

A COMPREHENSIVE STUDY REVEALING FUNGAL VIRULENCE FACTORS ASSOCIATED WITH *CORYNESPORA* LEAF FALL DISEASE (CLFD) IN *HEVEA BRASILIENSIS* ELUCIDATED BY WHOLE GENOME AND TRANSCRIPTOME ANALYSIS

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Corynespora leaf fall disease (CLFD) caused by the fungus *Corynespora cassiicola* is a major leaf disease of *Hevea brasiliensis* that severely affects its growth and yield. The pathogen is genetically highly diverse, but there is no clear understanding regarding its pathogenicity. A small glycosylated secreted protein called cassiicolin is thought to be an effector involved in the disease development process in most of the virulent isolates. The present study was aimed at identifying the virulence factors involved in CLFD in *Hevea*.

The genome of a highly virulent *C. cassiicola* isolate (HV) from the rubber tree was sequenced and assembled. Sequence data was generated and gene prediction was performed. The predicted genes were searched against the Database of Fungal Virulence Factors (DFVF). One thousand and twenty six proteins of the organism matched against the database and two hundred and twenty nine proteins were classified as leaf spot-associated virulence factors. The genes predicted from the assembled whole genome were validated by RNA sequencing and transcriptome analysis. The *de novo* transcriptome was assembled, and the transcripts were searched for homology against DFVF using Diamond tool with an e-value threshold of 0.00001. One thousand four hundred and twenty eight genes were annotated as virulence factors, of which five hundred and sixty five were classified as plant pathogen related. The genomic and transcriptomic analysis revealed that the major virulence proteins were classified as leaf spot-associated virulence factors of the mapped genes, which are predominant in *Corynespora* leaf fall disease of rubber.

Keywords: *Corynespora cassiicola*, *Corynespora* leaf fall disease, Fungal virulence factors, *Hevea brasiliensis*, Transcriptome analysis, Whole genome sequencing

INTRODUCTION

Corynespora leaf fall disease (CLFD) of rubber tree (*Hevea brasiliensis*) caused by the fungus *C. cassiicola* pose a serious threat to plantations in all rubber-growing countries of South East Asia. In India, CLFD is a

serious problem in rubber plantations, especially in South Karnataka and adjoining areas of the Kasaragod district of Kerala (Rajalakshmi and Kothandaraman, 1996). The disease is more severe during December to April, the re-foliation period of the rubber