

Scope of First Fungal Culture Bank of Pakistan

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Abstract

Significance of microorganisms is ever increasing and in today's scenario the wheel of advanced biotechnologies is revolving around microbes to recapture the ecological balance lost in the past few decades. In Pakistan, however, we lack sufficiently reliable biological data to start with and our knowledge of functional importance of the indigenous microbiota is highly fragmentary. Cataloging and preserving our rich flora is therefore of extreme importance for regional and national resource management, bioprospecting and fundamental scientific research. Some institutes have their own collection but status of preservation is not satisfactory. The First Fungal Culture Bank of Pakistan (FCBP) established in 2003 at Punjab University, is an initiative meeting the research needs with a focus on particular biological groups and on generation of authentic data archives and maintenance of live specimens. FCBP has conserved over 800 species of fungi, over 60 of bacteria and 10 of yeast. FCBP is the only microbial germplasm conservation centre in Pakistan, known internationally and registered with international data collection centres like WDCM, WFCC and MIRCEN. Through HEC sponsorship of project (Rs. 34.4M) it is going to be developed on international standards. The FCBP is offering services in terms of provision of fungal and bacterial cultures, identification services and storage facility to researchers and students in the field of biological and agricultural sciences.

Key words: microbial diversity; biodiversity conservation; microbial germplasm.

Conservation of Microbial Germ-plasm in the World

Microorganisms like algae, bacteria, fungi, protists, and viruses, not normally visible to the naked eye, are an essential component of biological diversity, without which there can be no sustainable ecosystems (Hawksworth, 1991; Hawksworth, 1992; Hawksworth & Colwell 1992; Sly, 1994; Staley *et al.*, 1997). Fifty percent of the living biomass on the earth is microbial consortia and microorganisms provide a major source of genetic information for molecular biology and biotechnology (Bull *et al.*, 1992., Nisbet, 1992).

Natural habitats that harbor these undiscovered microorganisms are disappearing rapidly. Destruction of tropical forests is estimated at between 16.4 and 20.4 × 10⁶ hectares per year. Only a small percentage of the Earth's temperate forests remain. The amount and quality of the world's natural habitat are declining, and only the deepest parts of the ocean appear to have maintained some degree of pristine quality. Microorganisms, too, are disappearing from the Earth. (Lean & Hinrichsen, 1992).

Standard policies, such as the US Endangered Species Act (ESA) and the Convention on International Trade in Endangered Species of Fauna and Flora (CITES) protect individual species but microorganisms, especially those we have not yet

discovered, can not be protected in this way. Habitat protection is a means to protect organisms and their habitats (Eisner *et al.*, 1995), a method that would be more beneficial to protection of microbial biodiversity.

Hawksworth (1995) pointed out that completing worldwide inventory of biota requires additional taxonomic collections, training of people in many different countries to carry out taxonomic studies, and serious international coordination of these efforts. The African Network of Microbiological Resources Centres (MIRCENs) is a step in that direction (DaSilva, 1993). A new MIRCEN, focusing on microorganisms used in biohydrometallurgical processes has been established in Puna, India (Anon, 1995). Not only are culture collections important, but in a world united by electronic communication, computer databases may supply invaluable information to taxonomists and other researchers. A move to link several microbiological databases and add functional data to the genetic data, was explored at the recent International Symposium on Microbial Ecology in Santos, Brazil (Wertheim, 1995). There are 521 culture collection centers working in 66 countries worldwide. Some worldwide known culture collection centres are International Mycological Institute (IMI), American Type Culture Collection (ATCC), Belgian Co-ordinated Collections of Micro-

organisms (BCCM), Centraalbureau voor Schimmelcultures (CBS).

IMI was founded in 1920 and is part of CAB International, an organization supported by 32 Member Governments established by treaty and with international legal status. The IMI culture collection comprises over 16,500 strains of filamentous fungi, yeasts and bacteria of interest in plant pathology, industry, biodeterioration studies, standards testing and specifications, systematic and biochemical research and education. Uses of fungi include biosynthesis of organic compounds, physiological assay, soil analysis, and enzyme production. The institute provides identification, preservation, microbial testing of materials, contract, consultancy, and training, development of preservation protocols, safe deposit and patent deposit services.

ATCC was established in 1925 when a committee of scientists recognized a need for a central collection of microorganisms that would serve scientists all over the world. The early years were spent at the McCormick Institute in Chicago until the organization moved to Georgetown University in Washington, D.C., in 1937. As research in the biosciences expanded, ATCC began to diversify its holdings, and as the collections grew ATCC occupied a series of sites, each providing more storage space. ATCC moved to its current state-of-the-art laboratory in 1998. Common Access to Biological Resources and Information (CABRI) provides a unified search interface for a handful of European culture collections. These include BCCM, CABI, and CBS, among others CBS is an important center for mycological research in The Netherlands. Their extensive culture collection can be searched on many criteria, including cultural characteristics. CBS also provide access to databases on fungal nomenclature.

Maintenance of Microbial Cultures in Pakistan

Until 3 years ago in Pakistan, few research groups (NIBGE & CEMB) were holding small collections. Most of the research was based on foreign microbial cultures. This was creating a huge economic burden also causing unnecessary delays and discontinuity of research due to accidental loss or death of cultures. Mycologists and plant pathologists have been culturing microorganisms specially fungi for a long time but there has been no maintenance of microbial cultures in Pakistan with the result that whenever cultures were needed by researchers, teachers and students, they were not available anywhere in Pakistan.

Conservation of Microbial Germplasm in Pakistan

Under newly established department of Mycology & Plant Pathology, First Fungal Culture

Bank of Pakistan (FCBP) was established early in 2003. From June 18, 2003 it started functioning with a meager staff, an Incharge with two research associates.

FCBP is registered with the following international organizations: The World Data Centre for Microorganisms (WDCM), World Federation of Culture Collection (WFCC) and Microbial Research Centre (MIRCEN). The main activity of FCBP is isolation in pure culture, identification and preservation of fungi of Pakistan. It has already obtained pure culture, identified and preserved over 800 strains of fungi. On excessive demand of researchers for cultures of bacterial species, about six months ago, bank has also initiated isolation and conservation of bacteria as well. Now bank hold inventory of around 62 isolates of bacteria, this activity will also continue. FCBP is providing authentic cultures to researchers, teachers and students on nominal charges. Disease diagnostic services are also being provided.

Many researchers and research students isolate fungi and other microorganism but they can't identify them. FCBP is providing facility to identify such cultures up to species level. It has already provided facility to various research organizations and universities all over Pakistan and activity is in progress. It offered internship on isolation, purification, preservation and identification of fungi during last one year since the internship program was started by Pakistani universities and also providing training to students of the Punjab University. FCBP is supervising M.Sc. (Hons) and Ph.D. research in taxonomy to overcome scarcity of manpower in this field. It provides training to college teachers and researchers in isolation, identification and conservation of microbial flora. FCBP organized a week long workshop on "Identification and Conservation of Micromycetes" from August 23 to 28, 2004 with financial support of HEC. Submitted a program to HEC for holding second workshop and intends to make it an annual feature. MYCONEWS', an official publication of FCBP since June, 2003 has just completed its three years of publications (13 issues). MYCONEWS consists of news, views and research notes. The most important regular feature is a list of updated accessions of cultures of Pakistani fungi in each issue published as "Current Inventory of FCBP" and also disseminates inventory of bacterial isolates.

FCBP research work is also published in the form of Research Bulletins. First research bulletin entitled "NEW RECORDS OF FUNGI IMPERFECTI FROM PAKISTAN" published in April 2005. This research bulletin includes 22 species of fungi imperfecti as new records with descriptions and microphotographs. It includes five species of

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Aspergillus, four species of *Phoma*, two species of *Acremonium*, two species of *Curvularia*, two species of *Fusarium*, two species of *Trichoderma* and one species of *Alternaria*. Second research bulletin entitled "COPROPHILOUS FUNGI OF PAKISTAN" was published in December 2005. This research bulletin includes nineteen species of coprophilous fungi with descriptions and microphotographs. four species of *Absidia*, one species of *Drechslera*, two species of *Pilobolus*, one species of *Fusarium*, two species of *Acremonium*, one species of *Saccobolus*, two species of *Ascobolus*, one species of *Penicillium*, one species of *Phycomyces*, one species of *Isaria*, one species of *Syncephalastrum*, one species of *Doratomyces*, one species of *Cephalophora*.

We are preserving our authentic cultures at 4 °C in fridge, in mineral oil and at -20 °C. FCBP has introduced silica gel technique in preserving cultures. It requires regular reculturing. All these methods are laborious, time consuming and expensive, sometimes resulting in loss of culture viability. FCBP is now acquiring Cryopreservation system, to facilitate long-term preservation and going to equip itself with clean room technology, bio-safety cabinets to follow international standards. A project under PSF-US-linkage (83 M) has been submitted for further improvement of infrastructure on international standards and its upgradation into National Microbial Culture Centre (NMCC).

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