

Fungal endophyte communities in two tropical forests of southern India: diversity and host affiliation

T. S. Murali · T. S. Suryanarayanan · G. Venkatesan

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Abstract Fifteen tree species from a tropical dry thorn forest and fifteen tree species from a tropical dry deciduous forest in the Mudumalai Wildlife Sanctuary, Nilgiri Biosphere Reserve, southern India, were surveyed for their foliar endophyte communities during the dry and wet seasons. Surface sterilized leaf segments of uniform dimension were plated on nutrient agar and culturable endophytes growing from the segments were identified. Endophyte diversity was greater in the dry thorn forest than in the dry deciduous forest in the dry season. Although the isolation frequency of culturable endophytes increased for both forests during the wet season, the assemblages were represented not by any unique fungal species but by the commonly occurring ones. Furthermore, although individual leaves were densely colonized by endophytes, only a few species of endophytes colonized the whole leaves; and, only a few fungal species dominated the foliar endophytic communities and were common for both forests during both dry and wet seasons. Thus, even under wet conditions that favour dispersal and infection by fungi, the endophyte diversity increased only marginally, an indication that certain tropical forests are not hyperdiverse with reference to fungal endophytes. This should be considered when using culturable endophyte diversity as a surrogate for estimating global fungal diversity.

Introduction

We are only beginning to understand the relationship between plant communities and different fungal guilds such as mycorrhizal fungi and pathogens (Durrall et al. 2005). We have limited understanding about the relationship between endophytic fungal communities and tropical forests. Endophytic fungi reside within living tissues of plants and do not produce visible symptoms of their presence. Apart from the fact that some pathogenic fungi can survive in plant hosts as symptomless endophytes (Photita et al. 2004; Suryanarayanan and Murali 2006), observations that endophyte presence can increase the fitness of plant hosts by enhancing their resistance to abiotic (Redman et al. 2002) and biotic (Arnold et al. 2003) stresses indicate that endophytes have a definite, yet so far unrecognized, role in shaping and maintaining plant communities such as tropical forests.

The fungal kingdom is hyperdiverse and is estimated as representing 1.5 million species (Hawksworth 2004). However, only 7% of this estimated figure has been described so far and endophytes of tropical plant communities are one of the groups of fungi that need to be explored to account for the remaining 93% (Hawksworth 2004). While it is accepted that endophytes are ubiquitous and are an important component of fungal diversity, the extent to which they are host restricted in the tropics (which is pivotal to estimating fungal diversity) is unclear (Arnold et al. 2000; Hawksworth 2004; Murali et al. 2006; Pandey et al. 2003). In the opinion of some mycologists, the rich plant diversity existing in the tropics should mirror endophyte diversity (for e.g. Hyde et al. 2005). Investigations by Arnold et al. (2000, 2001) in neotropics have lent credence to this view. However, other studies indicate that the dry tropical forests do not support very high endophyte diversity (Suryanarayanan et al. 2002, 2003). In dry tropical forests, rainfall is seasonal and the rest

T. S. Murali · G. Venkatesan
PG & Research Department of Botany,
RKM Vivekananda College,
Chennai 600 004, India

T. S. Suryanarayanan (✉)
Vivekananda Institute of Tropical Mycology, RKM Vidyapith,
RKM Vivekananda College,
Chennai 600 004, India
e-mail: t_sury2002@yahoo.com