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Revealing the endophytic mycoflora in tea (*Camellia sinensis*) leaves in Sri Lanka: the first comprehensive study

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Abstract

Endophytic fungi are a diverse group of microorganisms that live asymptotically in healthy tissues of host and they have been reported from all kinds of plant tissues such as leaves, stems, roots, flowers, and fruits. In this study, fungal endophytes associated with tea leaves (*Camellia sinensis*) were collected from Kandy, Kegalle, and Nuwara Eliya districts in Sri Lanka and were isolated, characterized, and identified. A total of twenty endophytic fungal isolates belonging to five genera were recovered and ITS-rDNA sequence data were used to identify them. All isolated endophytic fungal strains belong to the phylum Ascomycota and the majority of these isolates were identified as *Colletotrichum* species. *Phyllosticta capitalensis* was the most commonly found fungal endophyte in tea leaves and was recorded in all three districts where the samples were collected. This is the very first investigation on fungal endophytes associated with *C. sinensis* in Sri Lanka based on molecular sequence data. In addition, a comprehensive account of known endophytic fungi reported worldwide on *Camellia sinensis* is provided.

Keywords: Ascomycota, *Colletotrichum*, Endophytes, ITS-rDNA, *Phyllosticta*, Sordariomycetes

Introduction

Tea (*Camellia sinensis* (Linnaeus 1753:515) Kuntze (1887:195), the most widely consumed drink in the world after water, is an evergreen shrub widely cultivated throughout the tropical and subtropical regions including Asia and Africa. Tea is reported to have a wide range of beneficial physiological and medicinal effects (Miller 1995, Sharangi 2009, Mahmood *et al.* 2010, Namita *et al.* 2010). To meet the increasing demand, tea cultivation has been expanded in many countries including Sri Lanka. The total tea production in Sri Lanka is about 300 million kilograms per annum and the export of tea today is one of the key sources of foreign income for the country (Ratnasiri *et al.* 2008). The tea cultivation in Sri Lanka is classified into three different elevation zones; high grown or upcountry tea (grown in the Badulla and Nuwara Eliya districts generally fall above 1200 m elevation), low grown or low country tea (generally cultivated below 600 m elevation and found mainly in Galle, Matara, Ratnapura, Kegalle and Kalutara districts) and Mid grown or Mid country tea (generally cultivated between 600 and 1200 m; the middle-elevation zone Kandy and Matale districts) (Sandika 2008).

A number of fungal saprobes, endophytes, and pathogens, are associated with the tea plant while some of these fungal pathogens cause foliar, stem, and root diseases resulting in a significant threat to tea leaves (Saha *et al.* 2005, Augusta *et al.* 2006, Rabha *et al.* 2014). Bird's eye spot disease (*Cercospora theae* Breda de Haan in Chupp, Bulletin Inst. Bot. Buitenzorg (1900: 12), brown blight (*Colletotrichum* sp.), leaf blotch (*Colletotrichum* sp.), grey blight (pestalotiopsis-like species), blister blight (*Exobasidium vexans* Mas. in Bull. Misc. Inf., Kew (1898:111), collar canker (*Phomopsis theae* Pet. in Ann. R. bot. Gdns Peradeniya (1925: 324) = *Diaporthe theae* (Petch 1925: 324) Rossman & Udayanga (2015:150), twig die-back and stem canker (*Botryodiplodia theobromae* Pat. in Patouillard & Lagerheim,