



Morpho-Taxonomic Studies On The Genus Zygnemopsis (Skuja) Transeau 1934 (Chlorophyta) Occuring In Fresh Water Bodies Of Jammu, Jammu And Kashmir

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Abstract:

Three species of Zygnemopsis (Skuja) Transeau 1934. (Zygnemophyta, Chlorophyceae) were collected during 2008 to 2010 from different freshwater habitats of three districts of Jammu province viz., Samba district, Jammu district and Udhampur district. They were taxonomically determined on the basis of vegetative structure and reproductive structure. Their reproduction was mostly studied during winters and spring seasons. Z. splendens, Z.tiffaniana and Z. minuta taxonomically determined in this investigation are new to algal taxonomy of Jammu. All four species were found abundantly in both lentic and lotic water habitat. Z.tiffaniana was epilithic while Z.minuta was epiphytic.

Key words: *Zygnemopsis, Vegetative Structure, Reproductive structure, morpho-taxonomic, lentic and lotic water bodies.*

1.Introducton

Zygnematales, commonly known as pond scum make up the filamentous periphyton in ponds, growing on and around the larger aquatic plants, generally occurring in every kind of fresh water habitat. This filamentous green algae has been studied by a large number of phycologists all around the world. The order zygnematales comprises of 13 genera i.e, Mougeotiopsis, Temnogametum, Debarya, Mougeotia, Pleurodiscus, Zygonium, Zygnema, Zygnemopsis, Entransia, Sirogonium, Hallasea, Spirogyra, Sirogonium, Sicrocladium (Randhawa,1959).This genus is characterized by simple or often branched filaments, symmetrical cells, elaborate chloroplasts and amoeboid gametes. Among these, the most important characters which keep the Zygnematales apart from all the green algae are the conjugation by amoeboid gametes.

Martens (1869) was the first to record the occurrence of Zygnematales in India from Raneeganj area of West Bengal. Randhawa (1940) recorded various filament green algae growing in Indian fresh water and later in 1959 compiled these filamentous green algae in his monogram 'Zygnemaceae'.

Patel and Kumar (1975) report three taxa of Zygnemopsis viz., *Z. cholensis*, *Z. alharampurensis* and *Z. tricarinate* from Gujarat algal flora. Sharma and Kargupta (1986) described three species of Zygnemopsis from West Bengal. Randhawa (1959) and Kargupta (1998) studied morphological variations with respect to vegetative structure, reproductive structure, zygosporangium dimensions, shape and colour in *Z. splendens*, *Z. tiffansis* and *Z. minuta*, collected from Indiana Pennisula.

In the records of Jammu , earlier work in recording 17 more taxa belonging to Zygnemataceae was conducted by Misra (1937) in fresh waters of J&K. Kant & Kachroo (1970) & Kant (1974) stated that about 80% of aquatic plants population in Lakes of Kashmir was represented by Conjugales.

Since then no much work had been done in the field of taxonomic studies of Zygnemopsis growing in Jammu waters. Keeping in view the paucity of the work done on morphology and taxonomic studies on Zygnemopsis , an extensive survey had been conducted in three districts of Jammu (Jammu,Samba and Udhampur) from 2008 to 2010. While surveying various local water bodies like pond, puddles, road side ditches,lakes, slow moving streams, rivers etc. four species of Zygnemopsis were studied , all the three species described were new to taxonomy of Jammu i.e *Z. splendens*, *Z.tiffaniana* and *Z. minuta*.

2. Materials And Methods

Collections were made from Samba, Udhampur and Jammu districts of Jammu province during the period of January 2008 to March 2010. The specimens were obtained by hand-picking from various freshwater habitats like fountain water, running water channels, stagnant ponds and road-side puddles. They were preserved in glass bottles containing 5 % formalin and brought to the laboratory, where they were stained in iodine solution and examined in 10 % glycerin mounts under light microscope. Their drawings were made with the help of camera lucida and was micro photographed. The material was taxonomically determined with the help of authentic literature (Randhawa, 1959; Transeau, 1951; Chin-Chin, 1982; Vidyavati, 1995; Kargupta and Jha, 2004; Taft, 2009).

3. Result

Four species of pond scum genus *Zygnemopsis* (phylum Chlorophyta, class Chlorophyceae, order Zygnemetales, family Zygnemetaceae) have been identified. Their taxonomic enumeration is as follows:

3.1. *Zygnemopsis* (Skuja) Transeau 1934

The genus are not distinguishable from *Zygnema* during vegetative phase, but at the beginning of reproductive phase, the cell contents are partially replaced by refractive pectic material, which may be smooth or lamellated.

3.2. Vegetative Features

vegetative cells 2.5 (x 10) times as long as broad with slightly stellate, or polster-form stellate chloroplasts with a single large pyrenoid in each.

3.3. Reproductive Features

Reproduction by zygospores, parthenospores, aplanospores; during reproduction vegetative cells slightly swell, get filled with a shining pectic colloid; zygospores compressed- spheroid or quadrate with round, truncate, or retuse angles filling the conjugation canal and extending into gametangia; at maturity the zygospore have four lamellate solid appendages attached to them; aplanospore common, ovoid to ellipsoid; mesospore smooth, punctuate, scrobiculate or verrucose.

The following four species were collected which may be distinguished as follows:

3.4. Key to the local species of genus *Zygnemopsis*

- | | | |
|------|---------------------------------|----------------------|
| 1 | Reproduction by zygospores..... | 2 |
| 2(a) | Spore wall smooth | <i>Z. minuta</i> |
| 2(b) | Spore wall punctuate | <i>Z. tiffaniana</i> |
| 2(c) | Spore wall scorbiculate..... | <i>Z. splendens</i> |

3.5. *Zygnemopsis Minuta* Randhawa

(Randhawa, 1937. Proc. Indian Acad. Sci. 5, p.312, Figure.8 ; Randhawa, 1959, The Zygnemataceae, p 192, Figure. 119)

- Habitat and Habit: Lentic/ lotic water conditions ; Free floating.
- Vegetative feature: Vegetative cells 8 -10 μ x 38-48 μ ; end wall plane ; chloroplast 2 irregularly rounded, having tendency to associate with each other. (Plate-I; Figure-1).
- Reproductive feature: reproduction by aplanospores; cudgel shaped; 18-22 μ x 18-30 μ ; 2 layered (Plate-I; Figure-2 &3).
- Geographical distribution:
 - o India: Uttar Pardesh.
 - o Jammu: permanent pond in Botanical garden, JU (21-12-2008); Seasonal pond at Sagoon(4-1-2009) . New records.
- Variations recorded : This species was collected in winter seasons from the ditches, fields, ponds and puddles. This species is highly variable in vegetative cell dimensions; aplanospore show variation in shape and dimensions.

3.6. *Zygnemopsis Tiffaniana* Transeau .

(Transeau. 1944. Ohio. Jour. Sci. 44.p.244 ;Randhawa. 1959. The Zygnemataceae : p. 194, Figure.122,a-b).

- Habitat and Habit: Lentic water condition ; Free floating; sometimes epilithic.
- Vegetative feature: Vegetative cells 10-14 μ x 32-60 μ ; end wall plane ; chloroplast 2 star- shaped. (Plate-I; Figure-4).

- Reproductive features : Conjugation scalariform; tubes extenuating into both gametangia; Zygosporangia broad, oval; $22-24 \times 30-58 \mu$; median spore wall punctuate, brown. (Plate-I; Figure-5).
- Geographical Distribution:
 - World: U.S.A, Canada.
 - India: New record.
 - Jammu: Slow moving stream at surinsar (12-3-2009), Seasonal ditches at R.S.Pura (15-2- 2008), River Tawi banks (18-10-2008). New record.
- Variation recorded: This species was collected in winter seasons from the ditches, fields, ponds and puddles and is rice field after monsoons. This species is highly variable in vegetative cell dimensions; Zygosporangia show variations in dimension, shape and colour.

3.7. *Zygnemopsis Splendens* Randhawa

(Randhawa.1937. Proc. Indian. Acad. Sci.5,p.297,Figure.2; Randhawa.1959. The Zygnemataceae : p.196, Figure.126 a-c; Kargupta.1998).

- Habitat and Habit: Lentic water condition ; Epiphytic.
- Vegetative feature: Vegetative cells $12 - 13\mu \times 32- 42\mu$; with plane ends ; 2 regularly rounded chloroplasts, with a central pyrenoids . (Plate-I; Figure-6).
- Reproductive features : Conjugation Scalariform; Aplanospores quadrately ovoid; $40-52 \times 25-28\mu$; spore wall smooth ,scrobiculate pits, blue. (Plate-I;Figure-7
- Geographical distribution:
 - India: U.P.
 - Jammu: Paddy fields of R S Pura (21-9-2008). New record.
- Variation recorded: This species was collected in winter seasons from the ditches, fields, ponds and puddles. This species is highly variable in vegetative cell dimensions; . aplanospore show variations in dimension and shape.

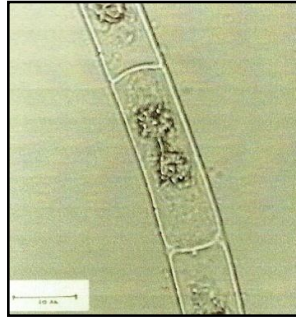


Figure 1: *Z. minuta* vegetative filament (10x)

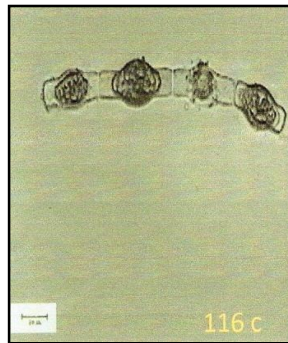


Figure 2: *Z. minuta* aplanospore (10 x)



Figure 3: *Z. minuta* Aplanospore (40x)

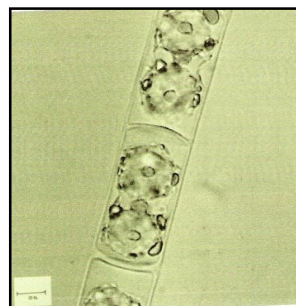


Figure 4: *Z. tiffaniana* vegetative filament



Figure 5: *Z. tiffaniana* conjugation tube (40x)

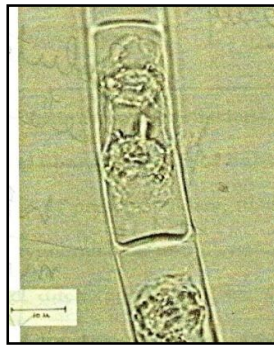


Figure 6: *Z. splendens* vegetative filament

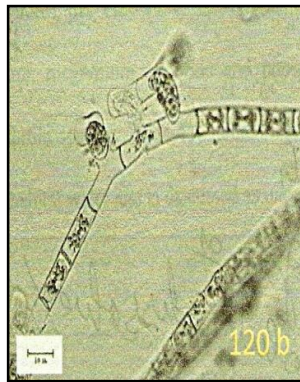


Figure 7: *Z. splendens* zygosporangium (10x)

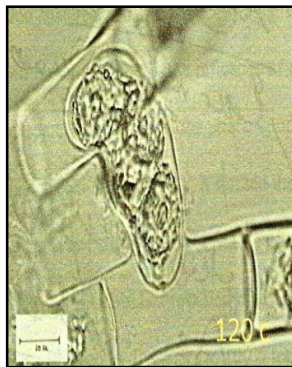


Figure 8: *Z. splendens* zygosporangium (40x).

4.Reference

1. Chin-Chi ,J.1982. Notes on the Zygnemataceae of China. J. Oceanology and Limnology 1(1).
2. Kant , S. and Kachroo, P.1970.Phytoplankton population dynamics and distribution in two adjoining lakes in Srinagar. Revised 20th July,1970, after revision 3rd Septmber,1970.
3. Kant, S.1974. On some species of Zygnema from Jammu. Current Science. 43(16):523-524.
4. Kargupta, A.N. and Jha,R.N.2004. Algal flora of Bihar (Zygnemataceae). Bishen Singh Mahendra Pal Singh, Dehra Dun ,India.
5. Kargupta, A.N.1998. Conjugation in Zygnemataceae. Advances in Phycology:119-135.
6. Misra.1937.Proc. Indian Acad. Sci.5.p.112, Figure.1.
7. Randhawa, M.S. 1940. Some peculiarities in conjugation in a new Himalayan species of Zygnema. 129
8. Randhawa, M.S. 1959. Zygnemaceae. ICAR, New Delhi, 478 pp.
9. Randhawa,1937. Proc. Indian Acad. Sci.5, p.312, Figure.8
10. Taft, C.E.2009. Some Oedogoniacea and Zygnemataceae from Texas and Louisiane. Transction of American Microscopial Society. 65 (1): 18-26.
11. Transeau, E.N. 1951. The Zygnemataceae.(Ohio. State Univ. Press, Columbus, 327 pp).
12. Vidyavati.1995. Biology of Conjugales. Pritwell. Jaipur.
13. Transeau. 1944. Ohio. Jour. Sci. 44.p.244