Introduction

The genus Galiella was proposed by Nannfeldt and Korf (Korf, 1957) to accommodate all the "Bulgaria-Sarcosoma-like" fleshy species having warted ascospores with callose-pectic markings. The American species Galiella rufa (Schwein.) Nannf. & Korf was selected as the type species and three new combinations were proposed: Galiella javanica (Rehm) Nannf. & Korf, Galiella celebica (Henn.) Nannf. and Galiella thwaitesi (Berk. & Broome) Nannf. Three new combinations and three new species have been described so far as well, i.e. Galiella amurensis (Li,J.N. Vassiljeva) Raithv. (Vassiljeva, 1950; Raithviir, 1965), G. japonica (Yasuda) Y. Otani (Yasuda, 1921; Otani, 1980), G. spongiosa (Berk. & M.A. Curtis) Pfister (Berkeley, 1868; Pfister, 1974), G. coffeata Gamundi (Gamundi, 1971), G. oblongispora J.Z. Cao and G. sinensis J.Z. Cao (Cao et al., 1992). Zhuang & Wang (1998) transferred Galiella oblongispora into the genus Wolfina Seaver and considered Galiella sinensis a synonym of Galiella celebica.

Le Gal (1958, 1960) and Boedijn (1959) considered Galiella a synonym of Sarcosoma Casm. whilst it was regarded as a distinct genus by many authors (e.g. Korf, 1957, 1972, 1973; Otani, 1980; Moravec, 1983; Paden, 1983; Cao et al., 1992; Zhuang & Wang, 1998; Pant & Prasad, 2008), although in many cases their concept included species belonging to the genus Trichaleurina Rehm. Carbone et al. (2013a) proved that Galiella is an independent genus in the family Sarcosomataceae Kobayasi and that at least two species formerly included in the genus, i.e. G. javanica and G. celebica, constitute an independent lineage within the Chorioactidaceae and are definitely unrelated to the type species G. rufa. The old generic name Trichaleurina was then restored for these two tropical taxa. A revision of the type species Trichaleurina polytricha Rehm (and also Uruma philippinarum Rehm) has been published by Carbone et al. (2013b).

According to the available mycological literature, it seems possible that many ancient (and poorly known) species described in the genera Sarcosoma, Wolfina and Bulgaria Fr. could be very closely related to Galiella. Thus the aim of this study, and the further ones, is to clarify the identity of these species. The first step is to propose a good view of the type species Galiella rufa in order to delimit the generic concept of Galiella.

Material and methods

Morphological study

The microscopic studies were based on dried specimens. Two optical microscopes were used: Olympus CX41 trinocular and Optika B533 trinocular with plan-achromatic objectives 4x, 10x, 40x, 60x, 100x in oil immersion. The following main reagents were used: Melzer’s reagent, Cotton Blue, Congo Red, 5% KOH. Water mounts were used for the observation of the pigmentation and measurements. At least 30 spores were measured from each apospore. MOMS is the acronym for the Missouri Mycological Society Herbarium; all of MOMS’ vouchers are secured at the Dunn-Palmer Herbarium at the University of Missouri in Columbia (UMO).

Studied collection

Galiella rufa. U.S.A. Missouri, St. Louis County, Glencoe, Rockwood Reservation, on very moist dead wood. 11.VI.2004, leg. et det. Brad Bomanz (MOMS 207).

Summary: In this first resuming study on the genus Galiella, Galiella rufa, the type species of this genus, is described based on macro- and microscopic characters. Colour pictures of fresh specimens and microscopic features are also given.

Keywords: Sarcosomataceae, Plectania, Peziza hirtipes, Eastern United States of America.

Riassunto: In questo primo studio sul genere Galiella, viene descritta macro- e microscopicamente Galiella rufa, la specie tipo di questo genere. Vengono fornite inoltre foto a colori di esemplari freschi e del quadro microscopico.

Parole chiave: Sarcosomataceae, Plectania, Peziza hirtipes, Stati uniti d’America orientali.

Introduzione

L'auspicio di propose il genere Galiella proposto da Nannfeldt e Korf (Korf, 1957) per includere tutti i "Bulgaria-Sarcosoma-like" fleshy spezies having warted ascospores with callose-pectic markings. L’American species Galiella rufa (Schwein.) Nannf. & Korf was selected as the type species and three new combinations were proposed: Galiella javanica (Rehm) Nannf. & Korf, Galiella celebica (Henn.) Nannf. and Galiella thwaitesi (Berk. & Broome) Nannf. Three new combinations and three new species have been described so far as well, i.e. Galiella amurensis (Li,J.N. Vassiljeva) Raithv. (Vassiljeva, 1950; Raithviir, 1965), G. japonica (Yasuda) Y. Otani (Yasuda, 1921; Otani, 1980), G. spongiosa (Berk. & M.A. Curtis) Pfister (Berkeley, 1868; Pfister, 1974), G. coffeata Gamundi (Gamundi, 1971), G. oblongispora J.Z. Cao and G. sinensis J.Z. Cao (Cao et al., 1992). Zhuang & Wang (1998) transferred Galiella oblongispora into the genus Wolfina Seaver and considered Galiella sinensis a synonym of Galiella celebica.

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According to the available mycological literature, it seems possible that many ancient (and poorly known) species described in the genera Sarcosoma, Wolfina and Bulgaria Fr. could be very closely related to Galiella. Thus the aim of this study, and the further ones, is to clarify the identity of these species. The first step is to propose a good view of the type species Galiella rufa in order to delimit the generic concept of Galiella.

Materiali e metodi

Studio morfo-stilografico

I studi morfologici sono stati basati su campioni asciutti. Due microscopi ottici sono stati usati: Olympus CX41 trinucleare e Optika B533 trinucleare con obiettivi plan-achromatica 4x, 10x, 40x, 60x, 100x in immersione in olio. I seguenti principali reagenti sono stati usati: reagente di Melzer, Blu di Cotone, Rosso di Congo, 5% KOH. I montaggi acquatici sono stati utilizzati per l’osservazione della pigmentazione e delle misurazioni. Almeno 30 spore sono state misurate da ogni apospore. MOMS è l’acronimo per la Società Micologica del Missouri; tutti i saperi di MOMS sono custoditi al Dunn-Palmer Herbarium dell’Università del Missouri in Columbia (UMO).

Colezione studiata


Rassegna: In questa prima rassegna sul genere Galiella, Galiella rufa, la specie tipo di questo genere, è descritta macro- e microscopicamente. Vengono fornite inoltre foto a colori di esemplari freschi e del quadro microscopico.

Parole chiave: Sarcosomataceae, Plectania, Peziza hirtipes, Stati uniti d’America orientali.
Macroscopical characters
Apothecium at first globose to urn-shaped, then concave to shallow cup-shaped, 2.5–3 cm across. Hymenium tan brown to brownish orange, smooth. Margin incurved to more opened in age, toothed to fringed. Flesh tough, rubbery and gelatinous, tan brown, brownish orange to blackish brown in age. External surface wrinkled, with a dense covering of hairs, blackish brown. Stipe mostly lacking but sometime a pseudostipe extending downward to 5 mm.

Microscopic characters
Asci on average 270 × 12 μm, cylindrical, operculate, inamyloid, eight-spored, with wall up to 1 μm thick and a tapered, flexuous, aporhynchous base. Paraphyses not exceeding the asci, 1.5–2 μm wide, cylindrical, septate, sometimes anastomosing, branched below, with a simple apex, slightly undulated or, in few cases, slightly lobed. Hymenial hairs cylindrical, as long as the paraphyses, 3–3.5 μm wide, with a simple apex, and a single septum at the very base. Ascospores ellipsoid-subfusoid, slightly thick-walled, (17–) 18–21 (−23) × 8–10 μm, Q = (1.9–) 2.1–2.5 (−2.8), hyaline, very minutely verrucose (if seen in heated lactic Cotton Blue mounts), containing two large oil drops. Subhymenium ca. 100 μm thick, composed by a dense textura intricata of cylindrical, frequently septate hyphae, 3 μm diam., light brown if seen at low magnifications. Medullary excipulum very gelatinous, of textura intricata with cylindrical, septate, hyaline, slightly thick-walled hyphae, 2–3 μm wide. Ectal excipulum very thin, ca. 20 μm thick, of textura subglobulosa to angularis made up of elements up to 10 μm wide, dark brown due to the colored thick wall. External hairs cylindrical, septate, smooth, 4–5 μm wide, up to 220 μm long but on average ≤ 130 μm, mostly straight but also slightly wavy, with tips blunt, and enlarged to bulbous base. They are light brown due to an epimembranaceous pigmentation, with wall thickened up to 1 μm.

Plate 1 – Galiella rufa
Upper: Fresh fruitbodies in situ; Bottom: Fresh fruitbodies. Photos: B. Bomanz
Plate 2 – Galiella rufa

All water mounts otherwise stated. A: Spores in ascus; A1: Spore in heated Cotton Blue; B: Hymenial hair; C: Hymenial hair (red arrow) and paraphyses (black arrows), in heated Cotton Blue; D: Hymenium and subhymenium; E: Medullary excipulum, ectal excipulum and external hairs; F-G: Ectal excipulum and external hairs. Scale bars: A-B-C-F-G = 10 μm; A1 = 2 μm; D-E = 100 μm. Photos: M. Carbone & C. Agnello.
Ecology and phenology

The studied collection fruited in early summer on a wooded hillside. Found in small, loose clusters in a small group on a fallen decaying hardwood branch of an unidentified broadleaf tree, in forest litter.

Discussion

_Galiella rufa_ is a well known eastern American species treated in many morphological works like DURAND (1903), SEAVER (1928, 1942), LE GAL (1951), ultrastructural (SAMUELSON et al., 1980) and also many mushrooms field guides (e.g. BESSETTE et al., 1997; PHILLIPS, 2005; BEUG et al., 2014). It was first described by SCHWEINITZ (1832) from Bethlehem (Pennsylvania, USA), and then transferred into two others genera before being selected as the type species of the genus _Galiella_ (KORF, 1957). It is characterized by a globose to shallow cupulate (sub)sessile apothecia with irregularly toothed margin, reddish-brown to orange-brown hymenium, blackish-brown external surface covered with hairs that give it a felt-like appearance; the flesh is gelatinous and rubbery; microscopically the main striking features are the subfusoid, very minutely warted spores, the presence of the so-called hymenial hairs and (mostly) straight, smooth, brown external hairs.

From a morphological point of view, the combination of gelatinous apothecia, warted spores, and smooth external hairs (of one kind only), are the main features distinguishing the genus _Galiella_ in the family _Sarcosomataceae_.

In contrast to SEAVER (1928, 1942), who listed _Peziza hirtipes_ Cooke as a synonym of _Plectania melastoma_, RIFAI (1968) regarded it as a synonym of _Galiella rufa_ after the study of the type specimen. We have not studied this type but, at present, we have no reasons to doubt in Rifi's proposal. Cooke's plate and description (COOKE, 1876) as well the English and Latin description (COOKE, 1875a, 1875b) seem to support this view. For a quick comparison we report here the original diagnosis: "Substipitata, cupula carnosa, hemispherica (1-2 unc. lata) disco urceolato, extus atro-brunneo flocculosa, intus pallidiore, margine leniter incurvato; stipite brevi, basi tomento denso radicante atro strigoso. Ascis cylindraceis, sporiis ellipticis (0.02 × 0.012 m.m.). Paraphysibus furcatis, hyalinis. Grevillea III fig. 91. Ad ramulos dejectos. Maine U.S. (Bolles 74) affinis P. melastomae. Sow."

PECK (1906) described the taxon _Bulgaria rufa_ var. _magna_ Peck from the New York State. He distinguished it mainly for a bigger size of the fruitbodies, ochre brown hymenium, little longer spores and habitat, growing in the ground under _Abies balsamea_ (L.) Mill. We have not yet a final opinion on its identity but all these features seem too much different from those of _Galiella rufa_ and such, at least until a type study will be done, we prefer not to consider it a variety of _Galiella rufa_. We know from MyCoPortal database that a collection NYS-F-001831 (housed in NYS herbarium) and listed as “possible type” does exist.

Finally, the records of _G. rufa_ in Malaysia (ABDULLAH & RUSEA, 2009) seem doubtful and definitely need more studies. According to our morphological and phylogenetical studies (still unpublished) we believe that its geographical range should be restricted to the eastern part of North America.
References


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