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Soil Algal Flora and Cyanobacteria of Sugarcane Field from the Khuldabad Region Dist. (Aurangabad) Chhtrapati Sambhaji Nagar, Maharashtra, India

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Abstract: *Soil algae constitute an important group of soil microflora. Ecologically soil algae are significant and play a crucial role in soil fertility. To study the algal flora of cultivated fields, a sugarcane (Saccharum officinarum L.) field located in the Khuldabad tehsil area of (Aurangabad) Chhtrapati Sambhaji Nagar district of Maharashtra has been selected. Algal samples from moist places of the sugarcane field were collected at regular intervals from November 2021 to December 2022. Bold`s basal medium was also used to culture algae from the soil of the sugarcane field. Under a research microscope, algae samples were carefully examined, and their identities were confirmed using standard algae literature. A total of 69 species from 35 genera belonging to the families Chlorophyceae, Xanthophyceae, Bacillariophyceae and Cyanophyceae were identified and recorded. Cyanobacteria were found to be dominant. The main algal forms were Gloeocystis, Trebouxia, Chlorella, Nitzschia, Chroococcus, Gloeothece, Aphanothece, Myxosarcina, Oscillatoria, Phormodium, Lyngbya, Microcoleus, Nostoc, Plectonema and Scytonema. Physic-chemical analysis of the soil of the sugarcane fields was carried out by choosing important physical and chemical parameters, such as pH, electrical conductivity, organic carbon, affordable nitrogen, affordable phosphorus, and available potassium. It was discovered that the soil of a sugarcane crop contained algae.*

Keywords: Cyanobacteria, Physicochemical parameters, Soil algal flora, Sugarcane field

I. INTRODUCTION

An essential class of soil microflora are soil algae. A inspection of the literature reveals that the majority of the researcher on algae pertain to the life history and morphological studies with lesser emphasis on interrelationship between plant root and soil microbes like algae. Certain soil algae, especially heterocystous Cyanophycean algae fixes atmospheric nitrogen and increases fertility of soil. Investigation of soil microorganisms other than algae found that particular plants attached specific groups or species of organisms (Katznelson et.al. 1948). Distribution and regarding the variety of soil algae in various agriculyural sectors, such as paddey, banana, wheat and brinjal has been well studied (Santra 1983,Chaporkar and Gangawane 1984, Kolte and Goyal 1985, Kottawar and Pachpande1986, Nayak et.al. 2001, Auti and Pingle 2006 and Nimbhore and Jadhav 2014). In term of soil`s economy, algae are very important. Asurvey of the literature indicates that most studies on algae focus on their morphology and life history, with little attention paid to the interaction between soil bacteria like algae and plant roots. A rare attention has been paid towards algal flora of sugarcane field.

Therefore it has been decided to work systematically on algal flora of sugarcane (*Saccharum officinarum* L.) field.

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II. MATERIALS AND METHODS

A sugarcane field located in Khuldabad tehsil area of (Aurangabad) Chhtrapati Sambhaji Nagar district of Maharashtra has been selected to study soil algal flora. Algal samples from moist places of selected sugarcane field were collected at regular intervals from November 2021 to December 2022. Samples of algae were gathered in sterile collection bottles. The sun dried soil samples collected from same sugarcane field were examined for their algal components by petriplate culture method by using agarized Bold`s basal medium (Bold 1942). Collected and culture algal samples were observed thoroughly under research microscope and identified with the help of literature on algae. In order to know the fertility status of selected sugarcane field, analysis of soil was performed for certain selected physicochemical parameters such as, pH, electrical conductivity, organic carbon, available nitrogen, available phosphorus and available potassium (Trivedy et.al. 1998).

III. RESULTS AND DISCUSSION

A total of 69 species under 35 genera of algae belonged to Chlorophyceae, Xanthophyceae, Bacillariophyceae and Cyanophyceae were identified and recorded from collected and cultured algal samples of sugarcane field. Out of these 14 species under 12 genera belonged to Chlorophyceae, 3 species under 2 genera belonged to Xanthophyceae, 5 species under 4 genera belonged to Bacillariophyceae and 47 species under 17 genera belonged to Cyanophyceae (Table 1) Cyanophyceaen algae were found dominant. Dominance of Cyanophycean algae from soil of different crop fields have been observed by Bongale and Bharati (1994), Kottawar and Pachpande (1986), Auti and Pingle (2006), Jadhav (2010), Nimbhore and Jadhav 2014), Gadekar and Lambat (2011) and Yadav (2022) (Table 1).

Algal taxa of *Gloeocystis, Trebouxia, Chlorella, Nitzschia, Chroococcus, Aphanothece, Oscillatoria, Phormodium, Lyngbya, Microcoleus, Nostoc, Plectonema* and *Scytonema* were found abundant. One of the important feature of present study is that occurrence of Xanthophyceae members i.e. *Protosiphon botryoids* and *Vaucharia geminata*, These algal members are unique in soil algal flora. Prasad (2005) reported *Vaucheria sissilis* from wheat field of Nepal. Unicellular, colonial and filamentous algae were recorded. Filamentous algal taxa were found in maximum number. During investigation the greatest number of filamentous algal taxa were identified and recorded.

A physicochemical analysis reveals the fertility of the soil. The overall fertility status of selected sugarcane field was moderate alkali (8.17), normal electrical conductivity (0.53 m mhos/cm), moderate organic carbon (0.56%), moderate available nitrogen (420.00 kg/hectare), moderate available phosphorus (36.14kg/hectare) and very high available potassium (415.64 kg/hectare) (Table 2). Moderate alkaline nature of soil favours growth of Cyanophycean algae. Normal electrical conductivity is good for algal growth. Moderate organic carbon also supports growth of algae. Soil rich in nitrogen, phosphorus and potassium encourages growth of algal flora. Similar kinds of observation were made by Nimbhore and Jadhav 2014(Table 2).

Table 1: Algal taxa recorded from soil of Sugarcane field in Khuldabad.

Class	Algal Taxa
Chlorophyceae	*Gloeocystis gigas, Gloeocystis major, Stichococcus subtilis, Oedogonium* sp., *Chlorococcum humicola, Trebouxia humicola, Characium debaryanum, Tetrahedron minimum, Chlorella vulgaris, Selenastrum westii, Ankistrodesmus falcatus, Closterium acutum Closterium venus, Cosmarium granatum.*
Xanthophyceae	*Protosiphon botryoides, Vaucheria geminate, Vaucheria sessilis.*
Bacillariophyceae	*Achanthes* sp., *Navicula hustedtii, Pinnulara* sp. *Nitzschia gracilis Nitzshia palea.*
Cyanophyceae	*Chroococcus minor, Chroococcus minutus, Chroococcus turgidus, Gloeothece palea, Aphanothece nidulans, Aphanothece saxicola, Aphanothece pallida, Gloeocapsa rupestris, Aphanocapsa pulchra, Synechococcus aeruginosus, Chlorogloea fritschii,Myxosarcina burmensis, Arthrospira platentensis, Spirulina giganta,Oscillatoria acuta, Oscillateria acuminata, Oscillatoria animalis,Oscillatoria obscura, Oscillatoria princeps, Oscillatoria subbrevis, Oscillatoria curviceps, Phormidium abronema,Phormidium africanum, Phormidium bohneri, Phormidium molle,Phormidium subincrustatum, Phormidium usterii,*

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	Lyngabya balcum,Lyngbya hieronymussi, Lyngbya major, Lyngbya majuscula, Microcoleus acutissimus, Microcoleus lacustris, Microcoleus sociatus, Microcoleus subtoralosus,Microcystis elabens, Microcystis marginata, Nostoc linckia, Nostoc muscorum, Nostoc piscinale, Nostoc punctiformae, Nostoc commune, Plectonema gracillimum, Plectonema radiosum,Scytonema bohneri, Scytonema schmidtii,Stigonema hormoides.

Table 2: Physicochemical analysis of Sugarcane field Soil in Khuldabad.

Sr. No.	Physicochemical parameter	Observation	Fertility status
1	pH	8.17	Moderate alkali
2	Electrical conductivity	0.53	Normal
3	Organic Carbon (%)	0.56	Moderate
4	Available Nitrogen (Kg/ hectare	420.00	Moderate
5	Available Phosphorous (Kg/ hectare)	36.14	Moderate
6	Available Potassium (Kg/ hectare)	415.64	Very high

IV. CONCLUSION

It is concluded that the sugarcane fields algal flora is abundant and varied. Occurrence of Xanthophyceae members such as *Protosiphon botryoids* and *Vaucheria geminata* is a unique feature. Cyanophyceae algal taxa are found dominant. A positive correlation among algal flora composition and physicochemical analysis of soil were observed.

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