


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

Mubashar Raza ^{1,2,*†}, Lei Cai¹, Muhammad Waseem Abbasi³, Marium Tariq⁴ and Nalin N. Wijayawardene⁵

¹State Key Laboratory of Mycology, Institute of Microbiology, Chinese Academy of Sciences, Chaoyang District, Beijing 100101, P.R. China

²Department of Plant Pathology, College of Agriculture, University of Sargodha, Sargodha, Punjab 40100, Pakistan

³Department of Botany, University of Karachi, Karachi, Sindh 75270, Pakistan

⁴M.A.H. Qadri Biological Research Centre, University of Karachi, Karachi, Sindh 75270, Pakistan

⁵Center for Yunnan Plateau Biological Resources Protection and Utilization, Qujing Normal University, Qujing, Yunnan 655011, P.R. China

*Corresponding author: Tel: +86-10-6480 6139; Email: mubasharraza73@yahoo.com

†Alma mater.

Citation details: Raza, M., Cai, L., Abbasi, M.W. *et al.* <https://www.fungiofpakistan.com>: a continuously updated online database of fungi in Pakistan. *Database* (2021) Vol. 2021: article ID baab080; DOI: <https://doi.org/10.1093/database/baab080>

Abstract

The website [fungiofpakistan.com](https://www.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](https://www.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.

Received 5 July 2021; Revised 30 November 2021; Accepted 9 December 2021

© The Author(s) 2021. Published by Oxford University Press.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted reuse, distribution, and reproduction in any medium, provided the original work is properly cited.

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 Ascomycota, Basidiomycota, 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 sub-continent 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 myco-flora 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

database is featured in a wordmark in the green circle with two macro-fungi on either side while a few characteristics of micro-fungi are featured in the center. In fact, it would not be an exaggeration to say that the unique concept of Fungi of Pakistan logo design will contribute immensely to the website/database's success.

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

HOME HISTORY OUTLINE ARCHIVES NOTES MORE CONTACT [Data Submission & Updates](#)

Xylaria mellissii Photo: Mubashar Raza

Fungi Of Pakistan

This platform is a collection of all the available data with reference to macro as well micro fungi of Pakistan. 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 database, collection of data, putting into electronic form and updating it according to the recent classification was indeed a challenge. Other related information such as substrate, location where they observed and isolated or collected, and the related references are provided. Where "unknown" is stated in the database, especially to substrate or location, indicates that relevant information was not provided in the original publication. Fungal species with respect to their culture collection accession number were listed such as "PLU" (refers to University of the Punjab) culture collection number. This platform will provide valuable information about all reported strains from Pakistan. Its applicability will be helpful to get knowledge about myco-flora of country and also will be able to help researchers to find updated taxonomy, history, molecular details, and status of the strains.

The Fungi Of Pakistan Online Resource

has several strong positive features and its main objectives are to:

- 1 Provide the mycoflora of significant and insufficiently known regions and keep a record of it.
- 2 Present the continually updated consensus of fungi classification.
- 3 Provide a platform to introduce the molecular data of previously reported species rather than to described them as novel species with molecular data.
- 4 Provide details and notes on important changes to the registered users via this platform.
- 5 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

The Fungi Of Pakistan Online Resource has several strong positive features.

12 Phyla	42 Classes	109 Orders	308 Families
767 Genera	3,065 Species	1 Fungi-Like Organism	111 Ambiguous Genera, Species
751 Reported Novel Species	135 Species With Sequence Data	0 Viewers	28-Sep-21 Last Update

Our Curators

MEET ALL

Mubashar Raza | PhD, PostDoc
Head curator

Prof. Lei Cai
Senior curator

Prof. Nalin Wijayawardene
Senior curator

The website is launched to provide continuously updated list of fungal species which have been reported from Pakistan since 1947.

Quick Links

- > Home
- > History
- > Outline
- > Curators
- > Notes
- > Databases
- > Contact

Information

Phone
+923347544751

Address
Mubashar Raza
Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, China.

Email
mubasharraza73@yahoo.com


Figure 2. The homepage view of fungiofpakistan.com.

HOME HISTORY OUTLINE ARCHIVES NOTES MORE CONTACT Data Submission & Updates


CURATORS

Home > Curators


Our Expert TEAM




Mubashar Raza | PhD, PostDoc
Head curator
 mubasharraza73@yahoo.com
 Country (Pakistan) representative to Asian Mycological Association.
 Institute of Microbiology, CAS, Beijing, China.




Prof. Lei Cai
Senior Curator
 call@im.ac.cn
 Institute of Microbiology, Chinese Academy of Sciences, Beijing, China.




Prof. Nalin Wijayawardene
Senior Curator
 nalinwijayawardene@yahoo.com
 Center for Yunnan Plateau Biological Resources Protection and Utilization, Qujing Normal University, China.



M Waseem Abbasi | PhD
Managing curators
 abbasimw@gmail.com
 Department of Botany, University of Karachi, Karachi-75270, Pakistan.



Marium Tariq | PhD
Managing curators
 mariumtariq2@gmail.com
 M.A.H. Qadri Biological Research Centre, University of Karachi, Karachi-75270, Pakistan.



The website is launched to provide continuously updated list of fungal species which have been reported from Pakistan since 1947.

Quick Links

- > Home
- > History
- > Outline
- > Curators
- > Notes
- > Databases
- > Contact

Information

Phone
+923347544751

Address
Mubashar Raza
Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, China.

Email
mubasharraza73@yahoo.com

Copyright © 2021 Fungi Of Pakistan | Powered by Fungi Of Pakistan

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



[HOME](#) [HISTORY](#) [OUTLINE](#) [ARCHIVES](#) [NOTES](#) [MORE](#) [CONTACT](#)

[Data Submission & Updates](#)

HISTORY

Home > History

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 fungal history of sub-continent is Butler and Bisby (1993) that provided a list of 2,351 fungi belongs to order Uredinales, perithecial stages of family Erysophyceae (15 species) and sooty moulds (64 species) from British India. Seventy collections of Indian smuts were critically re-identified by Mundkur (1940). Mundkur (1938) studied and listed fungi from North western part of India. However, Butler and Bisby (1993) and Mundkur (1938) 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 for 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 (Ahmad 1948, 1950, 1951, 1952, 1955a, 1955b, 1956c, 1969, 1972a, 1972b; Müller and Ahmad, 1955) and by Ghaffar in late 60s and early 70s (Ghaffar and Kaf, 1968; Ghaffar et al., 1971; Ghaffar and Abbas, 1972). Many species of coelomycetous fungi from southern parts of Pakistan were collected and described by Sutton and Abbas (1986), Abbas and Sutton (1988), Abbas et al. (1998, 1999, 2000a, 2000b).


Fungal species of order Agaricales, number of rust and smut species were described comprehensively by Ahmad (1980), Ono (1992) and, Ono and Kakishima (1992, 1993). 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' (Gardezi 2003; Gardezi and Ayub 2005), Basidiomycota of Kaghan Valley (Sultana and Qureshi, 2007), fungi on mangrove plants (Tariq et al., 2006), checklist of the Lichens (Aproot and Iqbal, 2010), checklist of Boletales (Sarwar an Khalid, 2006; Razaq and Shahzad, 2016), checklist of Ascomycetes and Gasteromycetes of Kaghan Valley (Sultana et al., 2015), species diversity in Basidiomycota of district Malakand (Hussain, 2016) and records of Russula species (Razaq et al., 2019).

The most eminent and influential mycologist in Pakistan was S. Ahmed (Sultan Ahmed). His contribution to botany and conservation is well known that laid the groundwork of our understanding to fungal myco-flora and huge taxonomic work for biodiversity in Pakistan - his comprehensive work recorded 1219 species in Pakistan and was published in 1997 (Ahmad et al., 1997). The second edition of fungi of Pakistan was reprint of first edition without any updated information, published in 2014 (Ahmad et al., 2014). 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.

There are various culture collection centers across the country which are working for myco-flora isolation, identification, and deposition of various culture-able strains. First Fungal Culture Bank of Pakistan (FCBP) was established in 2003 at University of the Punjab (Bajwa, 2006). Among all, few of them have proper online catalogue describing the strain's history, molecular evidence, or status of publication. Some published data is found having no clue about its disposition to any culture center (Butt et al., 2016; Abbas et al., 2016). Due to the unavailability of the published strains at collection centers, their viability is doubtful.

References:

- 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) *Seimatoporiella* 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, 407-406.
- Abbas, S.Q., Sutton, B.C. and Ghaffar, A. (2000a) An addition to *Sphaeropsis* from Pakistan. *Pak. J. Bot.*, 32, 35-39.
- Abbas, S.Q., Sutton, B.C. and Ghaffar, A. (2000b) An addition to *Septoria* from Pakistan. *Pak. J. Bot.*, 32, 247-250.
- Abbas, S.Q., Sutton, B.C. and Ghaffar, A. (2001) *Cystotrichopsis* Abbas, Sutton and Ghaffar gen. nov., an addition to Coelomycetes from Pakistan. *Pak. J. Bot.*, 33, 365-368.
- Abbas, S.Q., Perveen, A., Riaz, S., Iftakhar, T. and Abbas, A. (2016) New fungal records on *Psidium guajava* from Pakistan. *Proc. Pak. Acad. Sci. B. Life and Environ Sci.*, 53, 111-119.
- Ahmad, S. (1948) Fungi of Pakistan I. *Sydowia*, 2, 72-78.
- Ahmad, S. (1950) Fungi of Pakistan II. *Sydowia*, 4, 82-83.
- Ahmad, S. (1951) Fungi of Pakistan III. *Sydowia*, 5, 390-395.
- Ahmad, S. (1952) Gasteromycetes of West Pakistan. Punjab University Press Lahore, 1-92.
- Ahmad, S. (1956a) Fungi of Pakistan. *Biol. Soc. Pak. Lah. Mono.*, 1, 1-126.
- Ahmad, S. (1956b) Uredinales of Pakistan. *Biol.*, 2, 29-101.
- Ahmad, S. (1956c) Ustilaginales of West Pakistan. *Mycol. Papers*, 64, 1-17.
- Ahmad, S. (1959) Contributions to the fungi of Pakistan. *IX. Biol.*, 15, 1-10.
- Ahmad, S. (1972a) Contributions to the fungi of Pakistan. *XIII. Biol.*, 18, 1-6.
- Ahmad, S. (1972b) Basidiomycetes of Pakistan. *Biol. Soc. Pak. Lahore Mono.*, 6, 1-41.
- Ahmad, S. (1980) A contribution to the Agaricales of Pakistan. *Bull. Mycol. Faisalabad*, 1, 35-90.
- 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 ISBN 969-8368.
- Ahmad, S., Bilal, C., Imran, C. and Maaria, C. (2014) Fungi of Pakistan. 2nd Edition.
- Aproot, A. and Iqbal, S.H. (2010) Annotated checklist of the Lichens of Pakistan, with reports of new records. *Herz.*, 25, 211-229.
- Bajwa, R. (2006) Scope of First Fungal Culture Bank of Pakistan. *Mycopath*, 4, 41-43.
- Butt, H., Mukhtar, T., Batool, M. (2016) *Spilocaea pyracanthae* causing leaf scab on loquat in Pakistan. *Bragant.*, 75, 76-78.
- Butler, E.J. and Bisby G.R. (1953) The Fungi of India. *Imp. Council Agric. Res. Sci. Monogr.*, 1, Calcutta 337.
- Gardezi, S.R.A. (2003) Mushrooms of Kashmir IV. *Asian J. Pl. Sci.*, 2, 1126-1134.
- Gardezi, S.R.A. and Ayub, N. (2005) Mushrooms of Azzad Jammu and Kashmir, their collection, identification and descriptions. *Archives of Phytopath. Pl. Prot.*, 38, 53-68.
- Ghaffar, A. and Kaf, A. (1968) Fungi of Karachi. *Pak. J. Sci.*, 20, 5-19.
- Ghaffar, A., Abbas, S.Q. and Kaf, A. (1971) Fungi of Karachi-supplement I. *Pak. J. Sci.*, 23, 261-266.
- Ghaffar, A. and Abbas, S.Q. (1972) Fungi of Karachi-supplement II. *Pak. J. Bot.*, 4, 195-208.
- Müller, E. and Ahmad, S. (1955) Über einige neue oder bemerkenswerte Ascomyceten aus Pakistan. I. (About some new or remarkable Ascomycetes from Pakistan. I) *Sydowia*, 9, 233-245.
- Mundkur, B.B. (1938) Fungi of India. *Suppl. I. Imp. Council. Agri. Res. India. Sci. Mon.*, 12, 1-54.
- Mundkur, B.B. (1940) A second contribution towards a knowledge of Indian Ustilaginales: Fragments xxvi-1. *Trans. B. Mycol. Soc.*, 24, 312-326.
- Ono, Y. (1992) Uredinales collected in Kaghan Valley, Pakistan. In: *Cryptogamic flora of Pakistan*, 1, 217-240.
- Ono, Y. and Kakishima, M. (1992) Uredinales collected in Swat Valley, Pakistan. In: *Cryptogamic flora of Pakistan*, 1, 197-216.
- Ono, Y. and Kakishima, M. (1993) Smut Fungi (Ustilaginales) collected in Pakistan. In: *Cryptogamic flora of Pakistan*, 2, 187-214.
- Razaq, A. and Shahzad, S. (2016) New records of order Boletales from Pakistan. *Pak. J. Bot.*, 48, 1313-1317.
- Razaq, A., Rajput, A.Q. and Shahzad, S. (2019) New records of Russula species from Pakistan. *Pak. J. Bot.*, 51, 255-258.
- Sarwar, S. and Khalid, A.N. (2013) A preliminary checklist of the Boletales in Pakistan. *Mycotax.*, 121, 500.
- Sutton, B.C. and Abbas, S.Q. (1986) *Aphanoxia irregularis* sp. Nov., from Pakistan. *Trans. Brit. Mycol. Soc.*, 87, 640-642.
- Sultana, K. and Qureshi, R.A. (2007) Check list of Basidiomycetes (Aphylo. and Phragmo.) of Kaghan Valley-11. *Pak. J. Bot.*, 39, 2629-2649.
- Sultana, K., Bhatti, M.I., Akram, A., Irahad, G., Mastoi, M.I., Jilskani, M. (2015) Check list of mushrooms Asco. and Gasteromycetes of Kaghan Valley III. *Sci. Int. (Lahore)*, 27, 6199-6205.
- Tariq, M., Dawar, S. and Mehdi, F.S. (2006) Occurrence of fungi on mangrove plants. *Pak. J. Bot.*, 38, 1293.
- Hussain, S. (2016) Species diversity of Basidiomycetes of district Malakand. PhD. thesis. Department of Botany Hazara University Mansehra.



The website is launched to provide continuously updated list of fungal species which have been reported from Pakistan since 1947.

Quick Links

- [Home](#)
- [History](#)
- [Outline](#)
- [Curators](#)
- [Notes](#)
- [Databases](#)
- [Contact](#)

Information

- ☎ **Phone**
+923347544751
- 📍 **Address**
Mubashar Raza
Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, China.
- ✉ **Email**
mubasharraza73@yahoo.com

Copyright © 2021 Fungi Of Pakistan | Powered by Fungi Of Pakistan

Figure 4. Brief history of fungi collected in Pakistan.

HOME HISTORY OUTLINE ARCHIVES NOTES MORE CONTACT Data Submission & Updates

OUTLINE

Home Outline

What you looking for?

Outline Of Fungi Of Pakistan

Phylum: *Ascomycota* Caval.-Sm.
 Class: *Dothideomycetes* sensu O.E. Erikss & Winka
 Subclass: *Dothideomycetidae* P.M. Kirk, P.F. Cannon, J.C. David & Stalpers ex C.L. Schoch, Spatafora, Crous & Shoemaker
 Order: *Botryosphaeriales* C.L. Schoch, Crous & Shoemaker
 Family: *Aplosporellaceae* Slippers, Boissin & Crous
Aplosporella Speg. (= *Bagnisiella* Speg.)
 Family: *Botryosphaeriaceae* Theiss. & Syd. (= *Endomelanconiosidaceae* Tao Yang & Crous)
Botryosphaeria Ces. & De Not.
 Order: *Capnodiales* Woron.
 Family: *Cladosporiaceae* Chalm. & R.G. Archibald
Cladosporium Link
 Family: *Capnodiaceae* (Sacc.) Höhn. ex Theiss. *Capnodium* Mont.
 Family: *Mycosphaerellaceae* Lindau
Cercospora Fresen.
Cercosporaella Sacc.
Passalora Fr.
Phloeospora Wallr.
Polythrincium Kunze
Pseudocercospora Speg.
Ramularia Unger
Septoria Sacc. (= *Septocyta* Petr. fide Quaedvlieg et al. 2013)
Zasmidium Fr.
 Order: *Dothideales* Lindau (= *Neocelosporiales* Crous)
 Family: *Dothideaceae* Chevall. D *Dothidea* Fr.
Plowrightia Sacc
 Family: *Saccoltheciaceae* Bonord *Aureobasidium* Viala & G. Boyer
Saccolthecium Fr.
Selenophoma Maire
Dothideales genus *incertae sedis*
Pringsheimia Schulzer
Eremomycetales genus *incertae sedis*
Arthrographis G. Cochet ex Sigler
 Order: *Gloniales* *Jayasiri* & K.D. Hyde
 Family: *Gloniaceae* (Corda) E. Boehm, C.L. Schoch & Spatafora
Glonium Mühl
 Order: *Hysteriales* Lindau
 Family: *Hysteriaceae* Chevall
Gloniella Sacc
Gloniopsis De Not.
Hysterium Pers.
Rhytidhysterion Speg.
 Order: *Patellariales* D. Hawksw. & O.E. Erikss.
 Family: *Patellariaceae* Corda
Haematomyxa Sacc
Patellaria Fr.
 Order: *Pleosporales* Luttrell ex M.E. Barr
 Family: *Arthopyreniaceae* W. Watson
Arthopyrenia A. Massal. (= *Arthopyreniomyces* Cif. & Tomas.)
 Family: *Camarosporiaceae* Wanas., Wijayaw., K.D. Hyde & Crous
Camarosporium Schulzer
 Family: *Coniothyriaceae* W.B. Cooke *Coniothyrium* Corda
 Family: *Cryptocoryneaceae* A. Hashim. & Kaz. Tanaka
Cryptocoryneum Fuckel
 Family: *Cucurbitariaceae* G. Winter (= *Fenestellaceae* M.E. Barr)
Cucurbitaria Gray (= *Pleurostromella* Petr.)
 Family: *Cyclothyriellaceae* Jaklitsch & Voglmayr
Massariosphaeria (E. Müll.) Crivelli
 Family: *Didymellaceae* Gruyter, Aveskamp & Verkley (= *Microsphaeropsidaceae* Qian Chen, L. Cai & Crous fide Hongnanan et al. 2020)
Ascochyta Lib. (= *Heracleicola* Tibpromma, Camporesi & K.D. Hyde)
Epicoccum Link
Didymella Sacc. ex D. Sacc.

Quick Links

- > Home
- > History
- > Outline
- > Curators
- > Notes
- > Databases
- > Contact

Information

Phone
+923347544751

Address
Mubashar Raza
Institute of Microbiology, Chinese Academy of
Sciences, Beijing 100101, China.

Email
mubasharraza73@yahoo.com

The website is launched to provide continuously updated list of fungal species which have been reported from Pakistan since 1947.

Copyright © 2021 Fungi Of Pakistan | Powered by Fungi Of Pakistan

Figure 5. Fungi of Pakistan outline.

The screenshot displays the 'ARCHIVES' page of the Fungi Of Pakistan website. At the top, a navigation menu includes 'HOME', 'HISTORY', 'OUTLINE', 'ARCHIVES', 'NOTES', 'MORE', and 'CONTACT'. A search bar is positioned in the top right corner. The main heading 'ARCHIVES' is centered, with a breadcrumb trail 'Home > Archives' below it. The 'Fungi Of Pakistan Hierarchy' section lists various fungal phyla, each with a green plus sign for expansion. To the right, a search bar and a 'Categories' section are visible, with links for 'Mycologist', 'Herbarium', 'Databases', and 'Notes'. The footer contains the 'Fungi Of Pakistan' logo, a 'Quick Links' section, and 'Information' including contact details for Mubashar Raza.

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
CHIT	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

Quick Links

- > Home
- > History
- > Outline
- > Curators
- > Notes
- > Databases
- > Contact

Information

Phone
+923347544751

Address
Mubashar Raza
Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, China.

Email
mubasharraza73@yahoo.com

Copyright © 2021 Fungi Of Pakistan | Powered by Fungi Of Pakistan

Figure 7. Information on herbarium centers within Pakistan.

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

Name	Year of Graduation	Current Affiliation	Email
Kishwar Sultana	1986	Department of Plant Pathology, PMAS Arid Agriculture University, Rawalpindi.	nazia_kishwar1@yahoo.com
Prof. Shahnaz Dawar	1995 (PhD)	Department of Botany, University of Karachi, Karachi	shahnaz_dawar@yahoo.com
Prof. Syed Ehsan-ul-Haqe	1995 (PhD)	Department of Botany, University of Karachi, Karachi	sehaq@uok.edu.pk
Saleem Shahzad	1995 (PhD)	Department of Agriculture and Agribusiness Management, University of Karachi, Karachi	sshahzad@uok.edu.pk sshahzad@gmail.com
Prof. Abdul Nasir Khalid	1998 (PhD)	Department of Agriculture and Agribusiness Management, University of Karachi, Karachi	sshahzad@uok.edu.pk sshahzad@gmail.com
Muhammad Mushtaq	2003 (PhD)	Department of Biotechnology, Balochistan University of Information Technology, Engineering and Management Sciences, Quetta.	muhammad.mushtaq@buitms.edu.pk
Abdul Mubeen Lodhi	2007 (PhD)	Department of Plant Protection, Sindh Agriculture University, Tandojam	mubeenlodhi@gmail.com
Prof. Abdul Razaq	2008 (PhD)	Department of Biological Science, Karakorum International University, Gilgit, Pakistan	dr.razaq@kiu.edu.pk
Abdul Rehman Khan Niazi	2008 (PhD)	Institute of Botany, University of the Punjab, Lahore	dramiazi.botany@pu.edu.pk
Najam-Ul-Sehr Afshan	2009 (PhD)	Institute of Botany, University of the Punjab, Lahore	pakrust@gmail.com
Muhammad Hanif	2012 (PhD)	Institute of Botany, University of the Punjab, Lahore	dr.mhanif@gcu.edu.pk
Abdul Razaq	2013 (PhD)	Department of Botany, University of Veterinary and Animal Sciences, Lahore	ectomycornhiza@gmail.com
Marium Tariq	2013 (PhD)	M. A. H Qadri Biological Research Centre, University of Karachi, Karachi	mariumtariq02@gmail.com
Muhammad Fiaz	2013 (PhD)	Department of Botany, Hazara University, Mansehra	muhammadfiazhu@gmail.com
Samina Sarwar	2013 (PhD)	Department of Botany, Government College for Women University, Lahore	samina_botetus@yahoo.com
Sobia Ilyas	2013 (PhD)	Department of Botany, University of Veterinary and Animal Sciences, Lahore	fungalcommunity@gmail.com
Tayiba Ashraf	2013 (PhD)	Government Fatima Jinnah College (W), Chuna Mandi, Lahore	tayibamaan01@gmail.com
Abdul Gayoom Rajput	2014 (PhD)	Department of Agriculture and Agribusiness Management, University of Karachi, Karachi	abdulgayoomrj@gmail.com agayoom@uok.edu.pk
Muhammad Waseem Abbasi	2014 (PhD)	Department of Botany, University of Karachi, Karachi	abbasimw@uok.edu.pk abbasimw@gmail.com
Abdul Haq	2015 (PhD)	Department of Botany, University of Karachi, Karachi	muhammad.abdulhaq@gmail.com
Syeda Bint-e-Zahra	2014 (PhD)	Department of Botany, University of Karachi, Karachi	bintezahira@gmail.com
Maika Saba	2016 (PhD)	Department of Botany, Quaid-e-Azam University, Islamabad	rustflora@gmail.com
Sana Jabeen	2016 (PhD)	Department of Botany, Division of Science and Technology, University of Education, Township, Lahore	sanajabeenue@gmail.com sanajabeen@ue.edu.pk
Summiya Rahim	2016 (PhD)	Federal Seed Certification and Registration Department (FSC & RD), Peshawar	sumy6@hotmail.com
Shah Hussain	2016 (PhD)	Center for Plant Sciences & Biodiversity, University of Swat, Swat	shahpk85@gmail.com
Ishtiaq Ahmad	2017 (PhD)	Department of Botany, Istamia College, Peshawar	ishtiagmatta@gmail.com
Aamna Ishaq	2017 (PhD)	Department of Botany, University of Veterinary and Animal Sciences, Lahore	aamna_ishaq@yahoo.com
Sadiqullah	2018 (PhD)	Subject specialist GHSS Deotal, Tehsil Kabal, Swat	sadiqbotany@gmail.com
Arooj Naseer	2018 (PhD)	Institute of Botany, University of the Punjab, Lahore	arooj_hons@pu.edu.pk
Junaid Khan	2018 (PhD)	Center for Plant Sciences & Biodiversity, University of Swat, Swat	junaid.botany@gmail.com
Hira Bashir	2019 (PhD)	Department of Botany, University of Okara, Okara	hirabashir@gmail.com
Mubashar Raza (Curator)	2019 (PhD)	Institute of Microbiology, Chinese Academy of Sciences, Beijing, China	mubasharaza73@yahoo.com
Memoona Khan	2020 (PhD)	Government Degree College (W) Samanabad, Lahore	memoonakhan17@gmail.com
Munazza Kiran	2020 (PhD)	C/O Institute of Botany, University of the Punjab, Lahore	munazzakiran@gmail.com
Tayyaba Qasim	2020 (PhD)	C/O Institute of Botany, University of the Punjab, Lahore	tayyaba.qasim@yahoo.com
Kamran Habib	2021 (PhD)	C/O Institute of Botany, University of the Punjab, Lahore	kamranhabib@gmail.com

*Entries are welcome to add.

The website is launched to provide continuously updated list of fungal species which have been reported from Pakistan since 1947.

Quick Links

- > Home
- > History
- > Outline
- > Curators
- > Notes
- > Databases
- > Contact

Information

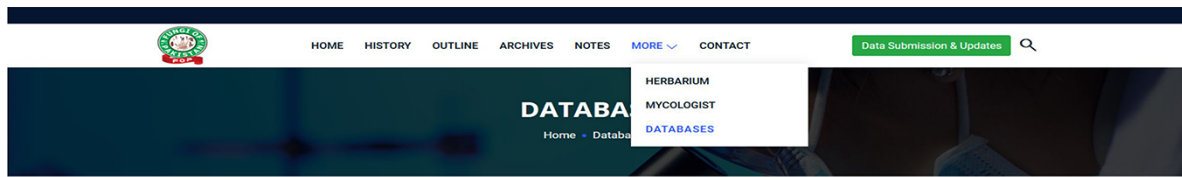
Phone
+923347544751

Address
Mubashar Raza
Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, China.

Email
mubasharaza73@yahoo.com

Copyright © 2021 Fungi Of Pakistan | Powered by Fungi Of Pakistan

Figure 8. Information of mycological community for international collaboration.



Mycological Databases In The World And In Pakistan

Online databases can be used for both professional and personal use that can be assessed from local internet from any part of the world.

Mycological Databases That Mainly Deals With Nomenclature Are:

Name	Provide information on	Link
FungalNames	Nomenclature, phylogeny, systematics and taxonomy of fungi	Visit Now
Index Fungorum	mycological nomenclatural novelties and associated data	Visit Now
Mycobank	biodiversity, classification, distribution, evolution, identification, nomenclature, phylogeny, systematics and taxonomy of fungi	Visit Now

Databases Deals With Taxonomy And Classification Of Fungi:

Name	Provide information on	Link
Faces of Fungi	descriptions of species and other taxonomic ranks	Visit Now
Fungal Genera	Typification data	Visit Now
Genera of Dothideomycetes	information on Dothideomycetes genera	Visit Now
Genera of Phytopathogenic fungi	plant pathogenic fungi	Visit Now
Onestopshop Fungi	pathogenic genera	Visit Now
Outline of Fungi	taxonomy and classification of the fungi	Visit Now
The yeasts	the yeast genera	Visit Now

Databases That Are Dedicated To Clinically Important Fungi:

Name	Provide information on	Link
Aspergillus and Aspergillosis	Aspergillus and the diseases it can cause	Visit Now
Doctor Fungus	identification and management of human and animal fungal infections	Visit Now
Mycology Online	biodiversity, classification, distribution, evolution, identification, nomenclature, phylogeny, systematics and taxonomy of fungi	Visit Now

Numerous Others Databases:

Name	Provide information on	Link
Marine Fungi	distribution and classification of marine fungi	Visit Now
Cybertruffle	series of websites related to fungi and associated organisms	Visit Now
Mycology Collections data Portal	fungal diversity	Visit Now
Colletotrichum	Colletotrichum research	Visit Now
The FUSARIOID-ID Database	Fusarium research	Visit Now

Pakistan Mycological Databases:

Name	Provide information on	Link
Fungi of Pakistan	country mycoflora with continually updated consensus of fungi classification and molecular data updates.	Visit Now
Macrofungi Database of Pakistan	DNA sequence database for Macrofungi In Pakistan	Visit Now



Figure 9. Some fungi related databases.

HOME HISTORY OUTLINE ARCHIVES NOTES MORE CONTACT Data Submission & Updates

CONTACT US

Home > Contact Us

Email Here
mubasharraza73@yahoo.com

Location Here
Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, China.

Call Here
+923347544751

Drop Us Message For Any Query

Your Name Your Email
Your Phone Your Subject
Your Message
Submit Query

Quick Links
> Home
> History
> Outline
> Curators
> Notes
> Databases
> Contact

Information
Phone
+923347544751
Address
Mubashar Raza
Institute of Microbiology, Chinese Academy of Sciences, Beijing 100101, China.
Email
mubasharraza73@yahoo.com

Copyright © 2021 Fungi Of Pakistan | Powered by Fungi Of Pakistan

Figure 10. Tool for user comments and suggestions.

Acknowledgements

M.R. is thankful to the Chinese Academy of Sciences (CAS) for the award of President's International Fellowship (PIFI). M.R. greatly acknowledges Dr Dhanushka N. Wanasinghe, Dr Lingwei Hou, Dr Samantha C. Karunarathna, Dr Peng Zhao and Dr Yingming Li, who provided pictures for the web homepage.

Funding

No funding source.

Conflict of interest

None declared.

References

- Stewart,R.R. (1972) *An Annotated Catalogue of Vascular Plants of West Pakistan and Kashmir*. Fakhri Printing Press, Karachi.
- Butler,R.A. (2020) *Total number of plant species by country*. <https://rainforests.mongabay.com/03plants.htm> (1 July 2021, date last accessed).
- Peter,H. (2020) *Flora of Pakistan*. <http://legacy.tropicos.org/Project/Pakistan> (1 July 2021, date last accessed).
- Mirza,J.H. and Qureshi,M.S.A. (1978) *Fungi of Pakistan*. University of Agriculture, Pakistan, p. 311, 202
- 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.
- 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. Council. Agri. Res. Inida. Sci. Mon.*, **12**, 1–54.
- Ahmed,S. (1948) Fungi of Pakistan-I. *Sydowia*, **2**, 72–79.
- Ahmed,S. (1950) Fungi of Pakistan II. *Sydowia*, **4**, 82–83.
- Ahmed,S. (1951) Fungi of Pakistan III. *Sydowia*, **5**, 390–395.
- Ahmad,S. (1952) *Gasteromycetes of West Pakistan*. Punjab University Press, Lahore. pp. 1–92.
- Ahmad,S. (1956) Fungi of Pakistan. *Biol. Soc. Pak. Lab. Mono.*, **1**, 1–126.
- Ahmad,S. (1956) *Uredinales* of Pakistan. *Biol.*, **2**, 29–101.
- 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.
- 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.
- Ghaffar,A. and Kafi,A. (1968) Fungi of Karachi. *Pak. J. Sci.*, **20**, 5–19.
- Ghaffar,A., Abbass,S.Q. and Kafi,A. (1971) Fungi of Karachi-supplement I. *Pak. J. Sci.*, **23**, 261–266.
- Ghaffar,A. and Abbass,S.Q. (1972) Fungi of Karachi-supplement II. *Pak. J. Bot.*, **4**, 195–208.
- 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 *Avetiaea* (*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.
- 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.
- 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.
- 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* (*Aphylo.* and *Phragmo.*) of Kaghan Valley-11. *Pak. J. Bot.*, **39**, 2629–2649.
- Tariq,M., Dawar,S. and Mehdi,F.S. (2006) Occurrence of fungi on mangrove plants. *Pak. J. Bot.*, **38**, 1293.
- 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.
- 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.
- 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.
- Ahmad,S., Bilal,C., Imran,C. *et al.* (2014) *Fungi of Pakistan*. 2nd edn. Khalid Chaudhry, USA, pp. 1–136.
- Butt,H., Mukhtar,T. and Batool,M. (2016) *Spilocaea pyracanthae* causing leaf scab on loquat in Pakistan. *Bragant.*, **75**, 76–78.
- 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.