

Species composition and distribution of genus *Tribonema* (*Xanthophyceae*) in Bulgaria

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Abstract: The article offers an overview of the studies of genus *Tribonema* (*Xanthophyceae*) in Bulgaria in various aspects: list of species, chorology and ecology. According to the literary sources and unpublished data, 15 species of *Tribonema* have been reported for Bulgaria, four of which are documented for the first time in the country.

Key words: algae, Bulgaria, *Tribonema*, *Xanthophyceae*

Introduction

A representative of genus *Tribonema* Derbès & Solier was reported for the first time from Bulgaria as *Conferva bombycina* (C. Agardh) Lagerh. var. *genuina* Wille by Petkoff (1904). In many research works this author (Petkoff 1906, 1907, 1908, 1910, 1911, 1919, 1922, 1925, 1929, 1932, 1933, 1938, 1939, 1950) reported on the structure and distribution of the species from this genus. Subsequently, studies of the differentiated species were presented in the works of Wodeničaroff (1959), Wodenitscharoff (1962), Vodeničarov & Kirjakov (1986), Kirjakov (1984), Kirjakov & Vodeničarov (1988), Draganov & al. (1987), Stoyneva & Draganov (1995), Temniskova & Kirjakov (2006).

Results

On the basis of published literature and of our observations of 27 current species of *Tribonema* (Ettl 1978; Lokhorst 2003), 15 species have been established in Bulgaria.

Four of the species are reported for the first time in the country and are marked with an asterisk before the name in the article. New localities are given for the remaining species.

The size of populations was recorded and data about the accompanying algae of some *Tribonema* species are also given.

According to Ettl (1978), *Tribonema tenerrium* Heering reported by Wodeničaroff (1959), Wodenitscharoff (1962) belongs to genus *Microspora*, so it is excluded from the systematic list.

Tribonema aequale Pascher

Distribution

Rhodopi Mts (*Central*): Smolyanski Ezera lakes (Kirjakov 1984; Kirjakov & Vodeničarov 1988); Temniskova & Kirjakov 2006), col. *I. Kiryakov*, 17.04.1971. Filaments 5.0 wide, and 22.0–23.0 μm long.

New localities

Rhodopi Mts (*Central*): Beevska Cheshma locality, in a water fountain in Slaveyno village, Smolyan district, col. *I. Kiryakov*, 03.02.1992. Developed with *Os-*

cillatoria beggiatoiformis (Grunow) Gomont f. *phormidioides* Korsh. and *Chlorococcales* gen. sp. Filaments 5.0–6.0 µm wide, cells 6.2–19.0 µm long; Inoglovo locality, Smolyan district, in a water fountain, col. I. Kiryakov, 12.08.2008. Filaments 6.0–6.2 µm wide, cells 12.5–16.0 µm long.

Thracian Lowland: in the Chirpan Bunar karst spring near Belozem village, col. I. Kiryakov, 15.05.1985. Developed with *Melosira varians* C. Agardh and *Spirogyra* sp. ster. The cells are with 1–2 chloroplasts. Filaments 7.5 µm wide, cells 13.7–15.0 µm long.

***Tribonema affine* (G.S. West) G.S. West**

Distribution

Rhodopi Mts (*Central*): in a swamp above Hrabrino village, Plovdiv district (Temniskova & Kirjakov 2006), col. I. Kiryakov, 28.02.1988. Developed with *Mougeotia* sp. ster., *Spirogyra* sp. ster., *Heterothrix mucicola* Ettl, *Microthamnion strictissimum* Rabenh. f. *macrocystis* Schmidle, *Microspora palustris* Wichmann var. *palustris*, *M. palustris* var. *minor* Wichmann, *Gomphonema acuminatum* Ehrenberg, and *Synedra ulna* (Nitzsch) Ehrenb. Filaments 5.6–5.8 µm wide, cells 20–38.0 µm long.

New locality

Mt Sredna Gora (*Western*): to the northwest of Hisarya town, in a puddle of melting snow, col. I. Kiryakov, 04.02.2008. The cells are with (1) –2 chloroplasts, filaments 4.5–6.2 µm wide, cells 8.8–38.5 µm long.

***Tribonema elegans* Pascher**

Distribution

Rhodopi Mts (*Central*): Chairski Ezera lakes near Trigrad village, Smolyan district (Kirjakov & Vodeničarov 1988; Temniskova & Kirjakov 2006), col. I. Kiryakov, 15.04.1971.

****Tribonema gayanum* Pascher**

The species is reported for the first time for the country and is distributed as follows:

Valley of River Mesta – in a river spill at Gotse Delchev town., col. I. Kiryakov, 15.12.1989. Developed with *Oscillatoria limosa* C. Agardh, *Oscillatoria* sp., *Anisonema obliquum* Roskin, *Euglena viridis viridis* (O.F. Müll.) Ehrenb., *E. pisciformis* G.A. Klebs, *Synedra ulna*, *Nitschia* sp., *Gomphonema* sp., *Vaucheria* sp., and *Closterium* sp. Filaments 10.0–11.5 µm wide, cells 12.0–25.0 µm long.

Mt Sredna Gora (*Western*): in a swamp at river Verigovska above Hisarya town, col. I. Kiryakov, 24.02.2008. Developed with *Hydrodictyon reticulatum* (L.) Lagerh., *Tetraspora cylindrica* (Wahlenb.) C. Agardh, *T. gelatinosa* (Vaucher) Desv., *Tribonema vulgare*, *Spirogyra* sp. ster., *Cosmoastrum punctulatum* (Bréb.) Pal.-Mordv., *Melosira varians*, and *Synedra ulna*. Filaments 11.5–12.5 µm wide, cells 13.0–38.0 µm long.

***Tribonema intermixtum* Pascher**

Distribution

Rhodopi Mts (*Central*): at a roadside ditch in Konski Dol village, Smolyan district (Kirjakov 1984; Temniskova & Kirjakov 2006), col. I. Kiryakov, 12.04.1971. Filaments 10.0–11.0 µm wide, cells 12.0–30.0 µm long.

New localities

Mt Sredna Gora (*Western*): in a water fountain between Strelcha and Koprivshitsa towns, col. K. Velichkova, 26.03.2006. Developed with *Stigeoclonium attenuatum* (Hazzen) Kollins and *Diatoma hiemale* (Lyngb.) Heib. var. *mesodon* (Her.) Grunow. Filaments 10.0–11.0 µm wide, cells 10.5–30.0 µm long.

Rhodopi Mts (*Central*): Balitsko locality, near Slaveyno village, Smolyan district, in a water fountain, col. I. Kiryakov, 22. 08. 2008. Filaments 14.0 µm wide, cells 13.0–25.0 µm Long.

Tundzha Hilly Country: in a spill of river Popovska around Bolyarovo town, Yambol district, col. I. Kiryakov, 23.11.1984.

***Tribonema minus* (G.A. Klebs) Hazen**

Distribution

Danubian Plain: Danube River and tributaries (Draganov & al. 1987).

Forebalkan: Petkoff (1910, 1933) as *Conferva bombycina* var. *minor* Wille in puddles near Lovech town. Developed with *Spirogyra longata* (Vaucher) Kütz. and *Vaucheria geminata* (Vaucher) DC.

Mt Vitoshka: in a slow flow near Boyana village (Petkoff 1922).

Pirin Mts: Golyamo Ribno Ezero lake, river Banderitsa, and Popovi Ezera lakes (Petkoff 1925).

Rila Mts: peak Nalbant, Yosafovitsa region (Petkoff 1939).

Rhodopi Mts (*Central*): south of Smolyan town, peak Kushlar, between villages Koshnitsa and Turen (Petkoff 1950).

Rhodopi Mts (*Western*): in a swamp at Bratsigovo town (Temniskova & Kirjakov 2006), col. *I. Kiryakov*, 14.08.1984. Developed with *Tribonema utriculosum* (Kütz.) Hazen, *Stigeoclonium* sp., *Euglena viridis*, and *Chlamydomonas* sp. Filaments 6.0–6.2 µm wide, cells 11.0–13.5 µm long.

New locality

Tundzha Hilly Country: Mt Sakar, in a puddle near Sinapovo village, Topolovgrad district, col. *I. Kiryakov*, 20.03.2008. Filaments 4.0–4.5 µm wide, cells up to 16.0 µm long.

**Tribonema monochloron* Pascher & Geitler

Rhodopi Mts: in a spill of river Arda at Kurdzhali town, col. *I. Kiryakov*, 20.02.2008. Developed with *Phacus splendens* Pochm., *Euglena anabaena* Mainx, *Peranema deflexum* Skuja, *Synura uvella* Ehrenb. em. Korsch., *Binuclearia tectorum* (Kütz.) Berger ex Wich., *Carteria* sp., *Characium seiboldii* A. Braun, *Coccoloba ovalis* Korsch., *Monoraphidium* sp., *Hydrianium ellipticum* Korsch., *Scenedesmus acutus* Meyen, *Hydrianium ellipticum*, *Cosmoastrum dispar* (Bréb.) Palm.-Mordv., *Tribonema viride* Pascher, *Vaucheria* sp. ster., and *Ophiocytium parvulum* A. Braun. Filaments 2.8 µm wide, cells 14.0–16.0 µm long.

Tribonema pyrenigerum Pascher

Distribution

Thracian Lowland: in the channel north of Plovdiv town, col. *I. Kiryakov*, 12.03.1969 (Kirjakov 1984, wrongly as *T. pyrenoidigerum*).

New locality

Mt Sredna Gora (*Western*): in a puddle of melting snow, westwards of Hisarya town, col. *I. Kiryakov*, 04.02.2008. The cells are with 1 pyrenoid. Filaments 6.0–6.5 µm wide, cells 9.0–18.7 µm long.

Tribonema regulare Pascher

Distribution

Rhodopi Mts (*Central*): in a water fountain in Slaveyno village, Smolyan district (Temniskova & Kirjakov 2006), col. *I. Kiryakov*, 05.01.1991. Developed with *Tribonema viride*, *Ulothrix tenuissima* Kütz., *Mougeotia* sp. ster., *Cosmoastrum* sp. Filaments 5.6–6.2 µm wide, cells 17.5–22.5 µm long.

New locality

Rhodopi Mts (*Central*): in a slow water flow covered with ice crust near St. Georgi Chapel, Slaveyno village, Smolyan district, col. *I. Kiryakov*, 30.01.2004. De-

veloped with *Tribonema vulgare* and *Bacillariophyta* sp. div. Filaments 5.0–5.5 µm wide, cells 12.5–16.0 µm long.

**Tribonema siderophilum* Ettl

Tundzha Hilly Country: Mt Sakar, in a backwater at Vishegrad town, Topolovgrad district, col. *I. Kiryakov*, 03.06.2008. Developed with *Trachelomonas* sp., *Synedra ulna*, *Gomphonema* sp., *Achnanthes* sp., *Ceratoneis arcus* (Ehrenb.) Kütz., and *Closterium aciculare* T. West. Filaments 7.0–8.0 µm wide, cells up to 16.0 µm long.

**Tribonema spirotaenia* Ettl

Tundzha Hilly Country: Mt Sakar in a flow-through pool near Cherepovo village and near Vishegrad town, Topolovgrad district, col. *I. Kiryakov*. The cells are with 1 chloroplast. Filaments 5.0–6.2 µm wide, cells 31.0–50.0 µm long, 29.06.2008. Developed with *Closterium aciculare* T. West, *Trachelomonas* sp., *Synedra ulna*, *Gomphonema* sp., and *Tribonema* sp.

Tribonema ulotrichoides Pascher

Distribution

Northeast Bulgaria: near Srebarna village, fountain Dyakova cheshma (Stoyneva & Draganov 1995).

Tribonema utriculosum (Kütz.) Hazen

Distribution

Rila Mts: Skakavitsa region (Petkoff 1910, sub *T. utriculosa* Kütz.).

Rhodopi Mts (*Western*): in swamps near Bratsigovo town, Pazardzhik district (Kirjakov 1984; Temniskova & Kirjakov 2006), col. *I. Kiryakov*, 08.05.1969. Developed with *Tribonema minus*, *Stigeoclonium* sp., *Euglena viridis*, and *Chlamydomonas* sp. The cells are with 8–11 disk-like chloroplasts. Filaments 7.5–10.0 µm wide, cells 12.5–20.0 µm long.

New localities

Rhodopi Mts (*Central*): in a water fountain at Sinora locality, northwest from Slaveyno village, Smolyan district, col. *I. Kiryakov*, 22.08.2008. Filaments 14.0–15.0 µm wide, cells 22.0–50.0 µm long.

Mt Sredna Gora (*Western*): in a flow spillage westwards of Hisarya town, col. *I. Kiryakov*, 04.02.2008. Filaments 16.0–17.5 µm wide, cells 21.0–25.0 µm long.

Tribonema viride Pascher

It is widespread in the country and is the widest reported species.

In all his works cited below, Petkoff gives it as *Conferva bombycina*, *C. bombycina* var. *genuina* Wille, or *C. bombycina* var. *pallida* Kütz.

Distribution

Black Sea Coast (*Northern*): between Kavarna and Balchik towns; (*Southern*): Pomorie region; Rakovskovo (Rakovo) village, Burgas district (Petkoff 1919, 1932).

Northeast Bulgaria: in the Sindelsko Blato swamp, river Luda Kamchia (Petkoff 1932, 1938).

Forebalkan: Lovech district (Petkoff 1933).

Balkan Range (*Western*): peak Kom, Koznitsa, Zverino village, peak Buzludzha, peak Shipka (Petkoff 1904, 1906, 1907, 1908, 1910, 1911).

Sofia district: Mt Lyulin, in swamps as *T. bombycina* (*C. Agardh*) Drebès & Solier and *T. bombycina* var. *sordida* Hansg. (Vodeničarov 1959).

Mt Vitosh: Dragalevski Monastery, Dragalevsko Blato swamp, river Vladaya, above Knyazhevo, and in many other unspecified locations (Petkoff 1904, 1906, 1907, 1908, 1922).

Valley of River Struma: Bogoslov village, Kyustendil district (Petkoff 1910).

Pirin Mts: Banderishki Ezera lakes, Chista Tepe locality, Bansko town, Popovi Ezera lakes, Yakoruda (Petkoff 1925).

Rila Mts: Panichishte, Skakavitsa region (Petkoff 1910, 1939).

Mt Sredna Gora (*Western*): river Topolnitsa (Vodeničarov & Kirjakov 1986).

Rhodopi Mts: Petkoff (1950) reported it as *Conferva bombycina*, but he did not point out concrete localities;

Rhodopi Mts (*Western*): in a swamp near Bratsigovo town (Kirjakov 1984).

Rhodopi Mts (*Central*): Chairski Ezera lakes near Trigrad village (Kirjakov & Vodeničarov 1988; Temniskova & Kirjakov 2006), as *Tribonema viride*.

Thracian Lowland: Belovo town, Plovdiv district and Straldzhansko Blato swamp (Petkoff 1910, 1929, 1932).

New localities

Rhodopi Mts (*Central*): in a water fountain above Slaveyno village, Smolyan district, col. *I. Kiryakov*, 05.01.1991. Filaments 10.0–11.0 µm wide, cells 20.0–30.0 µm long; in a water fountain at Chereshkite locality, between Slaveyno and Tikale village, Smolyan district, col. *I. Kiryakov*, 12.02.2008. Developed with *Lyngbia* sp., *Oedogonium* sp. ster., *Diatoma vulgare*, and *Synedra ulna*. Filaments 11.0–12.5 µm wide, cells 25.0–45.0 µm long.

Rhodopi Mts (*Eastern*): in a spill of river Arda at Kardzhali town, col. *K. Dragieva*, 20.02.2008. Filaments 12.5–13.0 µm wide, cells 37.0–62.0 µm long.

Mt Strandzha: river Mladezhka, at the bridge to Mladezhko village, col. *I. Kiryakov*, 02.10.1987.

Tribonema vulgare Pascher

Distribution

Rhodopi Mts (*Central*): Smolyanski Ezera lakes (Kirjakov 1984; Kirjakov & Vodeničarov 1988; Temniskova & Kirjakov 2006).

New localities

Rhodopi Mts (*Central*): in a slow water flow covered with ice crust at St. Georgi Chapel, Slaveyno village, Smolyan district, col. *I. Kiryakov*, 30.01.2004. Developed with *Tribonema vulgare* and *Bacillariophyta* sp. div. The cells are with 2–4 chromatophores. Filaments 5.5–6.0 µm wide, cells 12.5–16.0 µm long.

Rhodopi Mts (*Eastern*): at the Perperikon archaeological excavations, Kardzhali district, col. *K. Dragieva*, 08.04.2006. Developed with *Oedogonium* sp. ster. and *Scenedesmus acutus*. Filaments 7.5 µm wide, cells – 9.0–15.0 µm long; in a spill of river Arda at Kurdzhali town, col. *K. Dragieva*, 20.02.2008. Developed with *Tribonema monochloron*, *Vaucheria* sp. ster., *Ophiocyttium parvulum*, *Monomorphina splendens* (Pochm.) Popova, *Euglena anabaena*, *Peranema deflexum*, *Synura uvella*, *Binuclearia tectorum*, *Carteria* sp., *Characium seiboldii*, *Coenococcus ovalis*, *Monoraphidium* sp., *Hydrianium ellipticum*, *Scenedesmus acutus*, and *Cosmoastrum dispar*. Filaments 5.0–7.0 µm wide, cells 17.0–37.0 µm long.

Mt Sredna Gora (*Western*): in the spill of a flow, westwards of Hisarya town, col. *I. Kiryakov*, 04.02.2008. Filaments 6.5–8.7 µm wide, cells 11.2–37.0 µm long; in a small swamp near Verigovska river, above Verigovo square, Hisarya town, col. *I. Kiryakov*, 24.02.2008. Filaments 7.5–8.2 µm wide, cells 16.2–20.0 µm long. Developed with *Hydrodictyon reticulatum*, *Tetraspora cylindrica*, *T.gelatinosa* (Vaucher) Desv., *Tribonema gayanum*, *Spirogyra* sp. ster., *Cosmoastrum punctulatum*, *Melosira varians*, and *Synedra ulna*.

Thracian Lowland: in a pond at the city garden in Plovdiv town, col. *I. Kiryakov*, 17.09.1992. Filaments 6.3–6.6 µm wide, cells 7.5–16.3 µm long.

Tundzha Hilly Country: Mt Sakar, in pools around Spasovo village, Stara Zagora district, col. *K. Velichkova*, 12.03.2008. Filaments 6.0–7.5 µm wide, cells 22.5–26.0 µm long.

Mt Strandzha: in slow water at river Mladezhka around Mladezhko village, col. I. Kirjakov, 09.10.1987.

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