



CHLOROCOCCALEAN ALGAE FROM THE FOOTHILLS OF WESTERN HIMALAYA

SUNIL KUMAR SHUKLA, P.K. MISRA AND
CHANDRA PRAKASH SHUKLA

Phycology Research Laboratory, Department of Botany
University of Lucknow, Lucknow-226007

E-mail: misrapkm@yahoo.com; shuklask_algae@yahoo.com

Twenty one taxa of fresh water algae belonging to Class Chlorophyceae (Order-Chlorococcales), collected from different aquatic habitats of Lalkuan, Kathgodam and Pantnagar areas of Uttaranchal state and Pilibheet district of Uttar Pradesh from the foothill region of Western Himalaya have been described. These taxa belongs to 9 genera, 16 species and 5 varieties.

Key words: Algae, Chlorophyceae, Chlorococcales, Foothills of Western Himalaya, India.

Earlier works of Sengar and Sharma (1982), Jha *et al.* (1985), Pandey and Gangwar (1986), Rawla and Ratan (1989), Chaddha and Pandey (1977, 1978), Pandey *et al.* (1981) and Hortobagyi (1959, 1969) on Chlorococcales from foothills of the Western Himalaya reveals that a large part of it is still unexplored. Misra and Shukla (2004), Misra *et al.* (2005) have reported some desmids from Kumaon region. Habib *et al.* (1998) had reported chlorococcalean algae from Kotdwar, Garhwal, while Habib (1998a) reported eighteen taxa from Ramnagar, Kumaon Himalaya. Shukla and Misra (2006) have also reported *Dimorphococcus prasadii* sp. nov. from district Pilibheet. So far no work has been done on chlorococcalean algae of Pilibheet. In the present paper, chlorococcalean algae have been described which have been collected from Lalkuan, Kathgodam and Pantnagar area of Uttaranchal state and Pilibheet district of Uttar Pradesh.

In Lalkuan, algal samples have been collected from Gola River and a pond near railway line. In Kathgodam, samples have been collected from Gola River and Kalsia Nala near Gola Bairaj. In Pilibheet, algal samples have been taken from Chatta Tal and Ghannai Tal while in Pantnagar, from a water logged crop field.

MATERIALS AND METHODS

Random sampling technique has been applied in the algal collection procedure. Sample collections were made between November 2003 to January 2006 from different aquatic habitats by using planktonic mesh net. The algal samples were preserved in 3-4% formalin (aqueous solution of formaldehyde) and slides were prepared by staining chlorophycean algae by iodine and mounted in glycerine. Detailed studies were made by examining specimens under a Nikon Labophot microscope E-400 with H-III photomicrographic attachment.

Systematic Descriptions

Species identifications have been done after the Philipose (1967), Prescott (1961), Tiffany and Britton (1952) and Prasad and Misra (1992).

Order - Chlorococcales

Family – Hydrodictyaceae

Sub-Family – Hydrodictyoideae

1. *Hydrodictyon reticulatum* Lagerheim

Cells 170 µm broad. (Pl. 2, Fig. 3) **Collection Number and Date** – UTFH 11 & 12, 27/05/04
Locality – Gola River, Kathgodam.

2. *Pediastrum duplex* Meyen

Cells 10 µm in diameter, colonies 60 µm in diameter. (Pl. 1, Fig. 12) **Collection Number and Date** – UTFH 17, 21/12/04 **Locality** – Gola River, Kathgodam.

3. *P. tetras* (Ehr.) Ralfs var. *tetraodon* (Corda) Hansgirg.

Cells 8 μm in diameter, colonies 28 μm in diameter. (Pl. 2, Fig. 1) **Collection Number and Date** – UTFH 31, 22/01/06 **Locality** – Ghannai Tal, Pilibheet.

4. *P. tetras* var. *excisum* (Rabenh.) Hansgirt.

Cells 10- 11.5 μm in diameter, colonies 24-27 μm in diameter. (Pl. 2, Fig. 2) **Collection Number and Date** – UTFH 31, 22/01/06 **Locality** – Ghannai Tal, Pilibheet.

Sub Family – Tetraedronoideae

5. *Tetraedron trigonum* (Naeg.) Hansgirt

Cells 30 μm in diameter, length of spine is 6 μm . (Pl. 2, Fig. 8) **Collection Number and Date** – UTFH 2A+B, 08/11/03 **Locality** – Kalsia Nala Gola Bairaj, Kathgodam.

Family – Oocystaceae

Sub Family – Oocystoideae

6. *Oocystis elliptica* W. West

Cells 12 μm broad and 22 μm long. (Pl. 2, Fig. 7) **Collection Number and Date** – UTFH 15, 29/10/05 **Locality** – Chatta Tal, Pilibheet, Uttar Pradesh.

Family – Botryococcaceae

7. *Botryococcus braunii* Kuetzing

Cells 4 μm broad and 6 μm long, colonies 40 μm in diameter. (Pl. 2, Fig. 11) **Collection Number and Date** – UTFH 16, 24/10/06 **Locality** – Gola River, Lalkuan.

Family – Selenastraceae

8. *Ankistrodesmus spiralis* (Turner) Lemmermann

Cells 3 μm broad 43 μm long. (Pl. 2, Fig. 5) **Collection Number and Date** – UTFH 16, 24/01/06 **Locality** – Gola River, Lalkuan.

9. *A. sigmoides* (Rabenh.) Bruel & Biswas var. *radiatus* (Chodat) Lemmermann

Long cell is 43 μm , lateral cell is 3 μm . (Pl. 2, Fig. 4) **Collection Number and Date** – UTFH 15, 29/10/05 **Locality** – Chatta Tal, Pilibheet, Uttar Pradesh.

10. *Selenastrum gracile* Reinsch

Long cell is 20 μm , lateral cell is 5-6 μm . (Pl. 2, Fig. 6) **Collection Number and Date** – UTFH 15, 29/10/05 **Locality** – Chatta Tal, Pilibheet, Uttar Pradesh.

Family – Coelastraceae

11. *Coelastrum microporum* Naegeli

Diameter of cells 5 μm , diameter of colonies are 25 μm . (Pl. 2, Fig. 9&10) **Collection Number and Date** – UTFH 4, 23/12/04 **Locality** – Ghannai Tal, Pilibheet, Uttar Pradesh.

Family – Scenedesmaceae

Sub Family – Scenedesmoideae

12. *Scenedesmus incrassulatus* Bohlin

Length of cell – 16-18 μm , diameter of cell – 3-4 μm . (Pl. 1, Fig. 10) **Collection Number and Date** – UTFH 15, 21/12/04 **Locality** – Gola River, Kathgodam.

13. *S. prismaticus* Bruehl & Biswas

Cells 13 μm long, 6 μm broad. (Pl.1, Fig. 1) **Collection Number and Date** – UTFH 19, 29/10/05 **Locality** – Ghannai Tal, Pilibheet, Uttar Pradesh.

14. *S. dimorphus* (Turp.) Kuetzing

Cells 16-20 μm long, 4 μm broad. (Pl. 1, Fig. 11) **Collection Number and Date** – UTFH 4, 23/12/04 **Locality** – Chatta Tal, Pilibheet, Uttar Pradesh.

15. *S. obliquus* (Turpin) Kuetzing

Cells 16.5 μm long, 4 μm broad. (Pl. 1, Fig. 3) **Collection Number and Date** – UTFH 31, 22/01/06 **Locality** – Ghannai Tal, Pilibheet, Uttar Pradesh.

16. *S. quadricauda* (Turpin) Brebisson

Cells 18 μm long, 5 μm broad, length of spine – 14 μm . (Pl.1, Fig. 4&9) **Collection Number and Date** – UTFH 8, 11/11/03 **Locality** – Warer logged crop field, Pantnagar.

17. *S. quadricauda* (Turpin) Brebisson var. *westii* G.M.Smith

Cells 25- 28 μm long, 10 μm broad, length of

PLATE - 1

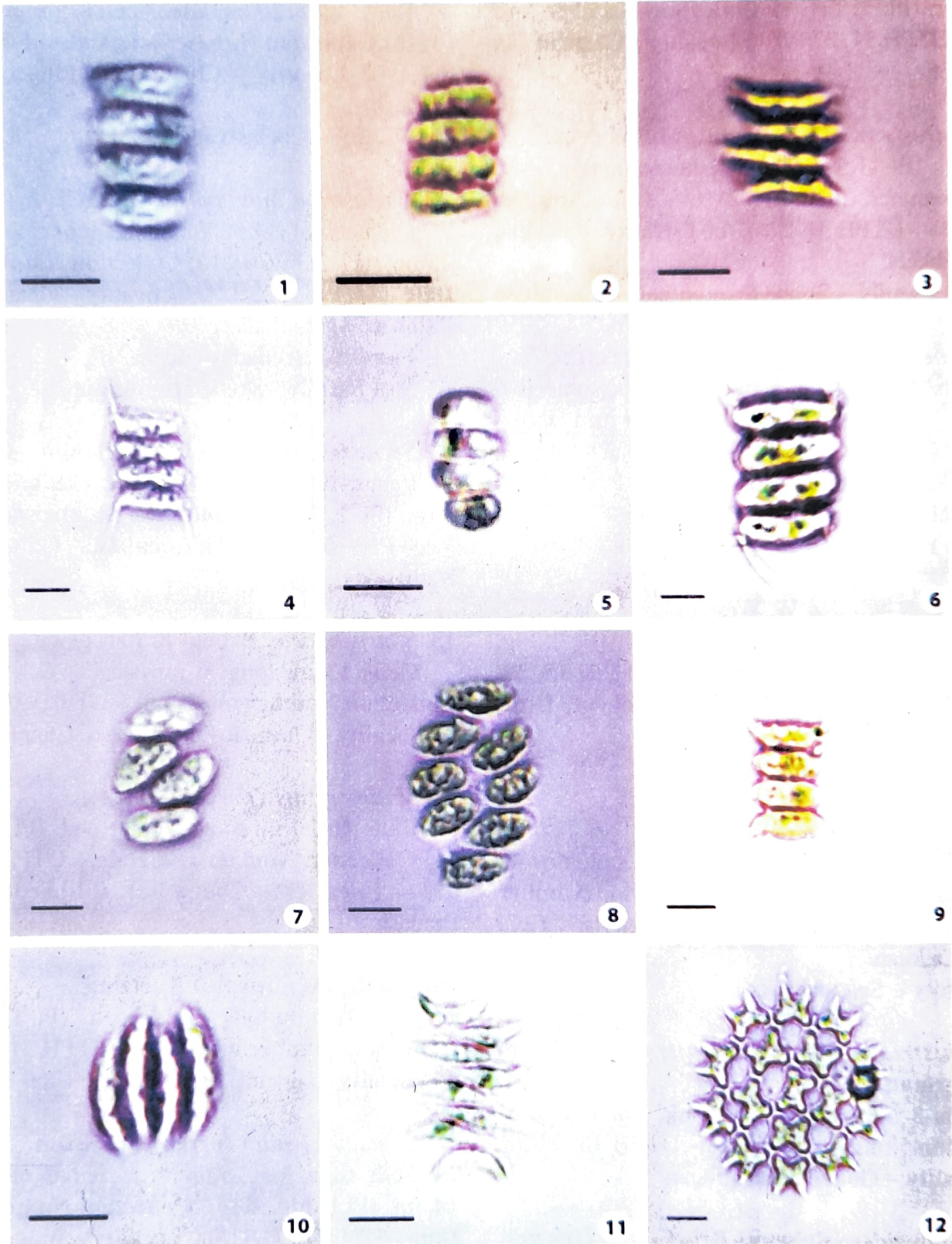


PLATE - 1

Explanation of Figures

1. *Scenedesmus prismaticus* Bruhl & Biswas 2. *S. bijugatus* (Turp.) Kuetzing 3. *S. obliques* (Turpin) Kuetzing 4&9. *S. quadricauda* (Turpin) Brebisson 5. *S. bijuga* (Turp.) Lagerheim 6. *S. quadricauda* (Turpin) Brebisson var. *westii* G.M.Smith 7. *S. bijugatus* (Turp.) Kuetz. f. *irregularis* Wille 8. *S. bijuga* (Turpin) Lagerheim var. *alternans* (Reinsch) Borge 10. *S. incassulatus* Bohlin 11. *S. dimorphus* (Turp.) Kuetzing 12. *Pediatrism duplex* Meyen

PLATE - 2

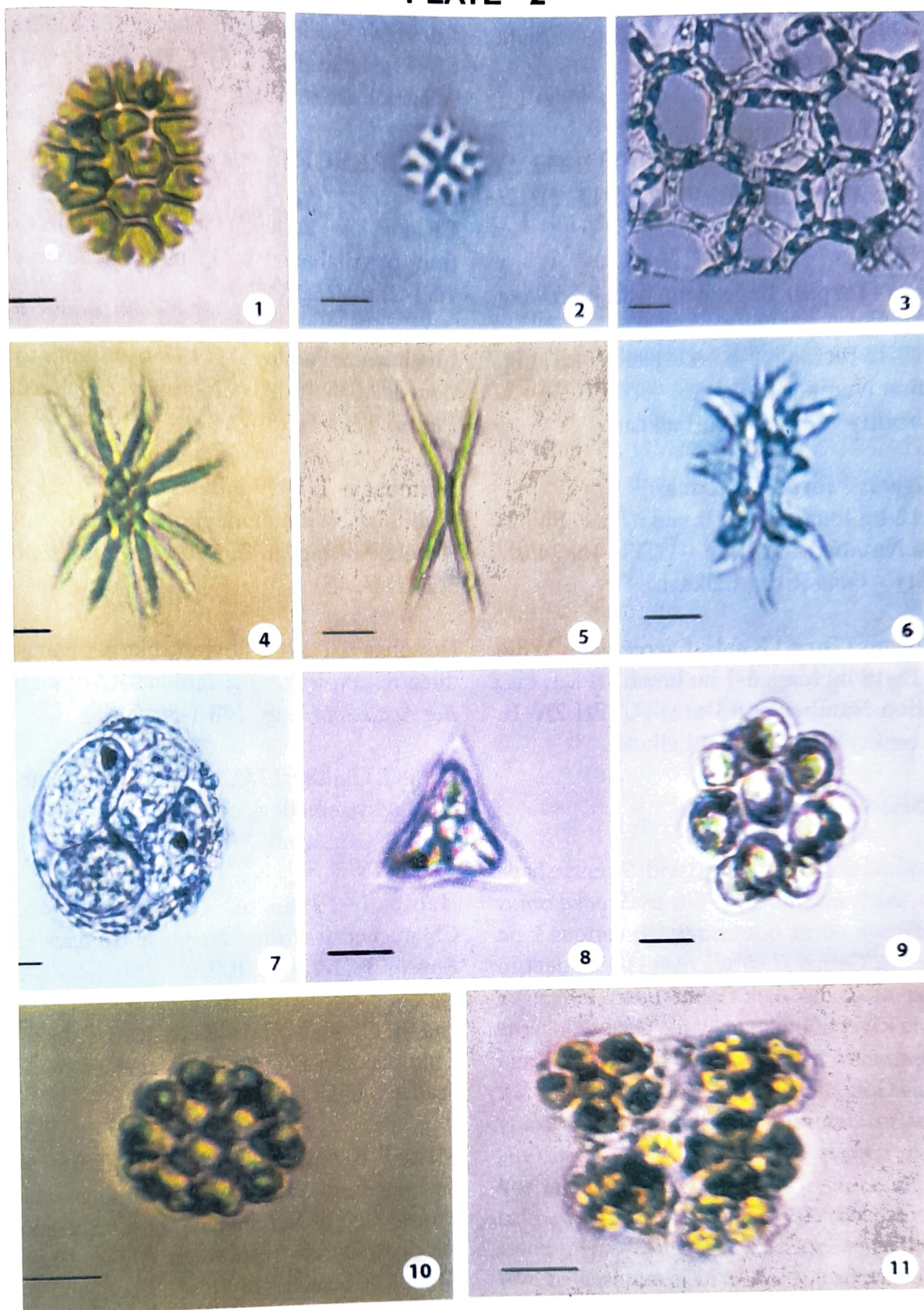


PLATE - 2

Explanation of Figures

1. *Pediastrum tetras* (Ehr.) Ralfs var. *tetraodon* (Corda) Hansgirg. 2. *P. tetras* var. *excisum* (Rabenh.) Hansgirg. 3. *Hydrodictyon reticulatum* Lagerheim. 4. *Ankistrodesmus sigmoides* (Rabenh.) Bruel & BISWAS var. *radiatus* (Chodat) Lemmermann. 5. *A. spiralis* (Turner) Lemmermann. 6. *Selenastrum gracile* Reinsch. 7. *Oocystis elliptica* W. West. 8. *Tetraedron trigonum* (Naeg.) Hansgirg. 9 & 10. *Coelastrum microsporum* Naegeli. 11. *Botryococcus braunii* Kuetzing.

spine – 16-20 μm . (Pl. 1, Fig. 6) **Collection Number and Date** – UTFH 15, 29/10/05 **Locality** – Chatta Tal, Pilibheet, Uttar Pradesh.

18. *S. bijuga* (Turp.) Lagerheim 1893

Cells 9-10 μm long, 4 μm broad. (Pl. 1, Fig. 5) **Collection Number and Date** – UTFH 15, 21/12/04 **Locality** – Gola River, Kathgodam.

19. *S. bijuga* (Turpin) Lagerheim var. *alternans* (Reinsch) Borge

Cells 12-15 μm long, 5-6 μm broad. (Pl. 1, Fig. 8) **Collection Number and Date** – UTFH 2A+B, 7/11/03 **Locality** – Gola River, Lalkuan.

20. *S. bijugatus* (Turp.) Kuetzing

Cells 12 μm long, 2.5 μm broad. (Pl. 1, Fig. 2) **Collection Number and Date** – UTFH 16, 24/01/06 **Locality** – Gola River, Lalkuan.

21. *S. bijugatus* (Turp.) Kuetz. f. *irregularis* Wille

Cells 15-18 μm long, 6-7 μm broad. (Pl. 1, Fig. 7) **Collection Number and Date** – UTFH 2A+B, 7/11/03 **Locality** – Gola River, Lalkuan.

DISCUSSION

Twenty one taxa, represented with 9 genera have been reported from this area. Genus *Scenedesmus* and *Pediastrum* occur dominantly in various lotic environments. Genus *Hydrodictyon* is abundant in Gola River of Kathgodam. Genus *Botryococcus* is rare in Gola River of Lalkuan, while Genus *Oocystis* and *Tetraedon* in Chatta Tal of district Pilibheet and Kalsia Nala Gola Bairaj of Kathgodam respectively. Genus *Ankistrodesmus* is rich but represented only by a single species & one variety viz. *A. spiralis* and *A. sigmoides* var. *radiatus* from Lalkuan and Pilibheet respectively. Genus *Selenastrum* is also represented by one species, *S. gracile* from Pilibheet and is rare. Genus *Scenedesmus* is represented by 7 species and 2 varieties. All these taxa are being reported for the first time from this area.

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REFERENCES

- Chadha A & Pandey D C 1977 Additions to the algal flora of Allahabad-I. Genus *Scenedesmus*. *Phycos* **16**(1-2) 69-75.
- Chadha A & Pandey D C 1978 Additions to the algal flora of Allahabad-II (Chlorophyta, Chlorococcales). *Phycos* **17**(1-2) 73-80.
- Hortobagyi T 1959 Kiszarado to Fenek algain ak tobbhonasos eletoemegnehezitett. Korulmenyek Kozott. A. Magyar Tud. Akad. Biol. Csoport Kozl., **3**(2) 211-245.
- Hortobagyi T 1969 Phytoplankton organisms from three reservoirs on the Jamuna River, India. *Acad. Bot Acad Sci Hung* **148** 1-80.
- Habib I, Ghildiyal J C, Negi K S & Chaturvedi U K 1998 A systematic account of Chlorococcales from Kotdwar, Garhwal. *Phycos* **38**(1&2) 25-129.
- Habib I 1998a A systematic account of Chlorococcales from Ramnagar, Kumaon Himalaya. *Phycos* **38**(1&2) 92-100.
- Jha B C, Kausal D K & Rao Rama Y 1985 Chlorococcales of Gobindsagar reservoir, Himachal Pradesh, India. *Phycos* **24** 27-32.
- Misra P K & Shukla S K 2004 Some fresh water desmids from Nainital district of Uttaranchal State. Proceedings of National Symposium on Biology and Biodiversity of fresh water Algae. University of Madras, Chennai. (In Press).
- Misra P K, Rai A K & Shukla Sunil Kumar 2005 Some fresh water desmids from Kumaon Himalaya. *J Applied Biosciences*. (Accepted)

- Pandey U C Tiwari G L & Pandey D C 1981 Additions to the algal flora of Allahabad-VII (Chlorophyta, Chlorococcales). *Proc. Indian Natn. Sci. Acad. B* **47**(2) 255-259.
- Pandey U C & Gangwar F C 1986 Chlorococcales of Bareilly-I. *Phycos* **25** 144-147.
- Philipose M T 1967 Chlorococcales, I.C.A.R. Monograph on algae. New Delhi. 365 p.
- Prasad B N & Misra P K 1992 Algal flora of Andman and Nicobar Island, vol. II. B. Singh and Mahendra Pal Singh Publ., Dehradun, Pp. 284.
- Prescott G W 1961 Algae of the Western great lakes area. W.M.C. Brown Publishers, Dubuque, Iowa. 977 p.
- Rawla G S & Rattan R S 1989 *Scenedesmus* Meyen species from Punjab, Himachal Pradesh and Chandigarh. *J Indian Bot Soc* **68** 287-293.
- Sengar R M S & Sharma K D 1982 Algal flora of Yamuna River at Agra. Chlorococcales. *Phycos* **21** 164-165.
- Shukla Sunil Kumar & Misra P K 2006 *Dimorphococcus prasadii* sp. nov. from foothills of Western Himalayas, India. *Cryptogamei Algologie* (Communicated)
- Tiffany L H & Britton M E 1952 *The Algae of Illinois*. Hafner Publishing Comp., New York. 407 Pp.