

The Importance of Microbiological Resource Centres (mBRCs) for Biotechnology

Nelson Lima

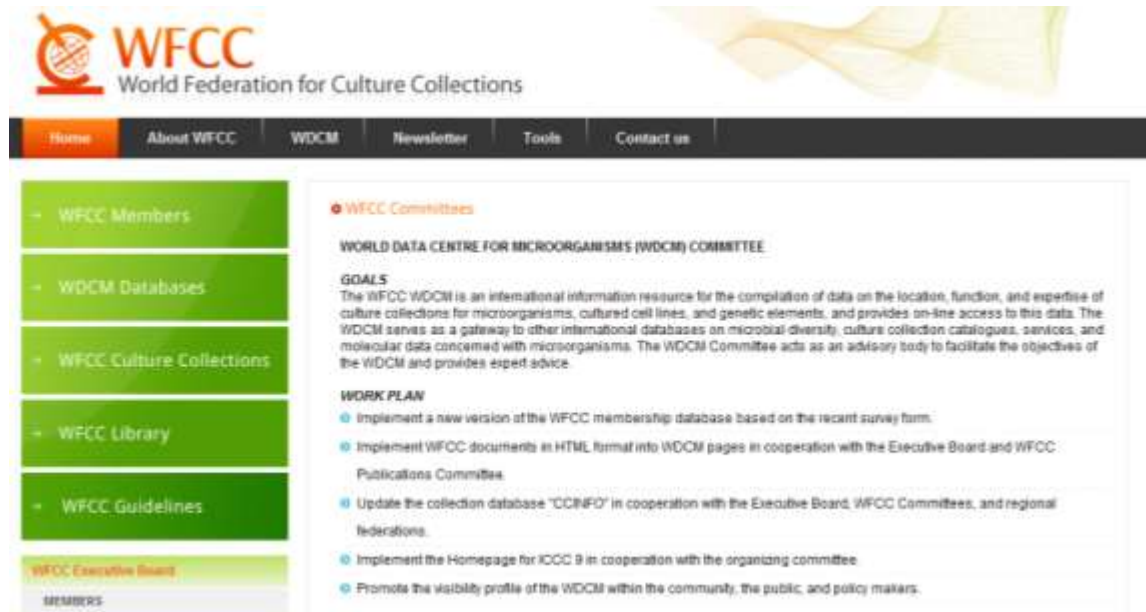
**Centre of Biological Engineering
Micoteca da Universidade do Minho (MUM)
Minho University
Braga – Portugal**

Preservation and distribution of microorganisms appears for the 1st time by the hand of **Frantisek Král** in **1890** in Prague (Czech Republic)

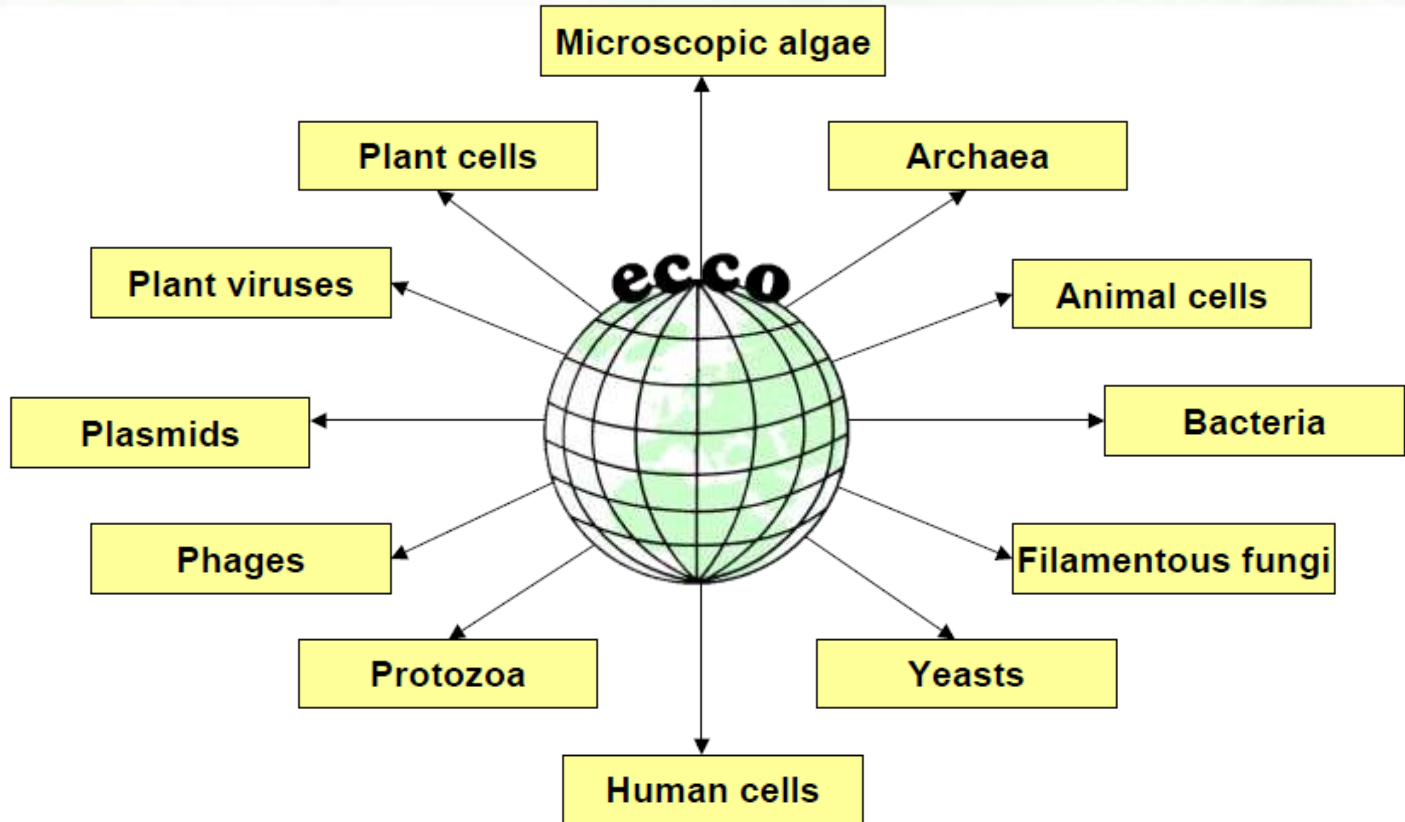


The concept of Culture Collection was born

705 Microbial Culture Collection from 72 Countries are Registered on WDCM and Preserved more than 2,539,750 Strains



The screenshot shows the WFCC website interface. At the top, the WFCC logo (World Federation for Culture Collections) is displayed. Below the logo is a navigation menu with links for Home, About WFCC, WDCM, Newsletter, Tools, and Contact us. The main content area is divided into two columns. The left column contains a list of links: WFCC Members, WDCM Databases, WFCC Culture Collections, WFCC Library, and WFCC Guidelines. The right column features a section titled "WFCC Committees" with a sub-section for the "WORLD DATA CENTRE FOR MICROORGANISMS (WDCM) COMMITTEE". This section includes "GOALS" and "WORK PLAN" sections. The "GOALS" section describes the WDCM as an international information resource for the compilation of data on the location, function, and expertise of culture collections for microorganisms, cultured cell lines, and genetic elements, and provides on-line access to this data. The "WORK PLAN" section lists several tasks, including implementing a new version of the WFCC membership database, implementing WFCC documents in HTML format into WDCM pages, updating the collection database "CCINFO", implementing the Homepage for ICOC 9, and promoting the visibility profile of the WDCM.



≈500,000 Strains in ECCO Member CC

Portugal has **6** Culture Collections (CC) Registered on WDCM :

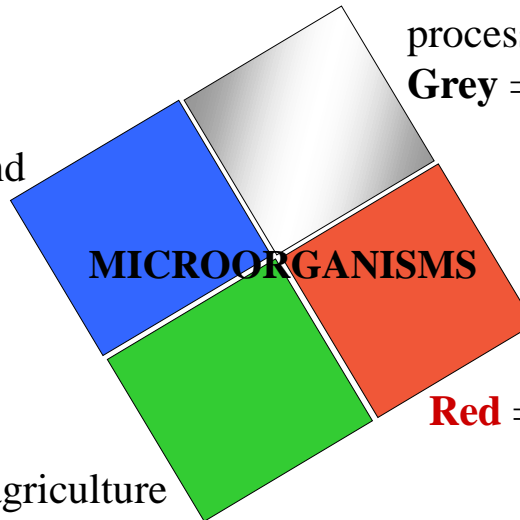
There are **7** collections in Portugal

Acronym	WDCM Number	Collection
ACOI	WDCM 906	Algoteca de Coimbra / Coimbra Collection of Algae
CCMI	WDCM 761	Culture Collection of Industrial Microorganisms
ICC	WDCM 595	Portuguese Yeast Culture Collection
LEGE	WDCM 1089	Blue Biotechnology and Ecotoxicology Culture Collection
MEAN	WDCM 881	Micoteca da Estacao Agronomica Nacional
MUM	WDCM 816	Micoteca da Universidade do Minho
PYCC	WDCM 1069	Portuguese Yeast Culture Collection



THE MICROORGANISMS ARE A FUNDAMENTAL RESOURCE FOR BIOTECHNOLOGY

Blue = encompasses processes in marine and aquatic environments



White = involves industrial processes

Grey = applies to the environment

Green = applies to agriculture

Red = involves medical processes

Challenges for Culture Collections

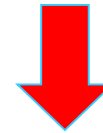
- Less than **1%** of microbial diversity is known
- Only a small fraction of all the studied microbial isolates are available in CCs for future research studies (e.g., only **0.9%** of bacteria described or used in international publications are deposited in CCs)
- Less than **50%** of the total bacteria in which the genome has been sequenced are deposited in CCs
- Quality control (e.g., authenticity and viability) is poor for microbial isolates not deposited in the CCs and these isolates are not easily obtained
- Most data from CCs are not integrated
(www.strainInfo.net; <http://gcm.wfcc.info/>; <http://www.microdnabank.eu>)

The Culture Collections must evolve to the advanced concept that is the mBRC



Biological Resource Centres (BRCs) are an essential part of the infrastructure underpinning life sciences and biotechnology.

BRCs consist of service providers and repositories of the living cells, genomes of organism, and information relating to heredity and the functions of biological systems.



mBRCs must operate under a Quality Control System and legal framework (e.g., CBD, Nagoya Protocol, EU Regulation 511/2014)



Procedure by which an authoritative body assesses organizations, goods or services, in accordance with QM standards.



Certification

Norma Portuguesa

NP
EN ISO 9001
2015

Sistemas de Gestão da Qualidade
Requisitos
(ISO 9001:2015)





ACREDITATION

Procedure by which an authoritative body gives formal recognition that an organization is competent to perform certain assays



Accreditation

Norma Portuguesa

NP
EN ISO/IEC 17025
2005

**Requisitos gerais de competência para laboratórios de ensaio e
calibração
(ISO/IEC 17025:2005)**

**Exigences générales concernant la compétence des laboratoires d'étalonnages et
d'essais
(ISO/IEC 17025:2005)**





26 (3.7%) out 705 of Culture Collections registered on WFCC have their quality systems implemented

-AGO – Arocrete Group Co., Taiwan	C: ISO 9000
-BIOCEN (BioCC) – Centro Nacional de Biopreparados, Cuba	C: ISO 9000
-CABI - Genetic Resource Collection, UK	A: ISO 17025
-CCCM – Czech Culture Collection of Microorganisms	C: ISO 9000
-CCRC – Culture Collection and Research Centre, FIRDI, Taiwan	C: ISO 9000
-CECT – Coleccion Española de Cultivos Tipo, Espanha	C: ISO 9000
-CIP – Collection de L’Institut Pasteur, França	C: ISO 9000
-DCG - Diatom Culture Collection, Bélgica	C: ISO 9000
-DSMZ – Deutsche Sammlung von Mikroorganismen und Zellkulturen, Alemanha	C: ISO 9000
-ECACC – European Collection of Cell Cultures, UK	C: ISO 9000
-ICLC – Interlab Cell Line Collection, Itália	GMP
-IFM – Quality Services Pty Ltd, Austrália	ILAC Guide 13:2000
-IHEM – Institute of Higiene and Epidemiology, Mycology, Bélgica	C: ISO 9000 & A: ISO 17025
-INCQS – Fundação Oswaldo Cruz, Brasil	A: ISO 17025
-ITM - Collection of Mycobacterial Culture, Bélgica	C: ISO 9000
-LMBP – Plasmid Collection, Bélgica	C: ISO 9000
-LMG – University of Gent, Bélgica	C: ISO 9000
-MUCL – Mycology, University Louvain la Neuve, Bélgica	C: ISO 9000
-MUM – Micoteca da Universidade do Minho, Portugal	C: ISO 9001
-NCIMB – National Collection of Industrial, Food, Marine Bacteria, UK	C: ISO 9000
-NCPV – National Collection of Pathogenic Viruses, UK	C: ISO 9000
-NCTC – National Collection of Type Cultures, UK	C: ISO 9000
-NCYC - National Collection of Yeast Cultures, UK	C: ISO 9000
-NBRC – NITE Biological Resource Centre, Japão	C: ISO 9001
-ULC – Culture Collection of (sub)polar Cyanobacteria, Bélgica	C: ISO 9000
-URM – Micoteca URM, Universidade Federal de Pernambuco, Brasil	C: ISO 9001



26 (3.7%) out 705 of Culture Collections registered on WFCC have their quality systems implemented

-AGO – Arocrete Group Co., Taiwan	C: ISO 9000
-BIOCEN (BioCC) – Centro Nacional de Biopreparados, Cuba	C: ISO 9000
-CABI - Genetic Resource Collection, UK	A: ISO 17025
-CCCM – Czech Culture Collection of Microorganisms	C: ISO 9000
-CCRC – Culture Collection and Research Centre, FIRDI, Taiwan	C: ISO 9000
-CECT – Coleccion Española de Cultivos Tipo, Espanha	C: ISO 9000
-CIP – Collection de L’Institut Pasteur, França	C: ISO 9000
-DCG - Diatom Culture Collection, Bélgica	C: ISO 9000
-DSMZ – Deutsche Sammlung von Mikroorganismen und Zellkulturen, Alemanha	C: ISO 9000
-ECACC – European Collection of Cell Cultures, UK	C: ISO 9000
-ICLC – Interlab Cell Line Collection, Itália	GMP
-IFM – Quality Services Pty Ltd, Austrália	ILAC Guide 13:2000
-IHEM – Institute of Higiene and Epidemiology, Mycology, Bélgica	C: ISO 9000 & A: ISO 17025
-INCQS – Fundação Oswaldo Cruz, Brasil	A: ISO 17025
-ITM - Collection of Mycobacterial Culture, Bélgica	C: ISO 9000
-LMBP – Plasmid Collection, Bélgica	C: ISO 9000
-LMG – University of Gent, Bélgica	C: ISO 9000
-MUCL – Mycology, University Louvain la Neuve, Bélgica	C: ISO 9000
-MUM – Micoteca da Universidade do Minho, Portugal	C: ISO 9001
-NCIMB – National Collection of Industrial, Food, Marine Bacteria, UK	C: ISO 9000
-NCPV – National Collection of Pathogenic Viruses, UK	C: ISO 9000
-NCTC – National Collection of Type Cultures, UK	C: ISO 9000
-NCYC - National Collection of Yeast Cultures, UK	C: ISO 9000
-NBRC – NITE Biological Resource Centre, Japão	C: ISO 9001
-ULC – Culture Collection of (sub)polar Cyanobacteria, Bélgica	C: ISO 9000
-URM – Micoteca URM, Universidade Federal de Pernambuco, Brasil	C: ISO 9001



Accreditation of mBRCs

ISO/TC 276/WG 2 N 119

© ISO 2016 - All rights reserved

ISO/TC 276/SC N

Date: 2016-02-18

ISO/WD

ISO/TC 276/SC /WG

Secretariat: DIN

Biotechnology — Biobanking — General requirements for Biobanks

Élément introductif — Élément central — Élément complémentaire

Warning

This document is not an ISO International Standard. It is distributed for review and comment. It is subject to change without notice and may not be referred to as an International Standard.

Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

Secretariat	Administrated by
DIN	ISO
	ISO
	ISO

A STANDARD PROPOSAL FOR BIOLOGICAL RESOURCES CENTRES

Anabela Martins

CEB-Biological Engineering Centre, Universidade do Minho, Braga, Portugal

Nelson Lima

CEB-Biological Engineering Centre, Universidade do Minho, Braga, Portugal

Piuhk Sampaio

Systems and Production Department, University of Minho, Braga, Portugal

Abstract

Purpose: Culture Collections play a vital role by expertly preserving biological material (BM) in a variety of repositories and making it promptly available to several users such as industry, R&D in biotechnology and teaching. The rise in the scientific and biotechnological importance of BM along with an increased awareness of governments on the necessity of preserve the microbiological diversity has resulted in a global understanding of the need to assure stable and well managed operations inside culture collections. Organisation for Economic Cooperation and Development (OECD) recommends culture collectors to work under certified or accredited schemes thus reaching the status of Biological Resource Centre

Martins, A., Lima, N. & Sampaio, P. (2015) **A standard proposal for biological resources centres**. International Journal of Quality & Reliability Management, accepted.

MIRRI in Europe

- Partner*
- Collaborating Parties[†]



16 Partners
28 Collaborating Parties
19 Countries across Europe



www.mirri.org



MIRRI aims to develop strategies and objectives to be use by the Biotechnology sector:



- creation of decentralised centres for microbial resources and information
- providing high quality microbial strains and services for biotechnology
- facilitated access to strains and data
- establishment of a platform of expertise
- capacity building (incl. training (CPD) and Master/PhD)

The Economics of Reproducibility



The screenshot shows the homepage of the European Microbial DNA Bank Network (EMbaRC). The page features a navigation bar with links for 'Procedures', 'Availability', and 'Order DNA', along with a 'Sign in' option. A large DNA double helix graphic is positioned on the left side. The main heading reads 'European Microbial DNA Bank Network'. Below this, there is a 'Home' section with a 'Welcome to the European microbial DNA Bank network' message. A 'News' section highlights a recent update: 'Procedures released for DNA extraction, storage and quality control - 13/03/2012', accompanied by a document icon with a green checkmark. A 'Tool box' section lists links for 'About us', 'EMbaRC homepage', and 'Français'. A 'BRC homepages' section lists various research centers: BCCM, CABI, CBS, CECT, CIRM, CRBIP, DSMZ, and MUM. At the bottom, there is an 'All the news' link.

The Economics of Reproducibility

Preserving Accuracy in GenBank

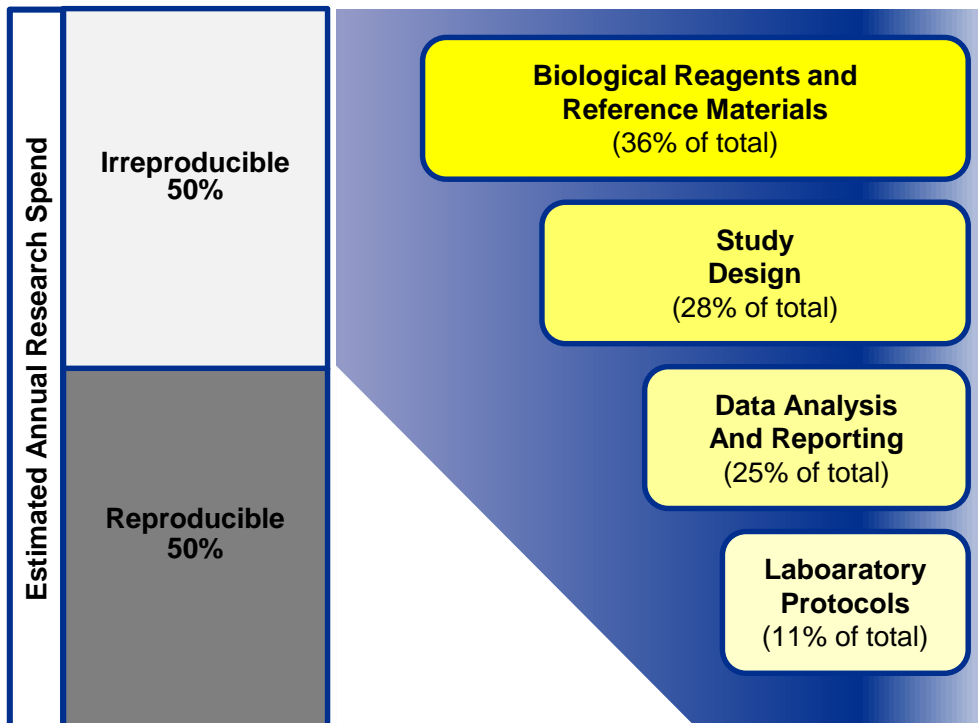
GENBANK, THE PUBLIC REPOSITORY FOR nucleotide and protein sequences, is a critical resource for molecular biology, evolutionary biology, and ecology. While some attention has been drawn to sequence errors (1), common annotation errors also reduce the value of this database. In fact, for organisms such as fungi, which are notoriously difficult to identify, up to 20% of DNA sequence records may have erroneous lineage designations in GenBank (2). Gene function annotation in protein sequence databases is similarly error-prone (3, 4). Because identity and function of new sequences are often determined by bioinformatic analyses, both types of errors are propagated into new accessions, leading to long-term degradation of the quality of the database.

Science 319 (5870):1616, 2008



The Economics of Reproducibility

Biotechnology can adopt the cost breakdown and the categories of errors that contribute to irreproducibility in Preclinical Research



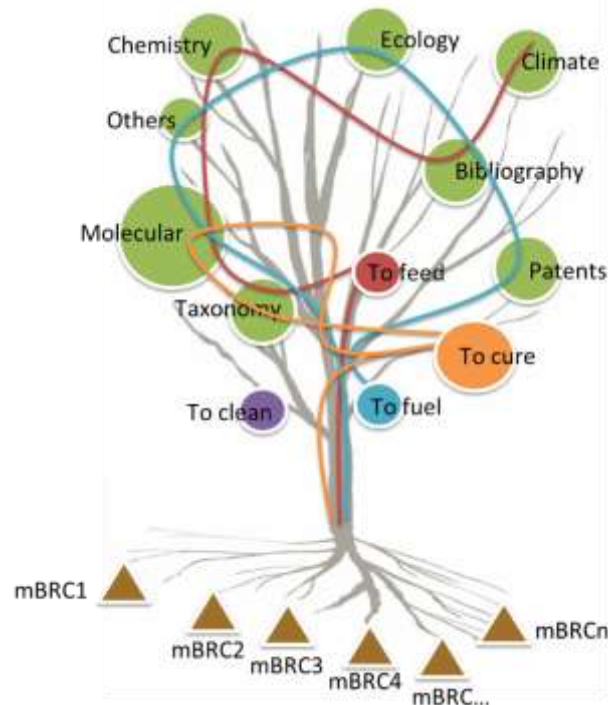
Contaminated
Mischaracterised
Misidentified
Mishandled
Mislabeled

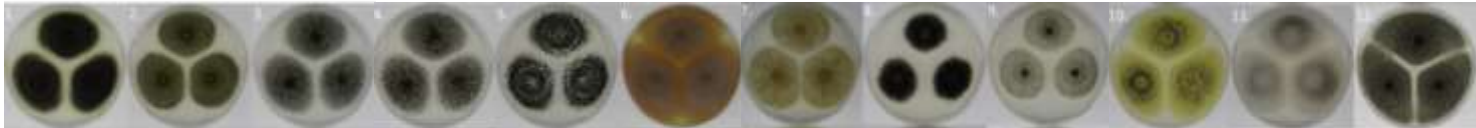


A significant problem in terms of lost money and lost of opportunities for scientific discovery

What makes MIRRI different?

The mBRCs together, through MIRRI,
can nurture the tree of innovation and foster the development of
biotechnology and bioeconomy

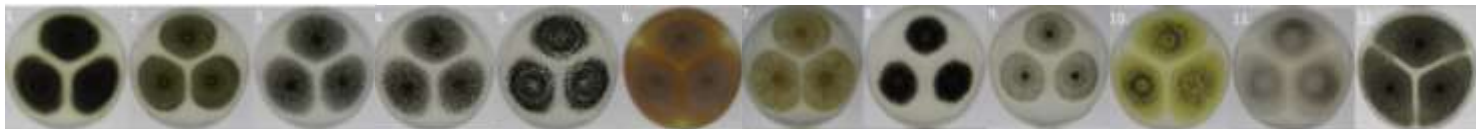




A. aculeatus *A. brasiliensis* *A. carbonarius* *A. ellipticus* *A. ibericus* *A. japonicus* *A. lacticofeatus* *A. niger* *A. phoenicis* *A. sclerotiumniger* *A. tubingensis* *A. uvarum*



Thank You for Your Attention



A. aculeatus *A. brasiliensis* *A. carbonarius* *A. ellipticus* *A. ibericus* *A. japonicus* *A. lacticofeatus* *A. niger* *A. phoenicis* *A. sclerotiumniger* *A. tubingensis* *A. uvarum*