

A new *Staurothele* species (lichenized *Ascomycota*, *Verrucariaceae*) from Spain

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Key words: Lichens, taxonomy, gypsum soil, sp. nov. – Mycobiota of Spain. – 1 new species.

Abstract: *Staurothele maculosa* from southern Spain is described as new. It is terricolous (on gypsiferous soil) and characterized by a greenish spotted thallus, fully immersed perithecia with a dimidiate involucrellum, long bacilliform hymenial algal cells, thick periphysoids and comparatively small, hyaline ascospores. A key to the six terricolous *Staurothele* species is provided.

Zusammenfassung: *Staurothele maculosa* aus dem Süden Spaniens wird neu beschrieben. Es ist eine terricole Art (auf Gipsboden) mit grünfleckigem Thallus, komplett eingesenkten Perithezien mit halbierterem Involucrellum, lang stäbchenförmigen Hymenialalgen, dicklichen Periphysen und vergleichsweise kleinen Ascosporen. Ein Schlüssel zu den sechs epigäischen *Staurothele*-Arten wird beigegeben.

Staurothele NORMAN as currently understood is a polyphyletic assemblage of crustose pyrenocarpous lichen species with a weakly differentiated cortex, muriform ascospores and the presence of photobiont cells within the fruiting bodies (GUEIDAN & al. 2009). Species with pale ascospores may belong to *Willeya* MÜLL. ARG. (GUEIDAN & al. 2014), but the taxonomy of this group – and *Staurothele* as a whole – is in need of a critical reconsideration. The importance of size and shape of the hymenial algal cells for species delimitation is discussed controversially among lichenologists, but this character indeed seems to be well applicable for determination (THÜS & SCHULTZ 2009).

Most *Staurothele* species are saxicolous, only five were known to occur on soil and plant debris. As these taxa do not share their combination of characters with certain saxicolous species, they are not regarded as mere terricolous forms of usually rock-inhabiting species.

All terricolous species are rare and little known: *Staurothele terricola* (BAGL.) POELT & NIMIS was described from clearings of Mediterranean garriques in Sardinia (BAGLIETTO 1879) and was not recollected since then (NIMIS 2016). *Staurothele argillacea* (FLAG.) ZAHLBR. was described from Algeria (FLAGEY 1896) and is not mentioned in checklists of other North African countries. *Staurothele geoica* ZSCHACKE is known from scattered collections in Switzerland, Italy, Scotland and Austria (ZSCHACKE 1918, ORANGE & al. 2009, NIMIS 2016, BERGER 2019). *Staurothele epigaea* BREUSS & ETAYO was yet found only in Spain (BREUSS & ETAYO 1995). Most recently,

Staurothele alboterrestres VAN DEN BOOM & ETAYO was described from the Canary Islands (VAN DEN BOOM & ETAYO 2017).

This year the second author collected a species from gypsiferous soil in southern Spain, which showed a new character combination and therefore is described below.

***Staurothele maculosa* BREUSS & BERGER, spec. nova** – Figs. 1, 2

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Diagnosis: Similar to *Staurothele epigaea* BREUSS & ETAYO from which it differs in having a greenish spotted thallus (due to algal cells in clusters), longer periphysoids, and longer hymenial algal cells (c. 7–12 vs. 4–8 µm).

Holotypus: Spanien: Andalusien, Prov. Almeria, Gipskarst von Sorbas, ca. 5 km E von Sorbas, Pfad zum Rio de Aquas, 270 m s. m., 37° 05′ 31″ N, 02° 04′ 31″ W, auf gipshaltiger Erde, 28. März 2022, F. BERGER no. 36305 (LI-03583067).

Etymology: from Latin *maculosa* = mottled because of the greenish flecks on thallus deriving from the discontinuous algal layer.

Description:

Thallus: on soil, forming a thin, continuous (getting rimose when dry), pale greenish grey crust, with fine green flecks. Upper cortex indistinctly delimited; algal layer 50–80 µm thick, algal cells in roundish nests (corresponding with green speckles of thallus); medulla inconspicuous, obscured by soil particles and dissolved in hyaline hyphae extending into the soil.

Perithecia: scattered, fully immersed in thallus/substratum or with slightly emerging black, slightly convex ostiolum. Exciple subglobose, pale to brown, c. 40 µm thick, 0.35–0.45 mm in diam.

Involucrum: covering upper third to half of the exciple, 50–80 µm thick, fully appressed or slightly spreading.

Periphysoids: 40–50 µm long and 3–4 µm thick, septate, rarely ramifying, with ± distinctly clavate terminal cells (up to 5 µm wide).

Hymenial algal cells: bacilliform, (5–)7–12(–15) × 3–3.5 µm.

Ascospores: 6–8/ascus, hyaline, muriform, 20–32 × 10–16 µm.

Habitat: on gypsiferous clayey soil on a trampled footpath, associated with bryophytes.

Distribution: known only from the type locality.

Discussion

Among the terricolous members of the genus, *Staurothele maculosa* is distinguished by its green-speckled thallus, fully immersed perithecia with a dimidiate involucrellum, long bacilliform hymenial algal cells, thick periphysoids and comparatively small, hyaline ascospores. It has several characters in common with *S. epigaea*, from which it is

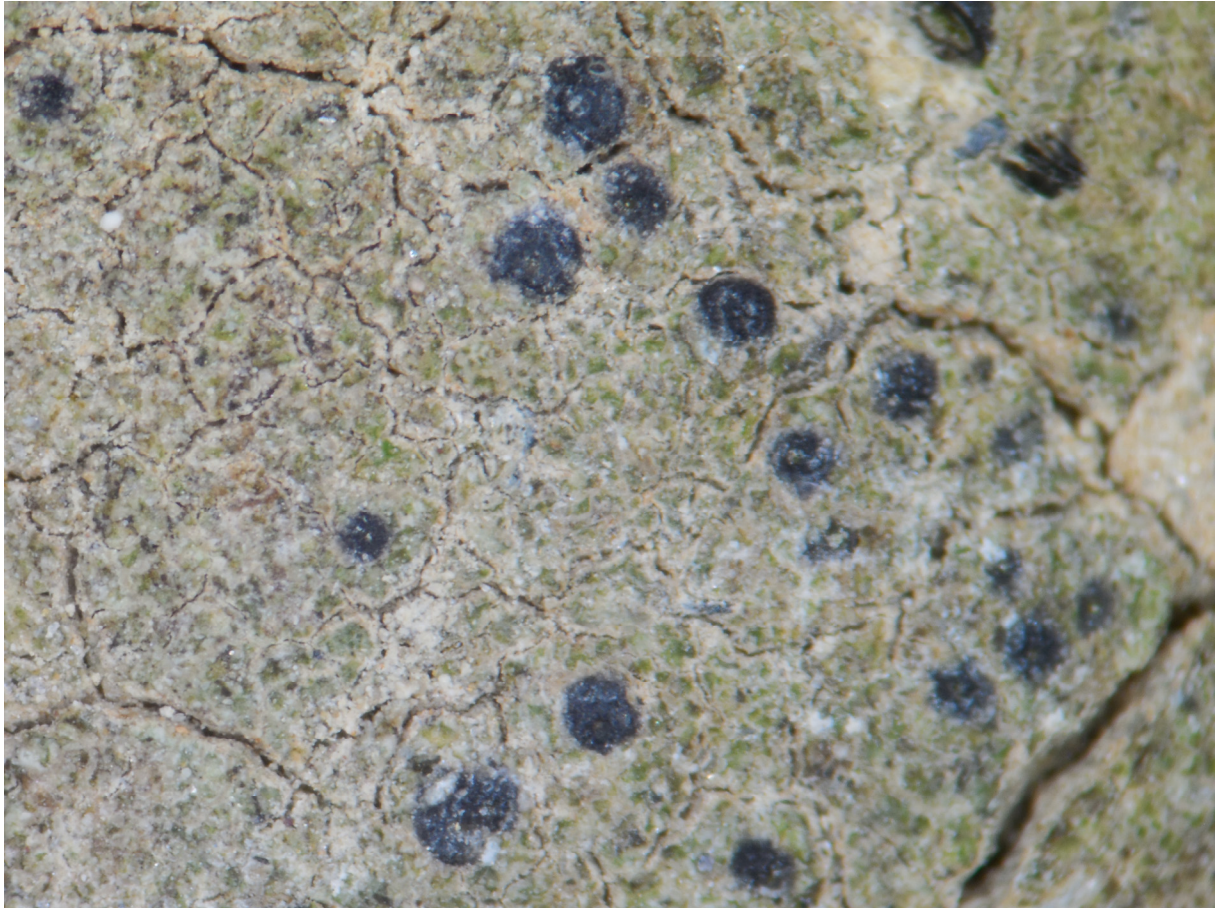


Fig. 1. *Staurothele maculosa*. Holotype. Habitus. Width of photograph 6 mm. Phot. O. BREUSS.

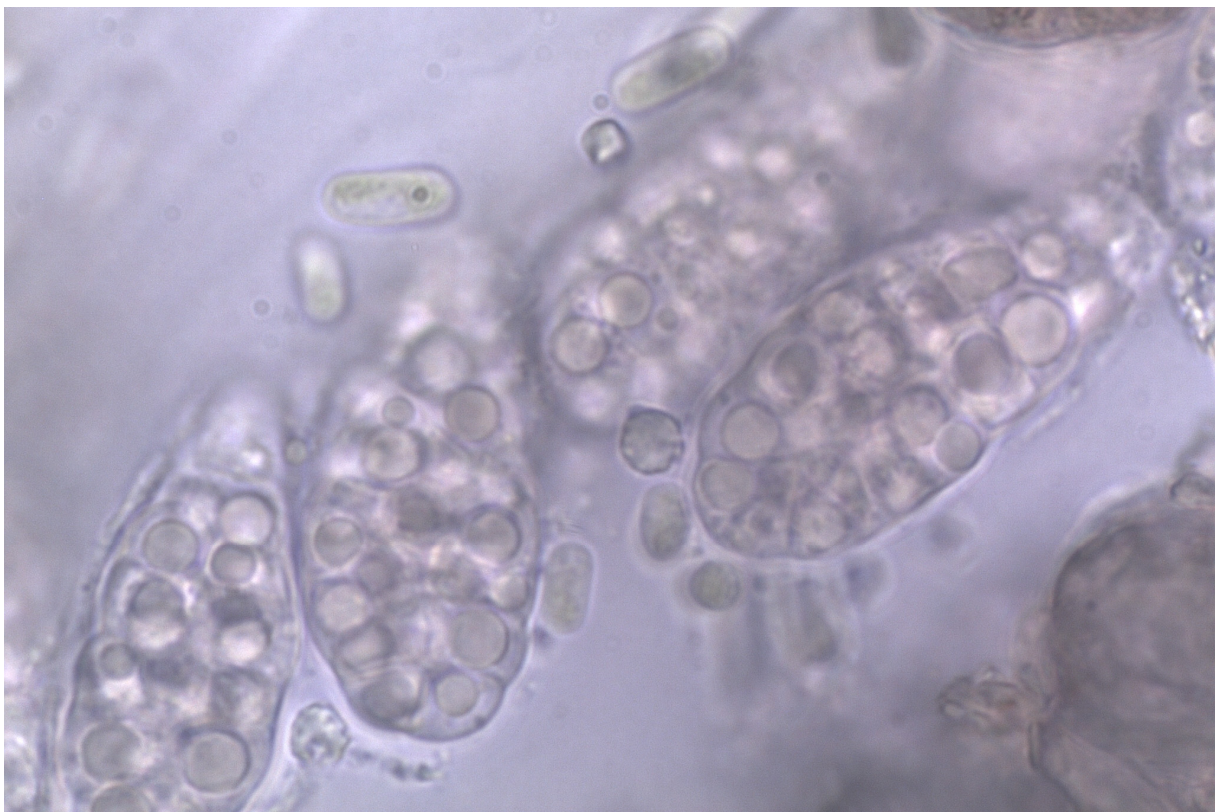


Fig. 2. *Staurothele maculosa*. Holotype. Muriform ascospores. Width of photograph 70 μm . Phot. F. BERGER.

separated by the discontinuous algal layer, longer periphysoids, and longer hymenial algal cells. The species are also ecologically different: *S. maculosa* was collected from gypsiferous clayey soil in formerly cultivated land within a karstic gypsum landscape, *S. epigaea* from argillaceous soil in an open pine forest (BREUSS & ETAYO 1995).

For comparison with other species, a key to the terricolous *Staurothele* species is provided below. Unfortunately, the type of *S. terricola* was not available for study (because of construction work at MOD), and in the description it is not mentioned if an involucrellum is developed or lacking; but the given combination of characters shows it to be distinct from the other species.

Key to terricolous *Staurothele* species

- 1 Ascospores 2 per ascus, brown, $40\text{--}45 \times 15\text{--}18\ \mu\text{m}$. Thallus yellowish-brown, areolate. Perithecia hemispherically prominent to almost superficial. Hymenial algal cells $4\text{--}5\ \mu\text{m}$ diam. *S. argillacea* (FLAG.) ZAHLBR.
- 1* Ascospores 6–8 per ascus, colourless to pale brown..... 2
- 2 Thallus finely granular, composed of goniocysts, brown to blackish green, subgelatinous when wet. Perithecia hemispherical emergent; exciple black, involucrellum lacking. Hymenial algal cells globose-cuboid (c. $3\ \mu\text{m}$ diam.). Spores hyaline, $28\text{--}36 \times 12\text{--}16\ \mu\text{m}$ *S. geonica* ZSCHACKE
- 2* Thallus not granular..... 3
- 3 Ascospores $20\text{--}32 \times 10\text{--}16\ \mu\text{m}$. Perithecia fully immersed, with an involucrellum covering the upper half of the exciple..... 4
- 3* Ascospores larger 5
- 4 Ascospores pale brown. Hymenial algal cells oblong to bacilliform ($4\text{--}8 \times 3\text{--}3.5\ \mu\text{m}$). Thallus brownish. Algal layer continuous. Periphysoids $30\text{--}35\ \mu\text{m}$ long *S. epigaea* BREUSS & ETAYO
- 4* Ascospores hyaline. Hymenial algal cells bacilliform (c. $7\text{--}12 \times 3\text{--}3.5\ \mu\text{m}$). Thallus greenish grey. Algal layer discontinuous. Periphysoids $40\text{--}50\ \mu\text{m}$ long..... *S. maculosa* BREUSS & BERGER
- 5 Ascospores $25\text{--}45 \times 16\text{--}24\ \mu\text{m}$, hyaline to brownish. Thallus pale greyish to pale greenish grey. Perithecia fully immersed in thallus/substratum. Involucrellum lacking. Hymenial algal cells oblong ($\sim 6\ \mu\text{m}$)..... *S. alboterrestis* VAN DEN BOOM & ETAYO
- 5* Ascospores $36\text{--}43 \times 13\text{--}17\ \mu\text{m}$, hyaline to brownish. Perithecia half immersed. Hymenial algal cells globose-cuboid to shortly oblong. Thallus grey. Involucrellum?.. *S. terricola* (BAGL.) POELT & NIMIS

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