



## A new species of *Amanita* growing under *Eucalyptus* is discovered in South Brazil

Wartchow F<sup>1\*</sup> and Cortez VG<sup>2</sup>

<sup>1</sup>Universidade Federal da Paraíba, Departamento de Sistemática e Ecologia, 58051-970, João Pessoa, PB, Brazil

<sup>2</sup>Universidade Federal do Paraná, Departamento de Biodiversidade, 85950-000, Palotina, PR, Brazil

Wartchow F, Cortez VG 2016 – A new species of *Amanita* growing under *Eucalyptus* is discovered in South Brazil. *Mycosphere* 7(3), 262–267, Doi 10.5943/mycosphe/7/3/2

### Abstract

*Amanita aliena* is described as new species from a *Eucalyptus* plantation in South Brazil. It belongs to subgenus *Amanita* where it has an isolate phenetic position, due to distinct morphology: yellowish brown pileus, universal veil as wart forming broken collars on the top of bulb from the junction to stipe base to near base, large basidiospores (7.5–) 8.5–14.5 (–16) × (5.7–) 6–9.5 (–11) μm, subhymenium with non-inflated cells and scarcity of clamp connection at base of basidia.

**Key words** – Amanitaceae – Agaricales – Agaricomycetes – taxonomy

### Introduction

In South Brazil, *Amanita* Pers. has been studied more recently. Wartchow et al. (2013a) reported two subspecies of *A. muscaria* (L.) Lam. (subsp. *muscaria* and subsp. *flavivolvata* Singer), and Wartchow et al. (2013b) described *A. petalinivolva* Wartchow (subgenus *Amanita*). Other six taxa also are referred from this region: *A. chrysoleuca* Pegler, *A. multisquamosa* Peck (subgen. *Amanita*), *A. grallipes* Bas & de Meijer, *A. strobiliformis* (Paulet ex Vittad.) Bertill. (subgen. *Lepidella*), *A. rubescens* Pers. and *A. spissa* (Fr.) Bertill. (subgen. *Validae*) (Rick 1906, 1937, Bas & de Meijer 1993, Giachini et al. 2000, Sobestiansky 2005, de Meijer 2006). It is notable that most recorded species of *Amanita* from South Brazil (e.g., *A. muscaria*, *A. multisquamosa* and *A. rubescens*) are ectomycorrhizal partners of exotic *Pinus* and *Eucalyptus*, the most cultivated trees in that region (Sulzbacher et al. 2013). During mycological fieldwork in South Brazil, an interesting species of *Amanita* growing under *Eucalyptus* plantation was collected, which could not be determined at that time. This material was considered as belonging to a new taxonomic entity, which is described in the present paper.

### Materials & Methods

The specimen was collected in a *Eucalyptus* plantation at the municipality of Minas do Leão, placed in the Pampa biome of South Brazil. Generic and infrageneric names and concepts follow Yang (1997). The methodology of Tulloss (2000), for biometric measurements and biometric variable names – summarized by Tulloss & Lindgren (2005) – was followed, as slightly modified by Wartchow & Gamboa-Trujillo (2012). Terminology used for *Amanita* are according Wartchow et al. (2013b). The holotype is deposited at ICN and a probable second collection of the new species is at FLOR (Thiers 2016).

## Taxonomy

### *Amanita aliena* Wartchow & Cortez, sp. nov.

Figs 1,2

Mycobank #815753

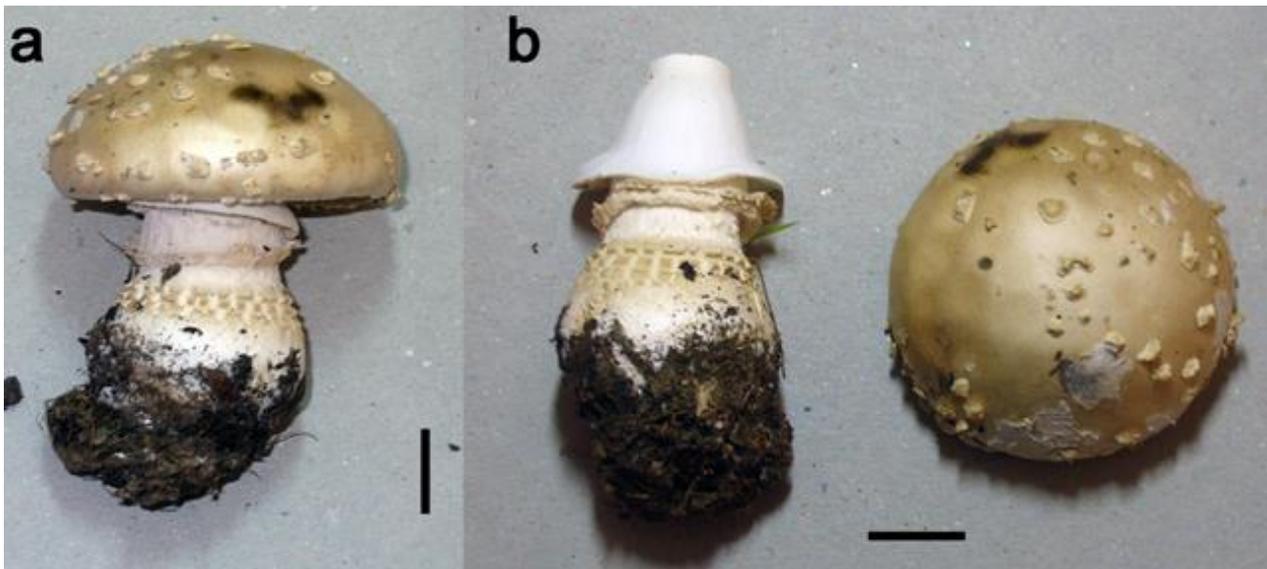
Type – Brazil, Rio Grande do Sul, Minas do Leão, Agropecuária Condor, 26 May 2008, V.G. Cortez 094/08 (ICN 170790 **holotypus hic designatus!**).

Etymology – from Latin ('aliena' = foreign).

Basidiome medium size. Pileus 80 mm wide and 40 mm high, hemispheric, pale yellowish-brown; margin indistinctly sulcate (about 5 mm long); context probably whitish, unchanging; universal veil as adnate, cream to ochraceous-brown, pyramidal warts, unchanging. Lamella narrowly adnexed, forming decurrent tooth at stipe apex, whitish to cream with concolorous edge, unchanging, crowded; lamellulae truncate, with several lengths. Stipe 40 × 30 mm, narrowing upwards, white, unchanging, surface smooth; bulb 50 mm high, 40 mm wide (in the widest portion), subglobose; context probably whitish, unchanging, solid (observed at exsiccate); partial veil white, apical, smooth with universal remnants at edge; universal veil as wart forming concentric broken collars, cream to ochraceous-brown on the top of bulb from the junction to stipe base to near base; "limbus internus" close to partial veil, concolorous to universal veil. Odor and Taste not performed.

Basidiospores [60/1/1] (7.5–) 8.5–14.5 (–16) × (5.7–) 6–9.5 (–11) μm, (**L** = 10.8 μm; **W** = 7.2 μm; **Q** = (1.14–) 1.28–1.71 (–1.82); **Qm** = 1.50), inamyloid, hyaline, colorless, ellipsoid occasionally to frequently elongate occasionally broadly ellipsoid, smooth, wall about 0.4 μm thick, usually at least somewhat adaxially flattened; apiculus obtuse, prominent somewhat large, sub lateral to almost apical; contents somewhat one or two large guttules. Basidia 39.5–48 × 9.5–11 μm, 4- somewhat 2-sterigmate, with sterigmata 3.5 μm long, clamps infrequent at base. Subhymenium 22 μm thick, with frequently uninflated cells e.g. 8 × 5 μm, to occasionally more inflated clavate, up to 15 × 11 μm; **w<sub>st-near</sub>** = 47–57 μm; **w<sub>st-far</sub>** = 54–68 μm. Lamella trama bilateral; **w<sub>cs</sub>** = 25 μm; filamentous hyphae up to 2–4 (–8) μm wide infrequently thickening to 14 μm, diverging abruptly and occasional slender clavate elements that range to 62 × 15 μm; oleiferous hyphae slender to 4 μm, very frequent. Marginal tissue on lamella edge not examined. Pileus context rehydrating satisfactorily; distinctly acrophysalidic; acrophysalides to 90–110 × 25–50 μm slender fusoid to fusoid, very common; filamentous hyphae 2–9 μm wide, common, usually branched, very interwoven, occasionally clamped; oleiferous hyphae 4–14 μm, frequent. Stipe context rehydrating satisfactorily; longitudinally acrophysalidic; acrophysalides 65–220 × 35–70 μm, common, wall thickening to 1 μm; filamentous hyphae 4–12 μm, longitudinally oriented but somewhat branched, very common; oleiferous hyphae 5–12 μm wide, with more or less longitudinal orientation, very common, mostly toward apex. Pileipellis a cutis ranging to 200 μm at pileus centre; suprapellis an ixocutis up to 70 μm thick with interwoven filamentous hyphae 1.5–4 μm, colorless, with a more or less radial orientation to more diffuse at apex to more or less anticlinal, somewhat gelatinized, oleiferous hyphae absent; subpellis up to 130 μm radially oriented, filamentous hyphae up to 2–4 μm wide, plentiful; yellow-brown more diffuse and interwoven; oleiferous hyphae frequent 4–11 (–16) μm wide. Universal veil On pileus: inflated cells elongate 80 × 28 μm, or ovoid 50 × 34 μm, hyaline, orientation more or less anticlinal; filamentous hyphae e 2–6 μm, hyaline, common; oleiferous hyphae absent. Above bulb ("limbus internus"): inflated cells 20–88 × 13–44 μm, ovoid to elliptic, colorless; filamentous hyphae up to 2–8 μm, hyaline, abundant; oleiferous hyphae occasional to 4 μm wide. Universal veil on bulb: inflated cells subglobose 15–58 × 14–55 μm, sometimes ovoid (50 × 38 μm), colorless, abundant; filamentous hyphae to 7 μm, thin-walled, hyaline, very interwoven, abundant; oleiferous hyphae absent. Partial veil filamentous hyphae up to 2–5 μm, strongly interwoven, ramified, abundant; terminal inflated elements difficult to locate, elongate-clavate to subcylindric (44 × 12 μm); edge with abundant inflated cells of the universal veil; oleiferous hyphae 4 μm wide, very occasional.

Habit – solitary on soil, under *Eucalyptus* sp. plantation, in the biome Pampa.



**Fig. 1** – *Amanita aliena* (holotype). a, b: Basidiome. Bars = 10 mm.

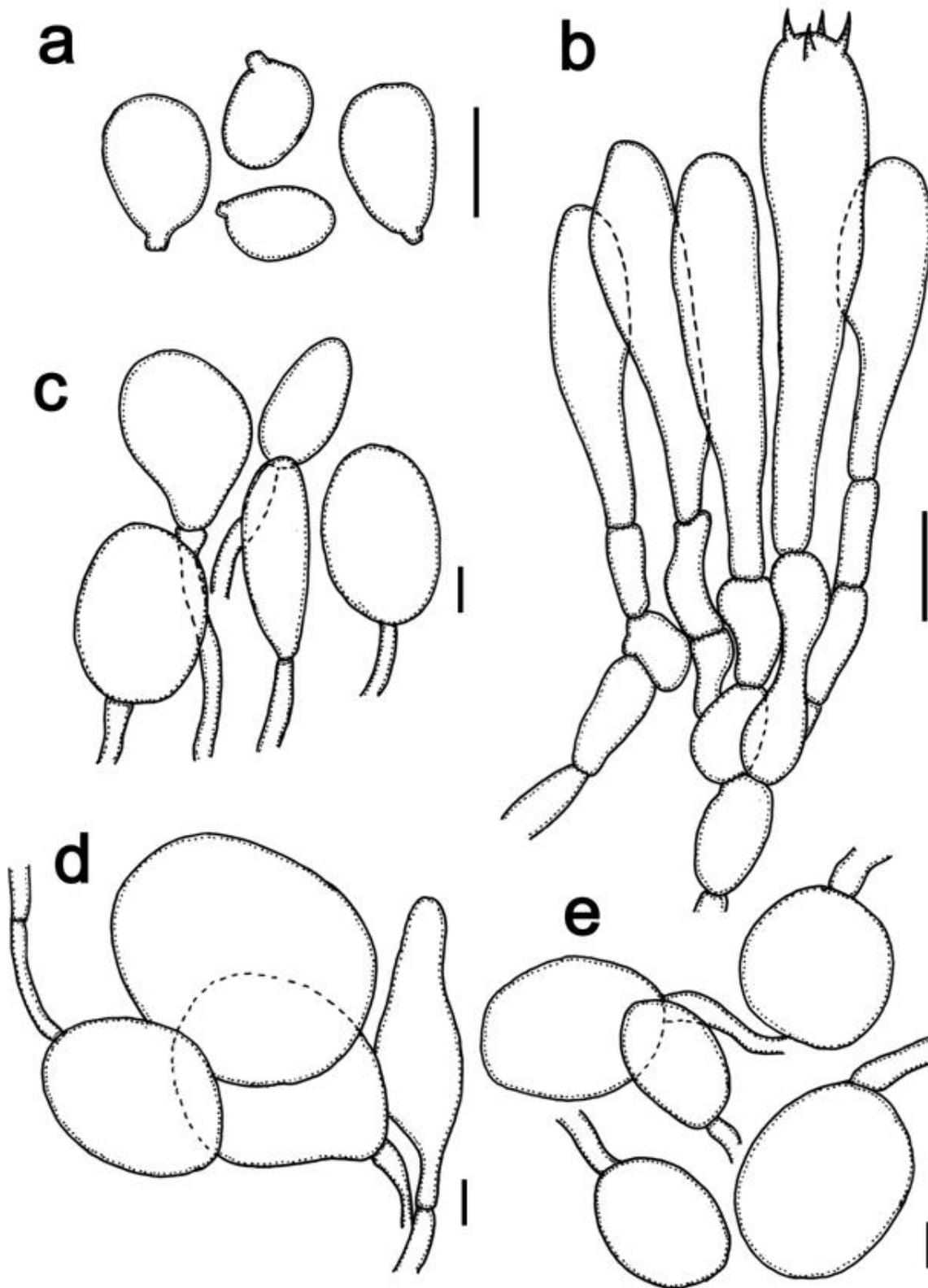
Known distribution – south Brazil, from the States of Rio Grande do Sul and Santa Catarina.

Additional material examined – Brazil, Santa Catarina, Correia Pinto, 10 July 1996, A.J. Giachinis.n. (FLOR 31461, as *Amanita pantherina* var. *multiscamosa*).

Notes – *Amanita aliena* is diagnosed by the combination of the following morphological features: pale yellowish brown pileus, universal veil as wart forming broken collars on the top of bulb from the junction to stipe base to near base, basidiospores  $(7.5\text{--}) 8.5\text{--}14.5\text{ (}\text{--}16) \times (5.7\text{--}) 6\text{--}9.5\text{ (}\text{--}11) \mu\text{m}$ , subhymenium with uninflated cells and scarcity of clamp connection at base of basidia. Our first attempt was to treat *A. aliena* (sect. *Amanita*) as a muscaroid taxon due the habit and disposition of the universal veil on bulb, forming a broken collar. However, the scarcity of clamp connections segregates that new species from this group (Tulloss & Yang 2016). Indeed, the occurrence of the ‘limbus internus’ on the stipe as like as an annulus resembles the one found in *A. breckonii* Thiers & Ammirati, originally described from California (Thiers & Ammirati 1982). However, *A. breckonii* is a typical muscaroid taxon, presenting abundant clamp connections in the basidia (Tulloss & Yang 2016), and the similarities are only superficial. The basidiospores of booth taxa are somewhat similar:  $[320/16/3] (7.2\text{--}) 10\text{--}12.8\text{ (}\text{--}16.0) \times (4.5\text{--}) 6.2\text{--}7.8\text{ (}\text{--}9.0) \mu\text{m}$ , ( $\mathbf{L} = 10.9\text{--}12\text{ (}\text{--}12.2) \mu\text{m}$ ;  $\mathbf{L}' = 11.3 \mu\text{m}$ ;  $\mathbf{W} = (6.6\text{--}) 6.7\text{--}7.1\text{ (}\text{--}7.2) \mu\text{m}$ ;  $\mathbf{W}' = 6.9 \mu\text{m}$ ;  $\mathbf{Q} = (1.31\text{--}) 1.47\text{--}1.89\text{ (}\text{--}2.29)$ ;  $\mathbf{Q} = (1.55\text{--}) 1.58\text{--}1.74\text{ (}\text{--}1.85)$ ;  $\mathbf{Qm} = 1.65$ ), but  $\mathbf{Qm} = 1.50$  for *A. aliena*. In addition, other aspects differ *A. breckonii* from our new species: the universal veil from pileus as scattered to abundant, deciduous plaques or patches, flat, irregularly shape, while *A. aliena* presents pyramidal warts; the universal veil from stipe as white, friable, low rim of tissue around the apex of the bulb in *A. breckonii* instead concentric broken collarswarts in our new species.

Certainly, *A. aliena* refers to a relatively isolated position among members of sect. *Amanita* based on the uncommon set of features mentioned above. Several works reported Amanitas growing under *Eucalyptus* but none report similar fungus as our new species (Miller 1991, 1992, Reid & Eicker 1991, Ridley 1991, Grgurinovic 1997, Wood 1997, Neville & Poumarat 2004, Davison 2011, Davison et al. 2013, 2015).

We found another material identified as *A. pantherina* var. *multisquamosa* (Peck) Dav. T. Jenkins (FLOR 31461), also collected under *Eucalyptus*; the basidiospores are very similar in size and shape to *A. aliena*:  $[40/1/1] (9.5\text{--}) 10\text{--}14\text{ (}\text{--}16) \times (6.5\text{--}) 7\text{--}9.5\text{ (}\text{--}10) \mu\text{m}$ ,  $\mathbf{L} = 11.7 \mu\text{m}$ ;  $\mathbf{W} = 8.1 \mu\text{m}$ ;  $\mathbf{Q} = (1.20\text{--}) 1.26\text{--}1.78\text{ (}\text{--}1.83)$ ;  $\mathbf{Qm} = 1.49$ . However, no field notes accompany the exsiccate and the subhymenium is poorly rehydrated. However, the basidiospores size and the habitat growing under *Eucalyptus* might identify this material as *A. aliena*. Collection with field notes is necessary for confirmation of the identity of Santa Catarina’s material.



**Fig. 2** – *Amanita aliena*(holotype). A Basidiospores. B Hymenium and subhymenium. C Universal veil elements of pileus. D Universal veil elements of stipe base. E Universal veil elements of the “limbus internus”. Bars = 10  $\mu$ m.

In Brazil, Wartchow et al. (2013a) reported specimen of *A. muscaria* subsp. *flavivolvata* growing under *Eucalyptus* forest in Rio Grande do Sul State. *Amanita aliena*, as described here is the second taxon found in this type of environment in the state.

## Acknowledgements

The first author thanks Dr. Rodham E. Tulloss (New Jersey) for his guidance in the studies of *Amanita*, and Dr. Leonor C. Maia and Dr. Maria Auxiliadora Q. Cavalcanti for supervision during PhD. The authors thank curator of FLOR for loan specimens and Dr. Jefferson Prado (IBt-SP) for nomenclatural advice. This work was supported by CNPq (PROTAX – Grant 141073/2006-3).

## References

- Bas C, de Meijer AAR. 1993 – *Amanita grallipes*, a new species in *Amanita* subsection *Vittadiniae* from Southern Brazil. *Persoonia* 15, 345–350.
- Davison EM. 2011 – *Amanita ochroterra* and *Amanita brunneiphylla* (Basidiomycota), one species or two? *Nuytsia* 21, 177–184.
- Davison EM, McGurk LE, Bougher NL, Syme K, Watkin ELJ. 2013 – *Amanita lesueurii* and *A. wadjukiorum* (Basidiomycota), two new species from Western Australia, and expanded description of *A. fibrillopes*. *Nuytsia* 23, 589–606.
- Davison EM, Giustiniano D, McGurk LE, Syme K, Robinson RM. 2015 – *Amanita drummondii* and *A. quenda* (Basidiomycota), two new species from Western Australia, and an expanded description of *A. walpolei*. *Nuytsia* 25, 1–13.
- Giachini AJ, Oliveira VL, Castellano MA, Trape JM. 2000 – Ectomycorrhizal fungi in *Eucalyptus* and *Pinus* plantations in southern Brazil. *Mycologia* 92, 1166–1177.
- Grgurinovic CA. 1997 – Larger Fungi of South Australia. The Botanic Gardens of Adelaide and State Herbarium & The Flora and Fauna of South Australia Handbooks Committee, Adelaide.
- de Meijer AAR. 2006 – Preliminary list of the macromycetes from the Brazilian State of Paraná. *Boletim do Museu Botânico Municipal (Curitiba)* 68, 1–55.
- Miller OK Jr. 1991 – New species of *Amanita* from Western Australia. *Canadian Journal of Botany* 69, 2692–2703.
- Miller OK Jr. 1992 – Three new species of *Amanita* from Western Australia. *Mycologia* 84, 679–686.
- Neville P, Poumarat S. 2004 – *Amanitae: Amanita, Limacella & Torrendia*. *Fungi Europaei* 9. Edizioni Candusso, Alassio.
- Reid DA, Eicker A. 1991 – South African fungi: the genus *Amanita*. *Mycological Research* 95, 80–95.
- Ridley GS. 1991 – The New Zealand species of *Amanita* (Fungi: Agaricales). *Australian Systematic Botany* 4, 325–354.
- Rick J. 1906 – Pilze aus Rio Grande do Sul. *Brotéria Série Botânica* 5, 5–53.
- Rick J. 1937 – *Agarici Riograndensis*. *Lilloa* 1, 307–346.
- Sobestiansky G. 2005 – Contribution to a macromycete survey of the states of Rio Grande do Sul and Santa Catarina in Brazil. *Brazilian Archives of Biology and Technology* 48, 437–457.
- Sulzbacher MA, Grebenc T, Jacques RJS, Antonioli ZI. 2013 – Ectomycorrhizal fungi from southern Brazil – a literature-based review, their origin and potential hosts. *Mycosphere* 4, 61–95.
- Thiers B. 2016 (continuously updated) – Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. – <http://sweetgum.nybg.org/ih/> [accessed 05February 2016].
- Thiers HD, Ammirati JF. 1982 – New species of *Amanita* from Western North America. *Mycotaxon* 25, 155–166.
- Tulloss RE. 2000 – Note sulla metodologia per lo studio del genere *Amanita* (Agaricales). – *Boletino del Gruppo Micologico G. Bresadola* 43, 41–58.
- Tulloss RE, Lindgren JE. 2005 – *Amanita aprica* – a new toxic species from western North America. *Mycotaxon* 91, 193–205.

- Tulloss RE, Yang ZL. 2016 – Studies on Amanitaceae – amanitaceae.org [accessed 05February 2016].
- Wartchow F, Gamboa-Trujillo JP. 2012 – *Amanita chocoana*– a new species from Ecuador. Mycotaxon 121, 405–412.
- Wartchow F, Maia LC, Cavalcanti MAQ. 2013a – Taxonomic studies of *Amanita muscaria* (L.) Lam. (Amanitaceae, Agaricomycetes) and its infraspecific taxa in Brazil. Acta Botanica Brasilica 27, 31–39.
- Wartchow F, Maia LC, Cavalcanti MAQ. 2013b – Studies on *Amanita* (Agaricomycetidae, Amanitaceae) in Brazil: two yellow gemmatoid taxa Nova Hedwigia 96, 61–71.
- Wood AE. 1997 – Studies in the genus *Amanita* (Agaricales) in Australia. Australian Systematic Botany 10: 723–854.
- Yang ZL. 1997 – Die *Amanita*-Arten von Südwestchina. Bibliotheca Mycologica 170, 1–240.