



## Identification of *Scenedesmus* species (Meyen) from Tirumala hills, Chittoor district, Andhra Pradesh, India

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### Abstract

The present paper reported 13 *Scenedesmus* taxa from small streams and ponds from Tirumala hills of Chittoor District, Andhra Pradesh. 13 *Scenedesmus* taxa were *Scenedesmus armatus* var. *bicaudatus* (Guglielment), *Scenedesmus acuminatus* (Lag.) Chodat, *Scenedesmus brasiliensis* Bohlin, *Scenedesmus bijuga* (Turp.) Lagerheim, *Scenedesmus bicaudatus* Dedusenko, *Scenedesmus protuberans* Fritsch & Rich, *Scenedesmus obtuse* Meyen var. *obtusus*, *Scenedesmus apiculatus* (West & G.S. West) Chodat, *Scenedesmus incrassatulus* Bohlin, *Scenedesmus arcuatus* (Lemmermann), *Scenedesmus acutiformis* Schroeder, *Scenedesmus obliquus* (Turp.) Kuetzing, *Scenedesmus longus* var. *Brevispina*, Smith.

**Keywords:** fresh water algae, Tirumala hills, chlorococcales, *Scenedesmus*, ponds and streams

### Introduction

Tirumala is a holy place, in Andhra Pradesh located 3,200 feet above the sea level and exists in latitude and longitude of 13.6500 N0 and 79.42 0E. Rao and Philipose (1967) <sup>[1]</sup>, contributed to Chlorococcales in Andhra Pradesh, no attempt has been made to document the fresh water algae of Chittoor district. 13 taxa of genus *Scenedesmus* was collected from the Tirumala hills. This was first report on the distribution of *Scenedesmus* Meyen from Chittoor district. *Scenedesmus* occurs mostly planktonic and associated with other aquatic vegetation and sediments in standing and slow running fresh water. *Scenedesmus* appears 2, 4 or 8 celled, rarely 16 or 32 celled colony. Cell ovoid, oblong, crescent, fusiform, spindle, ellipsoidal shape, cell wall with smooth, spiny and teeth, ridges, ribs and granules.

### Material and Methods

Fresh water algal samples were collected in small streams and ponds from Tirumala hills of Chittoor District, Andhra Pradesh, in the month of August. Algal samples were collected in zipped plastic covers, labelled and preserved in formaldehyde (4%v/v) and deposited in the Phycology lab, Division of Botany, Department of Sericulture, Sri Padmavati Mahila Visvavidyalayam (Women's University), Tirupati. Both permanent and semi-permanent slides were prepared by staining the organisms with aniline blue or Potassium iodide. They were identified with the help monographs of Philipose (1967) <sup>[1]</sup>, Anand (1998), Siba Prasad Adhikary (2007) <sup>[6]</sup>, Mousumi Das and Jai Prakash Keshri (2015) <sup>[7]</sup>.

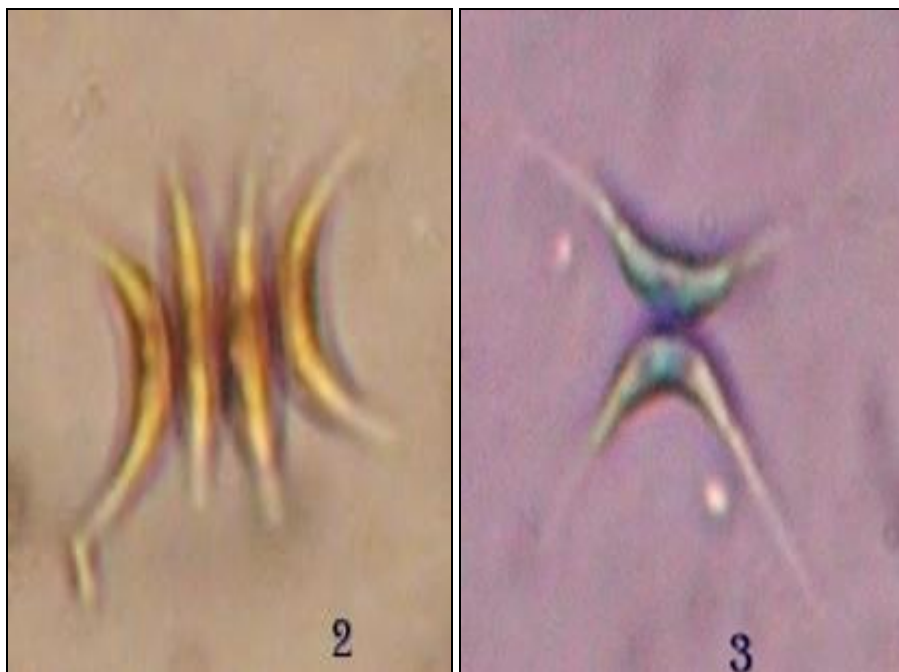
### Systematic Account

1. *Scenedesmus armatus* var. *bicaudatus* (Guglielment) Chodat 1913. (Fig.1)  
4 celled colony, cells attached side by side, arranged linearly, Cell body elliptical shape, terminal cell with spiny projections only on one end, 13 µm long, and 3.5 µm wide.



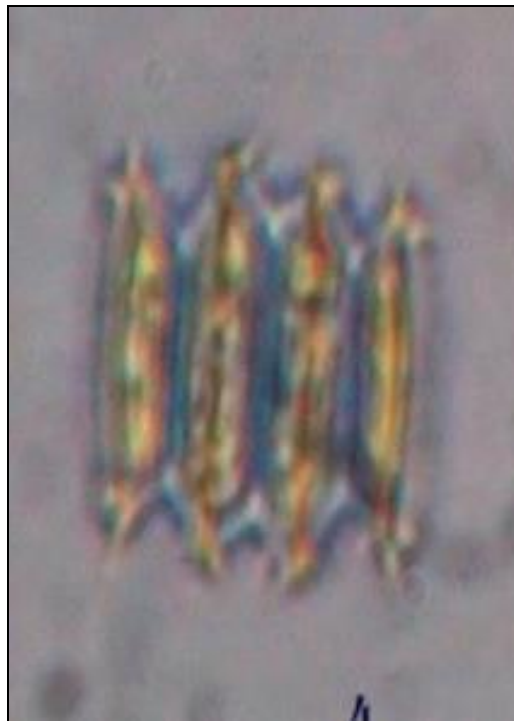
**Fig 1:** *Scenedesmus armatus* var. *bicaudatus* (Guglielment) Chodat

2. *Scenedesmus acuminatus* (Lag.) Chodat 1902 (Fig.2 & 3)  
Cells arranged in a curved series of 2, 4 cells strongly lunate, with sharply pointed apices, the convex wall adjoined inwardly, the concave faces directed outward; cells 7µm in diameter, 30-40 µm long.



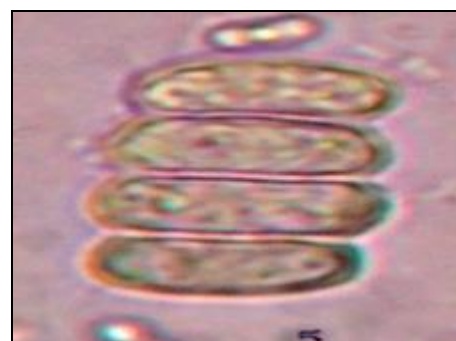
**Fig 2, 3:** *Scenedesmus acuminatus* (Lag.) Chodat

3. *Scenedesmus brasiliensis* Bohlin 1897 (Fig.4)  
 4 celled colony, sub cylindrical or ovate to ellipsoid cell arranged in a single series, each side apices of cell with 2 teeth and with a longitudinal median ridges extending between the apices of each cell, cells 5 µm diameters, 20.5 µm long.



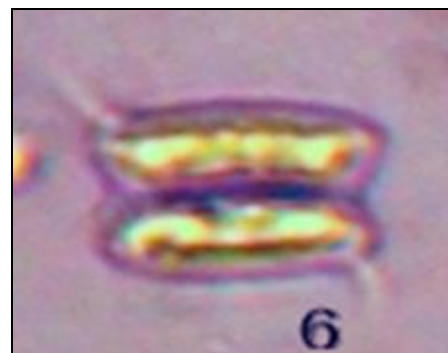
**Fig 4:** *Scenedesmus brasiliensis* Bohlin

4. *Scenedesmus bijuga* (Turp.) Lagerheim 1893 (Fig.5)  
 4 celled colony, arranged in a single series, cells straight, outer cells smaller than inner cells, cells oblong without spines and teeth. Cells 6.5 µm to 8 µm wide, 12.5 µm to 13 µm length.



**Fig 5:** *Scenedesmus bijuga* (Turp.) Lagerheim

5. *Scenedesmus bicaudatus* Dedusenko 1925  
*Desmodesmus bicaudatus* (Dedusenko) Tsarenko 2000 (fig.6)  
 2 cells arranging linearly, cell body ellipsoidal, both ends rounded, 8-13 µm long, 2-4.5 µm wide, outer cells with a spiny (3-13) projection at one end.



**Fig 6:** *Scenedesmus bicaudatus* Dedusenko

6. *Scenedesmus protuberans* Fritsch & Rich 1929 (Fig.7)  
 4 celled, cells in linear series, laterally in close contact with adjoining cells except at the ends; long spine arising from

outer side of each ends of terminal cells; inner cells end slightly truncate, inner edge with very minute spine or granular thickening; cells 5.8  $\mu\text{m}$  broad and 17.5  $\mu\text{m}$  long; spines 25  $\mu\text{m}$  long.



**Fig 7:** *Scenedesmus protuberans* F.E. Fritsch & M.F. Rich.

7. *Scenedesmus obtusus* Meyen var. *Obtusus* 1829 (Fig.8)  
Colonies within a gelatinous envelop, flat, 8 cells arranged in an various double series, cell body elliptical,

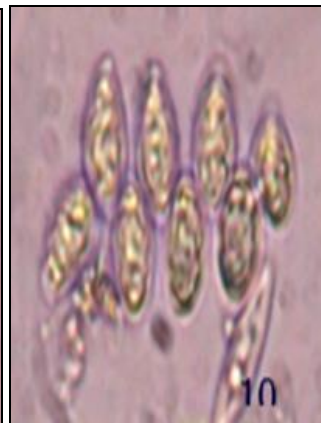
16.5  $\mu\text{m}$  long, up to 9.5  $\mu\text{m}$  wide, cell wall smooth, a single chloroplast with one pyrenoid.



**Fig 8:** *Scenedesmus obtuse* Meyen var. *Obtusus*

8. *Scenedesmus apiculatus* (West & G.S. West) Chodat 1926 (Fig.9 &10)

Cells 4-6  $\mu\text{m}$   $\times$  10-14  $\mu\text{m}$ , 8.7  $\mu\text{m}$   $\times$  18.8  $\mu\text{m}$  colonies of 4 or 8 cells in slightly alternating series. Cells ovate with both ends bearing a papilla.



**Fig 9, 10:** *Scenedesmus apiculatus* (West &G.S.West) Chodat

9. *Scenedesmus incrassatulus* var. *mononae* G.M. Smith 1916 (Fig.11)  
8 celled colony, arranged in a single series, outer cells curved

inward, inner cells slightly curved, cells ovate without spines and teeth. Free walled cells, strongly concave, 5  $\mu\text{m}$  in width and 12.5  $\mu\text{m}$  in length.



**Fig 11:** *Scenedesmus incrassatulus* Bohlin

10. *Scenedesmus arcuatus* (Lemmermann) Lemmermann 1899 (Fig.12)

Cells 3-5  $\mu\text{m} \times$  8- 13  $\mu\text{m}$ , Colonies of 8, the 8 celled colonies with cells arranged in a regular double row, forming a slightly curved disc, cells ovate or oblong with rounded ends, not flat.

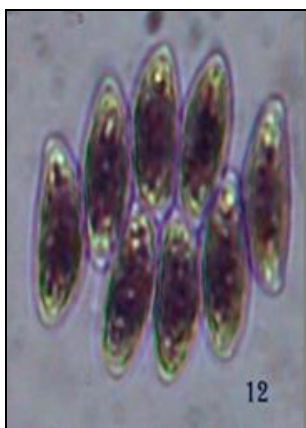


Fig 12: *Scenedesmus arcuatus* (Lemmermann)

11. *Scenedesmus acutiformis* Schroeder 1897 (Fig.13)

4 celled coenobium, linearly arranged spindle shaped cells, sharply pointed apices, longitudinal ridges were seen in centre of the cell. 7.6  $\mu\text{m}$  in diameter, 21  $\mu\text{m}$  in length.



Fig 13: *Scenedesmus acutiformis* Schroeder

12. *Scenedesmus obliquus* (Turp). Kuetzing (Fig.14)

8 celled colony, arranged in a single series, outer cells smaller than middle cell, cell wall smooth, apices were apiculate, cells connected each other 3/4 wall, 6.5 - 8 width  $\mu\text{m}$ , 14 - 17  $\mu\text{m}$  length.

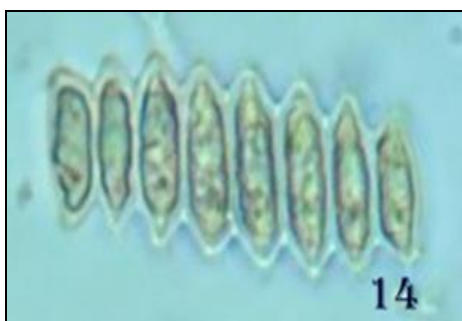


Fig 14: *Scenedesmus obliquus* (Turp). Kuetzing

13. *Scenedesmus longus* var. *Brevispina* G.M Smith 1916 (Fig.15)

4 celled colony, oblong to cylindrical cell, slender, arranged in a single series, cell apices each side with a spine, blunt end spine, 4.7 to 5.2  $\mu\text{m}$  in diameter, and 10 to 11  $\mu\text{m}$  long.

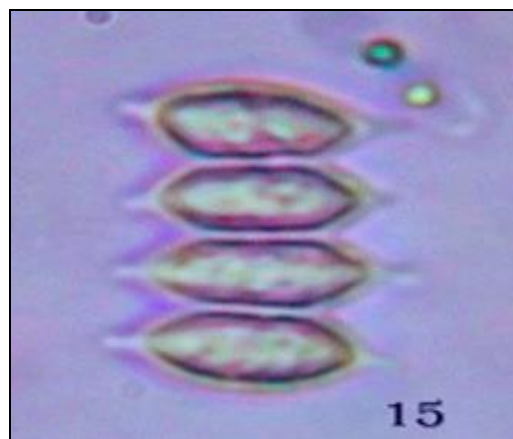


Fig 15: *Scenedesmus longus* var. *brevispina* G.M. Smith

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