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Mycological Research News¹

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Mycorama: a mycological mecca

Construction of Mycorama, the Centre International de Mycologie, in Neuchâtel, Switzerland, is now well underway. This bold US \$ 3 million initiative aims to provide a showcase for international mycology, and an inauguration date of 27 October 2007 has now been set. The displays, being designed with the help of mycologists from many countries, including France, Mexico, Spain, and the UK as well as Switzerland, will cover topics such as medical mycology, mushroom growing, the importance of fungi in plant survival, tinder fungi, slime moulds, lichens, and mushrooms in sacred rites. The project is run by the Fondation Suisse du Mycorama, and the future scientific director will be Gilles Faron. Mycorama's sponsors include: Loterie Romande, République et Canton de Neuchâtel, Johnson & Johnson Inc., British Mycological Society, Académie Suisse des Sciences Naturelles, Association Suisse des Cultivateurs de Champignons, Chambre Cantonale d'Agriculture et de Viticulture, and Fondation Binding. For further information and pictures of the building under construction, see <http://www.mycorama.com>.

Nomenclatural clarifications in Glomeromycota

Two recent publications (Spain *et al.* 2006; Walker *et al.* 2007) dealt contemporaneously with new taxa in the Archaeosporales, representing one of the more ancient lineages of the Glomeromycota (Schüßler *et al.* 2001) containing some of the arbuscular mycorrhizal fungi. Because some of the new taxa names are consequentially illegitimate, the nomenclature and systematics of these organisms is left in confusion, and we clarify some critical points here. We also validate the names of two *Pacispora* species (Diversisporales) that were originally invalidly published (Oehl & Sieverding 2004) and make a new combination in *Pacispora* for the species *Glomus patagonicum*.

Appendicispora (syn. *Ambispora*)

The revision of the Archaeosporales by Walker *et al.* (2007) was based on the erection of a new genus, *Ambispora*, typified by the new species *A. fennica* including the former *Archaeospora leptoticha* (syn. *Glomus leptotichum*) sensu Morton & Redecker (2001), *A. gerdemannii* (syn. *G. gerdemannii*), and *G. callosum*. Another publication of a new genus in the Archaeosporales, *Appendicispora* (Spain *et al.* 2006), based on the former *Acaulospora appendicula*, pre-dates Walker *et al.* (2007) by some weeks. Because *A. appendicula* was one of four species names listed as synonyms when the combination *Archaeospora leptoticha* was made, *Ambispora* and its associated higher taxon name, *Ambisporaceae*, are illegitimate under Art. 52.1 and Art. 18.3 respectively of the Code.

Some of the species discussed here were originally placed in different genera, later synonymised, and then separated again by Spain *et al.* (2006). The originally named *A. gerdemannii* is different from the former *G. gerdemannii*, being based on different type specimens and having different morphological characteristics. *Acaulospora gerdemannii* was renamed as part of *Archaeospora leptoticha*, and has been redefined as *Appendicispora jimgerdemannii*. *Glomus gerdemannii* was renamed as *Archaeospora gerdemannii* (Morton & Redecker 2001), and is now *Appendicispora gerdemannii* (Spain *et al.* 2006). *Archaeospora*

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leptoticha was established (Morton & Redecker 2001) by combining four species, *G. leptotichum*, *G. fecundisporum*, *A. appendicula* (now *Appendicispora appendicula*), and *A. gerdemannii* (now *Appendicispora jimgerdemannii*). Walker et al. (2007) made this combination (as *Ambispora leptoticha*) with reservations, suggesting that the most satisfactory way to establish relationships was to re-isolate living material and establish the position of each by molecular methods. Spain et al. (2006), although lacking such evidence, have now separated these organisms again, arguing that the two former *Acaulospora* spp. were not synonymous, and that the inclusion of the two former *Glomus* spp. was without any foundation. Contrary to this, morphological and molecular evidence had already been presented by Morton & Redecker (2001), concluding that both former *Glomus* spp. belonged to the *Archaeosporaceae*. Moreover, Walker et al. (2007) show that the former *Glomus callosum*, producing only glomoid spores, belongs in the *Archaeosporales*. In regard to '*G. leptotichum*' and '*G. fecundisporum*', Spain et al. (2006) 'return them to the genus *Glomus*', and exclude them from the *Archaeosporaceae*, leaving the nomenclature and systematics of these organisms in confusion. Herein, we propose an emended definition of *Appendicispora*, placing the three organisms producing solely glomoid spores as different species in that genus.

As defined by Spain et al. (2006), *Appendicispora* was based entirely on morphological characteristics, taking its name from the pedicel form of the spore base of some acaulosporoid spores in the genus, which they term an appendix, though it is clearly an integral part of the spore. The introduction of the name *Appendicispora* complies with the rules of the Code, but almost no consideration was given to the systematic position of the members of the new genus, apart from a brief mention in the abstract (presumably based on other work) that the separation of *Archaeospora* and *Appendicispora* is 'further supported by molecular data'. In presenting evidence for the systematic position of these organisms, molecular phylogenetic evidence was used to establish a separate family (the *Ambisporaceae*) in the *Archaeosporales* Walker et al. (2007). This must now be re-established as the *Appendicisporaceae* based on the only legitimate generic name available, *Appendicispora*.

Appendicisporaceae C. Walker, Vestberg & Schuessler, **fam. nov.**

Mycobank no.: MB 510505

Etym: referring to the pedicel (also erroneously termed 'appendix') during the formation of some of the acaulosporoid spores formed by some species in the type genus.

A familiis aliis in Archaeosporalibus ob sporas glomoidas, acaulosporoidas vel ambas formans et a characteribus rDNA differt.

Typus: *Appendicispora* Spain, Oehl & Sieverd. 2006.

Synonym: *Ambisporaceae* C. Walker, Vestberg & Schuessler, *Mycol. Res.* **111**: 143 (2007); nom. illegit. (Art. 18.3).

Arbuscular mycorrhizal fungi forming glomoid spores, acaulosporoid spores, or both glomoid and acaulosporoid spores. Glomoid spores almost lacking in pigmentation, and with a soft, pliable nature resulting in wrinkling and resistance to fracturing when crushed. Acaulosporoid spores formed from

a hyaline to subhyaline to whitish sporiferous saccule, often but not exclusively on a short pedicel resulting in a glomoid appearance once detached from the collapsed saccule. Separated from other families in the *Archaeosporales* by its rDNA characteristics.

Appendicispora Spain, Oehl & Sieverd., *Mycotaxon* **97**: 168 (2006).

Type: *A. appendicula* (Spain, Sieverd. & N. C. Schenck) Spain, Oehl & Sieverd. 2006.

Spores formed in the soil, either as glomoid spores only, or both acaulosporoid and glomoid spores. Glomoid spores formed singly in the soil or in loose clusters, pliable, differing from the normally brittle nature of such spores in the genus *Glomus*; open-pored or sealed by a septum formed from the inner wall component. Sporiferous saccule initially similar in appearance to the glomoid spores, with a soft, pliable nature, formed blastically from a hyphal tip, and becoming sealed by a septum. Acaulosporoid spores formed, usually laterally, from the sporiferous saccule; spore wall structure complex, of two or three groups. Outermost wall group continuous with the saccule wall, enclosing a distinct and separate entity with a wall structure of more than one flexible component in two groups. Forming arbuscular mycorrhizas.

The genus is re-circumscribed here to include also species which do not have acaulosporoid spores, and is separated from other genera in the *Archaeosporales* by its SSU and ITS rDNA as shown by Walker et al. (2007).

Appendicispora appendicula (Spain, Sieverd. & N. C. Schenck) Spain, Oehl & Sieverd., *Mycotaxon* **97**: 170 (2006).

Basionym: *Acaulospora appendicula* Spain, Sieverd. & N. C. Schenck, *Mycologia* **76**: 686 (1984).

Appendicispora callosa (Sieverd.) C. Walker, Vestberg & Schuessler, **comb. nov.**

Mycobank no.: MB 510504

Basionym: *Glomus callosum* Sieverd., *Angew. Bot.* **62**: 374 (1988).

Synonym: *Ambispora callosa* (Sieverd.) C. Walker, Vestberg & Schuessler, *Mycol. Res.* **111**: 148 (2007).

Appendicispora fecundispora (N. C. Schenck & G. S. Sm.)

C. Walker, Vestberg & Schuessler, **comb. nov.**

Mycobank no.: MB 510502

Basionym: *Glomus fecundisporum* N. C. Schenck & G. S. Sm., *Mycologia* **74**: 81 (1982).

Appendicispora fennica (C. Walker, Vestberg & Schuessler) C. Walker, Vestberg & Schuessler, **comb. nov.**

Mycobank no.: MB 510503

Basionym: *Ambispora fennica* C. Walker, Vestberg & Schuessler, *Mycol. Res.* **111**: 148 (2007).

Appendicispora gerdemannii (S. L. Rose, B. A. Daniels & Trappe) Spain, Oehl & Sieverd., *Mycotaxon* **97**: 174 (2006).

Basionym: *Glomus gerdemannii* S. L. Rose, B. A. Daniels & Trappe, *Mycotaxon* **8**: 297 (1979).

Synonyms: *Archaeospora gerdemannii* (S. L. Rose, B. A. Daniels & Trappe) J. B. Morton & D. Redecker, *Mycologia* **93**: 186 (2001).

Ambispora gerdemannii (S. L. Rose, B. A. Daniels & Trappe) C. Walker, Vestberg & Schuessler, *Mycol. Res.* **111**: 148 (2007).

Appendicispora jimgerdemannii (N. C. Schenck & T. H. Nicolson) Spain, Oehl & Sieverd., *Mycotaxon* **97**:176 (2006).
Basionym: *Acaulospora gerdemannii* N. C. Schenck & T. H. Nicolson, *Mycologia* **71**: 193 (1979).

Appendicispora leptoticha (N. C. Schenck & G. S. Sm.) C. Walker, Vestberg & Schuessler, **comb. nov.**
MycBank no.: MB 510501
Basionym: *Glomus leptotichum* N. C. Schenck & G. S. Sm., *Mycologia* **74**: 82 (1982).
Synonym: *Ambispora leptoticha* (N. C. Schenck & G. S. Sm.) C. Walker, Vestberg & Schuessler, *Mycol. Res.* **111**: 148 (2007).

Pacispora

Because the page number of the bibliographic reference to the basionym of each species combination was not cited precisely and only a page spread given, three of the seven new combinations made by Oehl & Sieverding (2004), including that of the type species of the genus, were not validly published under Art. 33.3 of the Code. This has created the curious situation in which a genus name was validly published, but the type species defining the new genus still carries the old genus name, *Glomus*. We therefore validate the affected species names here, apart from *P. dominikii*, which is considered to be a synonym of *P. scintillans* (Walker et al. 2004; Walker & Schüßler 2004). From its published characteristics, one other species, *Glomus patagonicum*, also should be moved to the genus *Pacispora*, as implied by a note added in the proof of the protologue (Novas et al. 2005). The original species description needs no emendation.

Pacispora chimonobambusae (C. G. Wu & Y. S. Liu) Sieverd. & Oehl ex C. Walker, Vestberg & Schuessler, **comb. nov.**
MycBank no.: MB 510507
Basionym: *Glomus chimonobambusae* Wu & Liu, *Mycotaxon* **53**: 284 (1995).
Synonym: *Pacispora chimonobambusae* (C. G. Wu & Y. S. Liu) Sieverd. & Oehl, in Oehl & Sieverding, *Angew. Bot.* **108**: 76 (2004), nom. inval. (Art. 33.3).
Gerdemannia chimonobambusae (C. G. Wu & Y. S. Liu) C. Walker, Blaszk., Schuessler & Schwarzott, *Mycol. Res.* **108**: 717 (2004).

Pacispora patagonica (Novas & Fracchia) C. Walker, Vestberg & Schuessler, **comb. nov.**
MycBank no.: MB 510517
Basionym: *Glomus patagonicum* Novas & Fracchia, *Nova Hedwigia* **80**: 534 (2005).

Pacispora scintillans (S. L. Rose & Trappe) Sieverd. & Oehl ex C. Walker, Vestberg & Schuessler, **comb. nov.**
MycBank no.: MB 510506
Basionym: *Glomus scintillans* S. L. Rose & Trappe, *Mycotaxon* **10**: 417 (1980).

Synonyms: *Pacispora scintillans* (S. L. Rose & Trappe) Sieverd. & Oehl., in Oehl & Sieverding, *Angew. Bot.* **78**: 76 (2004), nom. inval. (Art. 33.3).

Gerdemannia scintillans (S. L. Rose & Trappe) C. Walker, Blaszk., Schuessler & Schwarzott, *Mycol. Res.* **108**: 716 (2004).

Glomus dominikii Blaszk., *Karstenia* **27**: 37 (1988).

Pacispora dominikii (Blaszk.) Sieverd. & Oehl, in Oehl & Sieverding, *Angew. Bot.* **78**: 76 (2004), nom. inval. (Art. 33.3).

Morton JB, Redecker D, 2001. Two families of Glomales, *Archaeosporaceae* and *Paraglomaceae*, with two new genera *Archaeospora* and *Paraglomus*, based on concordant molecular and morphological characters. *Mycologia* **77**: 181–195.

Novas MV, Fracchia S, Menéndez A, Cabral D, Godeas A, 2005. *Glomus patagonicum* sp. nov. (*Glomerales*), a new arbuscular mycorrhizal fungus from Argentina. *Nova Hedwigia* **80**: 533–539.

Oehl F, Sieverding E, 2004. *Pacispora*, a new vesicular arbuscular mycorrhizal fungal genus in the *Glomeromycetes*. *Angewandte Botanik* **78**: 72–82.

Schüßler A, Schwarzott D, Walker C, 2001. A new fungal phylum, the *Glomeromycota*: phylogeny and evolution. *Mycological Research* **105**: 1413–1421.

Spain JL, Sieverding E, Oehl F, 2006. *Appendicispora*: a new genus in the arbuscular mycorrhiza-forming *Glomeromycetes*, with a discussion of the genus *Archaeospora*. *Mycotaxon* **97**: 163–182.

Walker C, Vestberg M, Demircik F, Stockinger H, Saito M, Sawaki H, Nishimura I, Schüßler A, 2007. Molecular phylogeny and new taxa in the *Archaeosporales* (*Glomeromycota*): *Ambispora fennica* gen. sp. nov., *Ambisporaceae* fam. nov., and emendation of *Archaeospora* and *Archaeosporaceae*. *Mycological Research* **111**: 137–153.

Walker C, Schüßler A, 2004. Nomenclatural clarifications and new taxa in the *Glomeromycota*. *Mycological Research* **108**: 981–982.

Walker C, Blaszkowski J, Schwarzott D, Schüßler A, 2004. *Gerdemannia* gen. nov., a genus separated from *Glomus*, and *Gerdemanniaceae* fam. nov., a new family in the *Glomeromycota*. *Mycological Research* **108**: 707–718.

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Lethal genes in yeast polyploids

In *Saccharomyces cerevisiae*, some genes that can be deleted in haploids or diploids with no effect, are lethal if deleted in

triploids or tetraploids. Storchová *et al.* (2006) developed a method of making tetraploids from diploid yeast strains which had some genes deleted, and examined 3740 mutations; 39 genes that when missing caused lethality in tetraploids were identified. Most of these affected homologous recombination, sister chromatid cohesion, or mitotic spindle function. They went on to study wild-type tetraploids and identified mechanisms by which the formation of tetraploids affected genome stability, and conclude that mismatches in ability to scale the size of the spindle pole body, spindle, and kinetochores. It is suggested that such geometric constraints may have major effects on genome stability generally and that this may be important in various biological contexts, including cancer cells.

Storchová Z, Breneman A, Cande J, Dunn J, Burbank K, O'Toole E, Pellman D, 2006. Genome-wide genetic analysis of polyploidy in yeast. *Nature* 443: 541–547.

Mycological Research dates of publication

As the dates of effective publication of scientific names can be critical in assigning priority to names, the dates on which the 12 issues of *Mycological Research* 110 (2006) were dispatched are summarized below. Under Rec. 31A of the *Code*, the date given here is that when the printed copies were delivered to carriers for distribution. Although articles now are published in advance online in advance of the hardcopy, it is these dates that are considered as those of effective publication under the *Code* (Art. 31 Note 1).

110 (1)	13 February 2006
110 (2)	7 March 2006
110 (3)	27 March 2006
110 (4)	17 May 2006
110 (5)	28 June 2006
110 (6)	10 July 2006
110 (7)	16 August 2006
110 (8)	28 September 2006
110 (9)	29 September 2006
110 (10)	6 November 2006
110 (11)	24 November 2006
110 (12)	22 December 2006

New scientific names in this issue

- Appendicisporaceae* fam. nov.
Appendicispora callosa (syn. *Glomus callosum*) comb. nov.
A. fecundispora (syn. *Glomus fecundisporum*) comb. nov.
A. fennica (syn. *Ambispora fennica*) comb. nov.
A. leptoticha (syn. *Glomus leptotichum*) comb. nov.
Astraeus asiaticus sp. nov.
Conidiotheca sp. nov.
C. tympanoides (syn. *Romellia tympanoides*) comb. nov.
Hypocrella panamensis sp. nov.
Pacispora chimonobambusae (syn. *Glomus chimonobambusae*) comb. nov.
P. patagonica (syn. *Glomus patagonicum*) comb. nov.
P. scintillans (syn. *Glomus scintillans*) comb. nov.
Phytophthora austrocedrae sp. nov.
Teracosphaeria gen. nov.
T. petroica sp. nov.