Mycoscience (2009) 50:1–2
DOI 10.1007/s10267-008-0448-y

EDITORIAL

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Editorial for the special feature: propagation strategy of fungi

Fungi are exceptionally diverse organisms, with an estimated 1.5 million taxa on Earth. They inhabit aquatic as well as terrestrial environments, and are among the principal players in biomes extending from tropical to polar zones (Hawksworth and Mueller 2005). Despite their higher populations and turnover, the ecology of fungi (mycoecology) has not been studied to the same extent as that of animals and plants, probably because of the difficulty of observing the whole vegetative structures of most fungi colonizing substrata and the mostly ephemeral reproductive structures. Furthermore, the majority of fungal propagules, such as various kinds of spores, are too small to be observed by the naked eye. Progress in molecular technology has made possible the direct identification of spores and/or colonizing mycelia in the substrata, but most of this research has been done in the past 10 years. Although fungi are eukaryotes, they often, or mainly, propagate with various asexual structures such as conidia, mycelial strands, sclerotia, and vegetative hyphae (fine mycelia), as well as with occasionally produced sexual propagules such as ascospores, basidiospores, and zygospores. Clearly, fungi have a more diverse array of reproductive strategies than most other organisms. These amazing propagation abilities are an attractive field for ecologists, with the ultimate goal of capturing the general features of fungal reproductive strategies. To overcome the difficulties of advancing fungal ecology, much physiological and ecological research has been based on using different kinds of media in the laboratory as well as by direct observation in the field (cf. Suzuki 2006). Therefore, fungal ecology has developed a tendency to emphasize autecology, although interactions between a fungal species and other organisms (including other fungi) are an essential factor influencing the propagation of fungi. Interactions between a fungus and another organism from which the fungus receives nutrients can be divided into three nutritional modes, i.e., biotrophy, saprotrophy, and necrotrophy (Cooke and Rayner 1984; Tuininga 2005). Interactions between a fungus and another organism from which the fungus does not receive nutrients can be categorized into coantagonism, antagonism, agonism, cohabitation, commensalism, and mutualism (Cooke and Rayner 1984; Tuininga 2005).

Many ecological groups of fungi have been categorized by different criteria, i.e., fungi inhabiting rock, soil, freshwater, brackish water, and seawater, by the impact of environmental factors such as temperature, pH, and nutrient concentration, and by their presence on various substrata such as litter, wood, and dung, and in soils that were disturbed by fire, chemicals, or scratching (Hudson 1980; Cooke and Rayner 1984; Hirsch and Braun 1992; Lisiewska 1992; Dix and Webster 1995; Hawksworth and Mueller 2005; Sagara et al. 2008). In other words, the potential number of propagation strategies for fungi inhabiting different substrata or associating with host organisms is huge. Fungal communities composed of diverse species and forming different ecological groups adjust their population sizes based on changes in the substratum and in plant communities caused by fungal activities. The changes in fungal species assemblages are categorized as fungal succession at different scales (Suzuki 2002). Fungal succession is, therefore, another important factor to examine in the context of fungal propagation strategies.

An accurate understanding of fungal propagation strategies with different nutritional modes and belonging to different ecological groups is indispensable to elucidate the mechanism of the establishment of fungal communities based on the acquisition of territory by each fungus, analyses of mechanisms of fungal succession, and the role of each fungus in fungal communities in various ecosystems.

It is generally accepted that, during evolution, different aspects of natural selection have resulted in a wide spectrum of survival strategies. Two types of organisms have been placed at opposite poles (Cooke and Rayner 1984; Hawksworth and Mueller 2005). Broadly speaking, organisms can be characterized as being adapted to take advantage of rapidly varying circumstances (*r*-selection), or, as being adapted to thriving in habitats and resource opportunities remaining stable over extended periods of time (*K*-selection) (Swift 1982). Most organisms lie between these two extremes of *r*- and *K*-selection. Ecological strategies can be considered within the framework of substrate group-

ing, taking into account competition (combativeness), stress, enrichment, and destructive disturbance (Cooke and Rayner 1984). Progress in the research in propagation strategy of each fungus contributes to the development of "fungal ecology": the mechanism of biogeographic distribution and population dynamics of each fungus, the elucidation of the establishment of a fungal community, and the role of fungi in ecosystems, etc.

Based on the foregoing considerations, we organized a symposium entitled "Propagation Strategy of Fungi" at the 8th International Mycological Congress (IMC8) held in Cairns in 2006. The aim of the symposium was to provide an overview of propagation aspects of fungi in different habitats and to foster the development and encouragement of fungal ecology.

We, as co-chairpersons of the Symposium, discussed the publication of the contributions presented at the Symposium in a suitable scientific journal. The former editor-in-chief of *Mycoscience* (2005–2007), Dr. Akira Nakagiri, kindly gave us the opportunity to publish those topics in a Special Feature of *Mycoscience*, on the condition of adding a couple of review articles about the propagation strategy of fungi. We added two topics to the presentations in the Symposium. Upon further discussion with Dr. Gen Okada, the editor-in-chief of *Mycoscience* from 2007 to 2009, he agreed to publish the five review papers in the Special Feature, "Propagation strategy of fungi," in the first issue of Volume 50 of *Mycoscience*, which is a commemorative volume published by the Mycological Society of Japan. Again, we would like to emphasize the functional aspects of this Special Feature on providing current ideas for advancing research in fungal ecology.

We are very grateful to the former and the present editors-in-chief of *Mycoscience* (Drs. Nakagiri and Okada), and the Mycological Society of Japan, for their kind invitation to publish these review papers in *Mycoscience*.

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September 25, 2008

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