

A Systematic Account of Chlorococcales-III new to Marathwada, Maharashtra

Yadav S.G.

Department of Botany Shivaji Mahavidyalaya Renapur District Latur. (413527) Maharashtra

ABSTRACT

While working on algal taxonomy of Latur district in the Marathwada region of Maharashtra during April 2018 to March 2019 the author came across some interesting members of Chlorococcales. A total of 125 taxa under 25 genera of Chlorococcales have been encountered for the first time from the Latur district by visiting various habitats like pools, ponds, streamlets, streams, polluted water passages (gutter) and puddles. As far as seasonal variation studies, they were recorded in all seasons; maximum numbers of species were found in winter season and followed by monsoon and summer.

The present paper deals with the systemic enumeration of 02 genera of Chlorococcales under 46 taxa.

Key words: Chlorococcales, Seasonal variation, Latur, Marathwada, Maharashtra.

INTRODUCTION:

Review of literature reveals that, studies on Chlorococcales in abroad and in India have been done extensively by many research workers.

India has a very rich and diversified algal flora. In India, Wallich, (1860) appears to have been the first to records some Chlorococcales (Tetraedron) from Bengal for first time in India. Carter, (1869) reported new genus Conococcus. Bruhl and Biswas, (1992, 1926) recorded 29 Chlorococcales from the filter beds of Bengal and Loktaklake of Manipur. Iyengar, (1925) described a new species of Hydridietyon from Madras. N. Carter, (1926) reported 15 chlorococcales from North-East India. During the years 1930, 1934, and 1936 Biswas recorded about 20 Chlorococcales from Bengal Assam. Skuja, (1949) reported 71 Chlorococcales from Burma. Philipose, (1940; 1959) finally reported a total of 1079 species of Chlorococcales under 173 genera. In Maharashtra tremendous work has been done on algal taxonomy by various workers (Iyengar and Balkrishnan (1959) described new species of Golenkinia from Poona city, Gonzalves (1959) recorded some chlorococcales from Bombay.) In Marathwada region of Maharashtra except few reports (Ashtekar 1979a, Andhale 2008, Talekar 2009) very rare attention has been paid towards

algal taxonomy, although the climatic conditions of Marathwada region are most suitable to grow Chlorococcales luxuriantly and in diverse form, therefore to fulfil this lacuna, it has been decided to work on algal taxonomy (Chlorococcales) of Latur district in Marathwada region of Maharashtra.

MATERIALS AND METHODS:

The present investigation was carried out by visiting various selected habitats like pools, ponds, streamlets, streams, polluted water passages (gutter) and puddles. The algal samples were collected during April 2018 to March 2019. The algal collections were made regularly from selected sampling stations. Acid washed collection bottles were used for the collection of algal samples. On return to the laboratory from field, the collections were carefully observed under the microscope and important points were noted. All collections were preserved in 4% commercial formalin added with 5% glycerine. Identification of algal taxa was performed by referring to the standard literature on algae. Brunthaler (1915), Collins (1928), Philipose (1967), Prescott (1951), Smith,(1920), (1951), Tiffany and Britton (1952), Scott and Prescott (1961).

SYSTEMIC ENUMERATION:

PEDIASTRUM Meyen, 1829

***Pediastrumboryanum* (Turp.) Meneghini:**

Colonies entire; cells 5-6 sided with granular walls; peripheral cells with outer margins extended into 2 blunt-tipped processes; cells 4.5-9 μ in diameter; processes 3-5 μ long; 32-36 celled colonies 50-55 μ in diameter.

***Pediastrumbraunii* Wartmann:**

Colony circular, nearly entire, with interstices, cells quadrate or 5 sided; peripheral cells with 3-4 short, sharp projections, unevenly spaced; interior cells 4-5 sided, cells 4.5-8 μ in diameter, 16-celled colonies upto 37 μ in diameter.

***Pediastrum duplex* Meyen v. *clathratum* (A.**

Braun) Lagerheim:

Colonies 16 celled, cells with more deeply emarginate sides with large intercellular spaces; cells 5-8.5 μ in diameter; colonies upto 43 μ in diameter.

***Pediastrum duplex* Meyen var.**

***cohaerens* Bohlin:**

Colonies 32 celled, inner cells quadrate to angular, with large intercellular spaces, inner side of marginal cells concave, outer side produced into two short, tapering blunt-tipped processes; cells 6.5-10 μ in diameter, colonies upto 45-53 μ in diameter.

Pediastrum duplex* Meyen v. *gracilimum* W. et*G. S. West:**

Colonies 15 celled, with very large intercellular spaces, cells narrow, as broad or narrower than the processes, marginal cells curved outwards and with two long processes with emarginate apices, inner cell similar to marginal cell but with shorter processes; cells 5-8 μ in diameter. 7-10 μ long; 16 celled colonies 30-38 μ in diameter.

Pediastrum duplex* Meyen v.**reticulatum* Lagerheim:**

Colonies consisting of 32 cells; cells more or less H shaped, with sides of processes of marginal cells nearly parallel; intercellular spaces large and oval; cells 6-9.5 μ in diameter, 8-12 μ long; colonies 37-48 μ in diameter,

***Pediastrum integrum* Naegeli:**

Colonies entire, consisting of 16 cells; peripheral cells 5-sided, outer margins with two short, much reduced processes, and granular walls, emarginate between the processes; inner cells 6-sided, central cell 5-sided; cells 4-10 μ in diameter; colonies upto 32 μ in diameter.

Pediastrum integrum* Naegeli var.**scutum* Raciborski:**

Colonies entire, 16 celled, walls thick; interior cells 5 or 6 sided; peripheral cells 5-sided, rhomboidal, the outer wall convex, without processes, surface of walls and free outer margins furnished with numerous, sharp granules, cells 4-

11 μ in diameter; colonies upto 25-35 μ in diameter.

***Pediastrum obtusum* Lucks:**

Colonies entire, oblong, rarely subcircular, with minute interstices formed by retuse margins of some cells; cells have a deep narrow sinus forming 2 major lobes, the lobes incised to form bluntly rounded lobules, the two central lobules in contact or nearly so, closing the sinus outwardly, the two lateral lobules in contact with the lateral lobules of the adjoining cells; cells 7-15 μ in diameter; 8 celled colony upto 32.5 μ in diameter.

***Pediastrum simplex* (Meyen) Lemmermann:**

Colonies entire, circular, consisting of 8-16 cells; inner cells 5 or 6 sided; outer sides of peripheral cells extended to form a single tapering horn-like process with concave margins; cells usually without intercellular spaces; cell wall smooth; cells 5-11 μ in diameter, 16-19.5 μ long; 8 celled colonies 40-46 μ in diameter.

Pediastrum simplex* Meyen v. *doudenarium**(Bailey) Rabenhorst :**

Colonies perforate, consisting of 8-16 cells, having large intercellular spaces to a single central space with the cells arranged in a ring at the periphery, cells with their inner margins concave, the outer face prolonged into a single tapering process; cells 6-10 μ in diameter, 8-12 μ long; 16 celled colonies 40 μ in diameter.

***Pediastrum tetras* (Ehrenb.) Ralfs:**

Colonies entire, 4 celled; cells with 4 straight sides, but with outer margin deeply incised, their lateral margins adjoined along 2/3 of their length; cells 6-10 μ in diameter; colonies upto 16 μ in diameter.

***Pediastrum tetras* (Ehrenb.) Ralfs v. *tetradon* (Corda) Hansgirg:**

Colonies consisting of 8 cells; incision of cells deep with the lobes adjacent to the incision of the marginal cells very pronounced; cells 4-11 μ in diameter; 8 celled colonies upto 22 μ in diameter.

SCENEDESMUS Meyen, 1829***Scenedesmus abundans* (Kirchner) Chodat:**

Colonies consisting of usually 4 cells, arranged in a single series; cells ellipsoid-cylindric; terminal cells with 2 polar spines and 3 spines on lateral wall; inner cells with a spine at each pole; cells 2.5-3 μ in diameter, 7.5-8 μ long; spines 2.5-5 μ long.

Scenedesmus abundans* (Kirchner) Chodat v.**brevicauda* G.M. Smith:**

Colonies consisting of 2-4 cells, in a linear series; cells ellipsoid-cylindric; terminal cells with 2 longer spines and 2 shorter spines on the lateral wall; inner cells with a spine at each pole; cells 3-3.5 μ in diameter, 10-12.5 μ long, spines 3-8 μ long.

***Scenedesmus acuminatus* (Lag.) Chodat:**

Colonies consisting of 4 cells, arranged in a linear series; cells strongly lunate, with sharply pointed

apices, the convex walls adjoined inwardly; the concave walls faces directed outward; cells 2.8-4.8 μ in diameter, 27.5-34.8 μ long.

***Scenedesmus acutiformis* Schroeder:**

Colonies consisting of 4 cells, arranged in a single series; cells fusiform-elliptic, with sharply pointed poles; inner cells with a single facial longitudinal ridge, outer cells with 2-4 longitudinal ridges; cells 4.8-5.5 μ in diameter, 15-16.5 μ long; 4-celled colonies 17.5-20 μ in diameter.

Scenedesmus arcuatus* (Lemmermann)*Lemmermann:**

Colonies consisting of 8 cells, curved, with small intercellular spaces; cells arranged in two series, oblong-ovoid; cell wall smooth, without teeth or spines; cells 3.2-4.8 μ in diameter, 7.5-8.8 μ long.

Scenedesmus arcuatus* Lemmermann v.**capitatus* G.M. Smith:**

Colonies consisting of 4 cells, arranged in two series; cells slightly curved with one side convex and the other straight or concave; ends of cells stumpy, with nodular thickening; cells 3-4.8 μ in diameter, 12-14.8 μ long.

***Scenedesmus armatus* (Chodat) G.M. Smith:**

Colonies consisting of 4 cells; terminal cells with a single long spine from each pole; cells with a median, lateral longitudinal rib; cells oblong-ellipsoid, arranged in a linear series; cells 3-6.5 μ in diameter, 7.5-12.5 μ long, spines 6.8-10.2 μ long; colonies upto 12.5-25 μ in diameter.

Scenedesmusarmatus* (Chodat) G.M. Smith v.**bicaudatus* (Guglielmetti) Chodat:**

Colonies consisting of 4 cells, arranged in a single series, terminal cells with large spines, only at one pole alternating with each other, internal cells with longitudinal ribs; cells 4-4.8 μ in diameter, 10-14.5 μ long, spines 5-7.5 μ long; colonies upto 15-17.5 μ in diameter.

Scenedesmusarmatus* (Chodat) G.M. Smith v.**major* G.M. Smith:**

Colonies consisting of 4 cells, arranged in a partially alternating series; cells oblong-ellipsoid, with broadly rounded ends; terminal cells with a single, long, usually curved or unevenly bent spine at each pole, inner cells with a median, incomplete longitudinal ridge; cells 7.5-8.5 μ in diameter, 18.5-20.2 μ long, spines 14-18 μ long; colonies upto 20-33 μ in diameter.

***Scenedesmusbernardii* G.M. Smith:**

Colonies consisting 4, lunate cells, arranged in a single series, but with terminal cells at an angle to the plane of arrangement of the inner cells; cells adjoined alternately by the apex of one cell to the midregion of the next in series; wall without spines, or teeth; cells 2.8-4 μ in diameter, 13-17.5 μ long.

***Scenedesmusbijugatus* (Turpin) Kuetzing:**

Colonies consisting of 4-8 cells, arranged in a single linear series; cells oblong, with broadly rounded ends, 4.8-5.2 μ in diameter, 10-15 μ long.

Scenedesmusbijugatus* (Turpin) Kuetzing v.**alternans* (Reinsch) Hansgirg:**

Colonies consisting of 4-8 cells, arranged in 2 alternating series; cells 3-4.8 μ in diameter, 7.5-11.5 μ long.

Scenedesmusbijugatus* (Turp.)Kuetz.v.**bicellularis* (Chodat) Philipose:**

Colonies consisting of 2 cells, cylindrical; cells 4.5-5.2 μ in diameter, 10-12 μ long.

Scenedesmusbijugatus* (Turp.)Kuetz.v.**graevenitzii* (Bernd.) Philipose:**

Colonies consisting of 8 cells; cells fusiform to ellipsoid, arranged in an alternating series with adjacent cells in contact only along a short portion of their length; cells 4.8-6.8 μ in diameter, 15-17.5 μ long.

Scenedesmusbijugatus* (Turpin) Kuetzing v.**irregularis*Wille:**

Colonies consisting of 8 cells; arranged in double and in an irregular subalternating series; cells 2.8-4.8 μ in diameter, 5-6.8 μ long.

***Scenedesmusbrasiliensis*Bohlin:**

Colonies consisting of 2-4-8, subcylindric to ellipsoid cells, arranged in a single series; apices of cells with 1-3 short teeth; cells with median longitudinal ridge extending between the apices of each cell; cells 4.8-5.2 μ in diameter, 14-17.5 μ long.

***Scenedesmusdenticulatus*Lagerheim:**

Colonies consisting of 4 cells, arranged in a single series; cells ovoid-oblong, apices of outer

cells with 2 short teeth at each pole, the inner cells with 2 short teeth at one pole alternating to each other; cells 4-5.2 μ in diameter, 10-15.2 μ long; 4 celled colonies upto 20-23 μ in diameter.

***Scenedesmusdimorphus* (Turpin) Kuetzing:**

Colonies consisting of 4-8 cells, arranged in a linear to sub-alternating series; outer cells of the colony more or less lunate, strongly curved with acute apices, the inner cells with straight, sharp apices; cells 3.8-4.5 μ in diameter, 17.2-24.8 μ long.

***Scenedesmusdimorphus* (Turpin) Kuetzing f.**

***tortus* Smith:**

Colonies consisting of 4-cells, arranged in a single series; the outer cells of the colony lunate, strongly curved, inner cells tapering at both the ends; cells 4.7-5.2 μ in diameter, 25-27 μ long.

***Scenedesmusincrassatulus* Bohlin:**

Colonies consisting of 4 cells; cells fusiform, arranged in subalternating series, with one side convex and the other side more or less straight to slightly concave; ends of cells stumpy and with apical nodules; cells 4-4.8 μ in diameter, 14.8-17.5 μ long.

***Scenedesmuslongus* Meyen:**

Colonies consisting of 4-cells; poles of terminal cells with two spines; internal cells with one spine at one pole; cells cylindrical, 3-4.5 μ in diameter, 9-12 μ long; spines 8-12 μ long.

***Scenedesmuslongus* Meyen var. *dispar* (Breb.)**

G.M. Smith:

Colonies consisting of 4-cells, outer cells with oblique spine from each pole, inner cells with a single, short spine from one pole only; cells 2.8-4.5 μ in diameter, 10-12.5 μ long; spines upto 7.5 μ long.

***Scenedesmusobliquus* (Turpin) Kuetzing:**

Colonies consisting of 4 cells, arranged in a single series; cells fusiform, with slightly rounded ends and usually with straight sides; outer side of terminal cells concave to slightly convex; cell wall smooth; apices of cells apiculate; cells 4.8-5.2 μ in diameter, 12.5-15.2 μ long.

***Scenedesmusopoliensis* P. Richter:**

Colonies consisting of 4 cells, arranged in a single series; cells naviculoid, free walls of outer cells slightly convex, the lateral adjoined walls in contact along 1/3 – 2/3 of their length; apices of outer cells with 2 long spines at each pole, inner cells with a short spine at one pole only; cells 4.8-5.4 μ in diameter, 12.2 – 14.8 μ long; colonies upto 18.8 μ in diameter.

***Scenedesmusopoliensis* P. Richter var.**

***mononesis* Chodat:**

Colonies consisting of 4 cells, arranged in a single series; terminal cells with attenuate, semitruncate to rostrate ends and with a long, straight or recurved spines from each pole, internal cells broadly fusiform, with rounded ends and without spines; cells 5-5.4 μ in diameter, 12.5

– 14. μ long; spines 10-14.2 μ long; colonies upto 20-22.5 μ in diameter.

***Scenedesmusplatydiscus*(Smith) Chodat:**

Colonies consisting of 8 cells, arranged in a double series; cells oblong- elliptic, interstices between cells absent; cells 5-7.2 μ in diameter, 10-12.5 μ long.

***Scenedesmusquadricauda*(Turpin) de Brebisson:**

Colonies consisting of 4 cells, arranged in a linear series; cells oblong-cylindrical, with rounded ends; outer cells with a long, more or less straight spines; cell wall smooth, without ridges; cells 4.2-5.5 μ in diameter, 13.8-15 μ long, spines 12.5-15.2 μ long.

***Scenedesmusquadricauda*(Turp.) de Breb. v. *eualternans* Proschk:**

Colonies consisting of 4 cells, arranged in a subalternate series; cells broadly ellipsoid, with broadly rounded ends; cells 2.5-3.8 μ in diameter, 7.5-9.8 μ long; outer cells with 2 spines at each pole, inner cells without spines; spines 5-6.8 μ long.

***Scenedesmusquadricauda*(Turp.) Breb. v. *longispina* (Chodat) Smith.**

Colonies consisting of 4 cells, arranged in a linear series; cells cylindrical, spines as long as to the length of the cells; cells 3.5-4.8 μ in diameter, 10-12.5 μ long, spines 9.8-12.5 μ long.

***Scenedesmusquadricauda*(Turp.) de Breb.v. *maximum* West et West**

Colonies consisting of 4-8 cells; arranged in a linear series; cells 4-7.5 μ in diameter, 10.2-17.5 μ long, spines 12.5-17.5 μ long.

***Scenedesmusquadricauda*(Turpin) de Brebisson v. *parvus* G.M Smith:**

Colonies consisting of 4 cells, arranged in a linear series; cells cylindrical; cells longer than broad, equal to the length of spines; outer cells with a long spine at each pole, inner cells without spines; cells 3-4.8 μ in diameter, 9.8-10.2 μ long, spines 7.5-10 μ long.

***Scenedesmusquadricauda*(Turpin) de Brebisson v. *quadrispina*(Chodat) G.M. Smith:**

Colonies consisting of 4 cells, arranged in a linear series; cells ovoid; about three times longer than broad; poles of terminal cells with small spines; cells 5.5-7 μ in diameter, 20-24.8 μ long, spines 10-11.5 μ long.

***Scenedesmusquadricauda*(Turpin) de Brebisson v. *westii* G.M. Smith.**

Colonies consisting of 2 cells; cells oblong cylindrical with broadly rounded ends; cells 4.8-5 μ in diameter, 15.8-17.5 μ long, spines 9.8-10.5 μ long.

REFERENCES :

Allen, W.E. (1920). A quantitative and statistical study of the plankton of the Son Joaquin river and tributaries in and near Stockton, California in 1913. *Publi 2001.22*: 1-297.

- Anand, V.K. (1975). A check list of planktonic algae from Mansarlake, Jammu. *Phykos***14(1 & 2):** 77-79.
- Andhale S.B. (2008). Studies on the flora of Jayakwadi Bird Sanctuary. Ph.D. Thesis, Dr. B.A.M.U. Aurangabad.
- Ashtekar, P.V. (1980). Studies on fresh water algae of Aurangabad district. Ph.D. thesis, Marathwada University, Aurangabad.
- Ashtekar, P.V. and Kamat, N.D. (1979b). Chroococcales of Aurangabad district, Maharashtra. *Marathwada Univ. J. Sic.***18(11):** 47-52.
- Aykulu, G., (1978). A quantitative study of the phytoplankton of the river Avon Bristol Br. *Phykal J.* **13:1** -102.
- Barhate, V.P. and J.L. Tarar (1981). The algal flora of Tapiriver, Bhusawal Maharashtra, *Phykos*,**20:** 75-78.
- Brunnthaler, J. (1915). Protococcales, In A. Pascher, Die Susswasserflora Deutschlands, Osterreich und der Schweiz. **5 (2):** 52-205, F. 1330, Jena.
- Collins, F.S. (1928). Green algae of North America. G.E. Strechert and Co. New York.
- Cronberg, G. (1999). Qualitative and quantitative investigations of phytoplankton in lake Ringsjon, Scania, Swedon. *Hydrobiologia*.**404(0):** 27-40.
- Das, S.K., Samad, L.K, Ramanujam. P. and Adikari, S.P. (2009). Freshwater algae of Meghalaya. *J. Indian Bot. Soc.* Vol. **88 (142):** 102-188.
- Dixit, S.C. (1937). The Chlorophyceae of the Bombay Presidency, India-I. *Ibid.***5(1):** 16-25.
- Fritsch, F. E. (1903). Observations of phytoplanktons of the river Tames, *Ann. Bot.***17:**631-647.
- Hegde G.R. and Bharati, S.G. (1983). Freshwater algae of Bijapur district, Karnataka state, India. *Phykos*.**22:** 167-170.
- Hegde, G. R. (1988b). Freshwater algae of Karnataka state-certain new records from Dharwad. *Indian Bot. Rpt.***7(1 and 2):** 51-53.
- Hilliard, D.K. (1959). Notes on the Phytoplankton of Karluklake, Kodiak, Island, Alaska. *The Canadian Field Naturalist*.**73 (3):** 135-143.
- Jawale, A.K. and Kumawat, D.A. (2003). Some *Ankistrodesmus* (Chlorococcales) from fish ponds, Maharashtra. *J. Aqua Bio.* Vol. **18 (2):** 17-19.
- Jose, L. and Patel, R.J. (1992). A systematic account of Chlorococcales new to Kerala. *Phykos*.**31 (1 & 2):** 95-102.
- Jyothi, B., Sudhakar, G. and Venkateshwaralu, V. (1990). Ecological evaluation of Chlorococcales

- nblooms-Acomparativeaccount. *J. Indian Botanical. Soc.***69**: 115-119.
- Kamat, N.D. (1962a). Chlorophyceae of Ahmedabad, India.*Ibid.***20(2)**: 248-279.
- Kamat, N.D. (1974). Algae of Marathwada, Maharashtra.*Phykos***13**: 22-32.
- Kamat, N.D. and Frietas, J.F. (1976). A Check list of Eulgenophyceae and Chlorophyceae of Nagpur, Maharashtra.*Phykos.***15**: 121-125.
- Kumawat D.A. and Jawale, A.K. (2003a). A Noteworthy on genus *Dictyophaerium* (Chlorococcales). Naeg. from fish ponds. *Indian J. Environ. And Ecoplan.***7 (3)**: 583-585.
- Kumawat D.A. and Jawale A.K. (2004b). An Ecological study of chlorococcales in the Inland Fishery. *J. Phytol. Res.***17 (1)**: 43-46.
- Nandan, S.N. (1993). Algal flora of fish pond in Dhule, Maharashtra. *Indian Bot. Rept.***12 (land 2)**: 61-63.
- Nandan, S. N. and Patel, R. J., (1986a). Algal flora of Vishwamitriver Baroda-II Chlorophyceae. *Indian Bot. Repr.***5(1)**: 97.
- Philipose, M.T. (1960). Fresh water phytoplankton of inland fisheries. *Proc. Symp Algology, ICAR.* 272-291.
- Phillipose. M.T. (1967). Chlorococcales. *ICAR. Monograph, New Delhi.* P. 365.
- Pingle, S.D. (1981). Studies on algae of impoundments and streams in Maharashtra, Ph.D. thesis, Poona University.
- Prescott G.W. (1951). Algae of the Western great lakes area. Granbrook Institute of Science, Michigan.
- Sabri, K. (1998): A study in the seasonal variation of phytoplankton in Hafiklake (Sivas Turkey). *Turkish J. of Bot.***22(1)**:35-4.
- Sirsat D.B., Ambore N.E. and Pulle J.S. (2004). Study of Phytoplankton of fresh water pond at Dharnapuri in Beed District (M.S.) *J. Aqua. Biol.***19(2)**: 7-10.
- Smith, G. M. (1950). The fresh water algae of the United states. McGraw Hill Book Co., New York. P: 719.
- Smith, G.M. (1920). Phytoplankton of the Inland lake of Wiscosin Part-I, Myxophyceae, Phaeophyceae, Heterokontae and Chlorophyceae exclusive of the Desmidiaceae. *Wis. Geol. Nat. Hist. Surv.***57**: 1-243.
- Talekar Santosh and Jadhav Milind (2009). Biodiversity of desmids in Manjarariver in Maharashtra. *The Ecotech***1(2)**: 104-105.
- Tiffany, L.H. and Britton, M.E. (1952). The algae of Illionois. Chicago.

Venkatraman, G.S. (1957). The algal flora of the ponds and puddles inside the Banaras Hindu University grounds, India *J. Bom. Nat. His. Soc.***54 (4):** 908-919.

Whitton, B.A. (1969). Seasonal changes in the phytoplankton of St. James park lake, London. *London Nat.***48:** 14-39.