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Buellia subericola, a new species with triseptate ascospores from the Iberian Peninsula

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Abstract: *Buellia subericola*, a new corticolous species characterized by a brown, blastidiate thallus without secondary chemistry and triseptate to occasionally submuriform ascospores, is described from the southern Iberian Peninsula. The species occurs on *Quercus suber* in grass-woodlands of cork-oak in the mesomediterranean belt with a warm mediterranean climate and oceanic influence. It is compared with other known *Buellia* s. lat. taxa which also reproduce asexually and have similar ascospores.

Key words: *Caliciaceae,* Lecanoromycetes, lichenized fungi, *Physciaceae*, south-western Europe, taxonomy

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Introduction

During studies of the triseptate species of the genus *Buellia* s. lat. in the Iberian Peninsula (Giralt & Nordin 2002), we examined a small specimen of an interesting but inconspicuous corticolous species, previously identified as *Buellia triphragmia* (Nyl.) Arnold. Pending additional material, the species was not described at that time. Since then, two additional collections have been made in the Algarve by one of us (PvdB) (van den Boom & Giralt 2012), and are described here as a new species. Further infertile Iberian specimens could be stored in herbaria under names of species with a similar habit (brown blastidiate crust) such as *Placynthiella icmalea* (Ach.) Coppins & P. James.

Materials and Methods

The specimens were examined by standard techniques using stereoscopic and compound microscopes. Only free ascospores lying outside the asci were measured. Measurements were made in material mounted in water at ×1000 magnification. Mean value (M) and standard deviation (SD) were calculated and the results in the diagnosis and species description are given as (minimum value observed) (M − SD)–(M + SD) (maximum value observed); M, SD and *n* (the total number of ascospores measured) are given in parentheses. The terminology used follows Rambold *et al.* (1994) for the asci, Giralt (2001) for the ascospore-types and their ontogeny, and Nordin (1996) for the ascospore septum-types.

Chemical constituents were identified by standardized thin-layer chromatography (TLC) (Orange *et al.* 2001).

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The Species

Buellia subericola Giralt & van den Boom sp. nov.

MycoBank No.: MB803840

Thallus brown, entirely blastidiate, lacking secondary metabolites. Apothecia lecideine, very small, 0·1–0·3 mm diam. Proper exciple paraplectenchymatous. Hymenium without oil droplets. Ascospores (1–2–)3-septate, rarely submuriform with a longitudinal septum in each middle cell, (14·0–)15·0–17·5(–18·0) × (5·0–)5·5–7·5(–8·5) µm; inner wall thickenings very pronounced at septa, absent at apices; walls smooth. Ontogeny of type A.

Type: Portugal, Algarve, S of Barranco do Velho, NW of São Brás de Alportel, 1 km N of Alportel, W side of Road 2, SW slope, shaded by shrubs and *Quercus suber*, on *Q. suber*, 360 m, 7°55·1′W, 37°10·8′N, 2 March 2006, *P. & B. v.d. Boom* 36108 (BR—holotype).

(Figs 1A & B, 2)

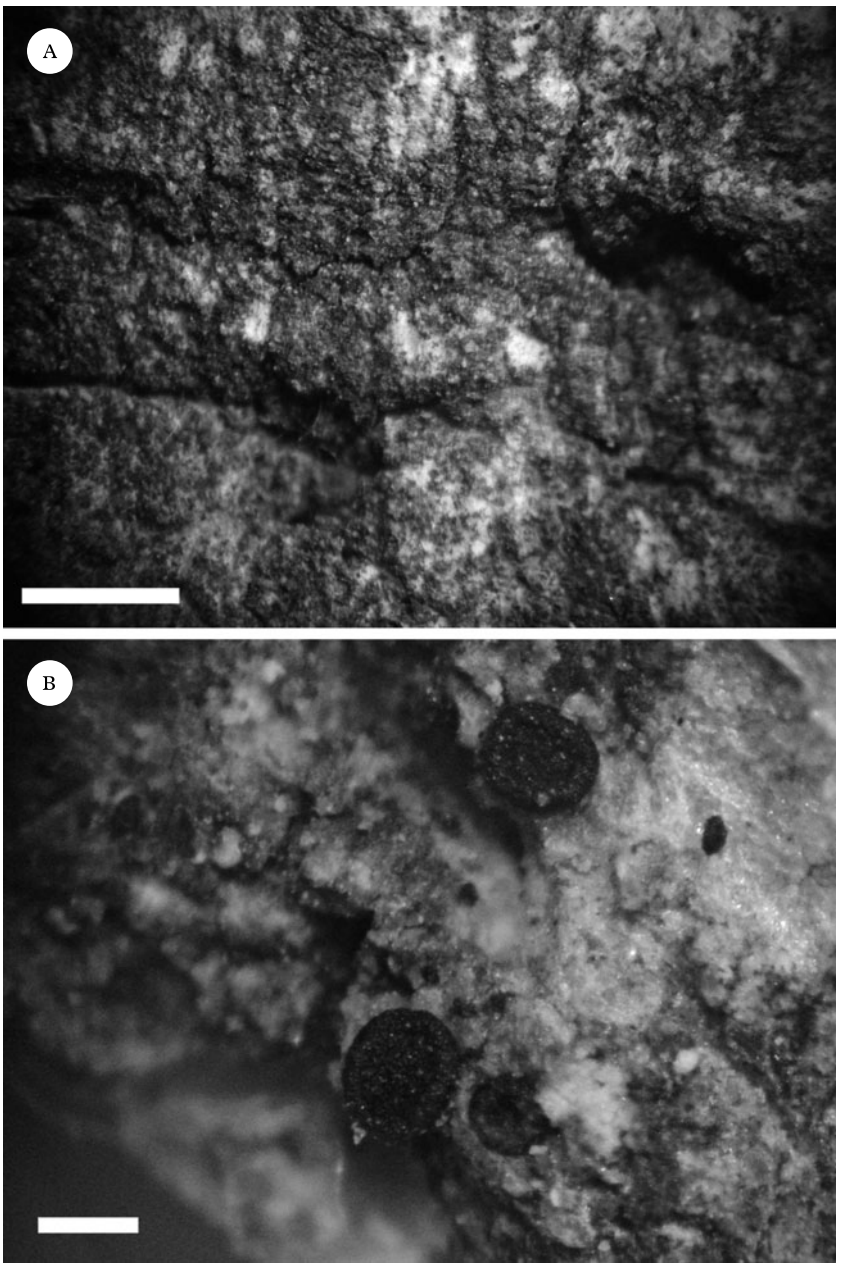

FIG. 1. *Buellia subericola* (holotype). A, minutely blastidiate thallus; B, scattered, minute apothecia. Scales: A = 2 mm; B = 0·2 mm.

Thallus corticolous, episubstratal, crustose, brown, thin, composed of discrete to usually contiguous areoles, ochraceous to brown; areoles becoming completely blastidiate, forming a ±continuous leprose crust (Fig. 1A); *blastidia* brown, up to 20–35 μm diam. *Prothallus* absent. All thallus structures non-amyloid. *Photobiont* chlorococcoid, inside the thallus 12–15 μm diam. and inside the blastidia of 5–8 μm.

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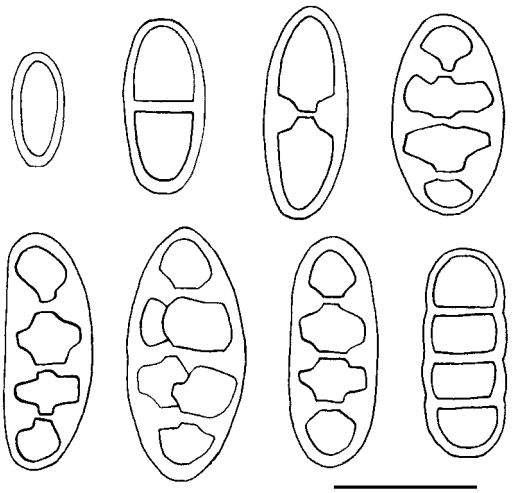

FIG. 2. *Buellia subericola*, ascospore ontogeny and variability (holotype). Scale = 10 µm.

Apothecia rare, lecideine, brownish to black, very small, (0·1–)0·2–0·3 mm diam., scattered, discrete, sessile. Proper margin thin, entire and prominent in young apothecia, becoming thinner, persistent, reddish brown to dark brown or black. *Disc* urceolate at first, then flat, epruinose, often darker than the proper margin (Fig. 1B). *Proper exciple* paraplectenchymatous, laterally 10–35 µm thick, expanded to 40(–50) µm below, inner part pale reddish brown composed of cells of 5–6 µm diam., outermost part darker, cells with dark brown caps up to 8 µm diam. *Hymenium* colourless, (50–)60–70 µm high, not inspersed with oil droplets. *Epihymenium* reddish brown to brown. *Hypothecium* 60–80(–100) µm deep, upper part dark brown, lower part reddish brown. *Paraphyses* slender, *c.* 1 µm wide, the apical cells slightly enlarged, 2–3 µm wide, dark brown. *Asci Bacidia*-type, 8-spored but very often immature and without ascospores. *Ascospores* with (1–2–)3-proper septa, rarely submuriform with a longitudinal proper-septum in each middle cell, (14·0–)15·0–17·5(–18·0) × (5·0–)5·5–7·5(–8·5) µm (M = 16·5 × 6·5 µm; SD = 1·2 × 0·9 µm; $n = 36$), not constricted at septa, straight or rarely slightly curved; inner wall thickenings very pronounced at septa, absent at apices; walls smooth (×1000). Ontogeny of type A (Fig. 2).

Pycnidia and *conidia* not seen.

Chemistry. K–, C–, KC–, Pd–, UV–. The thallus does not contain secondary lichen substances by TLC.

Etymology. The name reflects the substratum on which this species grows.

Ecology and distribution. The new species is known only from two localities in the southwestern Iberian Peninsula, growing always on the bark of *Quercus suber*. Both localities are cork-oak forests, more or less influenced by forestry practices, which belong biogeographically and bioclimatologically to the mesomediterranean subhumid-humid vegetation series (Rivas-Martínez 1987; Rivas-Martínez *et al*. 1990; Fos & Clerc 2000). The type locality is poor in lichen growth. The new species was found with fragments of *Candelariella reflexa* (Nyl.) Lettau, *Lecidella elaeochroma* (Ach.) M. Choisy, *Parmelia* s. lat. and *Rinodina* sp. On soil, near the *Quercus* tree with *B. subericola*, only *Cladonia subturgida* Samp. and *Micarea subviridescens* (Nyl.) Hedl. were observed.

The species was erroneously reported in Fos (1998) as *B. triphragmia*, a taxonomic synonym of *Tetramelas geophilus* (Sommerf.) Norman (cf. Nordin 1996; Giralt & Nordin 2002).

Observations. Buellia subericola is characterized by the brown, areolate to leprose thallus, a lack of secondary metabolites, and the relatively small, mostly 3-septate to rarely submuriform ascospores (Table 1) with pronounced septal wall thickenings which remain thickened for a long time (Fig. 2). Additional diagnostic characters are the minute apothecia, the paraplectenchymatous proper exciple and the ascospore ontogeny of type A.

Although *Buellia* s. lat. species with submuriform to muriform ascospores will be combined into several of the generic segregates of this genus (cf. Marbach 2000; Elix 2011) [e.g. *B. capitis-regum* W. A. Weber, *B. oidalea* (Tuck.) Tuck. and *B. oidalella* A. Nordin within *Buellia* s. str. (=*Hafellia*)], up to now, the genus *Diplotomma* Flot. and *Buellia auct. non* De Not. are the only ones which involve species with submuriform or

TABLE 1. *Main differences between* Buellia subericola *and other related* Buellia *s. lat. taxa discussed in this paper.*

	Mean ascospore-size (µm)	Ascospore-type	Secondary chemistry	Vegetative propagules
Buellia subericola	16·5 × 6·5	3-septate, rarely submuriform	–	± continuous, brown blastidiate crust
B. griseovirens	20·5 × 10·0	submuriform	atranorin, norstictic	discrete, greyish soralia
B. nordinii	32·0 × 13·5	3-septate	atranorin (traces)	± continuous, brown blastidiate crust
B. sorediata	17·5 × 6·5	3-septate, rarely submuriform	atranorin	discrete to confluent, whitish soralia
B. subdispersa	14·5 × 6·5	3-septate	–	–
B. triseptata	17·5 × 7·0	3-septate, rarely submuriform	atranorin, very rarely xanthones	–
B. vernicoma	13·0 × 4·5	3-septate	xanthones	–
Tetramelas graminicola	30·5 × 9·5	3-septate	xanthones	dispersed, yellowish soralia

M = mean value; –, absent

muriform ascospores. However, *Diplotomma* s. str. (=*Diplotomma*-group, Nordin 2000) as currently accepted (Helms *et al.* 2003; Nordin & Tibell 2005; Elix 2011), is also characterized by pruinose apothecia, a thallus rich in calcium oxalates and a thick perispore, features which are all absent in *B. subericola*. Thus, for the time being, the new species is included in *Buellia auct. non* De Not. which accommodates a great range of variation in several characters, among them the number of cells per ascospore (from 1-septate to pluriseptate, submuriform or muriform).

Other known *Buellia* s. lat. species with 3-septate or submuriform ascospores which, like *B. subericola*, are corticolous and develop vegetative propagules, are *B. griseovirens* (Sm.) Almb., widespread in the Northern Hemisphere, and the tropical *B. nordinii* Giralt, Kalb & Elix and *B. sorediata* (Tuck.) H. Magn. All three taxa are clearly distinguished from the new species. *Buellia griseovirens* develops discrete soralia, contains atranorin and norstictic acid, and has larger ascospores, which are typically submuriform (with 8–12 cells) and uniformly thin-walled (Nordin 2000). The blastidiate *B. nordinii* has larger, never submuriform ascospores (Giralt *et al.* 2010*a*). *Buellia sorediata* has a whitish sorediate thallus with atranorin, larger apothecia (up to 1·2 mm diam.) and ascospores without septal wall thickenings. An additional taxon with soralia and 3-septate ascospores is *Tetramelas graminicola* (Øvstedal) Kalb. This species, however, contains xanthones (6-*O*-methylarthothelin) and has larger ascospores, (Giralt & Clerc 2011) (Table 1).

According to the literature *B. subericola*, together with *B. sorediata*, *B. subdispersa* Mig. (=*Diplotomma lutosum* Arnold) and *B. vernicoma* (Tuck.) Tuck. [=*Gassicurtia vernicoma* (Tuck.) Marbach], are the *Buellia* s. lat. taxa with the smallest 3-septate or submuriform ascospores (Table 1).

In the Iberian Peninsula, *B. subericola* could be mistaken only for *B. triseptata* A. Nordin. This species, however, lacks vegetative propagules, contains atranorin and has significantly larger apothecia (up to 0·7 mm) and ascospores of ± *Callispora*-type, with slight subapical wall thickenings (Giralt & Nordin 2002; Giralt *et al.* 2010*b*) (Table 1).

When sterile, *B. subericola* looks like a poorly developed *Placynthiella dasaea* (Stirt.) Tønsberg or *P. icmalea*. However, these species contain the gyrophoric acid chemosyndrome and therefore give a C+ red reaction (Coppins & James 1984; Tønsberg 1992).

Additional specimens examined. **Portugal:** *Algarve*: S of Barranco do Velho, NW of São Brás de Alportel, 1 km N of Alportel, W side of Road 2, SW slope, shaded by shrubs and *Quercus suber*, on *Q. suber*, 360 m, 7°55·1′W, 37°10·8′N, 2006, *P. & B. van den Boom* 36103 (hb. van den Boom).—**Spain:** *Extremadura*: Badajoz, San Vicente de Alcántara, Puerto de Elice, 540 m, on *Q. suber*, 28 ix 1993, *S. Fos & E. Barreno* (VAB-Lich 9692).

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