacuoles. These entities provide buoyancy and allow cyanobacteria to float to the surface of the water where they may reproduce. A fibrillar look may be seen in the part of the cabinet that contains nucleoplasm, which is also referred to as the DNA-bearing zone. This region can be located in the center of the cabinet. Cyanobacteria have abnormal nuclei, and their DNA does not have a nuclear border or nucleolus to separate it from the rest of the cell. On the other hand, it is gathered together in clumps. The mobile service process, in which components from the nucleoplasm are distributed throughout the cytoplasm of the cell, does not involve the spindle machinery in any way. Cyanobacteria are composed of two basic cell types: heterocysts, which are in charge of the process of nitrogen fixation that leads to the manufacture of ammonia, and vegetative cells. Heterocysts are responsible for the process of nitrogen fixation that leads to the creation of ammonia (showing normal photosynthesis and reproductive growth).

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.

Rice cultivation and its importance

Rice is the primary source of food for about half of the people who live in this region, making it one of the most significant cereals in the world. As a result, rice is one of the most important cereal products in the world. China, India, Indonesia, Bangladesh, Vietnam, and Japan are the six countries that are responsible for eighty percent of the area's rice production and consumption accordingly. China also dominates the region in terms of the amount of rice that is produced. Almost 90% of the world's rice supply is produced and consumed in Asia, which also produces the majority of the world's rice. Brown rice output is forecast to reach 754.6 million tons in 2017, which is equivalent to 748.0 million tonnes, according to the Food and Agricultural Organization of the United Nations (FAO). This is a minor increase over the previous year's production of 748.0 million tonnes (496.7 million tonnes, land-based). (FAO).

Rice production has increased by more than three times since the beginning of the green revolution in 1961. Despite the development of new technologies, mutated rice varieties, and improved irrigation centers, rice production has virtually stopped in recent years. This is despite the fact that rice production has increased by more than three times since the beginning of the green revolution.

Yet, in spite of the rotation of food samples, it is expected that the production of rice would increase to more than 800 million tonnes by the year 2030 and 525 million tonnes by the year 2050. (IRRI, 2000). In a number of Asian countries, rice makes up more than forty percent of the daily calorie intake of the total number of calories that are consumed through diet (Timmer and Dawe, 2007; Timmer et al., 2010). Despite the fact that the number of people consuming rice has been on the decline for many years, rice is the major component of any effective Asian diet for weight reduction. This is true despite the fact that any successful Asian diet for weight reduction will include rice. Rice is the primary agricultural product in a number of Asian countries, and those countries' rice exports not only make a contribution to the economic system but also make a considerable contribution to GDP. In 2007, he made a contribution that was at least equal to one percent of the gross domestic product (GDP).

OBJECTIVES

1. Detection of pesticide-tolerant strains of cyanobacteria.
2. Efficacy testing of selected cyanobacteria to break down pesticides.
3. Analysis of the final product of the pesticide degraded by cyanobacteria.

RESEARCH METHODOLOGY

Topsoil was the only soil collected from fields designated at various locations, and this was used as the primary material for this study. In this study, Borosil brand glassware was used. First, a combination of potassium dichromate and sulfuric acid was used to clean glassware and then washed under running tap water. After the acid was completely removed from the glassware, it was cleaned with a cleaner and rubbed several times until the cleaner came off. After washing, the glassware was dried in a compressed air oven. Petri dishes or 250 mL Erlenmeyer flasks were used to hold the cultures during maintenance. Merck Specialties Ltd. Ltd., Mumbai was responsible for the production of all organic and inorganic chemicals used.

Isolation of cyanobacteria from the soil of paddy fields and other surrounding areas:

The following sites located in Dayalbagh district of Agra district were selected for research.

1. DEI Milk,
2. milk box,
3. Street of Lalgari village.

4. Dayalbagh Punjabi Farms

5. Nagal Talfi

Samples were taken from March to September 2008. Soil samples were taken according to the so-called sampling method. After complete and thorough mixing of the sub-samples, a composite sample was collected in polyethylene bags for further analysis in the laboratory. The following procedures were used to perform this experiment:

DATA ANALYSIS

(1) Height of the plant

1. Plant height (cm):

There was a significant difference in plant height in all treated experimental lots. Plant height was significantly affected 35 days after planting. At the end of the 35-day inoculation period, the heights of the plants in one of the trial lots were not significantly different from each other. At 70 and 110 days after sowing, plots treated with the combined inoculants showed superior growth, measuring 71.81 and 104.45 cm, respectively, compared to control plots measuring 65.23 and 69.06 cm.

As a result, plant height changed at different rates at 5% and 1% significance levels in 70 DAS (F=6.69, df=4.8) and 110 DAS (F=76.63, df=4.8).

Average plant height varied differently under different treatments.

Table 1: Observation of plant height (cm) in treated and untreated rice fields in Dayalbagh. (Mean of three replicates ± SD)

Treatment	35 WE WANT	70 WE WANT	110 WE WANT
FOR	4016 ± 0.77	67.39 ± 2.76	79.43 ± 1.07
B	41.62 ± 2.84	66.87 ± 0.22	78.93 ± 1.45
etc	38.22 ± 0.93	68.03 ± 0.70	79.01 ± 2.37
D	38.75 ± 1.62	71.81 ± 0.39	104.45 ± 5.01
bath	39.45 ± 4.58	65.23 ± 3.62	69.06 ± 0.34

DAS= day after planting WC= water control

or DAS) analysis of variance (ANOVA) .

	from source Difference	df	MIN E	SMS	F Value
70. – WE WANT	offers	4	44.14	176.58	6.69 *
	copies	2	2.11	4.22	
	Mistake	8.	6.6	52.76	

or DAS) analysis of variance (ANOVA) .

	from source Difference	df	MINE	SMS	F Value
110_ – WE WANT	offers	4	522.08	2088.33	76.63**
	copies	2	2.11	4.22	
	Mistake	8.	6.6	52.76	

Ns = not significant * Significant at 5% ** Significant at 5% and 1%

or DAS) analysis of variance (ANOVA) .

3 5	from source Difference	df	MINE	SMS	F Value

	offers	4	35.94	8.99	1.35ns__ –
	copies	2	13.12	6.56	
	Mistake	8.	53.18	6.65	

(2) Plant height with penis

Treatment	Plant Height (cm)	Panicle Length (cm)
Transplanting date		
T_1	84.70^{a}	23.38^{b}
T_2	84.91^{a}	24.65^{a}
T_3	82.43^{ab}	22.69^{bc}
T_4	81.31^{b}	21.80^{c}
LSD (p≤0.05)	**2.99**	**1.04**
Nitrogen rate		
N_1	80.56^{d}	21.68^{c}
N_2	82.70^{c}	22.49^{b}
N_3	84.41^{b}	24.14^{a}
N_4	85.68^{a}	24.22^{a}
LSD (p≤0.05)	**0.89**	**0.51**
Significance		
Transplanting date (T)	*	*
Nitrogen rate (N)	*	*
T × N	**NS**	**NS**

Plant height and panicle length are affected by different transplant dates and nitrogen application rates.

(3) the length of the penis

Table 2 Average cluster length and weight of the F3 population and its parents planted at Muara Experiment Station, 2012 dry season

Population	Panicle length (cm)	SD	Panicle weigth (g)	SD
Bintang Ladang × US2	25.90	2.29	3.97	1.07
Gampai × IR77674	23.54	2.33	2.86	0.78
Progol × Asahan	24.20	2.68	3.76	1.25
Bintang Ladang	27.15	2.71	3.81	1.21
US2	24.99	1.94	2.67	0.65
Gampai	19.42	1.70	1.92	0.64
IR77674	26.62	3.08	3.16	0.93
Progol	24.13	2.29	2.80	0.75
Asahan	23.34	1.51	2.23	0.50

Gampai had the shortest ear length (19.42 cm), Bintang Ladang had the longest ear length (27.15 cm), and IR77674 had the second longest ear length (26.62 cm). . Compared to other populations, the average length of the cobs in the Bintang Ladang x US2 population was the longest at 25.90 cm. The F3 population and long-cob parents have an average cluster weight of more than 3.5 grams. Examples of these plants are Bintang Ladang x US2 (3.97 g), Bintang Ladang (3.81 g) and IR77674. Ear weight also showed similar characteristics to ear length (3.16 g). A strong cob is also observed in the Progol x Asahan population (3.76 g). Gampai was the parent that produced the offspring with the lowest cob weight (1.92 g).

Inheritance

In the Progol x Asahan population, ear weight and length showed high and moderate heritability, respectively. This meant that phenotypes were influenced by genetic variants rather than environmental variants, and also suggested that traits were inherited. It was important to have traits with a high heritability to increase the efficiency of the breeding process. Because of the predominance of genetic variants in determining the plant phenotype, selection for traits with high heritability may occur early in the generation.

(4) Blade length

1. Sheet length (centimeter):

Inoculation with cyanobacteria, alone or in combination, improved plant height, as was the measurement of rice leaf length compared to control. Compared to control, plots treated with a combination of the three cyanobacterial inoculants had the longest leaves with a length of 45.79 cm. This was followed by single inoculated plots (A, B, C) measuring 32.96 cm, 32.59 cm and 32.64 cm (23.19 cm), respectively. Analysis of variance (ANOVA) results at the end of the 30-day data analysis (DAS) study were inconclusive (f=0.78, df=4.8). A correspondingly significant effect on leaf length was found in all treated plots at 70 and 110 days after the start of the growing season (f = 265.9; 73.99; dl = 4.8).

Table 3: Observation of leaf length (cm) in treated and untreated rice fields in Dayalbagh. (Mean of three replicates ± SD)

Treatment	35 WE WANT	70 WE WANT	110 WE WANT
FOR	7.75 ± 0.49	17.58 ± 0.39	32.96 ± 1.46
B	7.26 ± 0.21	17.92 ± 0.45	32.59 ± 0.85
etc	7.69 ± 0.27	17.12 ± 0.82	32.64 ± 0.85
D	7.66 ± 0.27	25.93 ± 0.56	45.79 ± 1.29
bath	7.58 ± 0.38	15:45 ± 0.4	23.19 ± 2.48

Table 4: analyzes from Difference (ANOVA) For Sheet length ($^{70°}$ WE WANT).

	from source Difference	df	MINE	SMS	F Value
70. – WE WANT	offers	4	201.47	50.37	265.9**
	copies	2	1.48	0.74	
	Mistake	8.	1.51	0.19	

Table 5 : analyzes from Difference (ANOVA) For Sheet length ($^{110°}$ WE WANT).

After that 110 days	from source Difference	df	MINE	SMS	F Value

	offers	4	777.51	194.38	73.99**
	copies	2	0.66	0.33	
	Mistake	8.	01/21	2.63	

ours = NO important *important Inside 5% ** Important Inside 5% AND %one

CONCLUSION

Photoautotrophic cyanobacteria or blue-green algae (BGA) along with other beneficial microbes make up about 60% of the total biomass and are considered the most successful and important photosynthetic devices on this planet. Cyanobacteria have a great ability to play a crucial role in agriculture and environmental services. Various studies have been conducted to improve our experience of the diversity, dynamics and functions of effective soil microorganisms and their beneficial spores in improving agricultural production. Untested advanced technology, including biofertilizers, including cyanobacteria, could be an effective way to remove soil pollutants, improve soil fertility and improve crop production by making agricultural structures in rice fields more resilient to stress . Additionally, cyanobacteria can help reduce energy input in the form of chemical fertilizers and reduce the recovery of stressed agro-ecosystems. It has now successfully proven that cyanobacteria are one of the most important beneficial microorganisms in the rice discipline agro-ecosystem. Cyanobacteria act as biological seeds for rice planting, providing additional nutrients and improving soil quality for crops. Currently, due to the excessive dependence on pesticides to control pests in rice crops, cyanobacteria are also affected by the harmful effects of these pesticides.

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