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# Studies of algae flora of sugarcane fields of Digras Region of Yavatmal District

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## Abstract

Algae play an important role in the economy of soil. A perusal of the literature reveals that the majority of the investigations on algae pertain to the life history and morphological studies with lesser emphasis on inter-relationship between plant root and soil microbes like algae. In Yavatmal district most of the sugarcane fields located in Digras Taluka is under water from August to October (Rainy Season). It becomes marshy from October to December. From December to February the soil become further dried and forms a moist soil. Rhizosphere and Non-rhizosperhic algal culture were cultured and flora was identified under Binocular microscope. Identified algae were used for making sub cultures; a few cells were drawn into a fine pipette, washed in sterilized water and transferred to 1.5 per cent De's modified Beneck's medium with agar in petridishes and test tubes. 1.5 per cent agar medium was prepared by mixing 15 gm of agarin one litre of De's modified Beneck's medium. The use of overdose of Inorganic fertilizers does not permit the establishment of soil micro flora especially the algal & Cynobacteria. This makes the soil Non Fertile and reduces the sugarcane production.

**Keywords:** Digras | Rhizosphere | Non-rhizosperhic | De's modified Beneck's medium | Cynobacteria

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## Introduction

Algae play an important role in the economy of soil. A perusal of the literature reveals that the majority of the investigations on algae pertain to the life history and morphological studies with lesser emphasis on inter-relationship between plant root and soil microbes like algae.

Investigations on soil microorganisms other than algae found that particular plants attracted specific groups or species of organisms (Katznelson *et al.*, 1948) and in 1960 Gonzalves and Yalavigi did experiments on rhizosphere algae of some crop plants and

came to the conclusion that the living plant furnishes algae in its rhizosphere with more suitable conditions for the growth and development.

Sugarcane field of Yavatmal district of Digras Taluka shows different seasons and at different stages of crop growth. In Yavatmal district most of the sugarcane fields located in Digras Taluka are under water from August to October (Rainy Season). It becomes marshy from October to December. From December to February the soil become further dried and forms a moist soil. During summer i.e. from February to June, the soil becomes fully dried and vegetative stages of algal are usually not observed.

This variation of habitat may further very at different location of the field. The different types of habitat in different season will allow the growth of different algae. To avoid elimination of any algal member, collection as well as culture studies were conducted. Collections of algae were done in different seasons while soil samples were collected in dry seasons.

## Materials and Method

### Non- rhizosphere soil samples

Soil samples from similar depth (as that rhizosphere) away from the roots of the plants were taken for each variety of rice. These samples were inoculated into the culture media. Here also, multiple culture of the same sample in a variety of media were made to rule out the possibility of an alga missing from the observation.

### Collection of algae from fields

Frequent visits to Sugarcane fields during rainy and winter season helped us to get maximum algal collections. These fresh collections were made with the help of scalpel, forceps and sieves and were collected in polythene bags. These were brought to the laboratory and identified and developed live cultures of it.

### Algal Cultures

#### 1. Culture Vessels

Conical flasks, flat bottles, petri dishes were used in the cultures. These glasswares were wall washed first with vim powder, then twice with tap water. These were then rinsed with concentrated sulphuric acid and finally washed with distilled water, 3 to 4 times. Then the flask and bottles were closed with plugs of non-absorbant cotton, whereas the petri dishes were closed with its pair petri dishes.

#### 2. Culture Media

Two types of cultures, liquid and moist, were prepared for studying the soil algae and fresh collections. The bottles and conical flasks were used for the liquid culture whereas petri dishes were used for the moist cultures. The culturing vessels with culture media were sterilized in an autoclave at 2 lbs pressure for 20 minutes prior to inoculation. Nine different culture media were employed for culturing. They are as follows:

**Chu. No.10 (Modified) medium (Cerloff *et al.*, 1950)**

$Ca(NO_3)_2$ - 0.04 gm

| | | |
|---|---|---|
| $K_2HPO_4$ | - | 0.01 gm. |
| $MgSO_4$. $7H_2O$ | - | 0.025 gm. |
| $Na_2SiO_3$ | - | 0.020 gm. |
| Ferric Citrate | - | 0.025 gm. |
| Citric acid | - | 0.003 gm. |
| $A_5$ solution | - | 1.0 ml |
| Distilled water | - | 1000 ml |

**$A_5$ trace element stock solution**

| | | |
|---|---|---|
| $H_3BO_3$ | - | 2.86 gm |
| $MnCl_2$ $4H_2O$ | - | 1.81 gm |
| $ZnSO_4$. $7H_2O$ | - | 0.222 gm |
| $MoO_3$ (85%) | - | 0.0177 gm |
| $CuSO_4$. 5 $H_2O$ | - | 0.07 gm |
| Distilled water | - | 1000 ml |

**Unialgal cultures**

In making sub cultures, a few cells were drawn into a fine pipette, washed in sterilized water and transferred to 1.5 per cent De's modified Beneck's medium with agar in petridishes and test tubes. 1.5 per cent agar medium was prepared by mixing 15 gm of agarin one litre of De's modified Beneck's medium. This solution was poured into petri dishes and test tubes aseptically after autoclaving.

87 spps of algal forms were identified from digras soil of which 63 belongs to cynophyta, 09 forms to chlorophyta, 02 forms belongs to Xanthophyta, 03 forms belongs to Euglinophyta, & 07 to Bacillariophyta. The 63 forms of Cynophyta belongs to 23 genus, while the chlorophyta reperesnted by 09 genus. The Xanthophyta is represented by single genus while three genus in Euglenophyta and 04 genus in bacillariophyta. This shows that cynophycean members are dominant in the cultivated fields. Out of the 87 spps of algal forms 21 spps of cynophycean member are nitrogen fixing forms. Only 16 spps were found in regularly cultivating sugarcane field. Out of the 16, 10 were of Cynophycean member, 03 chlorophycean member, 01 Xanthophycean member and 02 Bacillariophycean member. The n2 fixing forms were only just three spps in regularly cultivating sugarcane fields. The status of Soil algae in Digras region is quiet satisfactory especially the no. of N2 fixing forms in nearby areas, But the result of actual sugarcane field is not at all satisfactory. It can be one of the main causes in lower output of crop.

**Conclusion**

The use of large quantity of Inorganic fertilizers is a regular practice by the farmers to get higher crop production in this region. The higher dose of Inorganic fertilizers gives an inhibitory effect in the growth of soil microorganisms. The result of present study shows lower proportion of microorganisms in cultivated soil. This can be attributed to the methodology of cultivation.

The use of overdose of Inorganic fertilizers does not permit the establishment of soil micro flora especially the algal & Cynobacteria. This makes the soil Non Fertile and reduces the sugarcane production.

| S.No | | Tuptakli | | Mandhawa | | Lakh | |
|---|---|---|---|---|---|---|---|
| | | Region | Field | Region | Field | Region | Field |
| | **Cyanophyta** | | | | | | |
| 1 | *Microcystis elabens* | + | | | | + | |
| 2 | *Microcystis marginata* | | | + | | | |
| 3 | *Microcystis stagnales* | + | + | | + | | + |
| 4 | *Chroococcus minutus* | | | + | | | |
| 5 | *Chroococcus minor* | + | | | | | + |
| 6 | *Chroococcus turgidus* | + | | | | | |
| 7 | *Chroococcus tenax* | | | | + | | + |
| 8 | *Gloeothece palea* | | | | | | + |
| 9 | *Gloeothece samoensis* | | | | | | + |
| 10 | *Aphanocapsa biforms* | + | | | | | |
| 11 | *Aphanocapsa nivalis* | | | | + | | + |
| 12 | *Aphanocapsa pulchra* | + | + | | + | + | + |
| 13 | *Aphanothece pallida* | | | + | | | |
| 14 | *Arthrospira jenneri* | | | + | | | |
| 15 | *Oscillatoria anguina* | + | + | + | + | + | + |
| 16 | *Oscillatoria animalis* | | | + | | | |
| 17 | *Oscillatoria acuta* | + | | + | | | |
| 18 | *Oscillatoria curviceps* | + | + | | + | + | + |
| 19 | *Oscillatoria chilkensis* | | | + | | | |
| 20 | *Oscillatoria decolorata* | | | | | + | |
| 21 | *Oscillatoria jasorvensis* | | | + | | | |
| 22 | *Oscillatoria jenensis* | + | + | | + | | |
| 23 | *Oscillatoria princpes* | + | | | | + | + |
| 24 | *Oscillatoria raoi* | | | + | | | |
| 25 | *Oscillatoria salina* | | | + | | + | |
| 26 | *Oscillatoria tenuis* | | | | + | | + |
| 27 | *Phormidium abronema* | + | | | | | |
| 28 | *Phormidium bohneri* | + | | + | | | |
| 29 | *Phormidium Ceylanicum* | | + | + | + | | + |
| 30 | *Phormidium fragile* | | | | | + | |
| 31 | *Phormidium luridum* | + | | | | | |
| 32 | *Phormidium mucosum* | | | + | | + | |
| 33 | *Phormidium tenue* | + | | | | | |
| 34 | *Lyngbya allorgei* | | | + | | | |
| 35 | *Lyngbya ceylanica* | | | | | + | |
| 36 | *Lyngbya hieronymusii* | + | | + | | | |
| 37 | *Lyngbya kuetzingii* | + | | | | | |
| 38 | *Lyngbya lachneri* | | + | | + | + | + |
| 39 | *Lyngbya putealis* | | | + | | + | |
| 40 | *Schizothrix tenuis* | + | | | | | |
| 41 | *Symploca muscorum* | | | + | | | |
| 42 | *Anabacnopsis circularis* | | | | | + | |
| 43 | *Cylindrospermum musicola va longispora* | | | + | | | |
| 44 | *Nostoc commune* | + | + | + | + | + | + |
| 45 | *Nostoc microscopicum* | + | | | | | |
| 46 | *Nostoc muscorum* | | | + | | + | |
| 47 | *Nostoc punctiforme* | + | | + | | + | |
| 48 | *Nostoc spongiae forme* | | | | | + | |
| 49 | *Anabaena circinalis var crassa* | + | | | | + | |
| 50 | *Anabaena fertilissima* | | | + | | | |
| 51 | *Anabaena naviculoides* | + | | + | | + | |
| 52 | *Anabaena torulosa* | + | | + | | + | |
| 53 | *Aulosira aenigmatica* | + | | + | | + | |
| 54 | *Plectonema tomasinianum* | | | | | + | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 55 | *Scytonema hofmanni* | + | + | + | + | + | + |
| 56 | *Tolypothrix nodosa* | | | + | | | |
| 57 | *Microchacte tenera* | + | | | | + | |
| 58 | *Microchacte uberrima* | | | | | | |
| 59 | *Calothrix brevissima* | + | | | | | |
| 60 | *Calothrix epiphytica* | + | + | | + | | + |
| 61 | *Calothrix marchica* | | | + | | | |
| 62 | *Calothrix marchica va. erassa* | | | + | | | |
| 63 | *Stigonema hormoides* | | | | | + | |
| | **Chlorophyta** | | | | | | |
| 1 | *Chlamydomonas mucicola* | + | | | | | |
| 2 | *Chlorococcum humicola* | + | | | | | |
| 3 | *Ankistrodesmus falcatus* | | | + | | | |
| 4 | *Scenedesmus arcuatus* | | | | | + | |
| 5 | *Scenedesmus dimorphus* | | + | | + | + | + |
| 6 | *Protococcus viridis* | + | | + | | + | |
| 7 | *Oedocladium indicum* | | | + | | | |
| 8 | *Oedogonium acerosum* | + | | + | | + | |
| 9 | *Closterium acerosum* | | | + | | | |
| 10 | *Closterium acutum* | | | + | | + | |
| 11 | *Closterium venus* | + | + | | + | | + |
| 12 | *Cosmarium granatum* | + | | + | | + | |
| | **Xanthophyta** | | | | | | |
| 1 | *Vaucheria geninata* | + | | + | | + | |
| 2 | *Vaucheria sessilis* | + | + | + | + | + | + |
| | **Euglehophyta** | | | | | | |
| 1 | *Euglena fusca* | + | | | | | |
| 2 | *Phacus caudetus* | | | | | + | |
| 3 | *Prachelomonas hispida f. minor* | + | | + | | + | |
| | **Bacillariophyta** | | | | | | |
| 1 | *Synedra affinis* | | | + | | | |
| 2 | *Navicula clavata* | | + | + | + | | + |
| 3 | *Navicula grivillei* | | | | | + | |
| 4 | *Cymbella cymbiformis* | + | + | | + | | + |
| 5 | *Nitzschia dissipata* | + | | + | | | |
| 6 | *Nitzschia gracilis* | | | + | | | |
| 7 | *Nitzschia vermicularis* | + | | | | | |

**Table 1:** Soil Algae of Sugarcane fields of Digras Taluka

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