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Mycological Research News[1]

This issue of *Mycological Research News* features: Fungi from coral reefs: a commentary. An obituary of Meinhard M. Moser (1924–2002), doyen of European agaricologists and a Centenary Fellow of the British Mycological Society, is also presented.

Molecular papers in this part include the characterization of an α-L-arabinofuranosidase gene in *Penicillium*, the proteomomics of development in a *Phytophthora*, the isolation of differentially expressed genes in *Agaricus bisporus*, and the demonstration of different genotypes in somatic cells of *Armillaria*.

Nitrogen utilization by *Amanita* in Australia is documented, and species antagonistic to *Rhizoctonia cerealis* are compared enzymatically. Probes to detect *Rhizoctonia* spp. and *Suillus bovinus* are also reported. A single *Phyllosticta* species can live as an endophyte in different plant families, while two morphologically identical *Pseudocercospora* species on different hosts are molecularly distinct. Two karyotypes occur in the cacoa *Crinipellis perniciosa*, and new molecular phylogenetic data on the *Dermatocapron miniatum* and *Ophiostoma piceae* complexes is presented. New species described include a *Phytophthora* pathogenic to trees and shrubs in wet sites, and ectomycorrhizal mushrooms from Guyana and India.

The following new scientific names are introduced in this part: *Cortinarius conopileus*, *C. keralensis*, *C. phlegmophorus*, *Dermatocarpon taminium*, *Inocybe ayangannae*, *I. epidendron*, *I. lilacinosquamosa*, *I. pulchella*, *Phytophthora inundata*, *Pseudocercospora hibbertiae-asperae*, *P. platylobi* spp. nov.; and *D. tenue* (syn. *D. muhlenbergii* var. *tenue*) comb. nov.

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The first paper in this issue features the identification and sequencing of an α-L-arabinofuranosidase gene in *Penicillium purpurogenum*; these enzymes have biotechnological potential in relation to wine flavour and biomass conversions (pp. 388–394). Proteonomic analysis of the proteins produced in different stages of development of *Phytophthora palmivora* has revealed that about 1% of the proteins are restricted to each key part of the life-cycle, and 30% of the total protein profile is probably the same as that in *P. infestans* (pp. 395–400). Suppression subtractive hybridisation has been used to isolate cellulose-growth specific sequences in *Agaricus bisporus*; 183 clones were isolated, some homologues of endoglucanases, β-glucosidases, xylanases, hydrophobins, and other proteins known in other fungi (pp. 401–407). The somatic cells of *Armillaria gallica* fruit bodies have different genotypes for molecular-marker and mating-type loci, and show almost as much variation as sexually produced basidiospores in fitness-related traits; such variations within an individual has not previously been reported and is pertinent to the evolutionary potential of the species (pp. 498–412). If this phenomenon is widespread in macromycetes, it must be of major evolutionary significance.

The utilization of different nitrogen sources by ectomycorrhizal fungi has been little-studied outside the Northern Hemisphere. Here, 14 species of *Amanita* in Australia have been found to be capable of utilizing ammonium ions and some amino acids readily; the extent to which this ability contributes to the welfare of the host could be ecologically important (pp. 413–420). Antagonistic activities of four fungi and one bacterium against *Rhizoctonia cerealis* on wheat seeds have been investigated, *Trichoderma* spp. being most efficacious with glucosaminidase and chitobiosidase activity demonstrated (pp. 421–427).

The production of molecular probes for species detection continues, with the development of ITS 1-2 focussed probes able to detect uni- and binucleate *Rhizoctonia* spp. and *Suillus bovinus* (pp. 428–438).

Two papers address tropical microfungal genera in which many species are generally considered host-specific. Endophytic *Phyllosticta* isolates from the leaves of trees belonging to 16 plant families compared by molecular methods all appeared to belong to the single species *P. capitalensis* (pp. 439–444). In contrast, two morphologically indistinguishable new Australian *Pseudocercospora* species are described which occur on unrelated hosts, the recognition of these as species being confirmed by ITS sequence data (pp. 445–451). The issue of host specificity in such fungi clearly has to be addressed on a case-by-case basis and caution is

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evidently needed in making any generalizations founded on particular examples.

The potential of pulse-gel electrophoresis for elucidating chromosome numbers in fungi has hardly been realized. Here, the technique is used to study the cacao biotype of *Crinipellis perniciosa*, the causal agent of witches' broom in cacao; two genotypes were discovered, one with six and the other with eight chromosomal bands (pp. 452–458).

Molecular phylogenetic studies address two species complexes. First, the lichen-forming *Dermatocapon miniatum* group is shown to include some polyphyletic taxa, and others that merit resurrection or description as new species (pp. 459–468). And second, that of *Ophiostoma piceae* in the Southern Hemisphere, where new insights into species distributions are presented and the origins of *O. quercus* called into question (pp. 469–476). A pathogenic *Phytophthora* attacking trees and shrubs in wet and flooded soils, termed 'O-group' in the previous part of the journal (*Mycological Research* **107**(3): 277–290, 2003) is now formally named as *P. inundata* with additional information on its characters, breeding systems, and pathogenicity (pp. 477–484).

Finally two papers are included which indicate how much is still to be discovered of ectomycorrhizal mushrooms in the tropics. Three new *Cortinarius* species are described from southern India and their positions examined using ITS sequence data (pp. 485–494). In a similar vein, the *Dicymbe* forests in Guyana have yielded four new species of ectomycorrhizal *Inocybe* species (pp. 495–505).

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FUNGI FROM CORAL REEFS: A COMMENTARY

We would like to discuss recent comments in Mycological Research News (*Mycological Research* **106**(4): 387, April 2002; **106**(10): 1122, October 2002) dealing with three studies on fungi isolated from coral reefs. In all cases (Kendrick *et al.* 1982, Höller *et al.* 2000, Morrison-Gardiner 2002) the authors isolated primarily fungal genera or species which are generally considered terrestrial, such as *Aspergillus*, *Cladosporium* and *Penicillium*. It is interesting to recall that Sparrow (1937) already tried to isolate fungi from marine mud and obtained, among others, the same genera. His conclusions are as valid today as they were 66 years ago: 'The fungi obtained by the plate method were all common dust and wind-borne forms. ... it is doubtful in the present state of our knowledge whether these organisms play an active part in the disintegration of organic materials present in the mud' (Sparrow 1937). It would seem obvious that the main goal in studies of fungi from marine and estuarine habitats should be to clarify if the fungi found play an active role in this environment or if they occur there merely in the form of dormant spores or hyphae. Accordingly, the generally accepted broad ecological definition of marine fungi is: '*Obligate marine fungi* are those that grow and sporulate exclusively in a marine or estuarine habitat; *facultative marine fungi* are those from freshwater or terrestrial milieus able to grow (and possibly also to sporulate) in the marine environment' (Kohlmeyer & Kohlmeyer 1979). The best method to determine if a fungus is indigenously marine is to collect pieces of substrate (e.g. wood, detritus, algae) from the marine habitat and inspect it for fruiting structures as described in Kohlmeyer & Kohlmeyer (1979) and Hyde & Pointing (2000).

When either a plate method or incubation of marine-derived materials is used, it is up to the investigator to prove that the isolated fungus is active in the marine environment. Advocates of the plate method often wrongly argue that if a fungus is frequently or consistently isolated from the marine habitat it must play a role there. Recent studies of a sea fan pathogen resulted in the isolation of a common terrestrial mould, *Aspergillus sydowii* (Geiser *et al.* 1998).[2] Although the pathogen is morphologically identical and forms a strongly supported clade with strains isolated from terrestrial materials, only the marine strains are pathogenic as proven by inoculation of sea fans with cultures of terrestrial and marine origin, respectively (Geiser *et al.* 1998). This indicates that there are genetic differences between marine and terrestrial strains (Alker *et al.* 2001). It can be concluded that only detailed studies can ascertain if a marine-derived strain obtained through the plate method is natively marine.

Investigations for the purpose of finding novel secondary metabolites usually try to obtain large numbers of fast growing isolates from marine sources. An interesting study by Höller *et al.* (2000) yielded 681 fungal strains, isolated from marine sponges. The authors conclude that '... the high proportion of ubiquitous genera and the relatively low proportion of new compounds suggests that the fungi isolated from sponges ... are of terrestrial origin'. Jensen & Fenical (2002) point out that the isolation methods employed, *viz* inoculating a marine sample onto an agar plate, tend to select for non-marine species. This may explain why about 30% of the 'marine-derived' fungi producing new compounds belong to the genera *Aspergillus* and *Penicillium*. Therefore, the authors recommend an 'increased collaboration between natural product chemists and marine mycologists to ensure that

[2] See also Mycological Research News (*Mycological Research* **107**(2): 130, February 2003).

obligate marine species are effectively studied' (Jensen & Fenical 2002).

Obviously, the collection of authentic obligate marine fungi on corals is much more time-consuming and tedious than that of so-called 'marine-derived' fungi. Also, the isolation and culturing of true coral-inhabiting fungi is difficult or impossible, possibly because of their symbiotic associations with other organisms. Kendrick *et al.* (1982) illustrated the presence of fungal hyphae in the interior of living corals from the Caribbean and South Pacific. They also tried to isolate fungi by aseptically removing tiny samples from the freshly exposed surface and transferring them to a liquid medium, assuming that the interior contains only autochthonous endolithic fungi. However, corals are perforated by pores and tunnels, containing seawater and possibly dormant propagules of terrestrial fungi. Therefore, it is not surprising that most of the isolates in this study are well-known terrestrial species that could have derived from terrestrial sources. Even assuming that native marine species were among them, they would have been quickly overgrown by the faster growing terrestrial anamorphs. Le Campion-Alsumard *et al.* (1995) showed that endolithic septate fungal hyphae are common in coral skeletons and also inside soft coral tissues. These autochthonous fungi were not identified and not cultured by the authors. So far, the only autochthonous coral-inhabiting fungi that have been found fruiting in the natural habitat and have been described and illustrated are the following ascomycetes:

(1) *Corallicola nana*, known only from Belize; its ascomata are attached to dead coral slabs and may be associated with crustaceous sponges (Volkmann-Kohlmeyer & Kohlmeyer 1992).

(2) *Halographis runica* is an endolithic lichenoid from corals and shells of living snails, and has been reported from Australia (Queensland) and Belize (Kohlmeyer & Volkmann-Kohlmeyer 1988, 1992).

(3) Five species of *Koralionastes* live attached to coral slabs in shallow water and are associated with crustaceous sponges. *K. angustus* and *K. giganteus* are known only from Belize, *K. ellipticus* and *K. ovalis* occur in Belize and Australia (Queensland), and *K. violaceus* has been reported from Australia and Fiji (Kohlmeyer & Volkmann-Kohlmeyer 1987, 1990, 1992).

(4) *Lulworthia calcicola*, another coral-inhabiting species from Belize (Kohlmeyer & Volkmann-Kohlmeyer 1989).

(5) *Xenus lithophylli*, is a parasite of calcified algae (*Lithophyllum* sp.), attached to corals in Belize (Kohlmeyer & Volkmann-Kohlmeyer 1992).

We hope that this commentary will encourage research on a fascinating group of true marine fungi from an endangered habitat.

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