TAXONOMY AND DIVERSITY OF GENUS TETRAEDRON KÜTZING (CHLOROPHYCEAE) IN THE MAJOR RIVERS OF CHANDRAPUR DISTRICT, MAHARASHTRA

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Abstract:

The genus *Tetraedron* belongs to family Hydrodictyaceae of class Chlorophyceae. The plants are microscopic, unicellular, free floating, flat or twisted, triangular, quadrangular or polygonal in shape. Present study is carried out in Chandrapur district to find out the diversity of the genus *Tetraedron* in major rivers of the district. During this study total 13 taxa have been isolated, identified and classified. Among these, three taxa are reported first time from the Maharashtra state.

Key words: Hydrodictyaceae, Microscopic, Free floating, Unicellular, Triangular.

Introduction:

India is one of the mega-biodiversity hotspots of the world, having vast variety of flora and fauna. It is a habitat for threatened and endemic species that have immense ecological and commercial value. Algae are one of the most diverse groups of living organism that are distributed in all across the soil and water. They are highly diversified in distribution in India. They are of great importance both economically as well as ecologically. Hence, it is very necessary to document each and every species along with its distribution throughout the country.

Phycologists explored the different habitats of the country and documentedvarious species. But, still the Chandrapur district is not properly explored for its algal phyto diversity. Only few studies related with taxonomy are available from the district[1-5]. On the other hand there exist few wetlands in the district and that too are bearing the pressure of high industrialization. Day by day pollution in the district is increasing and changing the physico chemical environment of the rivers. So, a thorough investigation of algal flora of the district has become an urgent necessity.

The *Tetraedron* Kützing is a green algae genus belongs to family Hydrodictyaceae, order Chlorocaccales and class Chlorophyceae. The plants are microscopic, unicellular, free floating, flat or twisted, triangular, quadrangular or polygonal in shape. Angles of the cells are simple with or without spines. The different species are distinguished on the basis of shape, size and spines.

Chlorococcales are most common green algae and are studied by various workers from the Maharashtra state [6-11]. Recently 17 species of *Tetraedron* from have been reported from Beed district of the Maharashtra state[12]. But from Chandrapur district, no reports are available regarding the taxonomy of the genus *Tetraedron*. So, present work is undertaken to study the taxonomy and diversity of the genus *Tetraedron*fromChandrapur district.

Material and Method:

Present manuscript is a part of Taxonomic study of micro and macro flora of major rivers of Chandrapur district project. Chandrapur is the easternmost district of the Maharashtra

state, located between 18° 41' to 20° 50' north latitudes and 78° 48' to 80° 55' east longitudes (fig. 1). The work is carried out for two consecutive years between 2013 and 2015. During this work, water samples were collected from 21 sites of three major rivers of the Chandrapur district (fig. 2). The samples were collected seasonally from every site between 8 to 10am. Sampling was done with the help of phytoplankton net made up of bolting silk and having pore size 20µ. The samples were preserved in 4% formaldehyde solution and microphotographs were taken with Coslab microscope camera. Plants were identified with the helpof standard books, floras, monographs and recent research papers [13-17].

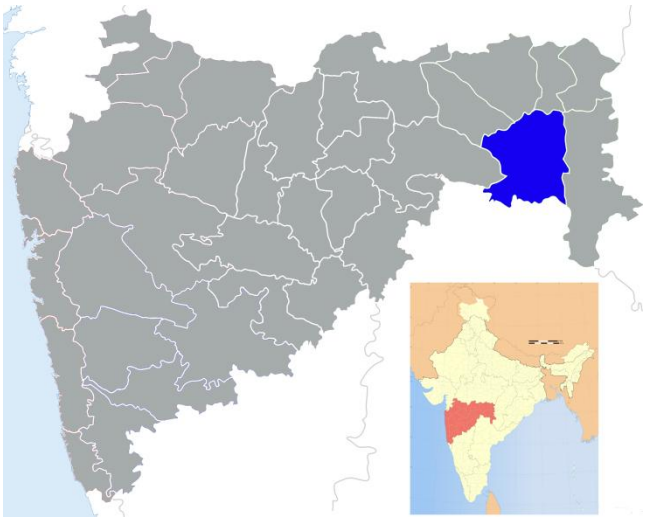

Fig. 1. Location of Chandrapur district.

Fig. 2. Sampling sites on major rivers.

Systematic enumeration:

The total taxa available during the study are classified as follows...

1a. Cells without spines	2
1b. Cells with spines	6
2a. Cells triangular	3
2b. Cells quadrangular or pentangular	4
3a. Tips with knob like projection	*T. triangulare*
3b. Tips without projection	*T. trilobulatum*
4a. Cells quadrangular	5
4b. Cells pentangular	*T. simmeri* var. *minus*
5a. Sides slightly concave, not lobed	*T. minimum*
5b. Sides markedly concave, lobes definite	*T. minimum* var. *tetralobulatum*
6a. Angles with single spine	7
6b. Angles with two spines each	*T. bifurcatum* var. *minor*
7a. Cells triangular	8
7b. Cells quadrangular or pentangular	9

8a. Sides concave, spine long	*T. trigonum*
8b. Sides markedly convex, spines short	*T. trigonum* f. *crassum*
9a. Cells quadrangular	10
9b. Cells pentangular	11
10a. Cells regular	*T. quadratum* f. *minus*
10b. Cells irregular	*T. regulare*
11a. All angles in same plane	12
11b. All angles not in same plane	*T. pentaedricum*
12a. Spines short and in same plane	*T. caudatum*
12b. Spines long and in different plane	*T. caudatum* var. *longispinum*

1. ***Tetraedron bifurcatum* var. *minor***Prescott 1944. [Pl. I, F. 1]
[Prescott 1962, p. 263, pl. 59, f. 15, 16]
Cells tetrahedral or pyramidal. Margins slightly concave to convex. Ends rounded and provided with two straight spines from each end.
Size: Cells 15µ-20µ in diameter; Spine: up to 8µ long.Occurrence: S4-S6, S11-S14

2. ***Tetraedron caudatum*** (Corda) Hansgirg 1888. [Pl. I, F. 2]
Basionym: *Asteriscium caudatum* Corda 1839.
[Korshikov 1953, p.239, f.181; Prescott 1962, p. 263, pl.59, f.17, 24, 25; Philipose 1967, p.150, f.64]
Cells five lobed, flat and elongated. Margins either similarly or dissimilarly slightly concave, ends rounded and provided with a short spine.
Size: Cells 6µ-15µ in diameter; Spine: up to 4µ long.Occurrence: S1-S6, S10-S12

3. ***Tetraedron caudatum* var. *longispinum***Lemmermann 1898. [Pl. I, F. 3]
[Korshikov 1953, p.240; Prescott 1962, p. 264, pl.59, f.20-22]
Cells five sided, flat and circular in outline. Margins similarly concave, ends rounded or slightly pointed and with a single, long spine. Spines are somewhat right angle to the plane of cell and oriented in different planes i. e two spines directed upward and three directed downward.
Size: Cells 11µ-14µ in diameter; Spine: up to 7µ long.
Occurrence: S1-S3, S5, S6, S10-S14
This is probably first report of the taxon from Maharashtra.

4. ***Tetraedron minimum*** (A.Braun) Hansgirg 1888. [Pl. I, F. 4]
Basionym: *Polyedrium minimum* A.Braun
[Korshikov 1953, p.241, f.185; Prescott 1962, p. 267, pl.60, f.12-15; Philipose 1967, p.138, f.53 a-c]
Cell quadrangular, flat with thick cell wall. Sides slightly concave. Ends broadly rounded with knob like projection.
Size: Cells 10µ-20µ in diameter.Occurrence: S1-S15, S19-S21

5. ***Tetraedron minimum* var. *tetralobulatum***Reinsch. [Pl. I, F. 5]
[Philipose 1967, p.139, f.53 e]
Similar to type, but deeply concave and form V shaped incision that leads to form four lobe like structures.

Size: Cells 11µ-15µ in diameter. Occurrence: S1-S7
This is probably first report of the taxon from Maharashtra.

6. ***Tetraedron pentaedricum*** West & G.S.West 1895. [Pl. I, F. 6&7]
[Korshikov 1953, p.241, f.183; Prescott 1962, p. 268, pl.60, f.21-23; Philipose 1967, p.151, f.65 a, b]
Cells irregularly five lobed with four lobes in one plane and fifth one is in different plane. Margins concave, ends rounded or pointed and provided with a short spine.
Size: Cells 8µ-18µ in diameter; Spine: up to 5µ long;Occurrence: S1-S7, S10-S15
Note: Some individuals in the collection are found to be somewhat similar to *Tetraedron caudatum* but lobes oriented in different plane. In which, three lobes in one plane and two lobes angular to previous.

7. ***Tetraedron quadratum* f. *minus***(Reinsch) De Toni 1889. [Pl. I, F.8]
Basionym: *Polyedrium quadratum* f. *minus* Reinsch 1888.
[Philipose 1967, p.145, f.59]
Cells quadrangular and flat. Margins straight or convex, ends rounded and provided with single short straight or curved spine.
Size: Cells 8µ-15µ X 11µ-17µ; Spine: up to 4µ long;Occurrence: S1-S5, S11-S14

8. ***Tetraedron regulare*** Kützing 1845. [Pl. I, F. 9]
[Prescott 1962, p. 269, pl.60, f.24-26; Philipose 1967, p.145, f.60 f]
Cells tetrahedral or pyramidal. Margins slightly concave, ends rounded with one straight spine from every end.
Size: Cells 15µ-18µ in diameter; Spine: 5µ long;Occurrence: S1-S6, S9-S11, S16-S18

9. ***Tetraedron simmeri* var. *minus***Philipose 1967. [Pl. I, F. 10]
[Philipose 1967, p.139, f.55]
Cell five angled and nearly flat. Margins slightly concave with rounded ends.
Size: Cells 13µ-15µ in diameter;Occurrence: S1-S3, S13-S19
This is probably first report of the taxon from Maharashtra.

10. ***Tetraedron triangulare*** Korshikov 1953. [Pl. I, F. 11]
[Korshikov 1953, p.239, f.180]
Cells triangular, flat with thick cell wall. Sides slightly concave. Ends broadly rounded with knob like projection.
Size: Cells 14µ-16µ in diameter; Occurrence: S19-S13, S19-S21

11. ***Tetraedron trigonum***(Nägeli) Hansgirg 1888. [Pl. I, F. 13]
Basionym: *Polyedrium trigonum* Nägeli
[Prescott 1962, p. 270, pl.61, f.11, 12; Philipose 1967, p.142, f.58 i]
Cell triangular, flat with thick cell wall. Margins concave, ends rounded and bear a long, stout spine.
Size: Cells 20µ-40µ in diameter; Spines: up to 10µ long;Occurrence: S1-S3, S13-S15

12. ***Tetraedron trigonum* forma *crassum*** (Reinsch) De Toni 1889.[Pl. I, F. 14 & 15]
Basionym: *Polyedrium trigonum* forma *crassum* Reinsch 1915.
[Philipose 1967, p.142, f.58 d-h]
Cells triangular, flat. Margins convex, ends rounded, spines short either straight or curved.
Size: Cells 13µ-15µ in diameter; Spine: up to 5µ long.Occurrence: S4-S6, S12-S14.

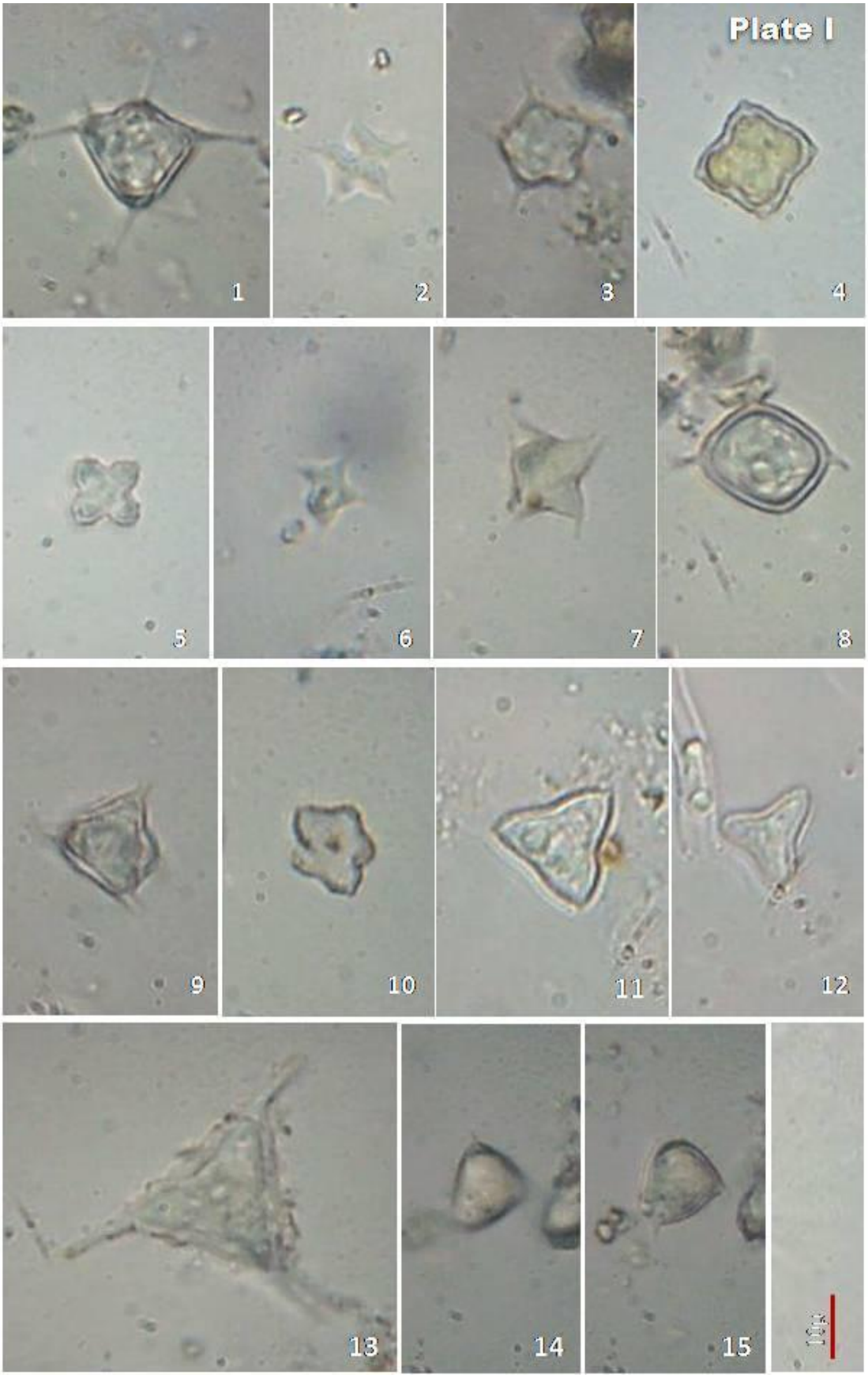

Plate I. Species diversity of the genus *Tetraedron* isolated from the rivers of Chandrapur

13. ***Tetraedron trilobulatum*** (Reinsch) Hansgirg 1889. [Pl. I, F. 12]
Basionym: *Polyedrium trilobulatum* Reinsch 1888.
[Philipose 1967, p.137, f.50]
Cells triangular, flat with thick cell wall. Sides equal and deeply concave and form three lobes. Ends broadly rounded and without any knob like structure.
Size: Cells 10µ-15µ in diameter; Occurrence: S9-S14.

Conclusion:

The rivers of the district are rich in biodiversity and contain total 13 species of *Tetraedron*. They are present throughout the year but most abundant during November month. The isolated taxa are properly identified and classified. A species key is also provided to identify the taxa properly.

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