



CHLOROPHYCEAE FROM THE CULTIVATED RICE FIELDS OF JAMMU DISTRICT (J&K).

Science

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ABSTRACT

The chlorophyceae (green algal flora) of cultivated rice fields of Jammu district (J&K) was surveyed, the collections were made from different locations like R.S. Pura, Mandal Phallan and Marh of Jammu district. The rice fields of Jammu harbour a very rich flora of green algae, 91 genera 268 species 49 varieties and 14 forms have been reported from the study area. Looking at the diversity of genera and species of algae studied, it has been found that the most dominant genus with regard to the number of species is *Cosmarium* followed by *Spirogyra*, *Oedogonium* and *Scenedesmus*. Though other genera of algae of greater significance were also present with less number of species but still it is quantitatively better represented. An attempt has been made to study the composition of various algal taxa in two phases. Once when the rice seedlings were transplanted in the fields and second the samples were collected when the rice crop was ready for the harvest and the fields still possessed a sufficient quantity of water and the soil was wet enough.

KEYWORDS

Chlorophyceae, *Cosmarium*, *Spirogyra*, *Oedogonium* and *Scenedesmus*

INTRODUCTION

Research has been done in different countries on blue green algal flora of rice fields but meagre work has been done on green algae from the rice fields from North and South India. Sixteen samples of soils were studied for the presence of algae from North and South India (Mitra, 1951). Arce, Gina and Bold, Harold, C. (1958) worked on some Chlorophyceae from Cuban soils and on the basis of comparison of morphological attributes exhibited by populations in culture, ten new species of Chlorophyceae have been identified. In Cuttuck, Singh (1973) worked on the occurrence of green algae *Pithophora* sp. and *Hydrodictyon reticulatum* as weed in rice fields and discussed the morphology and methods of control of these weeds. Grover and Pandhol, 1975 worked on the algal flora of paddy fields of Ludhiana and its adjacent areas and observed the occurrence of 43 species, out of which 17 species were green algae. 80 species of Chlorophyceae representing 44 genera were reported from Karnataka (Bongale, 1979). Tarar and Cherian, 1979 worked on the paddy fields soils of Nagpur and recorded 27 algal taxa belonging to Chlorophyceae. 80 more species of Chlorophyceae were also reported from Karnataka (Bongale and Bharat, 1980). Happy-Wood 1981, worked on the algal ecology of rice fields in Southern Australia and found that in comparison to green algae, blue green algae seemed to be a less important component of community in Australia than in other regions of the world. The systematic and ecology of rice fields soil gave an account of various aspects of algal flora, their relative abundance and biomass and also reported 5 genera with 5 species in Bangladesh (Aziz *et al* (1991).

An attempt has been made to survey the distribution of algae belonging to Chlorophyceae from the cultivated rice fields of Jammu district (J&K), in the present investigation.

MATERIALS AND METHODS

The algal materials have been collected from both water logged cultivated rice fields as well as soils of rice fields. The collection was made on monthly basis over a period of 2 years from the above fields. Phytoplanktons were also collected along with water samples in plastic bottles. Blooms, whenever and wherever in the fields were found were collected by physical methods. Algal materials were collected with the help of scalpels along with some soil from different sites in the same field. The algal materials taken from the field were mixed to retain a composite sample and then preserved in 70% alcohol and 4% formalin in the ratio of 4:1 for taxonomic work.

The algal materials was collected and preserved for identification and was thoroughly washed with water twice or thrice and sometimes studied as such or stained differentially to study the details of the cell. Picric acid and Potassium Iodide (KI) in concentration of 1% were

used to differentiate the chloroplasts. Simple glycerine mounts of the material were also made. The morphology of all the genera was studied under compound microscope and camera Lucida drawings were made at differential magnifications (4x10; 4x40; 10x10; 10x40; 10x100; 15x10; 15x40 and 15x100). Cell dimensions have been measured with the help of the ocular and stage micrometer.

For the identification of the different species, varieties and forms, the available literature in the form of research papers and books has been consulted sparingly.

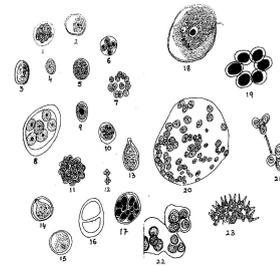


Fig:1-*Sphaerocystis schroeteri* Chodat; 2-*Chlorella farfurie* Fott et Novaska; 3-*Gloeocystis major* Germ.; 4- *Gloeocystis gtgas* (Kutz.) Lager.; 5-*Eremosphaera viridis* De Bary; 6- *Chlorella conglomerate* (Artari) Oltmanns; 7- *Coelastrum sphaericum* Naeg.; 8- *Asterococcus limneticus* Sm.; 9-*Chlorococcum humicolo* (Naeg.) Eabenh.; 10- *Pandorina morum* (Muell.)Bory; 11-*Coelastrum microporum* Naeg.; 12-*Crucigenia triangularis* (Braun)Gay; 13-*Myrmecea aquatica* Sm.; 14-*Dysmorphococcus variabilis* Takeda; 15- *Chlorococcum echinozygotum* Starr; 16-*Glaucocystis cingulata* Bohl.; 17- *Chlorococcum apalnosporum* Arce etBold; 18— *Chlorococcum infusionum* (Sch.) Menegh.; 19-*Coelastrum cambricum* Arch.; 20- *Pleodorina sphaerica* Iyengar; 21- *Tetrastrum punctatum* (Sch.) Ahls. & Tiff.; 22- *Chlorella vulgaris* Beyer.; 23-*Pediastrum duplex* Meyen var. *genuinum* (Braun) Hansg.

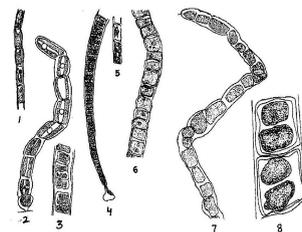


Fig:1-*Uroneme africanum* Borge; 2-*Ulothrix cylindricum* Prescott; 3-*Ulothrix tenuissima* Kutz.; 4-*Schizomeris leibleinii* Kutz.; 5-*Uroneme terrestre* Mitra; 6-*Microspora floccose* (Vaucher) Thuret; 7-*Cylindrocapsa oedogonioides* Randhawa; 8-*Binuclearia tectorum* (Kutz.) Beg. ex Wichm.

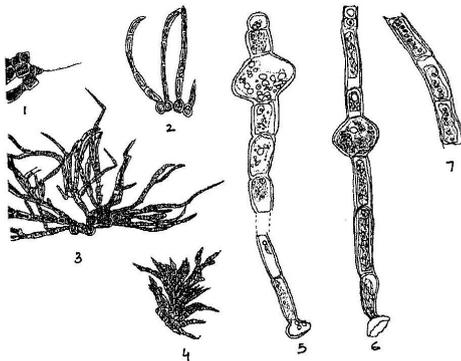


Fig:1 1- *Thamniochaete huberi* Gay; 2- *Chaetophora attenuate* Hazen; 3- *Coleochaete solute* (Breb.) Prings.; 4- *Stigeoclonium farctum* Berth.; 5- *Oedogonium lautuaniarum* (Witr.) Hirn. F. *gracilis* Venk.; 6- *Oedogonium intermedium* (Witr.) Hirn. var. *intermedium* Hirn. ; 7- *Mougeotia sphaerocarpa* Wolle.

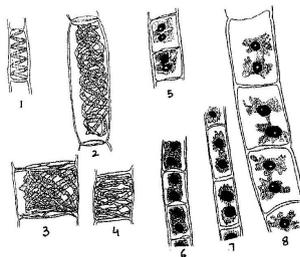


Fig:1- *Spirogyra juergensi* Kutz.; 2- *Spirogyra majuscula* Kutz.; 3- *Spirogyra maxima* (Hass.) Witr.; 4- *Spirogyra paradoxa* Rao; 5- *Zygnema misrae* Kolkwa. & Krieg.; 6- *Zygnema terrestre* Randhawa; 7- *Zygnema sphaericum* Misra; 8- *Zygnema giganteum* Randhawa.

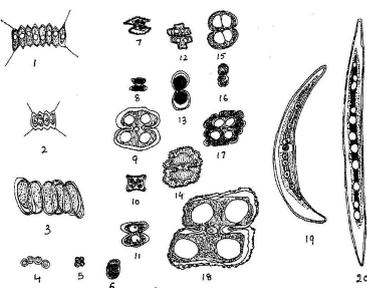


Fig:1- *Scenedesmus opoliensis* Rich.var. *mononensis* Chodat; 2- *Scenedesmus quadrispina* Chodat; 3- *Scenedesmus perforates* Lemm.; 4- *Scenedesmus bijugatus* (Turp.) Kutz.; 5- *Tetradesmus wisconsinensis* Sm.; 6- *Euastrum gayanum* var. *huberi* Krieg.; 7- *Staurastrum subsuecicum* Croas.; 8- *Staurastrum bieneanum* Rabenh. var. *elleptium* Wille; 9- *Cosmarium foreatum* Sch.; 10- *Crucigenia tetrapedia* (Kirchn.) West & West; 11- *Staurastrum punctulatus* Breb.; 12- *Euastrum ceylanium* (West & West) Krieg.; 13- *Xanthidium orcadense* West & West.; 14- *Euastrum denticulatum* (Krieg.) Gay. Var. *rectangular* West & West; 15- *Cosmarium circularis* Reinsch.; 16- *Euastrum papillare* Croas.; 17- *Euastrum pectinatum* Breb. Var. *laluliferum* Breb.; 18- *Staurastrum bieneanum* Kabenh. Var. *quadrangulare* Prasad & Misra; 19- *Closterium leibleinii* Kutz. Var. *recurvatum* West & West; 20- *Closterium rectimarginatum* Scott et Prescott.

OBSERVATIONS

The algal flora of the cultivated rice fields of Jammu district has been studied extensively from 72 fields comprising eighteen numbers of sites of three different blocks (R.S. Pura, Mandal and Marh) of Jammu district. It has been found that rice fields of Jammu harbour a very rich flora of green algae. An attempt has been made to study the composition of various algal taxa in two phases. Once when the rice seedlings were transplanted in the fields and second, the samples were collected when the rice crop was ready for the harvest and the fields still possessed a sufficient quantity of water and the soil was wet enough. The total algal genera belonging to Chlorophyceae identified has been represented hereunder. The genera and species have been classified according to Prescott (1950) and the classification has been modified here and there to accommodate the taxa which has either not been included in Prescott's classification or have been placed doubtfully by the author.

Division: **Chlorophyta**

Class: **Chlorophyceae**

1. Order: **Volvocales**

Family: **Phacotaceae**

1. *Dysmorphococcus variabilis* Takeda

Family: **Chlamydomonadaceae**

1. *Carteria klebsii* Dill.

2. *Chlamydomonas* (2 spp.)

Family: **Haematococcaceae**

1. *Sphaerella lacustris* (Girod.) Witr.

Family: **Volvocaceae**

1. *Pandorina morum* (Muell.) Bory

2. *Pleodorina sphaerica* Iyengar

3. *Volvox* (2 spp.)

2. Order: **Tetrasporales**

Family: **Coccomyxaceae**

1. *Nannochloris bacillaris* Naumann

Family: **Palmellaceae**

1. *Asterococcus limneticus* Sm.

2. *Gloeocystis* (2 spp.)

3. *Sphaerocystis schroeteri* Chodat.

Family: **Chlorangiellaceae**

1. *Malleochloris sessilis*

3. Order: **Ulotrichales**

a) Sub-Order: **Ulotrichineae**

Family: **Ulotrichaceae**

1. *Binuclearia tectorum* (Kutz.) Beg. ex Wichm.

2. *Uronema* (4 spp.)

3. *Ulothrix* (8 spp.)

b) Sub-Order: **Schizomeridineae**

Family: **Schizomeridaceae**

1. *Schizomeris leibleinii* Kutz.

4. Order: **Microsporales**

Family: **Microsporaceae**

1. *Microspora* (4 spp.)

5. Order: **Cylindrocapsales**

Family: **Cylindrocapsaceae**

1. *Cylindrocapsa* (2 spp.)

2. *Cylindrocapsopsis indica* Iyengar

6. Order: **Chaetophorales**

Family: **Protococcaceae**

1. *Protococcs viridis* Ag.

Family: **Coleochaetaceae**

1. *Coleochaete solute* (Breb.) Prings.

Family: **Trentepohliaceae**

1. *Trentepohlia* (2 spp.)

Family: Chaetophoraceae

1. *Apatococcus lobatus* (Chodat.) Boye-Petersen
2. *Chaetonema irregulare* Nowakowski
3. *Chaetophora attenuate* Hazen
4. *Desmococcus viridis* (Ag.) Brand
5. *Fritschella tuberosa* Iyengar
6. *Gomontia lignicola* Moore
7. *Gongrosira stagnalis* (West) Sch.
8. *Leptosira mediciana* Borzi.
9. *Microthamnion kutzingianum* Naeg.
10. *Protoderma viride* Kutz.
11. *Pseudochaete gracilis* West & West
12. *Stigeoclonium farctum* Berth.
13. *Thamniochaete huberi* Gay

Family: Cladophoraceae

1. *Pithophora oedogonia* (Mont.) Wittr.
2. *Rhizoclonium hieroglyphicum* Kutz.

8. Order: **Oedogoniales**

Family: Oedogoniaceae

1. *Bulbochaete* sp. Ag.
2. *Oedogonium* (30 spp.)

9. Order: **Schizogoniales**

Family: Schizogoniaceae

1. *Schizogonium murale* Kutz.

10. Order: **Chlorococcales**

Family: Characiaceae

1. *Characium* (3 spp.)

Family: Characiosiphonaceae

1. *Characiosiphon rivularis* Iyengar

Family: Hydrodictyaceae

1. *Pediastrum duplex* Meyen

Family: Chlorococaceae

1. *Chlorococcum* (5 spp.)
2. *Closteridium bengalicum* Turner
3. *Desmatractum plicatum* West & West
4. *Glaucosphaera vacuolata* Korsh.
5. *Myrmecia aquatica* Sm.

Family: Coelastraceae

1. *Coelastrum* (4 spp.)

Family: Botryococcaceae

1. *Botryococcus braunii* Kutz.

Family: Oocystaceae

1. *Ankistrodesmus* (2 spp.)
2. *Chlorella* (3 spp.)
3. *Dactylococcus infusio* Naeg.
4. *Dimorphococcus cordatus* Wolle
5. *Eremosphaera viridis* De Bary
6. *Glaucocystis cingulata* Bohl.
7. *Gloeotaenium loitelsbergerianum* Hansg.
8. *Kirchneriella lumaris* (Kirchn.) Moeb.
9. *Mycanthococcus antarcticus* Wille.
10. *Nephrochlamys subsolitaria* (West) Korsh.
11. *Nephrochloris incerta* Geitler & Gimes
12. *Oocystaenilegans elegans* Gonz. Et Mehra
13. *Oocystis* (6 spp.)
14. *Planktosphaeria gelatinosa* Sm.
15. *Schroederea planktonica* (Skuja) Philipose
16. *Selenastrum westii* Sm.
17. *Tetraedron* (2 spp.)
18. *Trochiscia aciculifera* (Lager.) Hansg.

Family: Scendesmaceae

1. *Actinastrum* (2 spp.)
2. *Crucigenia* (2 spp.)
3. *Scenedesmus* (15 spp.)
4. *Tetradesmus wisconsinensis* Sm.
5. *Tetrastrum* (2 spp.)

Family: Radiococaceae

1. *Pseudotetraspora gainii* Wille

11. Order: **Siphonales**

Family: Vaucheriaceae

1. *Vaucheria jaoi* Jao & Ley

12. Order: **Zygnematales**

Family: Zygnemataceae

1. *Mougeotia* (2 spp.)
2. *Sirogonium* (4 spp.)
3. *Spirogyra* (45 spp.)
4. *Zygnema* (7 spp.)

Family: Mesoteaniaceae

1. *Mesotaenium macrococcum* (Kutz.) Roy & Biss

Family: Desmidiaceae

1. *Closterium* (13 spp.)
2. *Cosmarium* (52 spp.)
3. *Cylindrocystis brebissonii* Menegh
4. *Desmidium swartzii* Ag.
5. *Docidium undulatum* Bailey
6. *Euastrum* (5 spp.)
7. *Gonatozygon pilosum* Wolle
8. *Micrasterias* (2 spp.)
9. *Pleurotaenium* (2 spp.)
10. *Staurastrum* (4 spp.)
11. *Xanthidium orcadense* West & West.

Among the above classification *Scenedesmus serratus* (Corda.) Bohl. var. *bicellularis* Kant & Pandoh, *Spirogyra farlowii* Trans. var. *denticulata* Kant & Pandoh and *Euastrum spinulosum* Delp. var. *major* Kant & Pandoh are the 3 new varieties which have been reported for the first time.

Table 1 Total genera, species, varieties and forms of the algal taxa of Chlorophyceae from the cultivated rice fields of Jammu district

S.No.	Class	Genera	Species	Varieties	Forms
1.	Chlorophyceae	91	268	49	14

Table 2: Order wise breakup of the algal taxa of Chlorophyceae from the cultivated rice fields of Jammu district

S.No.	Order	Genera	Species	Varieties	Forms
1.	Volvocales	07	10	-	-
2.	Tetrasporales	05	06	-	-
3.	Ultrichales			-	-
a.	Ultrichineae	03	13	-	-
b.	Schizomeridinae	01	01	-	-
4.	Microsporaes	01	04	-	-
5.	Cylindrocapsales	02	03	-	-
6.	Chaetophorales	16	16	-	-
7.	Cladophorales	02	02	-	-
8.	Oedogoniales	02	23	07	06
9.	Schizogoniales	01	01	-	-
10.	Chlorococcales	34	60	15	01
11.	Siphonales	01	01	-	-
12.	Zygnematales	16	127	27	07
	Total	91	268	49	14

RESULTS AND DISCUSSION

It has been found that rice fields of Jammu harbour a very rich flora of green algae. In all 91 genera, 268 species, 49 varieties and 14 forms have been reported from the study area table (1). Among various order-wise breakup of the algal taxa collected is given in the table (2). It is clear from the table that the order Chlorococcales is represented by maximum number of genera (34) whereas the total species in this order are only 60 and 15 varieties and 1 form is also represented in this order. On the other hand order Zygnematales though is represented only by 16 genera but the number of species in this order is maximum (127). The other order showing dominance with regard to the generic distribution is Chaetophorales with 16 genera and 16 species.

While focusing at the diversity of genera and species of algae studied,

it has been found that the most dominant genus with regard to the number of species is *Cosmarium* (60 species) followed by *Spirogyra* (45 species), *Oedogonium* (33 species), *Scenedesmus* (23 species), *Closterium* (17 species), *Euastrum* (10 species), *Ulothrix* and *Zygnema* (8 species each), *Oocystis* (6 species), *Staurastrum* (5 species), *Colestrum*, *Microspora*, *Sirogonium* and *Uronema* (4 species each) in the class Chlorophyceae. Though other genera of algae of greater significance were also present with less number of species but still it is quantitatively better represented. Such algae produce surface humus after death, decay and exert a solvent action on soil minerals maintaining a reserve supply of elements in a semi-available form for higher plants.

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