

ISSN 1534-2581

# MICROLOGIA APLICADA INTERNATIONAL

THE REFEREED JOURNAL OF APPLIED MYCOLOGY



Volume 24 (1)  
January 2012

Formerly



ISSN 0187-8921



ISSN 1083-8139

Berkeley, CA, U.S.A.

Included, indexed, and/or abstracted in:

ISI Web of Knowledge  
BIOSIS®/BIOLOGICAL ABSTRACTS, U.S.A.  
FOOD SCIENCE AND TECHNOLOGY ABSTRACTS, U.K.  
CAB ABSTRACTS, U.K.  
AGRICOLA, U.S.A.  
TROPAG & RURAL, U.K.-The Netherlands  
AGRIS-FAO, Italy  
LATINDEX, PERIODICA, REDALYC, Mexico  
ULRICH'S INTERNATIONAL PERIODICALS DIRECTORY, U.S.A.  
DIRECTORY OF OPEN ACCESS JOURNALS (DOAJ), Sweden  
EBSCO Publishing, U.S.A.  
DICTIONARY OF THE FUNGI, CAB INTERNATIONAL, U.K.  
NATIONAL CENTER FOR BIOTECHNOLOGY INFORMATION (NCBI), U.S.A.  
PLANT GENETICS AND BREEDING DATABASE, U.K.  
AFFRC DATABASE, Japan  
<http://www.micaplnt.com>

# MICOLOGIA APLICADA INTERNATIONAL

## *Editors-in-Chief*

**R. H. KURTZMAN, Jr.**

Berkeley, CA

U.S.A.

**D. MARTINEZ-CARRERA**

Colegio de Postgraduados, *Campus* Puebla

Mexico

## *International Editorial Board*

**L. I. DE BAUER**

Colegio de Postgraduados, Mexico

**S. T. CHANG**

Chinese University of Hong Kong, Hong Kong

**U. ELIASSON**

University of Göteborg, Sweden

**K. ESSER**

Ruhr Universität Bochum, Germany

**H. C. EVANS**

C.A.B. International Institute of Biological Control, England

**D. L. HAWKSWORTH**

Universidad Complutense, Madrid, Spain

**R. HERRERA Y SALDAÑA**

Colegio de Postgraduados, Mexico

**O. S. ISIKHUEMHEN**

North Carolina A&T State University, U.S.A.

**S. C. JONG**

American Type Culture Collection (ATCC), U.S.A.

**P. P. KALBERER**

Wädenswil, Switzerland

**J. LABARERE**

Université de Bordeaux II - INRA, France

**A. LARQUE-SAAVEDRA**

CICY, Mexico

**J. LELLEY**

GAMU GmbH, Germany

**P. MORALES**

Colegio de Postgraduados, Mexico

**D. N. PEGLER**

Royal Botanic Gardens, England

**R. H. PETERSEN**

University of Tennessee, U.S.A.

**S. A. REDHEAD**

Biosystematic Research Centre, Canada

**S. ROUSSOS**

Université Paul Cézanne, Marseille, France

**M. ULLOA**

UNAM, Mexico

**MICOLOGIA APLICADA INTERNATIONAL (ISSN 1534-2581)** represents the combined mycological journals: *The International Journal of Mushroom Sciences* (ISSN 1083-8139) and *Micología Neotropical Aplicada* (ISSN 0187-8921). This publication has the financial support from the *Instituto de Micología Neotropical Aplicada* (IMINAP, Puebla, Mexico; CONACYT-RENIICYT no. 2011/274), and the College of Postgraduates (CP-*Campus* Puebla, Mexico). This Journal promotes exchange of information within the scientific community, publishing original papers of applied mycology, which have been approved by all authors and their institutions. Publication on acid-free paper.

**SUBSCRIPTION INFORMATION:** This Journal is published twice a year in January and July. Annual subscriptions are \$50.00 USD. Air mail service is now standard for delivery outside U.S.A. Orders can be arranged through diverse companies worldwide. Orders and payments must be payable to **MICOLOGIA APLICADA INTERNATIONAL**, and drawn on a U.S.A. Bank. Cancellations are not accepted. All subscriptions and advertising should be addressed to:

**MICOLOGIA APLICADA INTERNATIONAL: 1) 445 Vassar Avenue, Berkeley, CA 94708, U.S.A.; or 2) Apartado Postal 701, Puebla 72001, Puebla, Mexico.**

LEGAL LEGEND FOR MEXICO. *MICOLOGIA APLICADA INTERNATIONAL*, revista semestral, enero de 2012. Editor Responsable en México: Daniel Claudio Martínez Carrera. Número de Certificado de Reserva otorgado por el Instituto Nacional del Derecho de Autor: 04-2011-032511501500-102. Número de Certificado de Licitud de Título: 15225. Número de Certificado de Licitud de Contenido: 15225. Domicilio de la Publicación: Colegio de Postgraduados, *Campus* Puebla, Biotecnología de Hongos Comestibles, Funcionales y Medicinales, km. 125.5 carretera federal México-Puebla, colonia La Libertad, C.P. 72130, Puebla, Puebla, tel.: 222-2852162, correo electrónico: dcarrera@colpos.mx . Imprenta: El Errante Editor, S.A. de C.V., Privada Emiliano Zapata 5947, Colonia San Baltazar Campeche, C.P. 72550, Puebla, Puebla, tel.: 222-2966708. Distribuidor, Dr. Ralph H. Kurtzman, Jr., 445 Vassar Avenue, Berkeley, California CA 94708, E.U.A.

## INSTRUCTIONS TO AUTHORS

**MICOLOGIA APLICADA INTERNACIONAL** publishes original and review papers on all aspects of applied and economic mycology. Biochemistry, entomology, ecology, economics, food technology, genetics, molecular biology, morphology, nutritional value, nematology, pathology, pharmacognosy, pharmacology, physiology, production management, computer programs and hardware, and other areas of applied mycology are of interest.

**Preparation of manuscripts** should be in accord with the latest issue of the most recent *CBE Style Manual*. Authors are encouraged to have at least two colleagues critically review their manuscript, before submission to **MICOLOGIA APLICADA INTERNACIONAL**. Manuscripts should be submitted along with an official letter from all authors stating a common consent for publication, and that the manuscript has not been sent for publication elsewhere simultaneously. Manuscripts received will be subjected to a blind-review process.

**Cover Page:** A cover page should be provided with title, authors' names and addresses, other contact information, foot notes referring to title or authors. Number all succeeding pages in sequence.

The English abstract, beginning with "ABSTRACT" on the line preceding the text, key words should be placed below the abstract. Choose key words carefully, words not supplied as key words will not be used in the subject index. Leave the remaining page blank.

**Second Page:** A "ZUSAMMENFASSUNG", "RESUME", or abstract in some other language may begin on the third page. Label in the same manner as the second page, but in the language used.

**Begin your introduction** on the page following the abstracts. The word "INTRODUCTION" should be on the line preceding the text. Be certain to identify properly the species being used in the introduction or materials and methods section. The taxonomic authority should be included when it is first mentioned, but not subsequently, except to avoid some apparent confusion. All accepted species and species authorities should be in agreement with international databases, not only for fungi ([www.indexfungorum.org](http://www.indexfungorum.org)), but also for other microorganisms and organisms ([www.atcc.org](http://www.atcc.org); [www.dsmz.de](http://www.dsmz.de); [www.catalogueoflife.org](http://www.catalogueoflife.org)).

**Headings:** It is expected that all original papers will have ABSTRACT (and in other languages), MATERIALS AND METHODS, RESULTS, DISCUSSION, and LITERATURE CITED headings. RESULTS and DISCUSSION may be separate or combined. Those headings will be in uniform type throughout the journal. Headings in review articles may be more varied.

**Paragraphs:** All paragraphs must be indented.

**Figures:** Photos, graphs and line drawings are all to be numbered as figures and described on a separate legend page. In the text, they should be referred to with the abbreviation "Fig.". Submission and handling is quite different.

**Photos.** All photos must be mounted on heavy illustration board to avoid damage. They must be on glossy paper and they should be as sharp and contrasty as possible. There is no charge for black and white figures. Color photos can be included as actual photos to give extremely high quality reproduction. The cost is less than printing by color separation, but the author will be billed about USD \$ 300 for each page.

**Graphs and line drawings** (no extra charge). If possible, submit graphs and line drawings as TIFF, JPEG or as W\* spreadsheet files. We can convert many other formats. If you can not supply a standard computer format, submit a carefully made copy on paper, mounted as photos (but not combined with photos on the same board). If you supply graphs as hand-drawings, also submit all the data shown in a table. If you use a program that does not allow superscripts, subscripts or other needed font changes, supply your graph as a spreadsheet file. Also supply a paper copy of your graph and note needed changes with red ink. You will be sent a proof of the final graph.

**Tables:** Use a minimum of lines, and no vertical lines. Tables may be submitted as MS-Office or Open-Office files, but it is always wise to submit paper copies as well. They need not be mounted.

**Statistical analysis:** Strongly encouraged.

**Literature Cited:** Literature should be organized alphabetically by the authors' names. When there is more than one publication by the same authors, the older publications should be listed first. In the text, the number of the reference should be shown in parenthesis, where cited. The abbreviation of Journal names is encouraged, as long as it is consistent in all section of Literature Cited and the official Journal abbreviations are used. Examples of citations by type of publication:

**Books:**

Chang, S. T., J. A. Buswell and P. G. Miles. 1992. *Genetics and*

*Breeding of Edible Mushrooms*. Gordon and Breach, New York. 374 pp.

**Symposia:**

Clift, A. D. 1986. A computer model to stimulate the occurrence and increase in number of several insects and mite pests of cultivated mushrooms in Australia. Pp. 371-384. *In: Cultivating Edible Fungi*. Eds. P. J. Wuest, D. J. Royle and R. B. Beelman. Elsevier, New York.

**Patents:**

Kurtzman, R. H., Jr. 1982. Mushroom growing medium. U.S. Patent 4,333,757. June 8.

**General references:**

*Merck Index*. 10th ed. 1983. Pleurotin, #7405. Merck and Co., Rahway, N.J.

**Mushroom Science (treat as a periodical):**

Verbeke, M. N. and A. Overstyns. 1991. Interrelationships between activated charcoal, carbon dioxide, oxalate, and iron chemistry for fructification of *Agaricus bisporus*. *Mushroom Science* 13: 737-746.

**Periodicals:**

Vilgalys, R. and B. L. Sun. 1994. Assessment of species distributions in *Pleurotus* based on trapping of airborne basidiospores. *Mycologia* 86: 270-274.

**Treatise, multi-authored:**

Zadrazil, F. and R. H. Kurtzman, Jr. 1982. The biology of *Pleurotus* cultivation in the tropics; Chapter 15. Pp. 277-298. *In: Tropical Mushrooms*. Eds. S. T. Chang and T. H. Quimio. The Chinese University Press, Shatin.

### Brief articles

They should normally not exceed 6 typewritten pages, including tables and figures. They should be organized in the same order as a full length manuscript. It should have a Literature Cited section, but no other section headings.

### Potpourri

This section is open to all contributions of interest to mycologists. The primary limitation is that no contribution may occupy more than one printed page. Contributions will not be submitted to referees, but they must appear to benefit subscribers. News, opinions and book reviews are some possible subjects.

### Submission of Manuscripts

It is preferred that manuscripts be submitted on e-mail attachments or CD. Most well-known word processor formats are acceptable, but RTF is preferred. Do not include figures or tables in the text file.

Those who do not have computers must submit three copies on A4 or U.S. letter paper (21.6 x 27.9 cm). Margins must be at least 2.5 cm at the top and both sides. It must be double spaced and no more than 27 lines per page. At least one copy must be an original, typed with a fresh ribbon. Typed manuscripts will require extra time to process and proofread. Poorly typed manuscripts may have to be rejected, but at a minimum will require much more time to process. Only one space should be used between words and sentences. Do not right justify any copy of the manuscript. Do not hyphenate words at the end of lines. Do not double-space lines or provide margins on any disk copy.

Carefully read the information under preparation of figures and tables, before submitting.

Print a copy of your manuscript from the floppy disk or CD that you submit, just before you send it to the editor. Every file on the disk should be checked. Computers do make errors and the editor can not correct them. If you send files that you are not equipped to print, the same information should be sent in another form.

### E-mail submissions

E-mail submission of manuscripts is encouraged. However, the rules must be more restrictive than for submission with paper copy. Text may be in ASCII, MS-Office, OpenOffice, or RTF. All figures: line drawings, graphs and photos must be sent as separate attachment. Unless color printing will be paid for, **graphs must be monochrome**. It is also desirable to have monochrome photos. **All figures must be at least 900 dots wide**, or occupy less than one journal column width. Send to <kurtzman@earthlink.net> or <dcarrera@colpos.mx>.

Manuscripts are normally submitted by geographic origin, but may be sent to either Editor:

For English speaking, northern Europe and south Pacific:

R. H. Kurtzman, Jr., Editor  
*MICOLOGIA APLICADA INTERNACIONAL*  
445 Vassar Avenue, Berkeley, CA 94708  
U.S.A.  
E-mail: rkurtzman@oystermushrooms.net  
[www.oystermushrooms.net](http://www.oystermushrooms.net)

For Latin America, Africa, Asia and southern Europe:

D. Martínez-Carrera, Editor  
*MICOLOGIA APLICADA INTERNACIONAL*  
Apartado Postal 701, Puebla 72001,  
Puebla, MEXICO.  
E-mail: dcarrera@colpos.mx  
Tel./Fax: +222-2852162

# MICOLOGIA APLICADA INTERNATIONAL

represents the combined

*INTERNATIONAL JOURNAL OF MUSHROOM SCIENCES* and *MICOLOGIA NEOTROPICAL APLICADA*

## Contents

Volume 24(1)

January 2012

- 1-10** Invertase production by *Aspergillus* and *Penicillium* and sequencing of an *inv* gene fragment. A. C. FLORES-GALLEGOS, F. CASTILLO-REYES, C. B. LAFUENTE, J. C. LOYOLA-LICEA, M. H. REYES-VALDÉS, C. N. AGUILAR AND R. RODRÍGUEZ HERRERA

Invertase is an important enzyme in the food industry. A xerophilic strain of *Aspergillus niger* produced high amounts of invertase, and it was possible to amplify the partial DNA sequence of the putative *inv* gene in two strains studied.

- 11-26** Mushroom prices and their effect on consumption: the case of Mexico. Y. MAYETT, D. MARTÍNEZ-CARRERA, M. SOBAL, P. MORALES AND M. BONILLA

Edible mushrooms show increasing importance as a food in many regions worldwide. The authors showed that the Mexican mushroom market expanded recently in terms of species cultivated, variety of products and presentations available at the point of sale. However, high mushroom prices restrict social consumption and further development of this emergent agri-food chain.

- 27-29** Mushrooms equal water conservation. R. H. KURTZMAN, JR.

Interesting theoretical discussion showing that mushroom cultivation can be a method of water conservation. In practice, it represents intensive biotechnological processes, in which water is efficiently used in comparison with other crops.

- 31** List of reviewers. THE EDITORS

Our reviewers for 2011.

Visit our website: [www.micaplint.com](http://www.micaplint.com)



Latin American Network on Edible and Medicinal Mushrooms:  
Production, Development and Consumption  
([www.hongoscomestibles-latinoamerica.com](http://www.hongoscomestibles-latinoamerica.com))