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CYANOBACTERIAL DIVERSITY AND ABUNDANCE IN MAIZE FIELD OF AHMEDNAGAR DISTRICT (M.S.) INDIA

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ABSTRACT:
Cyanobacteria is a diverse group of plant kingdom. They found in variety of terrestrial habitat. Cyanobacteria is one of the significant components of soil microflora. They fixes atmospheric nitrogen and increases fertility of soil. Majority of the species of cyanobacteria helps in retention of soil moisture and provides germination ground for the seeds of flowering plants. The cultivated field ecosystem provides favourable ground for the growth and development of Cyanobacteria. Present paper deals with the cyanobacterial flora of Maize (Zea mays L.) field, located in Shrirampur tahsil area of Ahmednagar district of Maharashtra. Cyanobacterial samples were collected at weekly intervals from moist soil surface of selected field. The work was carried out from July 2017 to October 2017. Bold's basal medium was also to culture cyanobacteria from soil of Maize field. Collected and cultured cyanobacterial forms were observed and identified. A total of 32 species under 15 genera were identified and recorded. Cyanobacterial taxa such as *Aphanothece nidulans, Myxosarcina burmensis, Oscillatoria obscura, Oscillatoria subbrevis, Microcoleus acutissimus* and *Nostoc punctiformae* were found dominant. Selected physico-chemical parameters shows positive correlation with diversity and abundance of cyanobacterial flora.

Keywords: Cyanobacteria, Maize field, Physico-chemical parameters.

INTRODUCTION:

Cyanobacteria is a large and diverse group of plant Kingdom, resembling gram negative bacteria in cellular organization and green plants in oxygenic photosynthesis. They found in almost every terrestrial and aquatic habitats. They occupy a variety of terrestrial habitats including soil, rocks, sand, walls and caves. Soil habitats are the most important ecosystems for Cyanobacteria. Soil Cyanobacteria performs important functions for agro-ecosystems. They contribute in formation of soil and stabilization of mature soil (Meeting, 1981). They promote aggregation of soil practicales and increases water retention capacity of soil. The most important effect of cyanobacteria in soil on agriculture are the input of carbon and nitrogen (Shields and Durrell, 1964). Cyanobacteria fixes atmospheric nitrogen and increases fertility of soil (Singh, 1961; Santra 1993; Goyal, 1997). The agronomic importance of cyanobacteria was recognized in 1938 by De while studing nitrogen fixation in rice field.

The cultivated field ecosystem is the favourable environment for the growth and development of cyanobacteria with respect to their requirements of light, water, temperature and nutrient availability. In India, diversity and distribution of cyanobacteria in different crop fields have been studied in detail by Bongale and Bharti (1980), Prasad and Mehrotra (1980), Sirdeshpande and Goyal (1981), Chatterjee and Chatterjee (1983), Chaporkar and Gangawane (1984), Kolte and Goyal (1985), Patil and Chaugule (2004), Auti and Pingle (2007), Jadhav (2010), Jadhav and Nimbhore (2015), and Wagh and Jadhav (2019). Present paper deals with the studies on diversity and abundance of cyanobacteria in soil of Maize (Zea mays L.) field in relation to physico-chemical analysis of soil.

MATERIALS AND METHODS:

A Maize field located in Shrirampur tehsil area of Ahmednagar district of Maharashtra has been selected for collection of cyanobacterial samples. Cyanobacterial samples which are grown on moist soil surface of Maize field were collected at weekly intervals from July 2017 to October 2017.These samples were collected in sterilized collection bottles. Collected samples were brought to the laboratory for observation and identification. Sun dried soil samples were examined for their cyanobacterial components by petriplates culture method. 1 gm of pulverized soil poured and spread uniformly into the petriplates containing agarized Bold's basal medium (Bold, 1942). Liquid nutrient medium was poured into the plates at the time of keeping those for incubation and frequently supplemented with the same. The petriplates were incubated under tubelights having 1000 to 1500 lux capacity in the algal culture chamber. Petriplets were checked for the growth of cyanobacterial colonies. After sufficient growth, colonies were picked up for identification. Collected and cultured cyanobacterial samples were observed under research microscope and identified with the help of standard literature.

In order to know the fertility status of selected maize field, physico-chemical analysis of soil was performed by selecting certain physico-chemical parameters such as soil texture, water holding capacity, electrical conductivity, pH, organic carbon, available nitrogen, available phosphorus, available potassium, total magnesium, total calcium, total sodium, copper, iron, zinc and manganese (Trivedi and Goel,1986).

RESULTS AND DISCUSSION:

A total of 32 species under 15 genera of cyanobacteria were identified and recorded (Table 1). Bongale and Barati (1980), Sirdeshpande and Goyal (1981), Chatterjee and Chatterjee (1983), Chaporkar and Gangawane (1984), Auti and Pingle (2007), Jadhav (2010), and Jadhav and Nimbhore (2015) and Wagh and Jadhav (2019) extensively studied diversity and abundance of cyanobacteria form rice, wheat, sorghum, bajra, gram, sugarcane, cotton, fenugreek and onion fields. During present study Cyanobacterial taxa such as *Aphanothece nidulans, Myxosarcina burmensis, Oscillatoria obscura, Oscillatoria subbrevis, Microcoleus acutissimus* and *Nostoc punctiformae* were found dominant. Wagh and Jadhav (2019) recorded similar kind of

observations from sugarcane and onion fields. Prasad (2005) observed dominance of *Chlorococcus, Gloeothece, Phormidium, Oscillatoria and Nostoc* from wheat field of Nepal. During present study *Gloeothece palea, Microcoleus lacustris, Nostoc muscorum, Plectonema gracillimum* and *Scytonema bohneri* were also found in maximum frequency. Heterocystous as well as non heterocystous cyanobacterial forms such as *Nostoc commune, Nostoc punctiformae, Nostoc muscorum, Scytonema bohneri* and *Scytonema schmidtii* were recorded. Unicellular, colonial and filamentous cyanobacterial forms were recorded during present study.

Data pertaining to physico-chemical analysis of maize field soil is given in Table 2. The soil is clay with medium water holding capacity which is suitable for colonization of cyanobacteria. Electrical conductivity is moderate which is good for growth of cyanobacteria. pH of soil is moderate alkaline which favours growth of cyanobacteria. Organic carbon content of soil was recorded very low. Available nitrogen was found low whereas phosphorus and potassium were high and very high respectively. Nitrogen, phosphorus and potassium plays key role in abundance of cyanobacteria. Magnesium and calcium was found high. Amount of sodium was moderate whereas copper was found in sufficient amount. Iron was low were as zinc and manganese were found sufficient in maize field soil. Overall fertility status of maize field soil reveals that soil is fertile and supports growth of cyanobacteria which are found abundant and in diverse form.

CONCLUSION:

Hence, it is concluded that Maize field ecosystem provides a favorable environment for growth and development of cyanobacteria. Cyanobacterial flora of maize field is rich and it is found in diverse form. Overall fertility status of maize field is fertile which supports luxuriant growth of cyanobacteria. A positive correlation among cyanobacterial flora and physico-chemical parameters of soil was observed. Cyanobacteria plays a significant and sustainable role in agroecosystem by increasing fertility of soil. They also contribute in soil formation and stabilization of mature soil. Cyanobacteria help in retention of soil moisture. Cyanobacteria are one of the important components of soil microflora and plays a crucial role in sustainable environment by enriching the soil.

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Table 1: Cyanobacterial taxa recorded from soil of Maize field.

Sr. No.	Name of Cyanobacteria	Frequency of Occurrence
1	*Chroococcus minutus*	++
2	*Chroococcus turgidus*	+
3	*Gloeocapsa rupestris*	+
4	*Gloeothece palea*	+++
5	*Aphanothece nidulans*	++++
6	*Aphanothece saxicola*	++
7	*Chlorogloea microcestoides*	++
8	*Myxosarcina burmensis*	++++
9	*Arthrospira plantesis*	+
10	*Spirulina subtilissima*	++
11	*Oscillatoria acuta*	++
12	*Oscillatoria obscura*	++++
13	*Oscillatoria subbrevis*	++++
14	*Phormidium abronema*	+
15	*Phormidium angustissium*	+
16	*Phormidium bohneri*	+
17	*Phormidium corium*	+
18	*Phormidium jenkelianum*	++
19	*Phormidium molle*	++
20	*Phormidium usterii*	+
21	*Lyngbya hieronymusii*	+
22	*Microcoleus acutissimus*	++++
23	*Microcoleus lacustris*	+++
24	*Microcoleus sociatus*	++
25	*Nostoc commune*	++
26	*Nostoc punctiforme*	++++
27	*Nostoc muscorum*	+++
28	*Plectonema gracillimum*	+++
29	*Plectonema putale*	+
30	*Plectonema radiosum*	+
31	*Scytonema bohneri*	+++
32	*Scytonema schmidtii*	++

+ = Minimum, + + = Moderate, + + + = Maximum, + + + + = Dominant.

Table 2: Physico-chemical analysis of Maize field Soil.

Sr. No.	Physicochemical parameter	Observation	Fertility Status
1.	Soil Texture	1.00	Clay
2.	Water Holding Capacity (%)	54.83 %	Medium
3.	Conductivity (M mhos/cm)	0.68	Moderate
4.	pH	7.93	Moderate Alkali
5.	Organic Carbon (%)	0.18 %	Very Low
6.	Available Nitrogen (Kg / hect.)	162.22	Low
7.	Available Phosphorus (Kg / hect.)	32.99	High
8.	Available Potassium (Kg / hect.)	311.09	Very High
9.	Total Magnesium (%)	14.35 %	High
10.	Total Calcium (%)	24.94 %	High
11.	Total Sodium (ppm)	6.02	Moderate
12.	Copper (ppm)	3.86	Sufficient
13.	Iron (ppm)	0.42	Low
14.	Zinc (%)	1.42 %	Sufficient
15.	Manganese (%)	9.75 %	Sufficient