

SOME INTERESTING *ANABAENA* BORY FROM PADDY FIELDS OF KAIRA DISTRICT, GUJARAT, INDIA

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Abstract

During the study of algal flora from paddy fields of Kaira District, Gujarat, the authors collected 15 taxa of the genus *Anabaena* Bory from three localities, viz., Navagam, Matar and Limbasi, well known places for paddy cultivation in the district. Out of these 5 species and 3 varieties, are reported for the first time from Gujarat.

Introduction

Rice fields harbour a luxuriant growth of blue-green algae. Most of the heterocystous forms possess a unique property of nitrogen fixation in the paddy fields. Pandey (1965) and Tiwari (1972) reviewed the literature on paddy field algae in India. Since then a number of workers studied the blue-green algae from paddy fields of different parts of India (Laloraya & Mitra, 1974; Grover & Pandhol, 1975; Sinha & Mukherjee, 1975; Khan & Mathur, 1976; Saha & Mandal, 1979; Prasad & Mehrotra, 1980; Bongale, 1981). The paddy fields of Gujarat remained unexplored as far as the blue-greens are concerned. Recently the authors described 12 taxa of Oscillatoriaceae (Mahajan & Patel, 1983) and 27 taxa of Rivulariaceae (Mahajan & Patel, *Unpublished*) from this region. The present communication deals with a systematic account of 15 taxa of the genus *Anabaena* Bory. Out of these 5 species and 3 varieties are described for the first time from Gujarat.

Description of the area

Kaira district is situated in the centre of Gujarat State and lies between 20°-7' and 23°-18' North latitude and 72°-15' and 73°-37' East longitude. Monsoon is moderate with its normal climate during June to October. The average annual rainfall is about 815 mm. Temperature remains maximum during may and minimum in January.

The collections were made from three different localities. Navagam, Matar and Limbasi. Navagam is situated just 15 kms North to the district headquarter, Kaira. Matar is about 6 kms south to Kaira while Limbasi is located about 10 kms to the East of Matar. The soil at Navagam is medium black with coarse texture while that of Matar and Limbasi is black.

Materials and Methods

From each of the localities collections were made monthly from June to November in the years 1981 and 1982. The algae growing in nature were collected in clean specimen bottles and preserved in 4% formalin. The plants were studied and sketched both from fresh as well as preserved materials. Identification of different taxa is based on the monographs by Geitler (1932), Desikachary (1959) and relevant research publications. The numbers in the brackets, at the end of description of each taxa, indicate the numbers, deposited in the department of Biosciences, Sardar Patel University, Vallabh Vidyanagar.

Systematic account

Anabaena anomala Fritsch (Fig. 3).

T.V. Desikachary, *Cyanophyta*, 398, Pl. 73, Fig. 2, 1959.

Habitat: Along with *Oscillatoria* and *Lyngbya*, Matar (5510)

The present taxon has slightly broader trichomes than the type (Desikachary, 1959).

Anabaena constricta (Szafer) Geitler (Fig. 4).

L. Geitler, *Kryptogamenflora*, 874, Fig. 555, 1932.

Habitat: With other members of Cyanophyceae, Gamdi (5511).

The present plant agrees well with *A. constricta* described by Nurul Islam (1973) from Bangladesh.

Anabaena cylindrica Lemm. var. *marchica* Lemm. Figs. (1-2).

Thallus expanding, gelatinous, blue-green; trichomes straight or bent, 3-4.5 μm broad; cells cylindrical or barrel-shaped, 3-4.5 μm long; heterocysts intercalary, oblong, 4.3-6.5 μm broad, 6.5-8 μm long; spores ellipsoidal with rounded apices, single or two on either side of heterocyst, (5.4-) 7.8 μm broad, (7.5-) 10-12 μm long; epispore colourless.

Habitat: With other members of Cyanophyceae, Matar (5532, 5536)

The present taxon agrees in all respects with the plant described by Tiwari & Pandey (1976) except in having slightly shorter spores.

Anabaena doliolum Bharadwaja (Fig. 5).

Thallus gelatinous; trichomes straight, 4.8-5.2 μm broad; cells 4-4.8 μm long; heterocysts subspherical, 5-6.7 μm broad, 6.2-8 μm long; spores ellipsoidal, in long chains, 5.6-6.4 μm broad, 7.8-11.2 μm long; epispore smooth yellowish.

Habitat: With *Chroococcus* and *Oscillatoria*, Matar (5543)

The plant agrees with the plant described by Tiwari & Pandey (1976) except in having slightly broader trichomes.

Anabaena fertilissima Rao, C.B. (Fig. 6).

T.V. Desikachary, *Cyanophyta*, 398, Pl. 74, Fig. 1, 1959.

Habitat: Along with *Calothrix* and *Gloeotrichia*, Limbasi (588).

Present plant agrees in all respects with *A. fertilissima* described by Parukutty (1940).

Anabaena iyengari Bharadwaja var. *attenuata* Rao, C.B. (Fig. 7).

Thallus mucilaginous; trichomes single, straight, 4-4.5 μm broad; cells 3.5-4.5 μm long; heterocysts subspherical, 6.2-8 μm broad, 6.2-7 μm long; spores ellipsoidal, one on either side of heterocysts, 11-13.5 μm broad, 12-17.5 μm long; epispore smooth, hyaline.

Habitat: With other members of Cyanophyceae, Navagam (5502).

The present taxon agrees well with the type (Rao, C.B. 1939). It has slightly smaller heterocysts and spores than var. *attenuata* described by Tiwari & Pandey (1976)

Anabaena laxa (Rabenh.) A. Br. (Figs. 8-9).

T.V. Desikachary, *Cyanophyta*, 413, 1959.

Habitat: Along with *Merismopedia* and *Oscillatoria*, Navagam (5582).

The plant has slightly shorter spores than those described by Desikachary (1959).

Anabaena orientalis Dixit (Fig. 10).

T.V. Desikachary, *Cyanophyta*, 405, Pl. 77, Fig. 6, 1959.

Habitat: Along with other members of Cyanophyceae, Matar (5540).

It may also be compared with var. *ellipsospora* Rao, C.B. in the nature and breadth

of trichomes but differs markedly from it in having smaller heterocysts, akinetes and single akinete on either side of heterocysts (Desikachary, 1959).

Anabaena oryzae Fritsch (Figs. 11-12).

Thallus soft, blue-green; trichomes (2.9-) 3.5-4.1 μm broad; cells 2.9-5.2 μm long; heterocysts oblong, 6.4-7.1 μm broad; 6.4-8 μm long; spores in long chains, 5.2-6.4 μm broad, 7-8.8 μm long; exospore yellow-brown.

Habitat: With *Chroococcus*, *Aphanocapsa* and *Lyngbya*, Matar (5536).

The present taxon agrees well with the description given by Desikachary (1959) except in having slightly broader trichomes and heterocysts.

Anabaena sphaerica Born. et Flah. (Fig. 13).

T.V. Desikachary, *Cyanophyta*, 393, 1959.

Habitat: Along with *Oscillatoria* and other species of *Anabaena*, Navagam (5502).

The plant agrees well with the plant described by Shukla (1971).

Anabaena sphaerica Born. et Flah. var. *attenuata* Bharadwaja (Fig. 14).

Thallus thin, membranous; trichomes curved, 3.5-4.5 μm broad, attenuated; cells 2.8-5 μm long; Heterocysts spherical, 5.5-6.5 μm in diameter; spores one on either side of heterocysts, spherical, 9-10 μm broad, 10-11.5 μm long; epispore smooth, yellowish.

Habitat: Along with other members of Cyanophyceae, Limbasi (2758).

The present taxon agrees in all respects with the description given by Desikachary (1959).

Anabaena spiroides Klebahn. (Fig. 15).

Trichomes single, free floating, spirally coiled; spirals 40-46 μm away from each other, 30-35 μm broad; cells 4-4.8 μm broad, 3.2-5.6 μm long; heterocysts, 5.2-6.5 μm broad, 6.4-7 μm long; single spore near the heterocyst, 13.5-14.9 μm broad, 14.5-18 μm long.

Habitat: With *Oscillatoria* and *Phormidium*, Navagam (5561).

The plant has slightly narrower spirals and trichomes (Desikachary, 1959).

Anabena voltzii Lemm. (Fig. 16-17).

T.V.Desikachary, *Cyanophyta*, 403, Pl. 77, Fig. 1, 1959.

Habitat: With other members of Cyanophyceae, Limbasi (878).

The plant agrees in all respects with those described by Desikachary (1959) and Yacubson (1974).

Anabaena vaginicola Fritsch *et* Rich (Fig. 18).

Many trichomes in a common sheath, 2.5-3.8 μm broad; filaments 17-22 μm broad, cells 3-4.5 μm long; heterocysts oblong, cylindrical, 5-6 μm broad, 7-9 μm long; spores cylindrical, near the heterocysts, 8-10 μm broad, 12-17 μm long; epispore smooth, hyaline.

Habitat: With *Oscillatoria* and *Lyngbya*, Matar (5542).

The plant agrees well with the one described by Tiwari & Pandey (1976).

Anabaena variabilis Kuetz. *ex* Born. *et* Flah. (Fig. 19).

Thallus mucilaginous; trichomes free, 3.5-5 μm broad; cells 2.5-4.5 μm long; heterocysts subspherical, 5.5-7 μm broad, 6.2-7.2 μm broad, 6-13 μm long, epispore smooth, colourless.

Habitat: With other members of Cyanophyceae, Matar (5510).

The present taxon agrees in all respects with a form of *A. variabilis* described by Rao, (1936). It may also be compared with *A. doliotum* Bharadwaja in having similar curved trichomes and spores in chains, but markedly differs from it in having subspherical, spores (Desikachary, 1959).

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