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***Sorosphaerula* nom. n. for the Plasmodiophorid Genus *Sorosphaera* J. Schröter 1886 (Rhizaria: Endomyxa: Phytomyxea: Plasmodiophorida)**

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Abstract

Sorosphaerula nom. n. is introduced to replace the phytomyxean generic name *Sorosphaera* J. Schröter, which is preoccupied by the foraminiferan genus *Sorosphaera* Brady. As it is agreed now that both the Foraminifera and the Phytomyxea belong to the Rhizaria, this homonymy within the same supergroup of eukaryotes needs to be revised. To avoid future homonymy, we recommend that the International Code of Zoological Nomenclature be applied for future taxonomic work on Phytomyxea.

Keywords

Foraminifera; Plasmodiophorea; Plasmodiophoromycota; protozoa; taxonomy

Phytomyxea sensu Cavalier-Smith and Chao (2003; Plasmodiophorida and Phygomycida) is a small, monophyletic group of obligate intercellular parasites of plants and straminopiles. Their taxonomic position has been controversial since their discovery, and therefore, to avoid specific taxonomic placement, the informal term “plasmodiophorids” has been used during the past few decades (Braselton 2001). When Woronin (1878) established the genus *Plasmodiophora*, he proposed an affiliation to the protists in the sense of Haeckel and considered them as the simplest group of the Myxomycetes. Because the Myxomycetes were historically considered as basal fungi (e.g. Fries 1829), Woronin and most subsequent authors followed the rules of the International Code of Botanical Nomenclature to scientifically name “plasmodiophorids.” Cavalier-Smith (1998) included the plasmodiophorids as “Phytomyxa” within the newly proposed protozoan group Cercozoa. Cavalier-Smith (2002) established the group Rhizaria where Cercozoa (incl. Phytomyxea) and Retaria (incl. Foraminifera) are included. Using molecular techniques this taxonomic position of plasmodiophorids was confirmed by Bulman et al. (2001), Cavalier-Smith and Chao (2003), Archibald and Keeling (2004), Bass et al. (2009), Pawlowski and Burki (2009), Burki et al. (2010), and Parfrey et al. (2010).

The long avoidance of a clear taxonomic placement has lead to an even more confusing situation within the “plasmodiophorids.” In current literature Phytomyxea, Plasmodiophorea, and Plasmodiophoromycota are used. Although the original concept of Phytomyxinae introduced by Schröter in Engler and Prantel (1897) is polyphyletic as *Phytomyxa* is a synonym of the bacterial genus *Rhizobium*, the term “Phytomyxea” (without

rank) was applied to the clade comprising Plasmodiophorida and Phagomyxida by Adl et al. (2005). To avoid increasing problems associated with the ambireginal status of Phytomyxea a consensus should be found in which nomenclatural rules should be applied. The choice of which code to apply to a protist is not regulated. If the nuclear phylogeny is considered as determining factor (Blackwell and Powell 1999), the International Code of Zoological Nomenclature (ICZN) is the document of choice for phytomyxean taxonomy. A large majority of the about 12,000 known Rhizaria has been described applying the ICZN rules. Using the same nomenclatural rules for all Rhizaria will avoid confusion and will not lead to any destabilization of names as article 2 of ICZN 1999 admits “names of taxa later but not at first classified as animals.” Therefore, we recommend the future use of the ICZN for the Phytomyxea to reduce future ambiguity.

Taxonomic summary

Sorosphaerula nom. n. (gender feminine). Etymology: We kept the etymology suggested by Schröter (1889) who referred to the spherical sporosori: from Greek: soros (σῶρος): cask, reservoir; sphairula (σφαίριον): little ball (diminutive of sphaira, σφαῖρα).

The following new combinations are necessary:

Type species: *Sorosphaerula veronicae* (J. Schröter, 1877) n. comb. Basionym: *Tubercinia veronicae* J. Schröter, 1877.

Sorosphaerula radicalis (Ivimey Cook & Schwartz, 1929) n. comb. Basionym: *Sorosphaera radicalis* Ivimey Cook & Schwartz, 1929.

Sorosphaerula ulei (J. Schröter, 1896) n. comb. Basionym: *Doassansia ulei* J. Schröter, 1896.

Sorosphaerula urticae (Naumov, 1954) n. comb. Basionym: *Sorosphaera urticae* Naumov, 1954.

Sorosphaerula viticola (Kirchmair, Neuhauser & L. Huber 2005) n. comb. Basionym: *Sorosphaera viticola* Kirchmair, Neuhauser & L. Huber, 2005.

In this regard, *Sorosphaera* J. Schröter, 1889 (Phytomyxea) is preoccupied by the foraminiferan genus name *Sorosphaera* Brady, 1879 (Foraminifera, Textularidia, Astrorhizida, Psammosphaeridae). Three species of the foraminiferan genus *Sorosphaera* are currently described: *Sorosphaera confusa* Brady, 1879 (type species), *Sorosphaera depressa* Heron-Allen & Earland, 1929, and *Sorosphaera perforata* Stschedrina, 1939 (Appeltans et al. 2001). Five species belonging to the phytomyxean genus *Sorosphaera* J. Schröt. are currently described, with *Sorosphaera veronicae* J. Schröt. as the type species.

In 1877 Schröter described *T. veronicae* J. Schröt. as a smut fungus infecting speedwell (*Veronica* spp.). Twelve years later Schröter recognized that this species was a close relative of *Plasmodiophora* Woronin, and he introduced the name *S. veronicae* for this parasite (Schröter 1889). This genus has been defined by the arrangement of resting spores, which is also accounted for in the etymology of the generic name. Single resting spores are elliptical, tapered, and arranged into hollow spheres.

The homonymy of *Sorosphaera* Brady and *Sorosphaera* J. Schröt. is evident and needs to be resolved, especially because Phytomyxea and Foraminifera are now recognized as members of the same supergroup of eukaryotes, the Rhizaria (Archibald and Keeling 2004; Bass et al. 2009; Burki et al. 2010; Cavalier-Smith and Chao 2003; Parfrey et al. 2010; Pawlowski and

Burki 2009). For this reason, *Sorosphaera* nom. n. is proposed as new name for *Sorosphaera* J. Schröt.

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