

Fresh Water Algal Diversity-Chlorophyceae from Kagdi Dam of district Banswara Rajasthan, India

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Abstract

Chlorophyceae represent a morphologically diverse group of photosynthetic organisms usually identified as green algae. This is the largest and heterogenous group of freshwater algae ranging in size from microscopic unicellular or coenocytic to large colonies and extensive filamentous forms. The Present study is a part of survey conducted on fresh water algal flora of Chlorophyceae in Kagdi Dam. The collections of algal samples were carried out during the month of July-August 2019 from different areas located in upstream and downstream of the Kagdi Dam. Samples were examined under microscope and identified in the laboratory of P.G. Department of Botany, S.G.G. Government College Banswara. The study revealed the presence of 15 different species of algae belonging to Chlorophyceae. Thallus diversity of morphology ranges from non motile *Chlorella* to well organised thallus of *Chara* showing tendency towards tree habit, through coenobial *Scenedesmus*, *Pediastrum* and large colonies of *Hydrodictyon* to unbranched filamentous *Spirogyra*, *Oedogonium*.

Main object of present work is to explore algal diversity of Banswara district of South Rajasthan. The work on the diversity of algae in South Rajasthan is very less. The present work deals with the systematic and ecological study of Chlorophyceae which forms major part of planktonic algae. The work on Chlorophyceae were carried out from different region of India by many workers like Brüehl and Biswas⁷, Gonzalves and Joshi¹⁰, Biswas⁵, Mitra¹⁵, Gupta¹¹, Bharati⁴, Philipose²⁰, Hortobadyi¹², Patel¹⁸, Patel and

Isabella¹⁹, Kant and Anand¹³, Pandey *et al.*,¹⁷.

Study Area :

Kagdi Dam is an important part of the Mahi Bajaj Sagar Project located around 3 Kms. from the main city in eastern limits of district Banswara on Ratlam Road. This is one of the most beautiful places to visit in Rajasthan. Kagdi Dam is situated in the extreme eastern part of Banswara city (23° 11" to 26° 56" North latitude and 73° 58" to 74° 47" East longitude). The temperature ranges

from 4° to 45°C with average annual rainfall 1000 mm. The district is divided into five tehsils namely 1. Banswara 2. Bagidora 3. Garhi 4. Ghatol 5. Kushalgarh. It is an earthen dam and is constructed on the Mahi river backwater in Banswara Tehsil. Mahi River is a natural boundary between Rajasthan and Madhyapradesh. The Kagdi dam is surrounded by rolling hills of Aravali ranges. *Mahi Dam* and *Gammon Bridge* is the main attraction and tourist spot of the district.

The sample collection site was selected from six different points, covering whole study area Kagdi Dam. The samples were collected from these points in different seasons and at monthly intervals. The samples were brought to the laboratory for further investigation³ and fresh materials were examined as much as possible. Few samples were centrifuged or cultured for their identification enumeration. The identification done by standard methods and keys^{6,8,9,16,20,21}.

Taxonomic Enumerations :

Ankistrodesmus spiralis (Turner)
Lemmermann; Philipose :

Acicular cells in group of 8-16, sometime two. Cells spirally twisted round one another in the median region, but free at the ends. Cells up to 4.5 μ broad, and up to 35 μ . Habitat - Planktonic in all area and forms a part of algal bloom, July and August 2019.

Chara zeylanica Klein ex Willd :

The plants are 30-50 cm in height, and consist of flexible axes with whorls of branchlets. There is no cortex at the basal portion of branchlets. Oogonia are formed

above the antheridia on the same branchlet node. Two whorls of stipulodes are distinct on the stem nodes.

Habitat – Found in static water upto 3-5 feet deep especially if the water is high in calcium. It often only noticed when the water levels drop it is exposed, April 2019.

Chlorella vulgaris Beijerin; Philipose :

Cells ovoid with usually a single chloroplast is in form of a parietal plate. Cells diameter ranging from 1.37 to 2.7 μ .

Habitat - form a major part of green algal bloom after rainy season, near way to temple, August, September 2019.

Chlorococcum infusionum (Schrank)
Meneghini; Philipose :

Cells usually spherical, rarely ovoid or elongated and of variable dimensions, solitary or in flat irregular colonies. Chloroplast likes a hollow sphere with a notch one side and with a single pyrenoid. Cells 10- 109 μ , rarely up to 135 μ in diameter.

Habitat- in crude culture of moist soil near backwater of dam, June 2019.

Cladophora glomerata (Linnaeus) Kuetzing:

Branched filamentous chlorophyte with large cylindrical cells forming long, regularly branched growths. Cells contain many parietal round chloroplasts, which usually join into a net-like structure. Pyrenoids in the chloroplasts are composed of two halves (bilenticular). Although cross-walls occur at regular intervals, the large cells are always multinucleate. Branches originate by a sideways protrusion of a cell end below the

apex, and branching frequency is influenced by the strength of the current.

Habitat - Common in unshaded waters especially during summer, April 2019.

Closterium striolatum Ben Cruachan; Pentecost :

Cell fusiform with finely attenuated apices, the two chloroplast are clearly ridged in the larger forms and contain several pyrenoids which are either scattered or in rows.

Habitat - The alga was collected with algal blooms during September from various parts of the tank 2019.

Pediastrum simplex Meyen; Philipose:

Colonies circular to oval, generally 16-32 cells. Inner side of marginal cells nearly straight, outer side produced in to a gradually tapering process, side concave. Inner cells polygonal. Cells in contact with adjacent ones and usually without intercellular spaces. When present, intercellular spaces very small and few in number. Cells wall smooth or punctae to granulate. Cells up to 12 μ broad and length vary from 14 μ to 28 μ .

Habitat - The alga was collected as plankton during September from parts of the tank 2019.

Hydrodictyon reticulatum (Linn.) Lagerheim; Philipose:

Colonies reticulate meshes pentagonal or hexagonal. Cells elongate-cylindrical. Cell wall two-layered. Cells up to 250 μ broad and up to 1.5 cm long. Nets up to 20 cm long.

Habitat – Moist Soil in surrounding area behind the garden, March 2019.

Hydrodictyon indicum Iyenger; Iyenger:

Colony easily breaking on handling, reticulate, meshes pentagonal to hexagonal. Cells are uninucleate in early stage (13.6 μ wide and 32.7 μ long) and becomes coenocytic on maturity, 672.0-682.0 μ wide and 1 cm or longer. Cell wall bilayered but short knob like projections not observed.

Habitat- The alga was collected from almost all parts of tank, Nov. 2019.

Oedogonium sociale Wittr Gonzalves:

Heterothallic, vegetative cells cylindrical, 9-10 μ m in diameter, 30-130 μ m long. Oogonium single, subglobose, poriferous, median pore. Oospore globose. The spore wall smooth, single antheridia.

Habitat- The filamentous plant body found attached with the stone, wood, leaves of aquatic plants, small branches of dead plant remain in water etc. by their basal cell the holdfast, Nov. 2019.

Scenedesmus acuminatus (Lagerheim) Chodat; Philipose:

Colonies generally four celled, cells fusiform or lunate with pointed ends, 3.5 – 4.0 μ wide and 20.0- 24.0 μ long. Cell wall without any spines.

Habitat- Planktonic in July-Oct. 2019.

Scenedesmus quadricauda (Turnip) Brèbisson; Philipose:

Colonies usually four-celled, sometimes 2- or 8-celled. Cells oblong-cylindrical with rounded ends and arranged in a linear series. Poles of terminal cells with a long, more or

less straight or curved spine. Cell wall smooth and without ridges. Cells 3-7 μ broad, 9-18.5 μ long. Spines 6.5 – 15 μ long.
Habitat- March-Oct. 2019.

Spirogyra angolensis Welwitsch; Randhawa:

Vegetative cell with 3-4 chloroplast, walls plane, cells 170- 400 μ m long and 38-47 μ m broad.

Habitat- As free floating plankton April-Nov. 2019.

Spirogyra nitida (Dillw.) Link; Prescott:

Filaments, 65-85 μ m in diameter, 80-150 μ m long with plane walls, chloroplast 3-5, making 11/2 turns.

Habitat- As free floating plankton April-Nov. 2019.

Ulothrix zonata (Weber et Mohr); Kützing:

Unbranched filamentous chlorophyte with generally short cells, each of which has a parietal band-like chloroplast wrapped around most of the interior cell surface, containing numerous pyrenoids.

Habitat - Commonly attached to the bed of tank, June-Dec 2019.

Table-1. Seasonal richness of algal species.

S. No.	Name of Species	Summer Season	Rainy Season	Winter Season
1	<i>Ankistrodesmus spiralis</i>	2	4	3
2	<i>Chara zeylanica</i>	3	3	3
3	<i>Chlorella vulgaris</i>	0	3	2
4	<i>Chlorococcum infusionum</i>	2	1	0
5	<i>Cladophora glomerata</i>	3	2	1
6	<i>Closterium striolatum</i>	1	3	3
7	<i>Pediastrum simplex</i>	2	4	3
8	<i>Hydrodictyon reticulatum</i>	3	2	0
9	<i>Hydrodictyon indicum</i>	0	2	4
10	<i>Oedogonium sociale</i>	0	2	4
11	<i>Scenedesmus acuminatus</i>	3	3	2
12	<i>Scenedesmus quadricauda</i>	2	3	3
13	<i>Spirogyra angolensis</i>	3	2	2
14	<i>Spirogyra nitida</i>	3	2	2
15	<i>Ulothrix zonata</i>	3	2	2

(4 = Most abundant, 3 = More Abundant, 2 = Abundant, 1 = Rare, 0 = Absent)

Table-2. Thallus organization of observed algal species

S. No.	Thallus Organisations	Number of Species
1	Unicellular Non-motile	4
2	Coenobium	1
3	Colonial	4
4	Unbranched Filamentous	4
5	Branched Filamentous	2

A check list of algal species sampled in the present study is presented in Table-1. The present study included algal taxa consisted of 12 genera and 15 species belonging to Chlorophyceae. Throughout the study period many green algae like *Scenedesmus*, *Ankistrodesmus*, *Pediastrum*, *Closterium* and *Chara* occurred abundantly and frequently. The present study also shows seasonal richness in monsoon followed by winter due to variation in temperature and light intensity. Variation of cellular organization prokaryotes to eukaryotes at cellular level was noticed on the basis of motility it shows clear character motility to non motility. In morphology there is great organisation diversity from unicellular, colonial to coenobial form, unbranched to branched thallus. Thus in a water body how this diversity occur is a matter of further study.

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