Reassessment of the order *Erysiphales* in its current allocation

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Abstract: Braun, U. & Bradshaw, M. 2025: Reassessment of the order *Erysiphales* in its current allocation. Schlechtendalia **42**: 282–284.

In a recently published comprehensive treatment of the phylogeny of the order *Helotiales* (*Ascomycota*), the powdery mildews (order *Erysiphales*, family *Erysiphaceae*) were included in the circumscription of this newly (more widely) defined order. In doing so, the name *Erysiphales* and additional names of orders were formally reduced to synonymy with *Helotiales*, irrespective of nomenclatural aspects. The name *Erysiphales*, introduced in 1884, is older than the name *Helotiales*, published in 1932, and represents the oldest available name for the newly introduced circumscription of the *Helotiales*. According to Art. 11.10 of the Madrid Code (ICNafp), the principles of priority do not apply to names above the rank family, so that the application of the name *Helotiales* is in concordance with the rules of the Code, although Rec. 16A.1 of the current Code recommends "In choosing among typified names for a taxon above the rank of family, authors should generally follow the principle of priority." Because the family *Erysiphaceae* represents a clear morphological outlier within the *Helotiales*, an order largely composed of discomycetes, we retain the use of the latter name to maintain consistency with its historical application to this group of ascomycetes. Nevertheless, to recognize the well-supported placement of powdery mildews within the *Helotiales*—forming a distinct, strongly supported 'erysiphoid clade'—and to highlight their unique biological and morphological traits, we propose establishing the suborder *Erysiphineae* to accommodate the former order *Erysiphales*. The phylogenetically confirmed affiliation of the *Arachnopezizaceae*, as discomyceous family most closely allied to the *Erysiphaceae*, to the suborder *Erysiphineae* reflects the phylogenetic evolvement of powdery mildews amongst discomycetes.

Zusammenfassung: Braun, U. & Bradshaw, M. 2025: Neubewertung der Ordnung *Erysiphales* in ihrer gegenwärtigen Zuordnung. Schlechtendalia **42**: 282–284.

In einer unlängst veröffentlichten umfassenden Behandlung der Phylogenie der Ordnung *Helotiales* (*Ascomycota*) wurden die Mehltaupilze (Ordnung *Erysiphales*, Familie *Erysiphaceae*) in die Umgrenzung der neue definierten Ordnung mit einbezogen. Somit wurde der Namen *Erysiphales*, zusammen mit weiteren Namen von Ordnungen, formal zum Synonym der *Helotiales* gemacht, ungeachtet nomenklatorischer Aspekte. Der 1884 eingeführte Name *Erysiphales*, der viel älter ist als der 1932 eingeführte Name *Helotiales*, stellt den ältesten Namen für die neu umgrenzte Ordnung *Helotiales* dar. Nach Art. 11.10 des Madrid Codes (ICNafp) gilt das Prinzip der Priorität jedoch nicht für Namen oberhalb der Rangstufe Familie, so dass die Anwendung des Namens *Helotiales* in diesem Fall in Übereinstimmung mit den Regeln des Codes ist, obwohl Rec. 16A.1 des gegenwärtigen Codes empfiehlt, dass Autoren bei der Auswahl des Namens eines Taxons oberhalb der Rangstufe Familie generell dem Prinzip der Priorität folgen sollten. Da die Familie *Erysiphaceae* eine klare Ausnahme innerhalb der hauptsächlich von Discomyzeten gebildeten *Helotiales* darstellt, behalten wir die Verwendung des letzteren Namens bei, um Kontinuität die historischen Verwendung des Namens für dieser Gruppe von Ascomyceten zu erhalten. Um die gut unterstützte Stellung der Mehltaupilze innerhalb der *Helotiales* zu würdigen, die ein hoch unterstütztes Clade („erysiphoid Clade") bilden und besondere biologische und morphologische Merkmale innerhalb der Ordnung aufweisen, schlagen wir allerdings vor, die Unterordnung *Erysiphineae* für die frühere Ordnung *Erysiphales* einzuführen. Die phylogenetisch bestätigte Zuordnung der *Arachnopezizaceae*, als Dicomyzeten-Familie mit engster Verwandtschaft zu den Erysiphaceen, zur Unterordnung *Erysiphineae*, spiegelt die phylogenetische Entstehung der Mehltaupilze unter Discomyzenten wider.

Keywords: Code, priority, powdery mildews, order, new suborder.

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The powdery mildews, belonging to the *Ascomycota*, are one of the most important, economically relevant groups of obligate plant pathogens with a wide host range and almost worldwide distribution (Amano 1986, Braun & Cook 2012, Bradshaw et al. 2024). They are nowadays generally assigned to the family *Erysiphaceae*, which is comprised of powdery mildew genera (the history of the treatment of powdery mildews on family level has been discussed in detail by Braun (1987) and Braun & Cook (2012). Furthermore, the family *Erysiphaceae* has until recently been placed in the monotypic order *Erysiphales*. However, uncertainty and confusion prevailed for a long time as to the nomenclature of the names *Erysiphaceae* and *Erysiphales*. In a proposal to conserve the family name *Erysiphaceae* against the old forgotten name *Oidiaceae*, Doweld (2014) pointed out that the first valid introduction of the name *Erysiphaceae* goes back to Sredinsky (1873), and that the order *Erysiphales*, previously usually ascribed to Gwynne-Vaughan (1922), was first introduced by Warming (1884). Braun (2017) provided a more detailed discussion on the history of the names *Erysiphaceae* and *Erysiphales*, focussing on older but not validly published names in this context.

The taxonomic placement of powdery mildews at the order level was fundamentally revised when a comprehensive phylogenetic analysis and reclassification of the *Leotiomycetes* by Johnston et al.

(2019) redefined the *Helotiales* to include the former *Erysiphales*, along with several other orders. *Arachnopeziza* (*Arachnopezizaceae*) turned out to be the closest relative of powdery mildews. However, the inclusion of powdery mildews in a predominantly discomycetous order was not completely surprising. Saenz et al. (1994) postulated a close affinity of the powdery mildew genus *Blumeria* to *Sclerotinia sclerotiorum* (*Scerotiniaceae*, *Helotiales*), and Pfister & Kimbrough (2001) assigned the powdery mildews to an assemblage of discomycetes. The new, emended circumscription of the *Helotiales*, including *Erysiphales*, is scientifically sound and should be recognized. It had already been emphasized by Hibbett et al. (2007) that the exclusion of the *Erysiphales* from the *Helotiales* would render the latter order paraphyletic. Haelewaters et al. (2021) followed Johnston et al. (2019) and formally treated the orders *Cyttariales* and *Erysiphales* as synonyms of *Helotiales*. However, there is an aspect of the newly circumscribed *Helotiales*, which has not yet been addressed.

According to the current Madrid Code (ICNafp), https://www.iaptglobal.org/_functions/code/madrid, the principle of priority does not apply above the rank of family. Therefore, the application of the name *Helotiales* for the newly circumscribed order by Johnston et al. (2019) and Haelewaters et al. (2021) is not in conflict with the Code, although Rec. 16.A.1 recommends to follow the principle of priority also in cases of names above the rank family. In the case of the newly circumscribed order *Helotiales*, published in 1932 (Nannfeld 1932), the included name *Erysiphales* (Warming 1884) is much older and would have priority when authors would follow Rec. 16.A.1. However, the given preference to the name *Helotiales* by Johnston et al. (2019) was a deliberate decision and not arbitrary. The order *Helotiales*, also in its current, wide circumscription, is largely comprised of typical discomycetes, whereas powdery mildews are biologically and morphologically an extreme outlier in this order. The application of *Erysiphales* for this order would cause confusion and disruption of the long-lasting traditional usage of *Helotiales*. Therefore, we accept this decision and follow Johnston et al. (2019). *Helotiales* in the new wide circumscription has also been recognized in the recently published survey of *Ascomycota* orders (Thiyagaraja et al. 2025). However, apothecial *Arachnopezizaceae* (Baral 2015) and the unique *Erysiphaceae* family form a strongly supported clade within the *Helotiales* which warrants the recognition of these families as formal category within this order. Therefore, we propose to introduce the new suborder *Erysiphineae* for the two families that form the "erysiphoid clade" (Johnston et al. 2019).

Helotiales Nannf., Nova Acta R. Soc. Scient. Upsal., Ser. 4, **8**(2): 68, 1932, emend. Johnston et al. (2019)

Helotiales subordo ***Erysiphineae*** U. Braun & M. Bradshaw, **subordo nov**.

MycoBank, MB861141.

Syn.: *Erysiphales* E. Warming, Haandbog i den Systematiske Botanik, Ed. 2: 63, 1884.

Typification (type name): *Erysiphe* DC., 1805 (*Erysiphaceae*).

Forming a highly supported clade within the *Helotiales* ("erysiphoid clade" according to Johnston et al. 2019) in phylogenetic multi-gene analyses (with up to 15 concatenated genes, including some available genomes).

Comments: The inclusion of the families *Erysiphaceae* and *Arachnopezizaceae* in the "erysiphoid clade" "erysiphoid clade" (Johnston et al. 2019) and hence in suborder *Erysiphineae* is the current state of science, which reflects the previously unexpected emergence of powdery mildews within helotialean discomycetes. The inclusion of the *Arachnopezizaceae* cannot be considered absolutely secure. A broadened sampling of allied fungal groups or more comprehensive whole genome sequences might change structure of the analyses and trees, i.e., it cannot be excluded with absolute security that the *Arachnopezizaceae* rather represent a sister group of the powdery mildews requiring a suborder of its own. In general, the whole *Helotiales* group in the analyses published by Johnston et al. (2019) is comprised of many highly supported clades which have been informally designated as "clades" (such as the "erysiphoid clade," "helotioid clade," etc.) Most of them likely deserve to be recognized as suborders.

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