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Chlorophycean flora of Kaylana Lake, Jodhpur (Rajasthan), India

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Abstract

From Kaylana lake Jodhpur, fifty species of Chlorophyceanalgae belonging to order Chlorococclaes, Conjugales (Filamentous), Conjugales (Desmids), Chaetophorales, Oedogoniales and Cladophorales have been observed and described with their morpho-taxonomic characters. In total, 50 species of 21 genera were taxonomically enumerated and identified. The most species rich genera are *Scenedesmus* (15 taxa) and *Cosmarium* (4 taxa).

Introduction

Jodhpur district is located between 26°00' and 27°37' N latitude and 72°55' and 73°52' E longitude and lies in the western part of Rajasthan. The district Jodhpur experiences arid to semi arid type of climate. The major part of the district covers desolate and dreary region and form an important part of the Great Indian Desert. The area of this region is characterized by various type of shifting and stabilizing sand dunes, alluvial area dotted with few hillocks and scattered hill chains. Kaylana Lake is situated about 8 km in the west of Jodhpur city. It lies at 26°29' N latitude and 72°96' E longitude. The depth of this lake varies from 5 feet to 50 feet with maximum towards south-west, and it has a capacity of 191 mcft. of water. Algal diversity of Rajasthan Desert area is very interesting due to its extreme climatic conditions and has been studied by many workers. (Anantani and Marathe, 1947; Singh, 1949; Vyas, 1968; Dwivedi, 1984; Soni and Bhardwaj, 1988; Gehlot *et al.* 2003; Gehlot and Barupal, 2010; Barupal, 2011; Barupal and Santosh, 2012; Summarwar, 2012; Bhatnagar and Bhardwaj, 2013). A very little attention has been paid to study the algal flora of Jodhpur region of by some workers (Bhandari, 1951, 1952; Goyal, 1964; Srivastava and Odhwani, 1991; Odhwani, 1992).

Material and Methods

Random sampling technique has been applied in the algal collection procedure. Sample collection were made between July 2013 to June 2014 from different habitats of Kaylana lake. Identification was carried out by using the morphological character mostly in the living condition under light and phase contrast microscope. Different stains were used if found necessary for the detailed study of the morphological characters. Identification of the taxa was done on the basis of monographs and standard work (West and West, 1904, 1905, 1906; Fritsch, 1935; Smith, 1950; Randhawa, 1959; Prescott, 1962; Pal *et al.* 1962; Philipose, 1967; Iyengar and Desikachary, 1981).

Results

Systematic enumeration and description

CHLOROPHYCEAE

Order : Chlorococcales

Family: Chlorococcaceae

Genus: *Chlorococcum* Meneghini

1. *Chlorococcum humicolo* (Naegeli) Rabenhorst [Figure – 1G]

Cells usually spherical, solitary or a number of cells crowed together to form a stratum. Chloroplast a hollow sphere with a lateral notch and a single pyrenoid, Cells 2- 25µ in diameter.

Family: Selenastraceae

Genus: *Ankistrodesmus* Corda

1. *Ankistrodesmus falcatus* var. *acicularis* (A. Braun) G.S.West [Plate – 1 (2)]

Cell mostly single, straight or slightly curved and with pointed ends, Cells 2-4.5 µ broad, 35-80 µ long.

2. *Ankistrodesmus convolutus* Corda [Plate – 1 (1)]

Solitary or in a group of 2-4 cells, cells strongly curved or twisted with the ends pointed, rarely blunt and stumpy, Cells 1.5-5 µ broad, 3-28 µ long.

Genus: *Selenastrum* Corda

1. *Selenastrum gracile* Reinsch [Figure – 1F]

Cells lunate to sickle-shaped and quite narrow in proportion to the length, apices of cells acute, chloroplast without a pyrenoid, Cells 3-5 µ broad, 13-30 µ long.

2. *Selenastrum minutum* (Naegeli) Collins [Plate – 1 (3)]

Cells crescent to sickle shaped with sharply pointed ends in colonies of 4-8-46 or more cells. Chloroplast single, parietal and usually with a pyrenoid, Cells 5-8 µ broad, 16-38 µ long.

Genus: *Kirchneriella* Schmidle

1. *Kirchneriella lunaris* (Kirchner) Moebius [Figure – 1C]

Colonies spherical to ellipsoid with an outer gelatinous envelope, cells irregularly arranged within the envelope in groups of four or eight, flattened and crescent shaped with pointed ends and about twice as long as broad, chloroplast nearly filling the cell and with a single pyrenoid, Cells 3-8 µ broad, 6-15 µ long.

Family : Characiaceae

Genus: *Characium* A. Braun ex Kuetzing

1. *Characium nasutum* Rabenhorst [Plate – 1 (4)]

Cells obliquely lanceolate with a stumpy hyaline beak at the apex and epiphytic by a broad base, Cells 18-21 µ broad, 25-30 µ long.

Family: Hydrodictyaceae

Genus: *Pediastrum* Meyen

1. *Pediastrum simplex* Meyen [Plate – 1 (6, 7)]

Colonies circular to oval of 4, 8, 16, 32 or more cells. Inner side of marginal cells nearly straight, outer side produced into a gradually tapering process, sides concave, inner cells polygonal, cells in contact with adjacent one and usually without intercellular spaces, cell wall smooth or punctuate to granulate, Cells 6.5-7 µ broad, 13.2-14.5 µ long.

2. *Pediastrum duplex* Meyen [Plate – 1 (8)]

Colonies usually of 16-32, sometimes of 4, 8, 16, 64 or 128 cells with small lens shaped perforations between cells. Inner cells quadrate to angular and not in contact at the central portion of the side walls. Inner side of marginal cells concave, outer side produced into two short truncate processes. 16 celled colonies up to 90 µ in diameter, Cells 15.5-16 µ broad, 13.8-14.5 µ long.

3. *Pediastrum duplex* var. *genuinum* (A. Braun) Hansgirg [Plate – 1 (9)]

Coloies 4-8-16-32 celled with fairy large intercellular space. Marginal cellswith stout processes which are straight or slightly curved. Cell membrane smooth or punctuat. Cells 6-18 µ. Colonies 45-65 µ in diameter.

4. *Pediastrum tetras* var. *tetraodon* (Corda) Hansgirg [Plate – 1 (10)]

Colonies 4, 8, 16 celled. Incision of cells deep with the lobes adjacent to the incision of the marginal cells very pronounced, Cells 8-18 µ diameter.

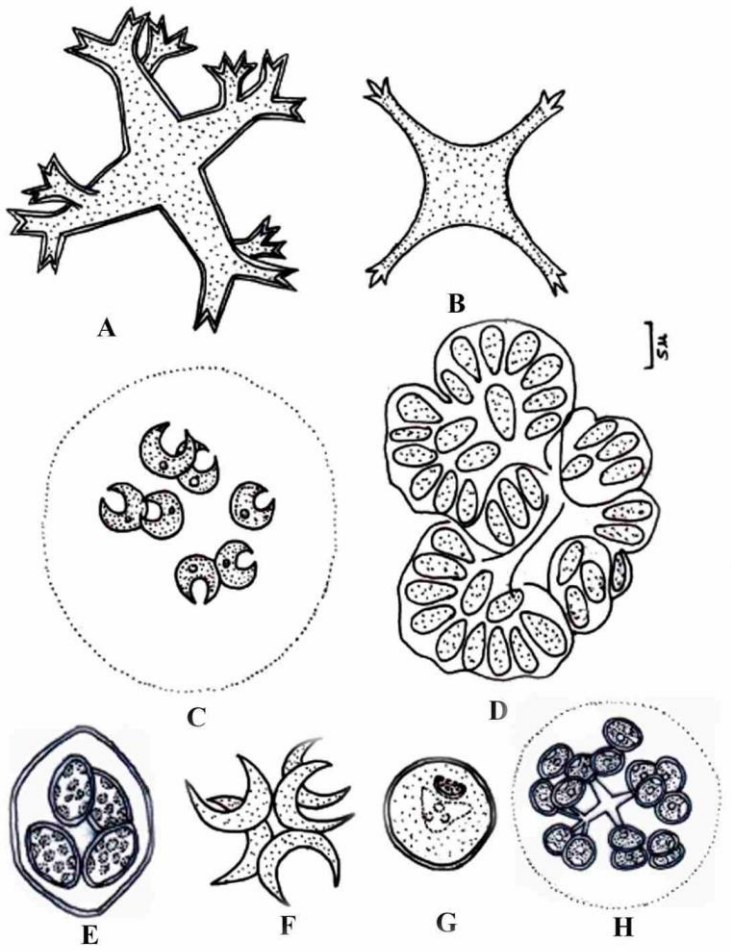

FIGURE - 1

A. *Tetraedron limneticum* var. *gracile* B. *Tetraedron hastatum*
C. *Kirchneriella lunaris* D. *Botryococcus braunii*
E. *Oocystis solitaria* F. *Selenastrum gracile*
G. *Chlorococcum humicolo* H. *Dictyosphaerium ehrenbergianum*

Genus: *Tetraedron* Kuetzing

1. *Tetraedron hastatum* (Reinsch) Hansgirg [Figure – 1B]

Cells tetragonal, pyramidate with the sides deeply concave, angles produced into long tapering concave unbranched processes ending in 2-3 short spines, Cells 28-36 µ diameter, Spine 2-3 µ long.

2. *Tetraedron limneticum* var. *gracile* Prescott [Figure – 1A]

Cells tetragonal with the angles produced in the processes having one to two dichotomous branching, narrower processes which almost adjoin at the base, ultimate branchlets with 2-3 short spines. Base of processes 5.3-8 µ broad, Cells 35.2-46.8 µ diameter

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Genus: *Hydrodictyon* Roth

1. *Hydrodictyon reticulatum* (Linn.) Lagerheim [Plate – 1 (5)]

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

Family : Botryococcaceae

Genus: *Botryococcus* Kuetzing

1. *Botryococcus braunii* Kuetzing [Figure – 1D]

Colonies free-floating and irregular shape, without a conspicuous gelatinous envelop but completely enclosed by a tough, orange colored or dark membrane that is produced into irregular wrinkles, folds or spine. Colonies often initiated in compound net like aggregates by means of long delicate mucilaginous projections from the colonial envelop. Cells ovoid to ellipsoid and arranged radially at the periphery of the colony, chloroplast yellowish green to grass green, single, parietal cup shaped, reticulate and with a pyrenoid, Cells 3-6 µ broad, 6-12 µ long, Colony up to 100 µ in diameter.

Family : Coelastraceae

Genus: *Coelastrum* Naegeli

1. *Coelastrum microporum* Naegeli [Plate – 1 (11)]

Colonies more or less spherical and of 8-16-32-64 (usually 16-32) cells with small intercellular spaces, cells spherical to ovoid, enclosed by delicate gelatinous sheath and interconnected by almost imperceptible gelatinous processe, Cells 6.5-25 µ diameter, Colony up to 30-76 µ in diameter.

2. *Coelastrum cambricum* Archer [Plate – 1 (12)]

Colonies spherical and usually 32 celled, sometime 8, 16, 64, or 128 celled. Cells spherical and thickened at the poles, 10-12 sided when seen from the apex, connected to each other by 4-6 short gelatinous flat truncate projections, interspaces between cells circular to triangular, Cells 6-12 µ diameter, Colony up to 70 µ in diameter.

Family : Oocystaceae

Genus: *Oocystis* Naegeli

1. *Oocystis solitaria* Wittrock [Figure – 1E]

Cells solitary or in colonies of 2, 4 or 8 cells enclosed within the old mother cell wall, ovoid to ellipsoid, thick walled and with markedly thick polar nodules, chloroplast numerous, parietal and discoid, Cells 3-20 µ broad, 7-39 µ long.

Family : Dictyosphaeriaceae

Genus: D*ictyosphaerium* Naegeli

1. *Dictyosphaerium ehrenbergianum* Naegeli [Figure – 1H]

Colonies spherical to ovoid and consisting of 4-8-16, rarely more cells. Cells ovoid to ellipsoid or nearly spherical. Chloroplast one to two in each cell, parietal and with a pyrenoid. Cells 4-7 µ broad, 6-10 µ long, Colonies up to 80 µ in diameter.

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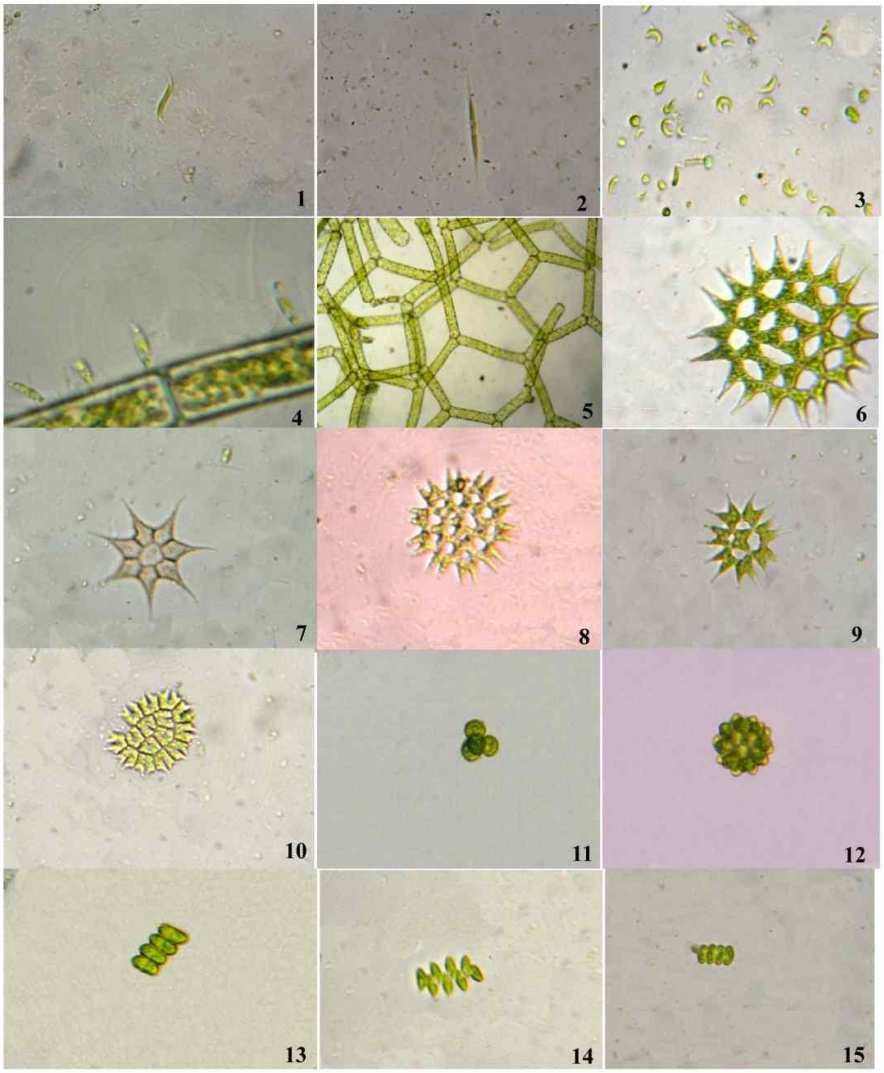
PLATE - 1



1. *Ankistrodesmus convolutus* 2. *Ankistrodesmus falcatus* var. *acicularis* 3. *Selenastrum minutum* 4. *Characium nasutum* 5. *Hydrodictyon reticulatum* 6. *Pediastrum simplex* 7. *Pediastrum simlex* 8. *Pediastrum duplex* 9. *Pediastrum duplex* var. *genuinum* 10. *Pediastrum tetras* var. *tetraodon* 11. *Coelastrum microporum* 12. *Coelastrum cambricum* 13. *Scenedesmus bijugatus* 14. *Scenedesmus bijugatus* var. *gravenitzii* 15. *Scenedesmus bijugatus* var. *bicellularis*

Family : Scenedesmaceae

Genus: *Scenedesmus* Meyen

1. *Scenedesmus obliquus* (Turnip) Kuetzing [Plate – 2 (8)]

Colonies usually of 4, sometimes 2 or 8, erect cells arranged in a linear or sub linear series, cells fusiform with acute or slightly rounded ends and usually with straight sides, outer side of terminal cell concave or slightly convex, cell wall smooth and without spines, Cells 2.7-6.6 µ broad, 6-23 µ long.

2. *Scenedesmus dimorphus* (Turpin) Kuetzing [Plate – 2 (6, 7)]

Colonies 4-8 celled with the cells arranged in a linear or sub alternating series, outer cells of the colony being more or less lunate and the apices of the cells being attenuated, Cells 2-8 µ broad, 14-35 µ long.

3. *Scenedesmus acuminatus* (Lagerheim) Chodat [Plate – 2 (13)]

Colonies curved and of 4 to 8 (usually 4) fusiform cells with sharp pointed ends. All the cells in a colony lunate, or the interior cells forming a flat plate and the other cells lunate and at an angle to the plane of the interior cells, cell wall smooth and without spines, Cells 2-7 µ broad, 12-48 µ long.

4. *Scenedesmus platydiscus* (G. M. Smith) Chodat [Plate – 2 (10)]

Colonies flat, eight celled, with oblong-elliptic cells arranged in a double series, interstices between cells minute or absent altogether, Cells 4.5-7.5 µ broad, 8-14 µ long.

5. *Scenedesmus arcuatus* (Lemmermann) Lemmermann [Plate – 2 (12)]

Colonies usually 8- celled, rarely four or 16- called, curved and with small intercellular spaces. Cells in eight celled colonies in two series, oblong – ovoid, sometimes slightly angular at the base due to mutual pressure, Cell well smooth, without teeth or spine, Cells 3.5-9.5 µ broad, 8.5-18 µ long.

6. *Scenedesmus bijugatus* (Turpin) Kuetzing [Plate – 1 (13)]

Colonies flat or slightly curved, of 2-4-8 cells arranged in a single linear series. Cells oblong-ellipsoid to avoid with the ends broadly rounded, Cells 3.5-7 µ broad, 7-23 µ long.

7. *Scenedesmus bijugatus* var. *bicellularis* (Chodat) comb. nov. [Plate – 1 (15)]

Colonies ususlly 2-celled, rarely four celled with the cell arranged in groups of two. Solitary ellipsoid-cylindrical cells almost uncommon. Colonies often seen enclosed within the ruptured parent cell membrane. A small apical spiny may be occasionally from the end of a cell of colony, Cells 2.6-5.3 µ broad, 6-11 µ long.

8. *Scenedesmus bijugatus* var. *alternans* (Reinsch) Hansgirg [Plate – 2 (1)]

Colonies flat, usually 8-celled, but sometimes four celled, with the cell arranged in a distinctly alternating series, adjacent cells adnate to each other along a short portion of their length only. Cells ellipsoid to ovoid, ellipsoid with rounded ends, Cells 6-8 µ broad, 13-16 µ long.

9. *Scenedesmus bijugatus* var. *alternans* f. *parvus* G.M.Smith [Plate – 2 (2)]

Colonies 4 celled with the cells arranged in a regular sub-alternating series, cells much smaller and oblong-ovoid, cell wall smooth, Cells 2.8-4 µ broad, 4.8-9 µ long.

10. *Scenedesmus bijugatus* var. *gravenitzii* (Bernard) comb. nov. [Plate – 1 (14)]

Colonies 4-8 celled, cells fusiform, ellipsoid, oblong-ellipsoid to ovoid with obtuse poles and arranged in an alternating series with adjacent cells in contact only along a short portion of their length, colonies frequently aggregated in syncoenobia by the broken remains of parent cell walls, Cells 3.5-7 µ broad, 7-23 µ long.

11. *Scenedesmus protuberans* Fritsch et Rich [Plate – 2 (11)]

Colonies usually 4 celled, rarely 2 or 8 celled, cells in a linear series and laterally in close contact with adjoining cells except at the ends. Terminal cells longer than the inner cells with their apices drawn out and protruding, and with a long spine usually arising from the outer side of each end. Inner cells with pointed or slightly truncate ends, inner edge of the terminal cells and ends of inner cells sometimes with minute spines or granular thickenings, Cells 6-7 µ broad, 25-32 µ long, Spine 25-35 µ long.

12. *Scenedesmus quadricauda* var. *quadrispina* (Chodat) G.M.Smith [Plate – 2 (4)]

Colonies usually 2-4 celled, cells broadly ovoid and about twice as long as broad. A single short recurved spine at each poles of terminal cells, Cells 3.5-8.5 µ broad, 8.5-19 µ long, Spine 2.5-5.5 µ long.

13. *Scenedesmus quadricauda* var. *longispina* (Chodat) G.M.Smith [Plate – 2 (3)]

Colonies usually 2-4 celled, rarely 8 celled. Cells avoid to cylindrical with the cells narrower than in the type and the spines proportionately longer, compared to the length of the cells. Internal cells sometimes with very short delicate spines from some of their pole, Cells 2.5-5 µ broad, 8-15.3 µ long, Spine 7.5-15 µ long.

14. *Scenedesmus quadricauda* var. *westii* G.M.Smith [Plate – 2 (5)]

Colonies usually four to eight celled, Cells 4.5-9-13 µ broad, 10-22-293 µ long, Spine 10.6-16.7 µ long.

15. *Scenedesmus opoliensis* P. Richter [Plate – 2 (9)]

Colonies usually 2- 4 celled with cylindrical o subfusiformis cells arranged in a linear series. Adjacent cells in contact only along about a third of their length. Terminal cell often narrower and subrectangular. Poles of all cells semitruncate to rostrate, sometimes ending in one or two very short spines, Cells 4.8-9-8 µ broad, 17-28 µ long, Spine 15-28 µ long.

Order : Conjugales (Filamentous)

Family: Zygnemaceae

Genus: *Spirogyra* Link.

1. *Spirogyra ellipsospora* Transeau [Plate – 2 (14)]

Cells long, end wall plane, chloroplast 3-8, 4-5 turns, conjugation scalariform, tube formed by both gametangia, fertile cell cylindrical, zygospore ellipsoid, more or less pointed, 130 µ broad and 223 µ long, median spore wall smooth, yellow brown, Cells 122.5 µ broad, 345.5 µ long.

2. *Spirogyra porticalis* (Muller) Cleve [Plate – 2 (15)]

Vegetative cells with plane end walls, one chloroplasts making 3-5 spiral turns, conjugation scalariform, fertile cells cylindrical or elongated, zygospore ovoid to globose ovoid, 38-50 µ broad and 50-83 µ long, Cells 40-50 µ broad, 50-200 µ long.

Order : Conjugales (Desmids)

Family: Desmidiaceae

Genus: *Closterium* Nitzsch.

1. *Closterium strigosum* Brebisson [Plate – 3 (3)]

Cells 11-12 time longer than broad, slightly bent, 20-30° of arc, ventral margin straight or very slightly tumid, poles slightly incurved with narrow subacute apices, Cells 19-23 µ broad, 227-234 µ long.

2. Closterium acerosum (Schroeder) Ehr. [Plate – 3 (1)]

Cells fusiform, variable in size, apices rounded, curvature 28-35° of arc, cell wall finely striate, yellowish brown, ridged chloroplast with 6-7 pyrenoids, Cells 25-35 µ broad, 250-390 µ long.

3. *Closterium leibleinii* kutzing [Plate – 3 (2)]

Cells curved with rounded ends, 8-9 times longer than broad, 150-165° arc, slightly tumid in the mid-region, cell-wall smooth, Cells 17-32 µ broad, 110-215 µ long.

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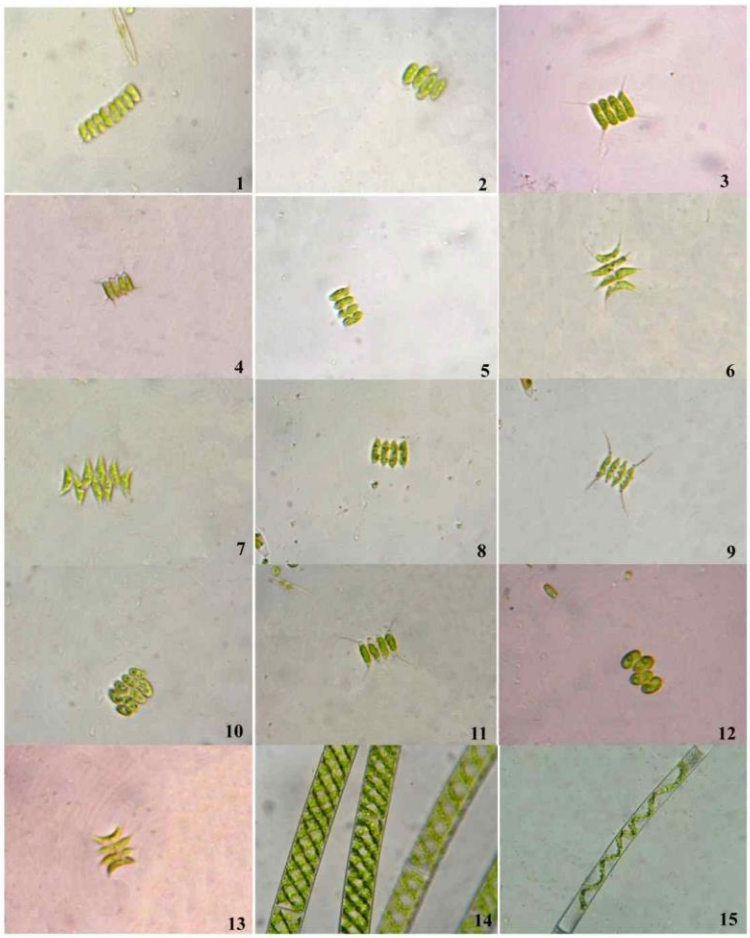
PLATE – 2



1. *Scenedesmus bijugatus* var. *alternans* 2. *Scenedesmus bijugatus* var. *alternans* f. *parvus* 3. *Scenedesmus quadricauda* var. *longispina* 4. *Scenedesmus quadricauda* var. *quadrispina* 5. *Scenedesmus quadricauda* var. *westii* 6. *Scenedesmus dimorphus* 7. *Scenedesmus dimorphus* 8. *Scenedesmus obliquus* 9. *Scenedesmus opoliensis* 10. *Scenedesmus platydiscus* 11. *Scenedesmus protuberans* 12. *Scenedesmus arcuatus* 13. *Scenedesmus acuminatus* 14. *Spirogyra ellipsospora* 15. *Spirogyra porticalis*

Genus: *Cosmarium* Corda

1. *Cosmarium impressulum* Elfwing [Plate – 3 (5)]

Cells longer than broad, deeply constricted, sinus narrowly linear, semi-cells vertically sub-quadrate with tri- undulate margin, undulation sub- acute, apex narrow and retuse with rounded angles, cell wall smooth, top view broadly elliptic, chloroplast parietal, isthmus 13-17 µ broad, Cells 17-20 µ broad, 20-25 µ long.

2. *Cosmarium subcostatum* Nordstedt [Plate – 3 (6)]

Cell surface granulated, spiny, semi cells pyramidal with flattened apex or trapezoid, Cells 23-32 µ broad, 26-38 µ long.

3. *Cosmarium reniforme* (Ralfs) Arch. [Plate – 3 (4)]

Cells up to 1.3 times longer than wide, sinus deeply open in isthmus to slightly closed outside, semi cells reniform, superior margin truncate, cell wall granulate, chloroplast with two pyrenoids, Cells 49-67.5 µ broad, 41.2-53 µ long.

4. *Cosmarium botrytis* Menegh [Plate – 3 (7)]

Cells 2 times longer than broad, median constriction deep, sinus very narrow, semi cells semicircular and more depressed at poles, chloroplast 5-6 ridged, cell wall smooth and with undulating margins, isthmus 16-22 µm, Cells 32-42 µ broad, 72-95 µ long.

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PLATE – 3

1. *Closterium acerosum* 2. *Closterium leiblenii* 3. *Closterium strigosum* 4. *Cosmarium reniforme* 5. *Cosmarium impressulum* 6. *Cosmarium subcostatum* 7. *Cosmarium botrytis* 8. *Staurastrum gracile* 9. *Staurastrum identatun* f. *minus* 10. *Staurastrum anatinum* 11. *Euastrum insulare* 12. *Stigeoclonium stagnatile* 13. *Oedogonium* with antheridial cells 14. *Oedogonium* with dwarf male 15. *Pithophora* sp.

Genus: *Euastrum* Ehrenberg

1. *Euastrum insulare* (Wittr.) Roy [Plate – 3 (11)]

Forms is found commonly in Kaylana lake, Isthmus deep 3-4 µ wide, Cells 12-14 µ broad, 20-25 µ long.

Genus: *Staurastrum* Meyen

1. *Staurastrum gracile* Ralfs and Ralfs [Plate – 3 (8)]

Cells variable, 2-$2^{1/2}$ times longer than broad excluding the processes, constriction slight, usually an acute notch, semi cell cup shaped, lower angles broadly rounded, lateral margin nearly vertical or slightly diverging, upper angles produced to form long slender processes, each tipped with 3 or 4 minute spines and provides with several concentric series of denticulations. Isthmus 8.4-11 µm, Cells 28-47 µ broad, 39-77 µ long.

2. *Staurastrum anatinum* Cooke & will [Plate – 3 (10)]

Segment in front view broadly fusiform, rough with prominent granules, wich are truncate on the outer margin, processes elongate, rough, terminated with minute spines, end view triradiate, processes elongate, rough, slightly and gradually concave, nodules at the centre truncate, Cells 20µ broad (at the sinus), 100µ broad (including processes), 50µ long.

3. *Staurastrum identatum* f. *minus* Scott & Prescott [Plate – 3 (9)]

Cells with undulate margin, two processes on each pole of semi cells, Isthmus 6.5-7 µm, Cells 32.5-37 µ broad, 43.5-48 µ long.

Order : Chaetophorales

Family: Chaetophoraceae

Genus: *Stigeoclonium* Kutzing

1. *Stigeoclonium stagnatile* (Hazen) Collins [Plate – 3 (12)]

Thallus yellowish green, up to 1.5 cm long, delicate, prostrate part in reduced form, primary axis consistly of cylindrical cells, without constriction at cross wall, branching by erection, alternate, opposite and more than one branch arising from the same place, which is characteristic feature of species, end of branch terminating with tapering ends, rhizoids numerous at nodes, Cells 5-13 µ broad, 8-29 µ long.

Order : Oedogoniales

Family: Oedogoniaceae

Genus: *Oedogonium* Link.

1. *Oedogonium* sp. [Plate – 3 (13, 14)]

Unbranched filament of cylindrical cells in which certain cells have transversely striate walls at the distal end. The basal cell of a filament is modified to form holdfast and the apical cell is broadly rounded, usually. The cells are uninucleate and have a single reticulate chloroplast completely encircling the protoplasm, many pyrenoids in chloroplast, one at each of the large inter-sections in reticulum, Cells 9.5-12 µ broad, 32-38.5 µ long.

Order : Cladophorales

Genus: *Pithophora* kewensis Wittr.

2. *Pithophora* sp. [Plate – 3 (15)]

Filaments are freely branched, branches mostly solitary, sometimes in opposite pairs, large terminal and intercalary akinates, densly packed with reserve food, cells cylindrical, chloroplast reticulate parietal, pyrenoid present, Cells 10.5 µ broad, 35-160 µ long.

Discussion

As primary producers in almost all the ecosystem, Chlorophycean algae have a tremendous importance and play a vital role in food chains. Inspite of their importance green algae are the least explored organism in the state of Rajasthan. In a year round study, total 50 species belonging to 21 genera of Chlorophyceae were observed from shallow and deep water zone of Kaylana Lake. Out of 50 taxa, Chlorococcales order represents 34 species of 13 genera followed by Conjugales (Desmids) with 11species of 4 genera, Conjugales (Filamentous) with 2 species of single genera and Oedogoniales, Chaetophorales and Cladophorales order with single taxa each. (Table - 1). In Chlorococcales order, 9 families have been listed. Of these family Scenedesmaceae represented by 15 species, Hydrodictyaceae by 7 species, Selenastraceae by 5 species, Coelastraceae by 2 species and family Chlorococaceae, Characiaceae, Oocystaceae, Botryococaeae and Dictyosphaeriaceae were represented by a single species each. In Conjugales (Desmids), Demidiaceae family has been reported. In this family, 11 species of 4 genera were observed. Conjugales (Filamentous) order was observed to represent by family Zygnemaceae which supports 2 species of single genera. Order Chaetophrales was represented by Family Chaetophoraceae, Oedogoniales by Oedogoniaceae and Cladophorales by Cladophoraceae.

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