https://www.fungiofpakistan.com: a continuously updated online database of fungi in Pakistan

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Abstract

The website fungiofpakistan.com is a collection of all the available data about macro- as well as micro-fungi collected from Pakistan. This website comprises reported fungal species with isolation source or host record, locality and updated classification. The data on this website is based on old literature (library data, personal data of specific authors or books that were not easily accessible to public) and recent publications. This website is an important potential platform for researchers, government officials, industries and other users. Users can provide their inputs related to missing taxa, new genera, the new record and new data. They also have the opportunity to express their opinions on valid names, invalid names and illegitimate names, with notes published in the 'Notes' section of webpage provided following review and editing by curators and fungal taxonomists. This website plays a significant contribution to our knowledge of the rich fungal diversity of Pakistan. However, much more sustained and detailed research is needed to fully evaluate fungal diversity in Pakistan. Undoubtedly, that many more fungi will be discovered and added in the future.

Database URL: https://fungiofpakistan.com/

Introduction

Pakistan is recognized as one of the mega-diverse countries in the world with estimated 6000 plant species known from Pakistan (1, 2). Despite years of research, the flora of Pakistan is poorly known. Generally, the flora of Irano-Turanian Region (Western Himalayan Province) is well known than the other provinces of Pakistan. The diversity of Asteraceae, Apiaceae, Brassicaceae, Fabaceae and Lamiaceae is known from various published works (3). The information on other families is still lacking and their checklist for Pakistan is yet to be compiled. In contrast, the fungal diversity of Pakistan is much less well known than that of flora of Pakistan.

Identifying this biodiversity gap, back in 1999, Syed Irtifaq Ali (S.I Ali) from University of Karachi (principal editor of flora of Pakistan) proposed a plan to Peter H. Raven from Missouri botanical garden, USA to complete the flora of Pakistan as a co-publisher and efforts are still underway. Likewise, the first introductory chapter about the fungal checklist that contained more fungal species than identified by Sultan Ahmed (S. Ahmed) from the different regions of Pakistan was introduced by Mirza and Qureshi (4). A brief history of collecting fungi in Pakistan has been detailed

below. Given limited fungal taxonomic expertise and the resources available at their disposal in the country, it is highly unlikely to obtain a complete inventory of fungi. Experience from numerous other projects that involved expert fungal taxonomist equipped with resources has shown that more concentrated work needs to be conducted over several decades.

Nevertheless, efforts have been underway at the University of the Punjab (PU), since June 2003 wherein they established 'first Fungal Culture Bank of Pakistan' (FCBP) to build inventory of the fungi and have published many fungal species in the newsletter (previously known as 'Myconews' which recently changed to 'Agrinews') or local journal (Mycopath) with accession numbers (5). We collected the information of isolated strains and have put it on a single platform (fungiofpakistan.com). This information could be very useful not only for comprehensive record and better appreciation of Pakistan fungal biodiversity but also as a source of reference for other scientists working on the same aspect of fungi such as biological control, biotechnology, fungi for food and medicine, fungal genetics, pest and disease control, plant pathology and other related subjects.

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The fungi, according to updated classification, listed in the fungiofpakistan.com online database are sourced from books, published articles and inventory of FCBP. Presently, our website includes members from nine fungal phyla. These phyla are Ascomvcota. Basidiomvcota. Blastocladiomycota, Chytridiomycota, Entomophthoromycota, Glomeromycota, Kickxellomycota, Mortierellomycota, Mucoromycota and Zoopagomycota. Fungi-like organism/taxa belong to Hyphochytriomycota and Oomycota (Kingdom Straminipila). Nevertheless, this does not imply that other phyla members are absent in Pakistan. It only demonstrates that they have not been reported in the available literature. We may have left out a few fungi especially those reported in older publications or in publications that we overlooked (in this case, users have an option to submit the data). All fungal genera used in the list have been checked and updated with those listed in the outline of fungi and fungi-like taxa (6), Index Fungorum and/or Mycobank (7) but species name further needs to be checked either are valid names, invalid names or illegitimate names.

Brief history and previous checklists

Knowledge regarding Fungi of Pakistan endeavor variety of macro- and micro-fungi from different areas of the country. One of the major documents on the fungal history of subcontinent is Butler and Bisby (8) that provided a list of 2351 fungi belonging to order Uredinales, perithecial stages of family Erysiphaceae (15 species) and sooty moulds (64 species) from British India. Seventy collections of Indian smuts were critically re-identified by Mundkur (9). Mundkur (10) studied and listed fungi from North western part of India. However, Butler and Bisby (8) and Mundkur (10) published around 200 species of order Uredinales from the area that represents Pakistan (formally known as West Pakistan before independence of East Pakistan). Then, Mundkur and Ahmad collaborated to work together on the description of different groups of fungi from Pakistan.

The earlier known collections of fungi from the regions that make up present-day Pakistan i.e. West Punjab and Sindh, Punjab and KPK provinces, or some parts of Sindh province including Karachi, were made between 1948 and 1972 by several studies (11–21) and by Ghaffar in late 60s and early 70s (22–24). Many species of coelomycetous fungi from southern parts of Pakistan were collected and described by Sutton and Abbas (25), Abbas and Sutton (26) and Abbas *et al.* (27–31).

Fungal species of order Agaricales, number of rust and smut species were described comprehensively by Ahmad (32), Ono (33) and Ono and Kakishima (34, 35). Myco-flora was also contributed by various authors individually in the form of publications from specified areas instead of any monograph or booklet such as 'Mushrooms of Kashmir' (36, 37), Basidiomycota of Kaghan Valley (38), fungi on mangrove plants (39), checklist of the Lichens (40), checklist of *Boletales* (41, 42), checklist of Ascomycetes and Gasteromycetes of Kaghan Valley (43), species diversity in Basidiomycota of district Malakand (44) and records of *Russula* species (45).

The most eminent and influential mycologist in Pakistan was S. Ahmed (Sultan Ahmed). His contribution to botany and conservation is well known and laid the groundwork for understanding of fungal myco-flora and huge taxonomic work for biodiversity in Pakistan. His comprehensive work recorded 1219 species in Pakistan and was published in 1997 (46). The second edition of Fungi of Pakistan was a reprint of the first edition without any updated information, published in 2014 (47). Many of his collections were deposited in Mycological Herbarium of the Department of Botany, University of Punjab, Lahore, Pakistan, duplicates in Herb. I.M.I, Kew, Surrey, England and also in the Mycological Herbarium of USDA, Beltsville, MD, USA. Nothing is known about the fate of those early collections that were deposited in Mycological Herbarium in Pakistan and others, they are now probably all lost or destroyed. How we can trace and find their deposition record is still a question mark as those are not listed in the publications.

Various culture collection centers across the country work for myco-flora isolation, identification and deposition of various culturable strains. The first Fungal Culture Bank of Pakistan (FCBP) was established in 2003 at the University of Punjab (5). Among all, few of them have a proper online catalogue describing the strain's history, molecular evidence or status of a publication. Some published data is found having no clue about its disposition to any culture center (48, 49). Due to the unavailability of the published strains at collection centers, their viability is doubtful.

Gaps and limitations of existing data

The authors recognized a few limitations while compiling the checklist.

- (i) The taxonomic/nomenclature status of many fungi listed by S. Ahmed has since not been revised and the list is outdated.
- (ii) Most of the old publications and fungal records present in printed form are unavailable to local as well as the international research community.
- (iii) Fungal species that were published before 1958 are still valid although the type was not indicated.
- (iv) There is no specific number for fungal species reported from Pakistan and information about which isolate has molecular data is also lacking.

Overcoming limitations of static publications

The website fungiofpakistan.com is launched to provide a continuously updated list of fungal species that have been reported from Pakistan since 1947. Despite the previously available data, it is essential and need of the day that reported strains should be organized based on the available information. While compiling the checklist for the website, collection of data, putting it into electronic form and updating it according to the recent classification were indeed a challenge. Other related information such as substrate, the location where they were observed and isolated or collected and the related references are provided. Where 'unknown' is stated in the online database under achieve and Fungi of Pakistan hierarchy, especially to substrate or location, indicates that relevant information was not provided in the original publication. Fungal species concerning their culture collection accession number were listed such as 'PU' (refers to the University of Punjab) culture collection number. This platform provides valuable information about all reported strains from Pakistan.



Figure 1. Fungi of Pakistan logo design represents the online database.

Its applicability will be helpful to get knowledge about mycoflora of country and also will be able to help researchers to find updated taxonomy, history, molecular details, and status of the strains.

Fungi of Pakistan web page and logo representation

The Fungi of Pakistan online resource has several strong positive features, and its main objectives are to

- (i) Provide the myco-flora of significant and insufficiently known regions and keep a record of it.
- (ii) Present the continually updated consensus of fungi classification.
- (iii) Provide a platform to introduce the molecular data of previously reported species rather than to describe them as novel species with molecular data.
- (iv) Provide details and notes on important changes to the registered users via this platform.
- (v) Provide an opportunity to graduate students, researchers and scholars to add missing data and put suggestions to modify the data with critical comments based on expert opinions.

Fungi of Pakistan e-portal has a unique logo (Figure 1) and its design represents a clear picture of the online database. The logo is in green color and circular in shape with a red ribbon at the base that includes an abbreviation of Fungi of Pakistan (FOP). Fungal features are brilliantly depicting the array of micro- and macro-fungi within the white and green color scheme. White and green colors are resembled with the flag of Pakistan to present growth, prosperity, purity and uniqueness, while red highlights the passion and love for fungi. The black outline around the green circle is a sign of power, authority, seriousness and strength. The name of the

Construction

Fungal genera recorded from Pakistan are, listed on the website, following the latest classification of kingdom fungi (6, 50).

Website interface and visualization

The home page includes seven tabs and other related information including a summary of the online database. We tried our best to make this website user-friendly and simple interface (Figure 2).

Tools included on the homepage

The home page includes the following tools:

- (i) Home: This online resource homepage provides an overview of the fungi of Pakistan and the objectives of launching the website. It contains the current number to phyla, classes, orders, families, genus, species, fungal-like taxa, ambiguous genera, reported novel species and reported species with sequence data. It also includes search option, the data submission button and a signup option for the latest updates. The list and contact details of all curators of the website can be found at bottom of the homepage and at the 'meet all' option (Figures 2 and 3).
- (ii) History: This section provides a brief history of fungi collecting in the region, Pakistan (Figure 4).
- (iii) Outline: This section provides the latest classification and list of fungal genera recorded from the region (Figure 5).
- (iv) Achieves: This section provides a hierarchy of fungal species reported from Pakistan (Figure 6).
- (v) Notes: This section provides the recent changes in taxonomy, novel species and new records.
- (vi) More: This section includes the following options:(a) Herbarium: This part provides the herbarium centers within the country dealing with the preservation of fungal specimens (Figure 7).
 - (b) Mycologists: This part provides the list and contact details of mycologist/taxonomists working in Pakistan (Figure 8).
 - (c) Databases: This part provides the list of online databases related to mycology around the world and in Pakistan (Figure 9).
- (vii) Contact: The 'contact' section allows the users to address any comment and suggestion (Figure 10).

Notes section and preparation

This is an important part of fungiofpakistan.com, which provides information on new additions, modifications and





The Fungi Of Pakistan **Online Resource**

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Fungi Of Pakistan



Figure 2. The homepage view of fungiofpakistan.com.



Figure 3. Experts team in database management.

user opinions. This provides an opportunity for users to understand recent changes.

Changes could be due to the following main reasons:

- (i) Classification changes by following recent publications.
- (ii) Addition of new or missing taxa, reported from Pakistan.
- (iii) Corrections and errors in uploaded data (e.g. wrong placement and duplication of taxa).

Preparation of notes will follow specific conditions:

(i) The addition of new taxa or published material that introduces new taxa is cross-checked with repositories such as Mycobank or Index Fungorum by the managing curators. Their main task is to keep the website up to date. As the second step, the new entries or addition will be checked by the senior curators. Once the new entries are edited by the managing curator, according to the





Figure 4. Brief history of fungi collected in Pakistan.



Figure 5. Fungi of Pakistan outline.

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Figure 6. Use of Archives tool.

senior comments, the head curator will cross-check the validity of taxa against repositories and upload it to the website. The list of new taxa will also be gathered from MycoBank or Index Fungorum, twice a year. Authors who publish new taxa (from Pakistan) are encouraged to provide entries.

(ii) Notes for missing taxa are expected from website users and expert mycologists. They can use the data

submission option on the home page to send the entries to curator (Figure 3).

(iii) Notes that correct errors or mistakes (such as typo errors and incorrect citation) will also be accepted by the website users. However, the head curator will check whether entries are necessary to upload or correct the web version.



Herbarium

Mycological Sources In Pakistan

Herbarium is a priceless resource to document the earth's biodiversity. Herbaria [fungoria] are places where dried material of plants [fungi] is permanently preserved. There are total 28 herbarium sources found in "The William & Lynda Steere Herbarium" which is one of the largest herbaria in the world. Most of herbarium sources around the country deals with preservation of plants. The following herbarium are active and dealing with preservation of fungi.



Herbarium Code	Institution	Location	Correspondents	Contact
СНІТ	University of Chitral	Chitral, Khyber Pakhtunkhwa, Pakistan	HAFIZ ULLAH	hafizullah@uoch.edu.pk +92 - 943 412401
HUP	Hazara University Mansehra	Mansehra, Pakistan	Abdul Majid and Jan Alam	janalamkuh@yahoo.com abdulmajidhu@gmail.com +92344 8924599 +92333 5056966
GCUSAH	GC University, Lahore	Lahore, Punjab, Pakistan	Safdar Mirza	drsultanaherb@gcu.edu.pk +92314 4108281
ICFP	Islamia College University Peshawar	Peshawar, Khyber Pakhtunkhwa, Pakistan	Ishtiaq Ahmad	ishtiaqmatta@gmail.com +923329702607
PUP	University of Peshawar	Peshawar, Khyber Pakhtunkhwa, Pakistan	Abdur Rashid	botanyuop@yahoo.co.uk +92919222252
QARSHI	Qarshi Industries (Pvt.) Ltd.	Haripur, Pakistan		rashid.afzal@qarshi.com +92995 617275
RAWWU	Rawalpindi Women University	Rawalpindi, Pakistan	Dr. F. Bibi	brine4f@gmail.com
LAH	University of the Punjab	Quaid-e-Azam Campus Lahore, Pakistan	Javed Iqbal	javeds@wol.net.pk



Figure 7. Information on herbarium centers within Pakistan.



Mycological Community In Pakistan

The following personalities are representing academic research across the field of mycology/taxonomy.

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Figure 8. Information of mycological community for international collaboration.





Figure 9. Some fungi related databases.

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Figure 10. Tool for user comments and suggestions.

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Conflict of interest

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References

- 1. Stewart, R.R. (1972) An Annotated Catalogue of Vascular Plants of West Pakistan and Kashmir. Fakhri Printing Press, Karachi.
- 2. Butler,R.A. (2020) *Total number of plant species by country.* https://rainforests.mongabay.com/03plants.htm (1 July 2021, date last accessed).
- 3. Peter,H. (2020) *Flora of Pakistan*. http://legacy.tropicos.org/Project/Pakistan (1 July 2021, date last accessed).
- 4. Mirza, J.H. and Qureshi, M.S.A. (1978) *Fungi of Pakistan*. University of Agriculture, Pakistan, p. 311, 202
- 5. Bajwa,R. (2006) Scope of first fungal culture bank of Pakistan. *Mycopath.*, 4, 41–43.
- Wijayawardene, N.N., Hyde, K.D., Al-Ani, L.K.T. et al. (2020) Outline of fungi and fungus-like taxa. Mycosphere, 11, 1060–1456.
- 7. Redhead,S.A. and Norvell,L.L. (2012) MycoBank, index fungorum, and fungal names recommended as official nomenclatural repositories for 2013. *IMA Fung.*, **3**, 44–45.
- Butler,E.J. and Bisby,G.R. (1933) *The Fungi of India*. Vol. 1. Imperial Council of Agricultural Research Sci. Monogr., Calcutta, p. 337.
- Mundkur,B.B. (1940) A second contribution towards a knowledge of Indian Ustilaginales: Fragments xxvi–l. Trans. B. Mycol. Soc., 24, 312–336.
- Mundkur,B.B. (1938) Fungi of India. Suppl. I. Imp. Counci. Agri. Res. Inida. Sci. Mon., 12, 1–54.
- 11. Ahmed, S. (1948) Fungi of Pakistan-I. Sydowia, 2, 72-79.
- 12. Ahmed, S. (1950) Fungi of Pakistan II. Sydowia, 4, 82-83.
- 13. Ahmed, S. (1951) Fungi of Pakistan III. Sydowia, 5, 390-395.
- 14. Ahmad,S. (1952) *Gasteromycetes of West Pakistan*. Punjab University Press, Lahore. pp. 1–92.
- 15. Ahmad,S. (1956) Fungi of Pakistan. Biol. Soc. Pak. Lah. Mono., 1, 1–126.
- 16. Ahmad, S. (1956) Uredinales of Pakistan. Biol., 2, 29-101.
- 17. Ahmad,S. (1956) Ustilaginales of West Pakistan. Mycol. Papers, 64, 1-17.
- Ahmed,S. (1969) Contributions to the fungi of Pakistan. IX. *Biol.*, 15, 1–10.
- Ahmed,S. (1972) Contributions to the fungi of Pakistan. XIII. Biol., 18, 1–6.
- 20. Ahmad,S. (1972) Basidiomycetes of Pakistan. Biol. Soc. Pak. Lahore Mono., 6, 141.
- Müller, E. and Ahmed, S. (1955) Über einige neue oder bemerkenswerte Ascomyceten aus Pakistan. I. (About some new or remarkable Ascomycetes from Pakistan. I.). Sydowia, 9, 233–245.
- 22. Ghaffar, A. and Kafi, A. (1968) Fungi of Karachi. Pak. J. Sci., 20, 5-19.
- 23. Ghaffar, A., Abbass, S.Q. and Kafi, A. (1971) Fungi of Karachisuppliment I. *Pak. J. Sci.*, 23, 261–266.
- Ghaffar, A. and Abbass, S.Q. (1972) Fungi of Karachi-suppliment II. Pak. J. Bot., 4, 195–208.

- 25. Sutton,B.C. and Abbas,S.Q. (1986) Aphanoflax irregularis sp. Nov., from Pakistan. Trans. Brit. Mycol. Soc., 87, 640-642.
- Abbas,S.Q. and Sutton,B.C. (1988) An addition to Avettaea (Coelomycetes) from Pakistan. Trans. B. Mycol. Soc., 90, 491–494.
- Abbas,S.Q., Sutton,B.C. and Ghaffar,A. (1998) Seimatosporiella gen. nov., an addition to Coelomycetes from Pakistan. Pak. J. Bot., 30, 271–278.
- Abbas,S.Q., Sutton,B.C. and Ghaffar,A. (1999) New species of Coniothyrium on Salvadora from Pakistan. Pak. J. Bot., 31, 407–436.
- 29. Abbas,S.Q., Sutton,B.C. and Ghaffar,A. (2000) An addition to *Sphaeropsis* from Pakistan. *Pak. J. Bot.*, **32**, 35–39.
- Abbas,S.Q., Sutton,B.C. and Ghaffar,A. (2000) An addition to Septoria from Pakistan. Pak. J. Bot., 32, 247–250.
- Abbas,S.Q., Sutton,B.C. and Ghaffar,A. (2001) *Cystotrichiopsis* Abbas, Sutton and Ghaffar gen. nov., an addition to *Coelomycetes* from Pakistan. *Pak. J. Bot.*, 33, 365–368.
- 32. Ahmad,S. (1980) A contribution to the Agaricales of Pakistan. Bull. Mycol. Faisalabad, 1, 35–90.
- Ono,Y. (1992) Uredinales collected in Kaghan Valley, Pakistan. In: Nakaike, T. and Malik, S. (eds) Cryptogamic Flora of Pakistan. Vol. 1. National Science Museum, Michigan, pp. 217–240.
- Ono,Y. and Kakishima,M. (1992) Uredinales collected in Swat Valley, Pakistan. In: Nakaike, T. and Malik, S. (eds) Cryptogamic Flora of Pakistan. Vol. 1. National Science Museum, Michigan, pp. 197–216.
- Ono,Y. and Kakishima,M. (1993) Smut Fungi (Ustilaginales) collected in Pakistan. In: Nakaike, T. and Malik, S. (eds) Cryptogamic Flora of Pakistan. Vol. 2. National Science Museum, Michigan, pp. 187–214.
- Gardezi,S.R.A. (2003) Mushrooms of Kashmir IV. Asian J. Pl. Sci., 2, 1126–1134.
- 37. Gardezi,S.R.A. and Ayub,N. (2005) Mushrooms of Azad Jammu and Kashmir, their collection, identification and descriptions. *Arch. Phytopathol. Plant Prot.*, **38**, 53–68.
- Sultana,K. and Qureshi,R.A. (2007) Check list of *Basidiomycetes* (*Aphyllo*. and *Phragmo*.) of Kaghan Valley-11. *Pak. J. Bot.*, 39, 2629–2649.
- 39. Tariq, M., Dawar, S. and Mehdi, F.S. (2006) Occurrence of fungi on mangrove plants. *Pak. J. Bot.*, 38, 1293.
- 40. Aptroot, A. and Iqbal, S.H. (2010) Annotated checklist of the *Lichens* of Pakistan, with reports of new records. *Herzogia*, 25, 211–229.
- Sarwar,S. and Khalid,A.N. (2013) A Preliminary checklist of the Boletales in Pakistan. Mycotax., 121, 500.
- 42. Razaq,A. and Shahzad,S. (2016) New records of order *Boletales* from Pakistan. *Pak. J. Bot.*, **48**, 1313–1317.
- Sultana,K., Bhatti,M.I., Akram,A. et al. (2015) Check list of mushrooms Asco. and Gasteromycetes of Kaghan Valley III. Sci. Int., 27, 6199–6205.
- Hussain, S. (2016) Species diversity of *Basidiomycetes* of district Malakand. *PhD. Thesis*. Department of Botany Hazara University Mansehra.
- 45. Razaq,A., Rajput,A.Q. and Shahzad,S. (2019) New records of *Russula* species from Pakistan. *Pak J. Bot.*, 51, 255–258.
- Ahmad,S., Iqbal,S.H. and Khalid,A.N. (1997) *Fungi of Pakistan*. Mycological Society of Pakistan. Department of Botany, University of the Punjab, Lahore Pakistan.
- 47. Ahmad,S., Bilal,C., Imran,C. et al. (2014) Fungi of Pakistan. 2nd edn. Khalid Chaudhry, USA, pp. 1–136.
- 48. Butt,H., Mukhtar,T. and Batool,M. (2016) *Spilocaea pyracanthae* causing leaf scab on loquat in Pakistan. *Bragant.*, **75**, 76–78.
- 49. Abbas,S.Q., Perveen,A., Riaz,S. *et al.* (2016) New fungal records on *Psidium guajava* from Pakistan. *Proc. Pak. Acad. Sci.*, 53, 111–119.
- Tedersoo,L., Sánchez–Ramírez,S., Koljalg,U. *et al.* (2018) High– level classification of the fungi and a tool for evolutionary ecological analyses. *Fung Divers.*, 90, 135–159.