



Lepiota elseae (Agaricales, Agaricaceae), a new species of section *Lepiota* from Spain

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Abstract

A new species, *Lepiota elseae*, is described from Mediterranean areas in Spain in association with *Quercus ilex*, based on both morphological and molecular characters (analysis of the ITS-rDNA sequences). Illustrations of fresh basidiomata in situ and of the main macro- and micromorphological features are provided. *L. elseae* belongs to section *Lepiota* and is compared with morphologically similar taxa. The phylogenetic relationship with related species based on ITS sequences is discussed.

Keywords: *Agaricomycetes*, *Basidiomycota*, ITS sequences, lepiotoid fungi, taxonomy

Introduction

The genus *Lepiota* (Pers.) S.F. Gray is traditionally divided into several sections and subsections based on morphological features such as pileus covering structure and spore shape (Pegler 1986; Singer 1986; Candusso & Lanzoni 1990; Bon 1993; Vellinga 2001a; Lange 2012). Based on molecular data, several studies have demonstrated that *Lepiota* is polyphyletic (Johnson & Vilgalys 1998; Johnson 1999; Vellinga 2003).

Lepiota sect. *Lepiota* encompasses species with fusiform or penguin-shaped spores, a pileus covering as a trichoderm consisting of long cylindrical or narrowly clavate elements, often intermixed with short elements, and clamp-connections (Singer 1986; Candusso & Lanzoni 1990; Bon 1993; Vellinga 2001a).

Phylogenetic analyses of the ITS and LSU regions by Vellinga (2003) first highlighted that all the sequenced species of sect. *Lepiota* form a well-supported clade (named *Lepiota* clade 1) together with the species with ellipsoid spores and a trichodermal pileus covering (sect. *Ovisporae* partim). These findings revealed that systematic inferences generated from morphological characters alone are often not uniformly consistent with molecular phylogenetic evidence. Further molecular work by Birkebak *et al.* (2011), Liang *et al.* (2011), Liang (2012), Liang & Yang (2012), Sysouphanhong *et al.* (2012), Ge and Smith (2013), Lebel & Vellinga (2013), confirmed the non-monophyletic status of sect. *Lepiota* as traditionally delimited.

Ge & Smith (2013) and Lebel & Vellinga (2013) transferred some sequestrate taxa formerly placed in *Amogaster* Castellano, *Cryptolepiota* Kropp & Trappe and *Notholepiota* E. Horak to *Lepiota*. According to Lebel & Vellinga (2013) these species are closely related and recently evolved from *Lepiota* clade 1 sensu Vellinga (2003).

During macrofungal diversity surveys of *Quercus ilex* (holm-oak) forests in Mediterranean Spain, several collections of an undescribed species of *Lepiota* were made. It belongs to the *Lepiota* clade 1 (following Vellinga 2003), hereafter named as *Lepiota* sect. *Lepiota* s.l. The aim of the present paper is to fully describe this taxon as a new species based on morphology and molecular (ITS-rDNA sequences) analysis.

clavate to pyriform 0–1 septate cheilocystidia and pileus squamules consisting of elongate, subcylindrical terminal elements with rounded apex, mixed with very rare short claviform elements. Due to these features, the morphologically closest species is *L. clypeolaria* (Bull.) P. Kumm., a taxon common in temperate-boreal areas, in Europe, North America and Asia, from the lowlands up to the montane zone, in deciduous or conifer woods (in Europe especially associated to *Fagus sylvatica*). It is distinguished, apart from the habitat, mainly in having a paler pileus surface, light orange, yellowish ochre scales without pinkish hues, abundant claviform elements forming a usually well-developed subhymeniform layer below the long elements of the pileus covering (Enderle & Krieglsteiner 1989; Candusso & Lanzoni 1990; Bon 1993; Breitenbach & Kränzlin 1995; Vellinga 2001a; Lange 2012) and a different ITS sequence (Fig. 1).

Lepiota eurysperma Sysouphanthong, K.D. Hyde & Vellinga, from Thailand, differs from *L. elseae* by smaller spores, $7.8\text{--}11.5 \times 4.5\text{--}6.5 \mu\text{m}$ (on average $8.9 \times 5.2 \mu\text{m}$), shorter elements of the pileus covering, $60\text{--}255 \times 5.0\text{--}11 \mu\text{m}$, and growth in mixed rain forest (Sysouphanhong *et al.* 2012).

The north temperate *L. magnispora* Murrill (syn. *L. ventriospora* D.A. Reid), and the western north American *L. spheniscispora* Vellinga resemble *L. elseae* macroscopically, but in general are more woolly on the pileus and stipe, have yellowish orange velar remnants and, microscopically are very different because of the long ‘penguin-shaped’ up to $25 \mu\text{m}$ long spores with a straight abaxial side (Enderle & Krieglsteiner 1989; Candusso & Lanzoni 1990; Bon 1993; Kelderman 1994; Breitenbach & Kränzlin 1995; Vellinga 2001a,b,c; Consiglio & Migliozi 2002; Lange 2012).

ITS sequence analyses (Fig. 1) suggest a close affinity of our new species with *L. erminea* (Fr.) P. Kumm. [syn. *L. alba* (Bres.) Sacc.] but that European grassland species differs mainly in having a white to pale yellow pileus, not radially fibrillose and without distinct scales (Enderle & Krieglsteiner 1989; Candusso & Lanzoni 1990; Bon 1993; Breitenbach & Kränzlin 1995; Vellinga 2001a; Lange 2012).

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