

## **Occurrence of Chlorophyceae members on the soil polluted by sugar factory waste in Sangamner tehsil of Ahmednagar district, Mharashtra.**

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### **Abstract**

Algae are predominantly found in aquatic environment. Some algae grow on soil also. Terrestrial algae can grow on polluted soil may be pollution tolerant or indicators of pollution. Sangamner tehsil is one of the major city of Ahmednagar district and based on agricultural as well as industrial economy. In present investigations Chlorophyceae members were recorded from the soil polluted by sugar factory waste. Total 7 genera and 22 species were recorded during the period July 2017 to June 2018. The species were found throughout the year on the soil where waste water is released after pre-treatment from the sugar factory.

Key Words: - Soil algae, Sugar factory waste, Chlorophyceae.

### **Introduction**

The study area selected was near Sangamner sugar factory where the waste water is released after giving pre-treatment. Sangamner Tehsil is located on the bank of Pravara River. The Sugarcane farming is totally based upon Sangamner Sugar Factory of the tehsil. The area near factory was selected to study occurrence of algae on polluted soil. The area was unexplored in relation with algal growth on polluted soil. The soil is polluted by sugar factory waste and in present investigation diversity and systematic study of algae growing on this soil was studied.

### **Material and Methods**

Soil samples were collected during the period July 2017 to June 2018 from the areas near sugar factory where waste water is released frequently. The samples were brought to laboratory, washed with water to separate algae and soil particles. Slides were prepared from fresh material and remaining material was preserved in 4% Formalin for further studies. The algae were observed under compound microscope and identified using standard literature and monographs. Camera lucida sketches were drawn by using the samples.

## Systematic Account

**DIVISION – CHLOROPHYTA**

**CLASS- CHLOROPHYCEAE**

**Family-Hydrodictyaceae**

**Subfamily-Hydrodictyoideae**

Genus - *Pediastrum* Meyen, 1829

**1. *Pediastrum ovatum* (Ehr.)A.Br.**

**Pl.1.Fig.a**

Philipose, 1967, PP.115-117, Fig.37.

Cells 4.2-12.6  $\mu\text{m}$  in diameter and 12.2-23  $\mu\text{m}$  long, cells are arranged in circular form; cells are arranged in 8 celled colonies, colonies are 37.2-52.3  $\mu\text{m}$  in diameter.

**2. *Pediastrum boryanum* (Turp.)Menegh.**

**Pl.1.Fig.b**

Philipose, 1967, PP.118-119, Fig.40a.

Cells are arranged in circular to oval colonies, 16-32 celled; 16 celled colony up to 69.2  $\mu\text{m}$  in diameter; cells 8.7-12.7  $\mu\text{m}$  in diameter; cells with 4.9  $\mu\text{m}$  long processes; cells are compactly arranged, intercellular spaces are absent, inner cells polygonal with straight sides, outer cells are with two spine like processes.

**3. *Pediastrum simplex* Meyen**

**Pl.1.Fig.c**

Philipose, 1967, PP.113-114, Figs.36a-c.

Cells 4.6-8.7  $\mu\text{m}$  in diameter, 12-20.4  $\mu\text{m}$  in length, colonies oval shaped, 8-16 celled, inner cells are polygonal, Eight celled colonies 31.8-46.8  $\mu\text{m}$ , central cell 6.9  $\mu\text{m}$  in diameter, polygonal in shape, outer cells show tapering and spiny structure, intercellular spaces small.

**Family- Oocystaceae**

Genus *Oocystis* Naegeli in A.Braun, 1855

**1. *Oocystis crassa*-Wittr.**

**Pl.1.Fig.d**

Philipose, 1967, P.181, Fig.90a.

Cells are 14.7  $\mu\text{m}$  broad and 25.2  $\mu\text{m}$  In length, single or in colonies of 2-4, oval cells, similar in length and breadth .

**2. *Oocystis echballoocystiformis* Iyengar**

**Pl.1.Fig.e**

Philipose, 1967, p. 186, Fig. 99

Cells ellipsoid, ends are broadly rounded. Thin cell membrane, polar thickenings absent. Chloroplasts 2-4-8, parietal and disc-shaped, each with a small pyrenoid. Cells 6.9-8.9  $\mu\text{m}$  broad, 17-23 $\mu\text{m}$  long.

**3. *Oocystis pusilla* Hansgirg, 1890**

**Pl.1.Fig.f**

Philipose, 1967, P. 184, Fig. 97

Colonies of 4-8 cells, rounded, covered by the mother cell wall. 8 celled colony, 22.2 $\mu\text{m}$  in diameter. Cells are cylindrical, spindle shaped, 8.9 $\mu\text{m}$  in length, and 5.21 $\mu\text{m}$  in diameter. Nodular thickenings not seen. Chloroplast in the form of parietal plates, disc shaped and without pyrenoids.

**Family-Scenedesmaceae**

Genus- *Scenedesmus* Meyen, 1829

**1. *Scenedesmus abundans*(Kirch.)Chodat**

**Pl.1.Fig.g**

Philipose, 1967, PP.278-279, Figs.148a-d.

Cells 2.6-4.4  $\mu\text{m}$  broad, 7.3-9.7  $\mu\text{m}$  long; spines 4.4-7.7  $\mu\text{m}$  long; colonies 2-4 celled, cells are oval ,oblong ,arranged in straight series, cells show terminal polar spines, the outer cells show 3-4 lateral spines.

**2. *Scenedesmus arcuatus*(Lemm.)Lemm.**

**Pl.1.Fig.h**

Philipose, 1967, P.256, Figs.166a-c.

Cells 7.9  $\mu\text{m}$  broad, 14.7  $\mu\text{m}$  long; cell wall smooth; spines absent, cells arranged in eight-celled colonies in two series, oblong-ovoid, colonies eight celled, ,curved and with few intercellular spaces, colonies up to 46  $\mu\text{m}$  long.

**3. *Scenedesmus arcuatus*(Lemm.)Lemm.var.*capitatus*G.M.Smith**

**Pl.1.Fig.i**

Philipose, 1967, P.257, Figs.66d-l.

Cells 8.2 µm broad, 20.8 µm long; cells in eight-celled colonies, cells slightly curved with one side convex and the other straight, ends of cell shows nodular thickenings; colonies curved, eight celled; cells in eight-celled colonies arranged in bilinear series.

**4. *Scenedesmus arcuatus* (Lemm.)Lemm.f.*gracilis* Hortobagyi Pl.1.Fig.j**

T.Hortobagyi, 1969, PP.49-50, Pl.21, Fig.295.

Cells arranged in 4 celled colonies; cells 5.8 µm broad, 15.8 µm long, alternately arranged with cavities between them; cells oblong, cylindrical, outer faces convex and inner faces concave; one end usually broader than other, cell wall smooth with rounded ends.

**5. *Scenedesmus bijugatus* (Turp.)Kuetz. Pl.1.Fig.k**

Philipose, 1967, P.252, Figs.c, e, f.

Cells 6.5 µm broad, 14.8 µm long, oblong- ovoid with rounded ends; colonies slightly curved, of 8 cells arranged in a single linear series.

**6. *Scenedesmus bijugatus* (Turp.)Kuetz.var.*alternans* (Reinsch) Hansg. Pl.2.Fig.a**

Philipose, 1967, PP.254-255, Fig.264 g.

Cell 7.3 µm broad, 16.8 µm long; ellipsoid in shape with rounded ends; colonies flat or slightly curved, usually eight-celled, but sometimes four-celled, with the cells arranged in a distinctly alternating series; neighbour cells jointed to each other along a small portion of their length.

**7. *Scenedesmus bijugatus* (Turp.)Kuetz.var.*bicellularis* (Chodat) Phil. Pl.2.Fig.b**

Philipose, 1967, P.253, Figs.d, n, o.

Cells 6.2 µm broad, 18.3 µm long, single, ellipsoid-cylindrical; colonies generally two-celled, In four-celled colonies, the cells arranged in groups of two; cell wall smooth without spines.

**8. *Scenedesmus incrassatulus* Bohlin, 1897 Pl.2,Fig.c**

Philipose -1967; 252: Pl. - 255, F.-163.

Cell body spindle-shaped, 4-8 cells attached side by side, spiny projections are not seen. Outer cells slightly curved inward and the inner side more or less straight or somewhat concave, ends of cells short and thick with apical nodules. Colony of 8 cells, 20.7 -21.45 µm long, 13.2 - 16.5 µm wide, cells 6.6 µm long, 3.3 µm wide.

**9. *Scenedesmus dimorphus*** (Turpin) Kuetzing, 1834.

**Pl.2.Fig.d**

Philipose- 1967; 249: Pl. - 250, Fig. - 160 a-c.

Colony consist 4 and 8 cells. In 4 celled colonies, cells arranged in linear series and in 8 celled colonies, cells are arranged in sub alternating series. 8 Celled colony-24.2µm long, 12.1µm wide; each cell 2.3µm wide and 11.3µm in length.

**10. *Scenedesmus bijugatus*** (Turp.) Kuetzing var. *flexuosus* Lemmermann, 1898

**Pl.2, Fig.e**

Philipose- 1967; 254: Pg.- 255, Fig.-164 k, l

Colonies are 8- 16 or 32 celled, cells arranged irregularly and spirally. Eight celled colony is 10.4µm broad, 40.6µm long, cells are about 4.1-4.55µm broad, 9.1-10.5µm long.

**11. *Scenedesmus dimorphus*** (Turp.) Kuetzing forma. *tortus* G.M. Smith, 1926.

**Pl.2.Fig.f**

Philipose -1967; 251: Pg.- 250, Fig.- 160 d.

Four to eight celled colonies arranged in a linear series, 8- celled colony in sub alternating series, outer cells are crescent shaped and the apices are thin. Cells 2-7µm broad, 32µm in length, eight celled colony 71.9µm long and 37.4µm broad.

**12. *Scenedesmus javanensis*** Chodat

**Pl.2.Fig.g**

R.J.Patel and Isabella George, 1989, P.47, Figs.7o, p.

Cells are arranged in 4 to 8 celled colonies, cells are somewhat curved, some are 'S' shaped and some are crescent shaped, apices of cells are pointed. Cells are 1.4 -4.6 µm broad and 17.9 – 25.2 µm long.

**13. *Scenedesmus prismaticus*** Bruhl et Biswas

**Pl.2.Fig.h**

Four celled colony. Cells are arranged linearly in series. Cells are triangular, prism like with pyramidal ends. Cells are 4-4.2 µm broad and 10-12.5µm in length.

**14. *Scenedesmus obliquus*** (Turpin) Kuetzing.

**Pl.2.Fig.i**

Philipose-1967; 248:Pg. 250, Fig.-159.

Colonies are four or eight celled, cells are fusiform with pointed ends. Cell wall smooth. Four celled colony 15.3µm in size. Cells are 2.53µm wide and 15.3µm in length.

15. *Scenedesmus qudricauda* (Turpin) Brébisson var. *bicaudatus* Hansgirg **Pl.2.Fig.j**

Philipose-1967; 284: Pg. - 283F. - 187 k, l.

Colonies are in the form of even number of cells i.e. 2-4-8 celled colonies. Cells are ellipsoidal or oval, outer cells show spiny projection at one end. Cell measures about 12.8µm in length and 3.87µm wide. Spines are 4.92-7.2µm long.

## **Order- Chaetophorales**

### **Family- Chaetophoraceae**

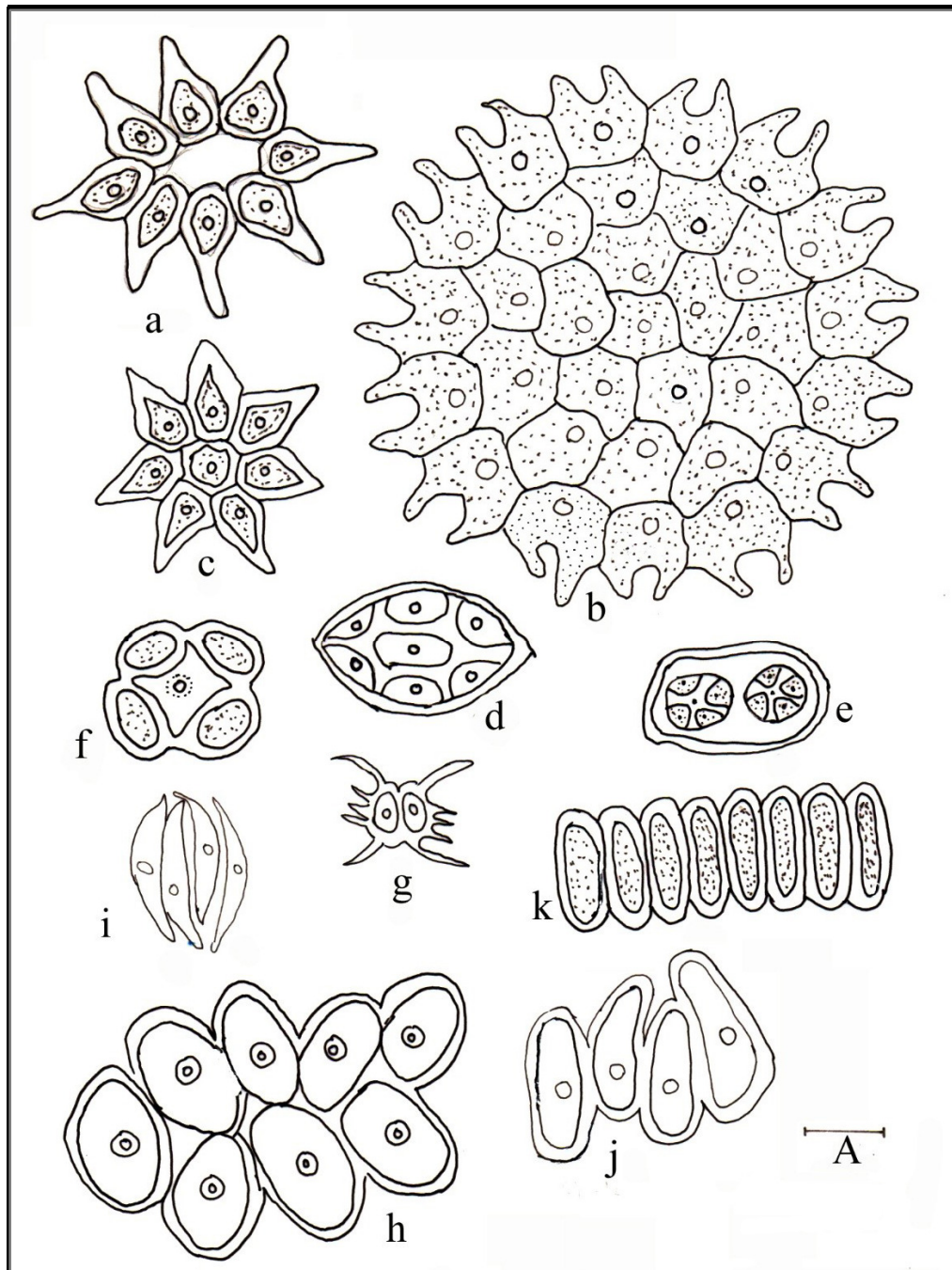
#### **Genus – *Stigeoclonium* Kützing, 1843**

1. *Stigeoclonium farctum* Berth. **Pl.2.Fig.k**

B.N. Prasad and P.K. Misra, 1992, P.61, Pl. 9, Figs. 8-10; V. Sankaran, 2005, P.90.

Filamentous form. Cells oval, compact, filaments unbranched. Cells are triangular with pointed tip. Cells arranged horizontally as well as vertically. Cells 5.2-12.26 µmbroad and 4.4-7.1µm long.

## PLATE-1



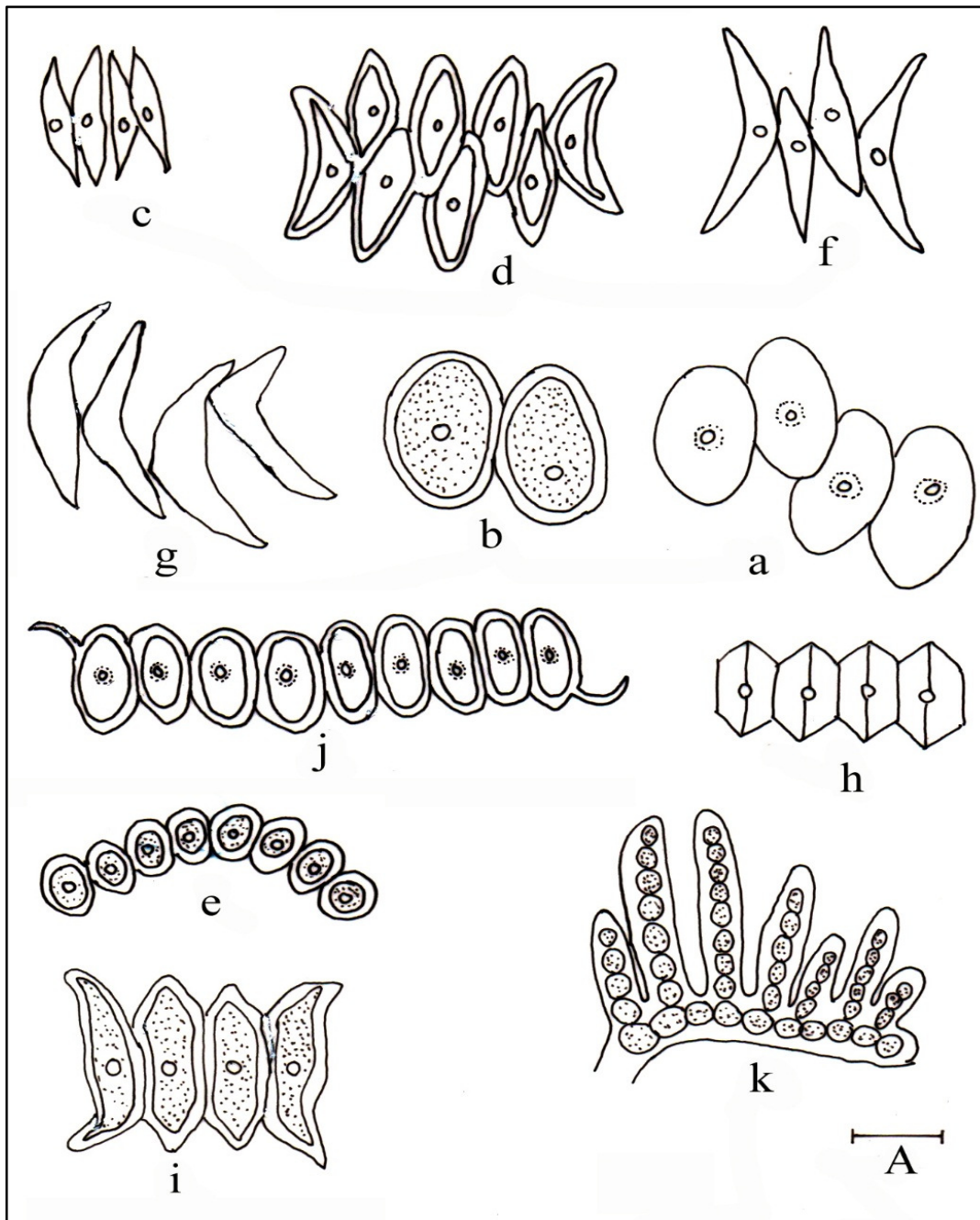
a. *Pediastrum ovatum* (Ehr.) A.Br. b. *Pediastrum boryanum* (Turp.) Meneghc. *Pediastrum simplex* Meyen. d. *Oocystis crassa* Witttr. e. *Oocystis echballo cystiformis* Iyengar f. *Oocystis pusilla* Hansg. g. *Scenedesmus abundans* (Kirch.) Chodat. h. *Scenedesmus arcuatus* (Lemm.) Lemm i. *Scenedesmus arcuatus* (Lemm.) Lemm .var.*capitatus*. j. *Scenedesmus arcuatus* (Lemm.) Lemm.f.*gracilis* Hortobagyik. *Scenedesmus bijugatus* (Turp.) Kuetz.

Scale Bars = 10  $\mu$

Scale A: Fig - a, c, d, e, f, g, i Scale B: Fig - b, h, j, k



## PLATE 2



a. *Scenedesmus bijugatus* (Turp.)Kuetz.var.*alternans*. b. *Scenedesmus bijugatus* (Turp.)Kuetz.var.*bicellularis*. c. *Scenedesmus incrassatulus*Bohlin.d.*Scenedesmus dimorphus* (Turp.)Kuetz. e. *Scenedesmus bijugatus* (Turp.)Kuetz.var.*flexuosus*f.*Scenedesmus dimorphus* (Turp.)Kuetz.f.*tortus*g. *Scenedesmus javanensis* Chodat. h. *Scenedesmus prismaticus* Bruhl & Biswas.i. *Scenedesmus obliquus* (Turp.)Kuetz.j.*Scenedesmus quadricauda* (Turp.)Breb.var.*bicaudatus* Hans. k. *Stigeoclonium farctum* Berth.

Scale Bars = 10 μ



## References

- Bhoge, O.N. and G. Ragothaman. 2005. Some Blue - Green algae from the soil of Suki dam, Jalgaon District, Maharashtra. *J.Aqua.Biol.*, 20(2) : 9 – 12.
- Bold, H. C. (1970). Some aspects of the taxonomy of soil algae. *Annals of the New York Academy of sciences*. 175(1); 601-616.
- Boralkar, D. B., Trivedy, R. K., Pathak, S. G., Deshmukh, A. M., & Patil, M. A. (1982). Studies on soil pollution along the Krishna River in the state of Maharashtra. *Journal of environmental biology*. 3(3), 113-117.
- Dev, M. K. (2015). Effect of factory waste on soil and ground water quality from Lote MIDC (Doctoral dissertation, DBSKKV. Dapoli). PP,100.
- Jawale A.K. and Dhande J.S. 2005. A Preliminary survey of Chlorococcales from Hartala Lake, Genus *Scenedesmus* Meyen, *Plant Diversity and Biotechnology*, PP.45-48.
- Kumawat, D.A. and Jawale, A.K., 2004. Genus *Scenedesmus* Meyen from Maharashtra. *Phytol. Res.* 17 (1): 117-118
- Marathe, K. V. (1966). Studies on soil algae of India. I. Soil algae from the cultivated fields of Dhulia (Maharashtra State). *J Univ. Bombay*. 35; 100-105.
- Patil, S. A. (2013). Genus *Scenedesmus* Meyen from Mangrul Dam Dist Jalgaon, Maharashtra. *Indian Journal of Fundamental and Applied Life Science*, 3(2); 204-210.
- Philipose, M.T. 1967. Chlorococcales, ICAR. New Delhi. PP, 365.
- Pingle, S.D.1992. A Note on algae of Pashan lake Chlorococcales. *Biologica Indica*, 3 (1& 2): 81-82.
- Shinde, M.D.1997. Study on soil characteristics and effect on green algae from Pravaranagar area, Ahmednagar district, Ph.D. Thesis, University of Pune.
- Tiwari, G. L. 1975. A study of the blue green algae from paddy field soils of India (II). Taxonomic Considerations of Non-heterocystous blue-green algae. *Nova Hedwigia* 26: 765-797.
- Wagh, S. G., & Jadhav, M. J. (2018). Diversity of soil algae in wheat field of Ahmednagar district (MS). *Indian journal of applied research*, 7(12); 599-600.