https://fungalgenera.org/: a comprehensive database providing web-based information for all fungal genera

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Abstract
Maintaining and updating databases and checklists of genera of fungi is an essential task for most fungal research. Advances in molecular techniques in the last 20 years have greatly influenced the fungal taxonomy and classification. Consequently, it is important to have access to all existing data and for these data to be continuously updated with recent changes. To address this issue, a website: https://fungalgenera.org/, was established in 2017 and introduced in this paper. This website provides basic information and links to data for all fungal genera with easily accessible and searchable functions.
Keywords – Database – Genera of fungi – Phylogeny – Taxonomy

Introduction
Fungal taxonomy is an integral part of fungal research. The importance of fungal taxonomy is evident in biodiversity and conservation, environmental monitoring, agriculture biotechnology and bioprospecting (Jayasiri et al. 2015, Hyde et al. 2019c). In the past decade, the knowledge of taxonomy and classification of fungi has advanced significantly. This is mainly due to the improvement and widespread application of molecular techniques used to study the fungal phylogeny and delineate species and relationships among taxa (Seifert et al. 2011). A combination of morphological and DNA sequence data has been successfully used to resolve new genera and species (Rossman & Palm-Hernández 2008). Changes outlined in the International Code of Nomenclature for algae, fungi, and plants (ICN) in 2012 has led to the end of the dual nomenclature for pleomorphic fungi (Hawksworth 2011). This has resulted in the publication of a list of protected fungal generic names (Kirk et al. 2013), which was later adopted and published in the Shenzhen Code 2018 (Turland et al. 2018).


The need for fungal genera database
Databases have the role of bringing data together, and online databases have become major tools for obtaining information worldwide. Current taxonomic studies have been expanded through numerous fungal databases, which provide valuable sources to find existing information concerning fungi (e.g. Jayasiri et al. 2015). The key taxonomic and nomenclatural databases of fungi include Index Fungorum, Species Fungorum and MycoBank. The NCBI, EBI and UNITE databases have been used to link DNA sequence data with fungal taxa.

Some of these databases, however, lack up-to-date information according to recent nomenclatural and taxonomic changes from various studies and none are not linked together (e.g. Hyde et al. 2013, 2019a, Wijayawardene et al. 2014, Senanayake et al. 2015, Maharachchikumbura et al. 2015, 2016, He et al. 2019). There have been several attempts to publish outlines that compile all existing data for Ascomycota and their asexual genera (Lumbsch & Huhndorf 2010, Hyde et al. 2011, Wijayawardene et al. 2012, 2017a, b, 2018a, b, Kirk et al. 2013, Jaklitsch et al. 2016, Ekanayaka et al. 2017, Hongsanan et al. 2017, Hyde et al. 2017, Liu et al. 2017, Lücking et al. 2017). Each published article, however, only provides a snapshot of the accepted taxonomy and nomenclature at the time of writing. It is essential to bring all these information together in a comprehensive database that is continuously updated. While Face of Fungi database has a role to deposit and provide comprehensive metadata of fungi, it mainly focuses on the species level. Therefore, this website will provide more details with the emphasis on genera.

The website: https://fungalgenera.org/
This website provides basic data and links to data for all genera of fungi. The purpose of the
site is to (1) provide a search facility to the notes and up-to-date classification of all accepted genera of fungi which includes the main fungal groups (Ascomycota, Basidiomycota, basal fungi), (2) maintain updated databases and higher classification of fungal genera and (3) supply links to all the important data of fungal genera including a list of recent publications.

Notes concerning placement and status are provided for each genus. These include classification, type species, the number of accepted species, life modes, geographic distribution, and culture and sequence availability. Links to online databases and recently published data are also provided. We will further expand the information of each genus, with descriptions, photographic plates, phylogenetic trees, keys to genera and other important data through the links from other related webpages (Face of Fungi: http://www.facesoffungi.org/, One Stop Shop: https://onestopshopfungi.org/, Marine fungi: http://marinefungi.org/) and other upcoming webpages (Basidiomycota fungi: http://www.basidio.org/, Freshwater fungi: http://freshwaterfungi.org/). The fungal genera database will enhance better understanding of fungal genera and allow mycologists to gain new insights into updated fungal taxonomy and classification. This webpage is user-friendly, and facilitates easy access to relevant information and easy search for genera.

Construction

All fungal genera in the database are listed according to the most recent classifications of Ascomycota (Wijayawardene et al. 2017a, 2018a), Basidiomycota (He et al. 2019), and basal fungi (=lower fungi) (Wijayawardene et al. 2018c). The database will be updated regularly to include new information on genera of fungi as they become available.

Database interface and visualization

The website incorporates several functions with a simple and user-friendly interface. The homepage provides a general introduction to the database (Fig. 1). There are two options to find information on fungal genera: (1) use the search box at the top of the homepage (Fig. 2) or (2) select the phyla listed in the menu bar of the homepage (“Ascomycota”, “Basidiomycota” and “Lower fungi”). Each phylum contains a scroll down menu listing classes, families and genera (Fig. 3). Clicking on the genus name reveals data on the genus. Each entry provides important information on the genus and links to other webpages (Fig. 4). We have invited international curators with expertise in various groups of fungi to continuously monitor the webpages and to suggest improvements (Table 1). Other interested parties can contact the moderator with their suggestions, or they can offer their service as curators.

Fig. 1 – The homepage view of fungal genera database
Fig. 2 – The use of search box to find the information of genera

Fig. 3 – A scroll down list of phyla, classes, families and genera

Fig. 4 – Information on each genus with links to access important references and databases
Table 1 Fungal groups and curators

<table>
<thead>
<tr>
<th>Fungal Group</th>
<th>Curators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ascomycota</td>
<td>Kevin D. Hyde, Eric H. C. McKenzie</td>
</tr>
<tr>
<td>Dothideomycetes</td>
<td>Alan J. L. Phillips, Sinang Hongsanan, Dhandevi Pem, Jian-Kui Liu, K. W. Thilini Chethana</td>
</tr>
<tr>
<td>Eurotiomycetes</td>
<td>Qing Tian</td>
</tr>
<tr>
<td>Leotiomycetes</td>
<td>Anusha H. Ekanayaka, Anis Lestari</td>
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<tr>
<td>Pezizomycetes</td>
<td>Ming Zeng, Qi Zhao</td>
</tr>
<tr>
<td>Sordariomycetes</td>
<td>Chada Norphanphoun, Pranami Abeywickrama, Sajeewa S. N. Maharachchikumbura, Ruvishika S. Jayawardena, Yi-Jyun Chen</td>
</tr>
<tr>
<td>Basidiomycota</td>
<td>Rui-Lin Zhao, Mao-Qiang He, Olivier Raspé</td>
</tr>
<tr>
<td>Basal fungi</td>
<td>Paul M Kirk, Eleni Gentekaki</td>
</tr>
</tbody>
</table>

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