

***Battarrea phalloides* – new for Saudi Arabia**

SAAD HOWLADAR

YEHIA A.-G. MAHMOUD*

AHMED MERISEEL

Biology Department (Biotechnology Program),
Faculty of Science, Al Baha University, Saudi Arabia

Email: Yehiamah@gmail.com

Accepted 15. 1. 2013

Key words: *Battarrea phalloides*, gasteroid fungi. – New record. – Mycobiota of Saudi Arabia.

Abstract: *Battarrea phalloides* was observed for the first time in Saudi Arabia from Bani Amer valley, Baljurashi county, Al Baha province. The species grew in sandy soil in association with *Ziziphus* trees. In the soil of the collection site the organic matter varied from 3.57-10.6% in soil depths between 10-25 cm.

Zusammenfassung: *Battarrea phalloides* wurde erstmals für Saudi Arabien im Bani Amer Tal im Bezirk Baljurashi in der Provinz Al Baha beobachtet. Die Pilzart wuchs in sandigem Boden bei *Ziziphus*-Bäumen. Am Fundort variierte der Gehalt an organischem Material von 3,57-10,6 % in Bodentiefen zwischen 10-25 cm.

Gasteroid fungi include puffballs, earthstars, stinkhorns, bird's nest fungi, false truffles, and gasteroid agarics. Gasteroid agarics often develop underground and appear epigeous only when the sterile portion elongates so that at the mature spores may be dispersed (LIU & FAN 2006).

Battarrea is considered as belonging to the *Agaricaceae* (RAUSCHERT 1986, KIRK & al. 2008). The young basidiomata are hypogeous and spherical. During maturity the scaly and hollow stipe is expanding, the exoperidium remains basally as a volva and apically as scales on the endoperidium. The endoperidium dehisces circular and degenerates apically, thereby exposing the spores.

Here we report *Battarrea phalloides* (DICKS.) PERS. for the first time for Saudi Arabia.

Materials and methods

Locality and collection examined: Saudi Arabia, province Al Baha, Baljurashi, 19° 51' 34" N, 41° 33' 26" E, Ben Amer valley, mountain range of al-Sarawat (al-Sarat), ca. 2000 m s. m., in sandy soil, close to *Ziziphus spina-christi* trees, December 2011, leg. SAAD HOWLADAR, YEHIA A.-G. MAHMOUD, and AHMED MERISEEL. The specimen is deposited in the Mycological Herbarium at Al Baha University in the Department of Biology, Faculty of Science, Saudi Arabia.

Soil organic matter determination: Soil organic matter content was estimated according to the modified method of WALKLEY & BLACK as described by JACKSON (1973). Five mg of soil weight was used for organic matter content analysis and analysed at the Central Laboratory for Soil, Water & Plant Analysis (CLSWPA), Faculty of Agriculture, Fayoum University, Egypt.

*Permanent address: Tanta University, Faculty of Science, Botany Department, Mycology Research Lab., Tanta 31527, Egypt.

Identification: The species was identified with classical morphological characters following SINGER (1962), MOSER (1978), ARORA (1986), CASTELLANO & al. (1989), TURNER & SZCZAWINSKI (1991), JORDAN & WHEELER (1995), and MARTÍN & JOHANNESSON (2000).

Results

Chemistry of the soil

Organic matter in soil samples from which *Battarrea phalloides* was collected ranged between 3.57 % and 10.60 % at soil depths between 10-25 cm (Table 1).

Table 1. Organic matter percentage in different depths of soil from which *Battarrea phalloides* has been collected.

Sample No.	Depth (cm)	Organic matter (%)	Sample No.	Depth (cm)	Organic matter (%)
1	10	3.57	8	20	9.06
2	10	5.74	9	13	8.97
3	20	4.28	10	17	10.61
4	25	6.49	11	12	7.57
5	15	3.97	12	12	7.14
6	20	8.88	13	20	6.13
7	9	7.75			

Description of the Saudi Arabian collection of *Battarrea phalloides* (Fig. 1)

Characters:

Basidiomata: developing rapidly, mature rust-colored, young hypogeous and spherical with thick peridium (Fig. 1 d), older epigeous, stipe expanding up to 40 cm (16 in) length and 0.4 to 1.6 cm (0.2-0.7 in) width and bearing the spore sack (Fig. 1 a-c).

Stipe: inner layer of the stipe consisting of arranged closely (almost parallel) strings, outer layer thicker, membranous, sometimes with corky fabric when dry, and dirty white.

Exoperidium: basally remaining as a volva and apically as scales on the endoperidium.

Endoperidium and spore sack: hemispherical to conical, 1.0-2.8 cm (0.4 to 1.3 in) in diam., later splitting circular along the equator and deteriorating (Fig. 1 c).

Stipe plectenchyma: with some clamp connections on the border between inner and outer layer.

Gleba: consisting of capillitium and elaters.

Capillitium hyphae: thin-walled, mostly septate, smooth, little branched, hyaline to pale yellow, with clamp-connections up to 5 µm in diam.

Elaters: 32-80 µm long and 3.5-7.0 µm wide, pale yellow, walls smooth, tapering and bearing spiral thickenings.

Basidiospores: thick walled, rusty brown, finely warted, 5.0-6.5 µm in diam.



Fig. 1. a-c. Mature basidiomata of *Battarrea phalloides*, d. young basidioma developing underground.

Endoperidium hyphae: densely interlocking, 3-9 μm in diam., thin-walled, walls less than 1 μm thick, septate, branched, pale yellow, with clamp connections.

Ecology and habitat: In Saudi Arabia *Battarrea phalloides* grew solitary and scattered in dry, sandy soils in the desert mostly along hedge banks. It occurred with alive or dead parts of the following plants: *Acacia gerrardii* var. *iraquensis* *Acacia*, *Argemone ochroleuca*, *Asphodelus fistulosus*, *Barbeya oleoides*, *Centaurea sinaica*, *Commiphora quadricincta*, *Cordia africana*, *Ephedra alata*, *Euclea schimperi*, *Faidherbia albida*, *Juniperus excelsa*, *Lavandula pubescens*, *Nepeta deflersiana*, *Otostegia fruticosa*, *Phlomis* spec., *Populus euphratica*, *Psiadia punctulata*, *Pulicaria crispa*, *Salvia multicaulis*, *Solanum incanum* and *Ziziphus spina-christi*.

Discussion

Ecology: *Battarrea phalloides* is a terricolous saprobic species, decomposing rotten leaves or other organic matter, occurring in warm-temperate, Mediterranean to tropical climate, on sandy and clay soils, in deserts, semideserts, steppes, or ruderal sites, in dry clear forests, often under trees in shade, sometimes on woody debris or sawdust, fruiting in all seasons (KREISEL 2001, GIBSON 2013). Old basidiomata may last for several months after they have dried up (ELLIS & ELLIS 1990).

In North America *Battarrea phalloides* was found to be associated with *Schinus molle*, as well as *Lycium brevipes*, *Solanum hindsianum*, *Subterminalis salicornia*, *Atriplex*

linearis, *Quercus agrifolia* and other oak species, with *Opuntia*, in the coastal dunes with variable soil salinity (ORR & ORR 1979). In Belgium, it was found on samples from sandy soil under bushes of *Sambucus nigra* (DITTMER 1978). In the present study we list for the first time the occurrence of *B. phalloides* in association with *Ziziphus* trees at more than two thousand meters above sea level. In Mexico a basidiomata length of 65 cm (25.6 inches) was recorded (ESQUEDA & al. 2002).

Distribution: *Battarrea phalloides* (incl. *B. stevenii*) is rare everywhere but distributed worldwide. It was found in USA (AZ, AK, BC, CA, ID, OR, YT, WA) and western Canada (ARORA 1986, ELLIS & ELLIS 1990, GIBSON 2013, REA 1942, SCHALKWIJK-BARENDSEN 1991), South America (Brazil, SOBESTIANSKY 2005), Africa (Angola, Burundi, Kenya, Mauretania, Morocco, Namibia, Socotra, Somalia, South Africa) (JACOBSON & al. 1999, KREISEL 2001, LEVIN & BRANCH 1985, OUTCOMIT 2007). It is known in the Middle East from Armenia, Azerbaidjan, Georgia, Iran, Israel, and Yemen (KREISEL 2001), in several countries of Europe (Austria, Belgium, Bulgaria, Czech Republic, England, France, Germany, Hungary, Italy, Rumania, Russia, Serbia, Slovakia, Spain) (AUSTRIAN MYCOLOGICAL SOCIETY 2013, DENCHEV & ASSYOV 2010, DITTMER 1978, KREISEL 2001, LANTIERI & al. 2009, LINDTNER 1931-1932, MARTIN & JOHANNESSON 2000, SILLER & al. 2006, WALLEYN & LETEN 2000), in West Pakistan (JEFFRIES & MCLAIN 2004), in China (LIU & FAN 2006), and in Australia (ORCHARD 1996, MAY & al. 2003).

Taxonomical remarks: Some authors consider *B. phalloides* and *B. stevenii* as two separate species (GÄUMANN & DODGE 1928, KREISEL 2001, MILLER & MILLER 2006, www.mycobank.org); others treat them as varieties or forms of only one species (HOLLÓS 1904, REA 1942, www.indexfungorum.org). A recent molecular study (MARTIN & JOHANNESSON 2000) points towards con-specificity of the two taxa.

Battarrea stevenii should differ from *B. phalloides* in larger basidiomata, up to 70 centimeters (27.6 inches) (WALLEYN & LETEN 2000), a non-gelatinous inner side of the volva, more yellowish-orange, less ornamented and slightly larger ($5\text{-}6.5 \times 5.7\text{-}7 \mu\text{m}$ vs. $4.5\text{-}5.25 \times 4.5\text{-}5.75 \mu\text{m}$) basidiospores (CUNNINGHAM 1932, WATLING & al. 1995).

The similar taxon *Battarreoides diguetii* (PAT. & HAR.) R. HEIM & T. HERRERA, known in the USA and recorded from the Mojave Desert, differs from *Battarrea phalloides* s. l. by smaller basidiomata, smaller endoperidium, and spore release through a number of pores on the upper surface of the endoperidium (ELLIS & ELLIS 1990).

References

- ARORA, D., 1986: Mushrooms demystified: a comprehensive guide to the fleshy Fungi. – Berkeley, CA: Ten Speed Press.
- AUSTRIAN MYCOLOGICAL SOCIETY, 2013: Database of fungi in Austria. – Edited by DÄMON, W., HAUSKNECHT, A., KRISAI-GREILHUBER, I. – [<http://www.austria.mykodata.net>] [20.1.2013].
- CASTELLANO, M. A., TRAPPE, J. M., MASER, Z., MASER, C., 1989: Key to spores of the genera of hypogenous Fungi of North temperate forests. – Eureka CA: Mad River Press.
- CUNNINGHAM, G. H., 1932: The Gasteromycetes of Australasia XIV. – Proc. Linn. Soc. New South Wales 57: 27-39.
- DENCHEV, C. M., ASSYOV, B., 2010: Checklist of the larger Basidiomycetes in Bulgaria. – Mycotaxon 111: 279-282 and [<http://www.mycotaxon.com/resources/checklists/denchev-v111-checklist.pdf>].
- DITTMER, H. J., 1978: A rare Gasteromycete in New Mexico, USA. – New Mexico Acad. Sci. Bull. 18: 12.

- ELLIS, J. B., ELLIS, M. B., 1990: Fungi without gills (Hymenomycetes and Gasteromycetes): an identification handbook. – London: Chapman & Hall.
- ESQUEDA, M., HERRERA, T., PEREZ-SILVA, E., APARICIO, A., MORENO, G., 2002: Distribution of *Battarrea phalloides* in Mexico. – Mycotaxon **82**: 207-214.
- GÄUMANN, E. A., DODGE, C. W., 1928: Comparative morphology of the Fungi. – New York: McGraw-Hill Book Co.
- GIBSON, I., 2013: *Battarrea phalloides* (DICKS.: PERS.) PERS. Desert drumstick. – In KLINKENBERG, B., (Ed.), 2013: E-Flora BC: Electronic atlas of the plants of British Columbia [eflora.bc.ca]. – Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. [Accessed: 01/21/2013].
- HOLLÓS, L., 1904: Die Gasteromyceten Ungarns. Im Auftrage der Ungarischen Akademie der Wissenschaften. – Leipzig: O. Weigel. (In German.)
- JACKSON, M. L., 1973: Soil chemical analysis. – New Delhi: Prentice Hall of India Private Ltd.
- JACOBSON, K. M., JACOBSON, P. J., MILLER, O. K. Jr., 1999: The autoecology of *Battarrea stevenii* in ephemeral rivers of southwestern Africa. – Mycol. Res. **103**: 9-17.
- JEFFRIES, P., MCLAIN, L., 2004: Report number 625. Synonymy between *Battarrea phalloides* and *B. stevenii*. – English Nature Research Reports. P. 1-31.
- JORDAN, P., WHEELER, S., 1995: The ultimate mushroom book. – London: Anness Press.
- KIRK, P. M., CANNON, P. F., MINTER, D. W., STALPERS, J. A., 2008: Dictionary of the Fungi. 10th edn. – Wallingford, UK: CABI.
- KREISEL, H., 2001: Checklist of the gasteral and secotioid Basidiomycetes of Europe, Africa, and the Middle East. – Austrian J. Mycol. **10**: 213-313.
- LANTIERI, A., GARGANO, M. L., VENTURELLA, G., 2009: The sabulicolous fungi from Sicily (southern Italy): additions and critical review. – Mycotaxon **110**: 151-154 and [http://www.mycotaxon.com/resources/checklists/lantieri-v110-checklist.pdf].
- LEVIN, H., BRANCH, M., 1985: A field guide to the mushrooms of South Africa. – Cape Town: C. Struik.
- LINDTNER, V., 1931-1932: *Battarrea phalloides* (DICKS.) PERS. aus Südserbien. – Bull. Inst. Jard. Bot. Univ. Belgrade **2** (1-2): 104-105.
- LIU, H., FAN, L., 2006: The genus *Battarrea* (Tulostomatales, Basidiomycota) in China. – Acta Bot. Yunnanica **28**: 19-21. (In Chinese.)
- MARTÍN, M. P., JOHANNESSON, H., 2000: *Battarrea phalloides* and *B. stevenii*, insight into a long-standing taxonomic puzzle. – Mycotaxon **75**: 67-75.
- MAY, T. W., MILNE, J., SHINGLES, S., JONES, R. H., 2003: Fungi of Australia 2B: Catalogue and Bibliography of Australian Fungi 2. Basidiomycota p.p. & Myxomycota. – Collingwood, Victoria: CSIRO Publishing.
- MILLER, H. R., MILLER, O. K., 2006: North American Mushrooms: a field guide to edible and inedible Fungi. – Guilford, Conn.: Falcon Guide.
- MOSER, M., 1978: Keys to Agarics and Boleti (*Polyporales*, *Boletales*, *Agaricales*, *Russulales*) , 4th edn. – London: Roger Phillips.
- ORCHARD, A. E., (Ed.), 1996: Fungi of Australia. – Canberra: Australian Biological Resources Study. – Collingwood, Victoria: CSIRO.
- ORR, D. B., ORR, R. T., 1979: Mushrooms of Western North America. – Berkeley: University of California Press.
- OUTCOMIT, A., 2007: Several remarks regarding a Moroccan crop of *Battarrea phalloides*. – Bull. Soc. Mycol. France **123**: 77-83.
- RAUSCHERT, S., 1986: Proposal to conserve the spelling *Battarraea* (Fungi: Gasteromycetes). – Taxon **35**: 733-36.
- REA, P. M., 1942: Fungi of Southern California. I. – Mycologia **34**: 563-574.
- SCHALKWIJK-BARENDSEN, H. M. E., 1991: Mushrooms of Western Canada. – Edmonton: Lone Pine Publishing.
- SILLER, I., DIMA, B., ALBERT, L., VASAS, G., FODOR, L., PAL-FAM, F., BRATEK, Z., ZAGYVA, I., 2006: Protected macrofungi in Hungary. – Mikológiai Közlemények **45**: 3-158. (In Hungarian and English.)
- SINGER, R., 1962: The *Agaricales* in modern taxonomy 2nd edn. – Vaduz: Cramer.
- SOBESTIANSKY, G., 2005: Contribution to a macromycete survey of the states of Rio Grande do Sul and Santa Catarina in Brazil. – Brazilian Archives Biol. Technol. **48**: 437-457.

- TURNER, N. J., SZCZAWINSKI, A. F., 1991: Common poisonous plants and mushrooms of North America. – Portland, OR: Timber Press.
- WALLEYN, R., LETEN, M., 2000: *Battarrea phalloides* (DICKS.: PERS.) PERS., a remarkable addition to the Belgian fungal flora. – Antwerpse Mycologische Kring Mededelingen 2000 (4): 101–103. (In Dutch.)
- WATLING, R., GUCIN, F., ISILOGLU, M., 1995: *Battarraea phalloides* – its history, biology and extension to its distribution. – Nova Hedwigia **60**: 13–18.

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Österreichische Zeitschrift für Pilzkunde](#)

Jahr/Year: 2013

Band/Volume: [22](#)

Autor(en)/Author(s): Howladar Saad, Mahmoud Yehia A.-G., Meriseel Ahmed

Artikel/Article: [Battarrea phalloides - new for Saudi Arabia. 1-6](#)