

Mycological Research News¹

This contribution of Mycological Research News features: New generic concepts in *Verticillium* sect. *Prostrata*, and The sterigmata of *Volucrisporium*: a clarification.

This issue includes 17 papers. The first describes a technique for genetically transforming ectomycorrhizal basidiomycetes. Molecular studies, often in association with other approaches, are applied to reassess species concepts in *Polymyxa*, explore the relationships of *Melanospora* and similar genera, examine lineages in violet root rot fungi, filament-beaked and other *Alternaria* species, *Nectria galligena* and *N. coccinea* var. *faginata* in North America, *Phialophora gregata* f. sp. *sojae*, the pine rusts *Cronartium flaccidum* and *Peridermium pini*, *Rosellinia necatrix* isolates from avocado, *Claviceps purpurea* populations on *Spartina*, *Colletotrichum* species on *Hevea*.

A major paper examines secondary metabolite profiles of 153 *Alternaria* isolates grown under standard conditions and assesses them in relation to morphological and RAPD data.

In addition, protein expression after low temperature exposure associated with fruit body formation in *Flammulina velutipes* is documented, the use of natural products to control sapstaining fungi reviewed, and the aerodynamics of conidia in *Erynia neoaphidis* and some other entomophthoralean fungi studied.

A new genus of mycorrhizal *Cortinariaceae* is described, and the *Coemansia spiralis* complex revised.

The following new scientific names are introduced: *Anamika* gen. nov.; *Coemansia bainieri* nom. nov.; *A. indica*, and *C. linderi* spp. nov.; and *Polymyxa graminis* f. sp. *colombiana*, f. sp. *subtropicalis*, f. sp. *tepida*, f. sp. *temperata*, and f. sp. *tropicalis* f. spp. nov.

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IN THIS ISSUE

This issue features the development of a technique for genetically transforming the genome of ectomycorrhizal basidiomycetes based on *Agrobacterium tumefaciens* which was tested in three species (pp. 132–137). Molecular studies using the 5.8S and ITS rDNA genes are used to reassess species concepts in *Polymyxa* recognizing two species, *P. betae* and *P. graminis*, with five special forms in the latter which have different temperature optima and host preferences as well as differing molecular sequences (pp. 138–147). This work provides a new and more precise basis for all future work on the pathology of these enigmatic organisms. The relationships of *Melanospora* and similar genera with translucent perithecia but different types of ascospores have long been uncertain with some authors placing them in *Hypocreales*, *Sordariales*, or an independent *Melanosporales*. Now SSU nrDNA data show that these fungi are definitely members of

Hypocreales, confirm the distinctiveness of *Persicispora*, *Scopinella* and *Syspastospora*, but question the separation of *Sphaerodes* from *Melanospora* (pp. 148–155). Hyphal anastomoses were carried out and ITS rDNA sequences obtained in 31 violet root rot fungal isolates; the molecular method distinguished five lineages with no more than single nucleotide substitutions, while all belonged to a single anastomosis group – raising questions about the biological and molecular species in some *Helicobasidium* and *Rhizoctonia* species (pp. 156–163).

Two papers focus on *Alternaria* species. Analyses of the ITS regions placed species with filament-beaked conidia as a separate group, and supported the inclusion of three *Ulocladium* species in the genus (pp. 164–169); further, the effect of different wind speeds and gusts on the liberation of beaked and unbeaked conidia was studied in a laminar flow cabinet. The secondary metabolite profiles of 153 isolates grown under standard conditions were compared and assessed in relation to morphological and RAPD data (pp. 170–182). While the *A. arborescens*-, *A. infectoria*- and *A. tenuissima*-species groups were separable, variation within the groups suggests several taxa are present in each which require formal recognition. Tentoxin was found in some *A. tenuissima* isolates for the first time.

The genetic diversity of the canker-causing *Nectria galligena* and *N. coccinea* var. *faginata* strains in North America has been compared by RAPD and rDNA

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polymorphism analyses (pp. 183–193). Numerous haplotypes were found, but polymorphism was greatest in *N. galligena*, suggesting that species is native and the *N. coccinea* variety a recent introduction. The examination of microsatellite genomic DNA loci in 118 isolates of *Phialophora gregata* f.sp. *sojae* revealed two distinct but sympatric populations with different pathologies which are probably clonal (pp. 194–202). Critical comparisons of the pine rust fungi *Cronartium flaccidum* and *Peridermium pini* using molecular markers establish that these belong to a single species, *P. pini*, arising as asexual or self-fertile host range mutants of *C. flaccidum* (pp. 203–209). A somatic incompatibility system has been found in *Rosellinia necatrix* isolates from avocado which has a high diversity suggesting it originates from sexual reproduction (pp. 239–244). The *Claviceps purpurea* populations on *Spartina* have been compared by morphological, molecular and chemical methods and found to be distinct from those from field and meadow grasses, the UK stands probably being introduced from North America (pp. 210–214). Molecular methods have also been used to establish that two *Colletotrichum* species can be pathogenic to *Hevea* in India, *C. acutatum* causing a raised spot and *C. gloeosporioides* anthracnose and papery lesions – the symptoms being illustrated in colour (pp. 215–221).

Flammulina velutipes is well-known as fruiting after frosts in the field. Reduction of the ambient temperature has now been shown experimentally to be the key to fruit body formation, and to be related to the expression of 22 new protein spots, four which appeared to be polypeptides expressed during fruit body formation (pp. 222–227).

Two papers concern biocontrol. The use of natural products to control sapstaining *Ophiostoma* and *Sphaeropsis* species on *Pinus radiata* wood in New Zealand is reviewed, massoialactone emerging as especially promising (pp. 228–232). The aerodynamics of conidia of the entomopathogen *Erynia neoaphidis* and some other entomophthoralean fungi have been studied by impaction methods, conidia formed in the field and in culture behaving similarly (pp. 233–238).

A new genus of mycorrhizal mushrooms belonging to the *Cortinariaceae* has been discovered in India associated with dipterocarp trees; it is distinguished by the type of spore ornamentation and kinds of cystidia formed (pp. 245–251). The primarily dung-inhabiting zygomycete *Coemansia spiralis* is rarely encountered and difficult to preserve, but a critical study of the published reports shows that three species are involved, one needing a replacement name and one described here as a new species (pp. 252–256).

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NEW GENERIC CONCEPTS IN *VERTICILLIUM* SECT. *PROSTRATA*

The section *Prostrata* of *Verticillium* was introduced by Gams (1971) to separate verticillium-like anamorphs of the *Clavicipitaceae* from other species of the genus that were known or supposed to have affinities with other families of the *Hypocreales*. Other sections of *Verticillium* were subsequently described by Gams & van Zaayen (1982). Messner *et al.* (1996) showed that the most important plant pathogens of the genus, which still are most frequently investigated, have affinities with the *Phyllachorales*. Also the type of species of the genus, *Verticillium luteo-album* (i.e. *V. tenerum*) has affinities with this order (Zare *et al.* 2000) and its connection with a '*Nectria inventa*' teleomorph supposed by Pethybridge (1919) is erroneous. The inclusion of these plant pathogens together with the unrelated, often valuable biocontrol organisms of sect. *Prostrata* in one and the same genus *Verticillium* is undesirable for both scientific and practical reasons.

In morphological and molecular work, laid down in a PhD thesis (Zare 2000), large numbers of isolates were analysed. The strains were first delimited according to RFLP patterns of amplicons of the ITS region, β -tubulin and mitochondrial DNA. The phylogenetic analysis of ITS sequences (Zare *et al.* 2000) then showed that species of section *Prostrata* should be divided into several genera. This conclusion was subsequently corroborated by the analysis of large and

small subunits of the ribosomal DNA carried out for a wider array of clavicipitaceous fungi (Sung *et al.* 2001). Gams & Zare (2001), therefore, distinguished several genera. *Lecanicillium* comprises the majority of the species of the former section *Prostrata*, mainly entomogenous and fungicolous taxa (revised by Zare & Gams 2001a). The same phylogenetic clade also includes the morphologically distinct genera *Beauveria*, *Microhilum* and *Paecilomyces tenuipes*, in relation to which *Lecanicillium* takes a paraphyletic position. A similar genus with generally simple (i.e. not verticillate), very slender phialides, *Simplicillium* (Zare & Gams 2001a), type species *S. lanosoniveum*, is a sister taxon and falls outside this clade. Both genera have teleomorphs in *Torrubiella*, *Lecanicillium* also in *Cordyceps*. *Pochonia* (syn. *Diheterospora*) comprises parasites of nematode cysts and eggs (Zare *et al.* 2001). *Haptocillium* is introduced for verticillium-like taxa with apically adhesive conidia which facilitate parasitism of free-living nematodes (Zare & Gams 2001b). In addition, *Rotiferophthora* is recognized as a distinct genus for parasites of bdelloid rotifers. Keys to the species of this genus and of *Harposporium* will be provided by Gams & Zare (2002).

The most important of the 19 so far recognized species of *Lecanicillium* are (Zare & Gams 2001a): *Lecanicillium lecanii*, which, however, is defined more

