

“*Quercirhiza tomentelloreticulata*”

+ *Quercus suber* L.

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Short description

“*Quercirhiza tomentelloreticulata*” ectomycorrhizae are characterized by monopodial-pyramidal systems with brownish to greyish tips. The mantle exhibits plectenchymatous organization in all layers. Outer mantle layers consist of irregularly shaped hyphae with no discernible pattern alternating with areas star-like organized; the mantle surface bears a thin hyphal net of repeatedly ramified hyphae that end into abundant emanating hyphae. This ectomycorrhiza was identified as a *Tomentella* species by nrDNA internal transcribed spacer (ITS) sequence analysis.

Morphological characters (Fig. 1): Mycorrhizal systems monopodial-pyramidal, 6–14 mm long, with 8–19 side-branches per 10 mm. – Main axes 0.35–0.55 mm diam. – Unramified ends 0.3–0.5 diam. and up to 1.8 mm long, cylindrical and straight, brownish, greyish, roundish at the very tips. – Surface of unramified ends smooth to rough, distinct, mantle not transparent, cortical cells not visible; emanating hyphae colourless, rather frequent and not specifically distributed. – Rhizomorphs not observed. – Cystidia lacking. – Sclerotia not observed.

Anatomical characters of mantle in plan views (Fig. 2): All mantle layers plectenchymatous, not gelatinous, hyphae smooth, without clamps. – Outer mantle layers with short, irregularly shaped hyphae, areas with no discernible pattern alternate with star-like arranged regions (type B/A, according to AGERER 1987–2006, AGERER & RAMBOLD 2004–2007); outer mantle bears a loose, delicate hyphal net, ending in horn-shaped cells and emanating hyphae (Fig. 2a); hyphal net hyphae thin, 1–2 µm diam., 7–21(30) µm long, colourless, rather strongly ramified and frequently bent at distal parts (Fig. 2b); mantle cells (4)5–8(12) µm diam. and 9–21(35) µm long, walls and septa from the hyphal net 0.2–0.3 µm, walls and septa of mantle hyphae 0.5 µm thick, walls of mantle hyphae and cytoplasm yellowish brown. Middle mantle layers consisting of irregularly shaped hyphae slightly constricted at septa or inflated between septa or with irregularly distributed elbow-like structures, with no discernible pattern alternating with irregularly distributed, star-like regions (not shown in the drawings), and with some areas composed of elongated hyphae, revealing a transition to a pseudoparenchymatous organization (Fig. 2c); hyphae 14–30(41) µm long and (3)4–6.5 µm diam.; septa as thick as walls, 0.5 µm thick. – Inner mantle layers with mostly cylindrical and elongated hyphae, 14–62 µm long and 3.5–5 µm diam., slightly constricted at septa and ring-like arranged (Fig. 2d); walls and septa 0.5 µm thick. – Very tip plectenchymatous and featured like remaining parts of the mantle.

Anatomical characters of emanating elements (Fig. 2a): Rhizomorphs not observed. – Emanating hyphae rather frequent, cylindrical, colourless, 2.5–4 µm diam., cells 18–45 µm long, slightly constricted at septa, walls 0.3 µm thick; ramifications frequent, mostly near the septum and Y-shaped; distal ends simple and roundish; clamps absent; intrahyphal hyphae not found; surface smooth, with no exudates or contents. – Cystidia lacking. – Chlamydospores lacking.

Colour reaction with different reagents: Mantle preparations: Melzer's reagent: n.r. (= no reaction); guaiac: n.r.; iron (II) sulphate: n.r.; KOH 15%: n.r.; lactic acid: n.r.; sulpho-vanillin: n.r.; toluidine blue: n.r.

Autofluorescence: Not tested.

DNA-Analysis: For methods compare description of “*Quercirhiza tomentelloreticulata*” (AZUL et al. 2008). The new sequence has been lodged in the EMBL database with the accession number AM924145. The sequence of “*Quercirhiza tomentelloreticulata*” clustered together (E-value 0.0) with *Tomentella* species, differing by 0.9% (5 of 559 sites) from the sequence UDB000207 (*Tomentella substacea*) with the alignment score of 773 base pairs and differing by 1% (6 of 562 sites) from the sequence UDB000954 (*Tomentella lateritia*) with the alignment score of 763 base pairs of the UNITE database (KÖLJALG et al. 2005; <http://unite.ut.ee/index.php>).

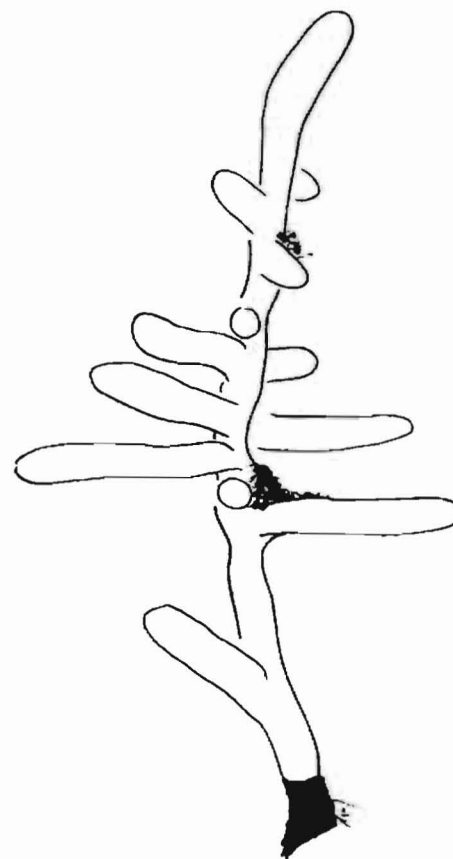
Reference specimen for *Quercus ectomycorrhiza*: Portugal, Distrito de Évora, Concelho de Montemor-o-Novo, Freguesia de Lavre, Herdade Freixo do Meio (latitude N 38°41'10", longitude W 8°20'23"), in managed oak woodland dominated by *Quercus suber* L., soil core exc. and myc. isol. AM Azul, 13.11.2004, AAM 1135/04 (in COD). Etymology: the epithet *tomentelloreticulata* refers to the presence of a loose and delicate hyphal net on the mantle surface and to the genus *Tomentella* that is according to DNA data the fungal partner.

Discussion: “*Quercirhiza tomentelloreticulata*” is well characterized by the presence of a loose and delicate hyphal net with thin, colourless, curved or bent and strongly ramified hyphae on the mantle surface. Two other *Tomentella* ectomycorrhizae are known to exhibit a delicate hyphal net: *Tomentella substacea* (JAKUCS & AGERER 2001) and “*Quercirhiza tomentellofuniculosa*” (AZUL et al. 2006). However, “*Quercirhiza tomentelloreticulata*” clearly differs from both ectomycorrhizae mentioned. Those of *T. substacea* exhibit pseudoparenchymatous outer mantle layers with angular cells that are covered by a hyphal net with acuminate, horn-shaped and triangular obtuse ends, and typically by awl-shaped, bristle-like and slightly capitate cystidia of the “fibulocystidium-type” with an intercalary clamp. The middle mantle layers of *T. substacea* are transient between pseudoparenchymatous and plectenchymatous, and the inner layers have no discernible pattern (JAKUCS & AGERER 2001). Additionally, slightly differentiated rhizomorphs, with somewhat enlarged central hyphae and cystidia on their surface are formed by the ectomycorrhizae of this species. In case of “*Quercirhiza tomentelloreticulata*” the outer mantle layer is plectenchymatous, no discernible pattern alternating with star-like arranged regions, and bears a loose, delicate network of strongly branched hyphae with horn-shaped end-cells and emanating hyphae, without cystidia. Also, no rhizomorphs were observed connected to these ectomycorrhizae.

An other similar ectomycorrhizal type, “*Quercirhiza tomentellofuniculosa*”, is characterized by plectenchymatous outer mantle layers with short and star-like arranged hyphae, bearing a loose and delicate hyphal net, with thin and strongly ramified hyphae, and forms slightly differentiated rhizomorphs with thin and densely twisted peripheral hyphae. In addition, “*Q. tomentellofuniculosa*” has clamped emanating hyphae, whereas those of “*Q. tomentelloreticulata*” are simple-septate.

Acknowledgments: This study was financially supported by Fundação Para a Ciência e a Tecnologia (SFRH/BPD/5560/2001) and SYNTHESYS program at the Real Jardín Botánico (Madrid) – ESTAF 1374.

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Captions: Fig. 1. – Habit of ectomycorrhiza. – Fig. 2. – a. Plan view of the outermost part of the surface net illustrating the horn-shaped cells and the emanating hyphae. – b. Plan view of the delicate hyphal surface net constituted by thin, rather highly branched and curved hyphae. – c. Plan view of the middle mantle layer with densely plectenchymatous organization with irregularly shaped and distributed hyphae. – d. Inner mantle layers with ring-like pattern. All figs. from AAM 1135/04 (in COI). Bar for Fig. 1: 2 mm, bar for Fig. 2: 10 µm.

Fig. 1 – “*Quercirhiza tomentelloreticulata*” + *Quercus suber*