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Soil Algal Flora of Sugarcane Fields from the Marathwada Region of Maharashtra

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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 interrelationship between plant root and soil microbes like algae. In Latur district most of the sugarcane fields located in Renapurtaluka 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 liter 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 andCyanobacteria. This makes the soil Non Fertile and reduces the sugarcane production.

Keywords: Sugarcane field,Rhizosphere, Nonrhizosperhic,De's modified Beneck's medium.

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 interrelationship 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 Studies of algae flora of sugarcane fields of Renapur tehsil of Latur District in the Marathwada region of Maharashtra 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 Latur district of RenapurTaluka shows different seasons and at different stages of crop growth. In Latur district most of the sugarcane fields located in RenapurTalukaare 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 Methods:

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 well 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(NO3)2 - 0.04 gm.
K2HPO4 - 0.01 gm.
MgSO4. 7H2O - 0.025 gm.
Na2SiO3 - 0.020 gm.
Ferric Citrate - 0.025 gm.
Citric acid - 0.003 gm
A5 solution - 1.0 ml
Distilled water - 1000 ml

A5 trace element stock solution:
H3BO3 - 2.86 gm
MnCl2 4H2O - 1.81 gm
ZnSO4. 7H2O - 0.222 gm
MoO3 (85%) - 0.0177 gm
CuSO4. 5 H2O - 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.

Results and Discussion:

In the presentstudies a total of166 algal forms were identified from the soils ofRenapur tehsil in which 91 belongs to cyanophyceae, 65 forms to chlorophyceae and 10 forms belongs to Bacillariophyta. Among the 166 forms of Cynophyceae belongs to 27 genus, while the chlorophyceaereperesnted by 26 genus and the bacillariophyceae is represented by its 10 genus.The results are agreed withJohn,R.P.(1942) and Reddy,K.V.S.(1979).This shows that cynophycean members are dominant in the cultivated fields. Out of the 166 species of algal forms 31 species of cynophycean member are nitrogen fixing forms. Only 26 species were found in regularly cultivating sugarcane field. Out of the 26, 18 were of Cynophycean member, 05chlorophyceanmember, and 03Bacillariophyceanmembers. The n2 fixing forms were only just three spps in regularly cultivating sugarcane fields. The status of Soil algae in Renapur tehsil 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 andCyanobacteria. This makes the soil Non Fertile and reduces the sugarcane production.

Table 1: Soil Algae of Sugarcane fields of Digras Taluka

Sr.No.	Name of Algae	Renapur		Pangaon		Pohregaon		Kharola		Karepur	
		F1	F2	F1	F2	F1	F2	F1	F2	F1	F2
	Cyanophyceae										
1	*Microcystisaeurginosa*Kuetzing	+	+	-	+	-	-	+	-	+	-
2	*Microcystiselongata*sp. nov.	-	-	-	+	+	+	-	-	-	-
3	*Microcystisflosaquae* (Wittrock) Kirchner	+	-	-	+	-	-	-	+	-	-
4	*Microcystislemilliformis*Holsinger	+	+	+	-	-	-	-	-	+	-
5	*Microcystisrobusta*(Clark) Nygaard	-	-	+	-	+	-	-	+	-	+

6	*Chroococcuscohaerens*(de Brebisson) Naegeli	-	-	-	-	-	-	-	+	+	-
7	*Chroococcusdispersus*(Keissler) Lemmermann	+	-	+	+	-	-	+	-	-	-
8	*Chroococcuslimneticus*Lemmerman n	--	-	-	-	-	-	-	-	+	+
9	*Chroococcus minor* (Kuetzing) Naegeli	+	+	+	-	-	+	+	+	+	+
10	*Chroococcusminutus* (Kuetzing) Naegeli	+	-	+	+	-	-	+	-	-	+
11	*Chroococcuspallidus*Naegeli	+	-	-	+	-	-	-	+	-	-
12	*Chroococcustenax* (Kirchner) Hieron	+	+	+	-	-	-	-	-	-	+
13	*Chroococcusturgidus* (Kuetzing) Naegeli	-	-	-	+	+	+	+	-	-	-
14	*Gloeocapsacompacta*Kuetzing	-	-	-	+	+	+	-	-	-	-
15	*Gloeocapsapolydermatica*Kuetzing	+	-	-	+	-	-	-	+	-	-
16	*Gloeocapsapunctata*Naegeli	+	+	+	-	-	-	-	-	+	-
17	*Gloeothecerupestris*(Lyngb.) Bornet	-	-	+	-	+	-	-	+	-	+
18	*Gloeothecesamoensis*Wille	-	-	-	-	-	-	-	+	+	-
19	*Aphanocapsagrevillei*(Hass.) Rabenhorst	+	-	+	+	-	-	+	-	-	-
20	*Aphanocapsakoordersi* Strom	--	-	-	-	-	-	-	-	+	+
21	*A22phanocapsa montana*Gramer	+	+	+	-	-	+	+	+	+	+
22	*Aphanocapsamuscicola* (Menegh.) Wille	+	-	+	+	-	-	+	-	-	+
23	*Aphanothecebullosa*(Menegh.) Rabenhorst	+	-	-	+	-	-	-	+	-	-
24	*Aphanothecemicroscopica*Naegeli	-	-	-	-	-	-	+	+	-	-
25	*Aphanothecemicrospora* (Menegh.) Rabehorst	+	+	+	-	-	-	-	-	-	+
26	*Aphanothecenidulans* Richter, P.	-	-	+	+	-	-	-	-	+	-
27	*Aphanothecepallida* (Kuetzing) Rabenhorst	+	-	+	--	-	+	-	-	-	+
28	*Aphanothecesaxicola*Naegeli	+	-	-	-	+	-	-	-	-	-
29	*Synechococcusaeruginosus*Naegeli	-	+	-	-	-	-	-	-	-	-
30	*Synechocystisaquatilis*Sauvageau	+	-	-	-	-	+	+	-	-	-
31	*Merismopediaelegans* A. Braun	-	-	+	-	+	+	+	-	-	-
32	*Merismopediaglauca* (Ehrenb.) Naegeli	+	-	-	-	-	-	+	+	-	-
33	*Merismopediapunctata*Meyen	+	-	-	+	-	-	-	+	-	-
34	*Myxosarcinaspectabilis*Geitle	+	+	+	-	-	-	-	-	+	-
35	*Arthrospiraplatensis*(Nordst). Gomont	-	-	+	-	+	-	-	+	-	+
36	*Oscillatoriaamoena*(Kuetzing) Gomont	+	+	+	-	-	-	-	+	+	-
37	*Oscillatoriaanimalis*Agardh ex Gomont	+	-	+	+	-	-	+	-	-	-
38	*Oscillatoriaannae*van Goor	--	-	+	+	-	+	-	-	+	+
39	*Oscillatoriacurviceps*Agardh ex Gomont	+	+	+	-	-	+	+	+	+	+
40	*Oscillatorialaete-virens*(Crouan) Gomont	+	-	+	+	-	-	+	-	-	+
41	*Oscillatoriaokeni*Agardh ex Gomont	+	-	-	+	+	+	+	+	-	-
42	*Oscillatoriaornata*Kuetzing ex Gomont	-	+	+	-	+	-	+	+	-	-
43	*Oscillatoria princeps* Vaucher ex Gomont	+	+	+	-	-	-	-	-	-	+
44	*Oscillatoriaproboscidea*Gomont	-	-	+	+	-	+	+	-	+	-

45	*Oscillatoriapseudogeminata*Schmid	+	-	+	--	-	+	-	-	-	+
46	*Oscillatoriarubescens*DC ex Gomont	+	-	-	-	+	-	-	-	-	-
47	*Oscillatoria sancta* (Kuetzing) Gomont	-	+	-	-	-	-	-	-	-	-
48	*Oscillatoriasplendida*Grev. Ex Gomont	+	-	-	-	-	+	+	-	-	-
49	*Phormidiumanomala*Rao. C.B.	-	-	+	-	+	+	+	-	-	-
50	*Phormidiumautumnale* (Agardh) Gomont	+	-	-	-	-	-	+	+	-	-
51	*Phormidium corium* (Agardh) Gomont	+	-	-	+	-	-	-	+	-	-
52	*Phormidiumcalcicola*Gardner	+	+	+	-	-	-	-	-	+	-
53	*Phormidiumfavosum*(Bory) Gomont	-	-	+	-	+	-	-	+	-	+
54	*Phormidiumjenkelianum*Schmid	+	+	+	-	-	+	-	+	+	-
55	*Phormidiummicrotomum*Skuja	+	-	+	+	-	-	+	-	-	+
56	*Phormidiummolle*(Kuetzing) Gomont	+	+	-	+	-	-	+	-	+	-
57	*Phormidiumtenue* (Menegh.) Gomont	-	-	-	+	+	+	-	-	-	-
58	*Phormidiumuncinatum*(Ag.) Gomont	+	-	-	+	-	-	-	+	-	-
59	*Lyngbyaaestuarii*Liemb. ex Gomont	+	+	+	-	-	-	-	-	+	-
60	*Lyngbyabipunctata*Lemmermann	-	-	+	-	+	-	-	+	-	+
61	*Lyngbyabirgei*Smith G.M.	-	+	-	+	-	+	-	+	+	-
62	*Lyngbyaceylanica*Wille	+	-	+	+	-	-	+	-	-	-
63	*Lyngbyadendrobia*Bruhl et Biswas	--	-	-	-	+	+	+	-	+	+
64	*Lyngbyahieronymusii*Lemmermann	+	+	+	-	-	+	+	+	+	+
65	*Lyngbyalagerheimii*(Moebius) Gomont	+	-	+	+	-	-	+	-	-	+
66	*Lyngbyalaxespiralis*Skuja	+	-	-	+	-	-	-	+	-	-
67	*Lyngbya major* Meneghini ex Gomont	+	+	+	-	-	-	-	-	-	+
68	*Lyngbyamajuscula*Harvey ex Gomont	-	-	-	+	+	+	+	-	-	-
69	*Lyngbyamartensiana*Menegh. ex Gomont	-	-	-	+	+	+	-	-	-	-
70	*Lyngbyaperelegans*Lemmermann	+	-	-	+	-	-	-	+	-	-
71	*Lyngbya semiplena* (C.Agardh)J.Agardh ex Gomont	+	+	+	-	-	+	-	+	+	-
72	*Lyngbyaspiralis*Geitler	+	-	+	-	+	-	-	+	-	+
73	*Schizothrixfriesii* (Agardh) Gomont	-	+	-	-	-	-	-	+	+	-
74	*Schizothrixmuelleri*Naegeli ex Gomont	+	-	+	+	-	+	+	-	+	-
75	*Symplocacartilaginea*(Mont.) Gomont	+	-	-	-	-	+	+	+	-	+
76	*Microcoleuslacustris*(Rabenh.) Farlow	-	-	+	-	+	+	+	-	-	-
77	*Microcoleusvaginatus* (Vaucher) Gomont	+	-	-	-	-	-	+	+	-	+
78	*Hydrocoleumcantharidosum* (Mont.) Gomont	+	-	-	+	-	-	-	+	+	-
79	*Anabaenopsiscircularis* (West) Wolosz. et Miller	+	+	+	-	-	-	-	-	+	-
80	*Cylindrospermumsphaerica* Prasad, B.N. f. *cylindricum*Kamat	+	-	+	-	+	-	-	+	-	+
81	*Nostocellipsosporum* (Desm.) Rabenh. ex Born. etFlah.	+	+	+	-	-	+	-	+	+	-
82	*Nostocpiscinale*Kuetzing ex GomontBornet et Flah.	+	-	+	+	-	-	+	-	-	+
83	*Anabaena orientalis* Dixit	+	+	-	+	-	-	+	-	+	-

84	*Anabaenatorulosa* (Carm.) Lag. exBornet et Flah.	-	-	-	+	+	+	-	-	-	-
85	*Raphidiopsiscurvata* Fritsch et Rich	+	-	-	+	-	-	-	+	-	-
86	*Aulosiraprolifica*Bharadwaja	+	+	+	-	-	-	-	-	+	-
87	*Plectonemanotatum*Schmidle	-	-	+	-	+	-	-	+	-	+
88	*Homoeothrix Juliana* (Menegh.) Kirchner	-	+	-	+	-	+	-	+	+	-
89	*Calothrixbharadwajae* De Toni J.	+	-	+	+	-	-	+	-	-	-
90	*Calothrixclavata* West, G.S.	--	-	-	-	+	-	+	-	+	+
91	*Calothrixclavatoides*Ghose	+	+	+	-	-	+	+	+	+	+
	Chlorophyceae	+	-	+	+	-	-	+	-	-	+
1	*Chlamydomonasangulosa* Dill	-	-	-	+	-	-	-	+	-	-
2	*Chlamydomonasglobosa*Snow	-	+	-	-	-	-	-	-	-	+
3	*Carteriaklebsii*(Dang.) Dill	+	+	+	-	-	-	-	-	-	-
4	*Pandorinamorum* (Muell.) Bory	-	-	-	-	+	-	-	-	-	-
5	*Eudorinaelegans*Ehrenberg	+	-	-	-	-	-	-	-	-	+
6	*Sphaerocystisschroeteri*Chodat	+	-	+	-	+	+	+	+	+	+
7	*Gloeocystisampla*(Kuetzing) Lagerheim	-	-	-	+	+	-	-	-	-	-
8	*Gloeocystisgigas*(Kuetzing) Lagerheim	+	-	-	+	-	-	-	-	-	-
9	*Tetrasporacylindrica*(Wahl.) C.A. Agardh	-	+	-	+	-	+	-	+	+	-
10	*Tetrasporalacustris*Lemmermann	+	-	+	+	-	-	+	-	-	-
11	*Schizochlamyscompacta*Prescott	--	-	-	-	+	-	+	-	+	+
12	*Schizochlamysgelatinosa*A. Braun	+	+	+	-	-	+	+	+	+	+
13	*Elakatothrixgelatinosa*Wille	+	-	+	+	-	-	+	-	-	+
14	*Elakatothrixviridis*(Snow) Printz	-	-	-	+	-	-	-	+	-	-
15	*Ulothrixaequalis*Kuetzing	-	+	-	-	-	-	-	-	-	+
16	*Ulothrixsubconstricta*G.S. West	+	+	+	-	-	-	-	-	-	-
17	*Stigeocloniumnanum*Kuetzing	-	-	-	-	+	-	-	-	-	-
18	*Stigeocloniumtenue* (Agardh) Kuetzing	+	-	-	-	-	-	-	-	-	+
19	*Protococcusviridis*Agardh	+	+	+	+	+	+	+	-	-	+
20	*Oedogoniumpisanum*Wittrock ex Hirn	-	-	-	+	+	-	-	-	-	-
21	*Oedogoniumplusiosporum*wittrock ex Hirn.	+	-	+	-	+	+	+	+	+	+
22	*Oedogoniumtapeinosporum*Wittrock ex Hirn.	-	-	-	+	+	-	-	-	-	-
23	*Chlorococcumhumicola* (Naegeli) Rabenhorst.	+	-	-	+	-	-	-	-	-	-
24	*Chlorococcuminfusionum* (Schrank) Menegh.	-	+	-	+	-	+	-	+	+	-
25	*Characiumambiguum* Hermann ex Rabenhorst	+	-	+	+	-	-	+	-	-	-
26	*Characiumcurvatum* G.M. Smith	+	-	-	-	-	-	-	-	-	+
27	*Characiumlimneticum*Lemmermann	+	-	+	-	+	+	+	+	+	+
28	*Characiumrostrastum*Reinhard	-	-	-	+	+	-	-	-	-	-
29	*Trochisciagranulata* (Reinsch) Hansgirg	+	-	-	+	-	-	-	-	-	-
30	*Trochisciaobtusa* (Reinsch) Hansgirg	-	+	-	+	-	+	-	+	+	-
31	*Trochisciareticularis* (Reinsch) Hansgirg	+	-	+	+	-	-	+	-	-	-
32	*Chlorella vulgaris* Beijerinck	--	-	-	-	+	-	+	-	+	+
33	*Nephrocytiumlunatum*W. West	+	+	+	-	-	+	+	+	+	+
34	*Ankistrodesmusfalcatus*(Corda)	+	-	+	+	-	-	+	-	-	+

	Ralfs										
35	*Ankistrodesmusspiralis*(Turner) Lemmermann	-	-	-	+	-	-	-	+	-	-
36	*Selenastrumbibraianum*Reinsch	-	+	-	-	-	-	-	-	-	+
37	*Selenastrumgracile*Reinch	+	+	+	-	-	-	-	-	-	-
38	*Crucigeniairregularis*Wille	-	-	-	-	+	-	-	-	-	-
39	*Crucigenialauterbornii*Schmidle	+	-	-	-	-	-	-	-	-	+
40	*Scenedesmusacuminatus* (Lagerheim) Chodat	+	+	+	+	+	+	+	-	-	+
41	*Scenedesmusacutiformis* Schroeder	-	-	-	+	+	-	-	-	-	-
42	*Scenedesmusarcuatus*(Lemm). Lemmermann	+	-	+	-	+	+	+	+	+	+
43	*Scenedesmusbrasiliensis*Bohlin	-	-	-	+	+	-	-	-	-	-
44	*Scenedesmusdenticulatus*Lagerheim	+	-	-	+	-	-	-	-	-	-
45	*Scenedesmusdimorphus*(Turpin) Kuetzing	-	-	-	-	+	+	+	-	-	-
46	*Closteriumvenus*Kuetzing	+	+	+	+	-	-	-	-	+	-
47	*Euastrumirregulare*Gozalves et Gangla	-	-	-	+	+	+	+	-	-	-
48	*Euastrumspinulosum*Delp.	-	-	-	-	+	-	-	-	-	-
49	*Cosmariumcontractum* Kirchner	+	-	+	-	+	-	+	-	+	-
50	*Cosmariumlibogense* West et West	-	-	-	-	+	-	-	-	-	-
51	*Cosmariumpseudoprotuberans*Kirch ner	+	+		-	-	-	-	-	-	+
52	*Cosmariumpseudopryramidatum*Lun d.	+	--	-	-	+	+	+	+	+	+
53	*Cosmariumrepandum*Nordstedt	+	+	+	+	+	+	+	-	-	+
54	*Cosmariumschmidtianum* Forster	-	-	-	+	+	-	-	-	-	-
55	*Cosmariumsexangulare*Lundell	+	-	+	-	+	+	+	+	+	+
56	*Cosmariumsubimpressulum*Borge	-	-	-	+	+	-	-	-	-	-
57	*Cosmariumsublatereundatum* West et West	+	-	-	+	-	-	-	-	-	-
58	*Cosmariumsubmamillatum*West et West	-	+	-	+	-	+	-	+	+	-
59	*Cosmariumtetragonum* (Naegeli) Archner	+	-	+	+	-	-	+	-	-	-
60	*Cosmariumundulatum*Corda ex Ralfs	--	-	-	-	+	-	+	-	+	+
61	*Staurastrumgracile*Ralfs	+	+	+	-	-	+	+	+	+	+
62	*Staurastrumlapponicum*Gronblad	+	-	+	+	-	-	+	-	-	+
63	*Staurastrummuticum*de Brebisson	-	-	-	+	-	-	-	+	-	-
64	*Staurastrumpunctulatum* de Brebisson	-	+	-	-	-	-	-	-	-	+
65	*Staurastrumquebecense*Irenee-Marie	+	+	+	-	-	-	-	-	-	-
	Bacillariophyceae	-	-	-	-	+	-	-	-	-	-
1	*Amphora ovalisKutz.*	+	-	-	-	-	-	-	-	-	+
2	*Cyclotella sp.*	+	+	+	+	+	+	+	-	-	+
3	*Cymbellasagarensis Gandhi*	-	-	-	+	+	-	-	-	-	-
4	*CymbellaventricosaKuetz.*	+	-	+	-	+	+	+	+	+	+
5	*EunotiamonodonEhrnb.*	-	-	-	+	+	-	-	-	-	-
6	*Navicula cuspidate Kuetz.*	+	-	-	+	-	-	-	-	-	-
7	*NaviculagastrumEhrnb.*	-	+	-	+	-	+	-	+	+	-
8	*NavicularadiosaKutz.*	+	-	+	+	-	-	+	-	-	-
9	*PinnulariafulvaEhrnb.*	-	-	-	-	+	+	+	+	+	+
10	*SynedratubulataKuetz.*	+		+	-	--	-	-	-	-	-

(F1-Field 1. F2-Field 2)

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