



Anthracnose of grapevines in Sri Lanka: Pathogen identification, epidemiological insights, and *in vitro* evaluation of bioactive extracts

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ABSTRACT

Anthracnose disease of grapevines, historically attributed to *Elsinoë ampelina*, has emerged as a significant concern in the Jaffna Peninsula, Sri Lanka. This study aimed to characterize the disease's etiology, epidemiology, and potential for biological control. Field assessments over two cultivation seasons (2022–2023) revealed a consistent pattern of disease progression, with peak incidence and severity occurring between 40 and 60 days post-pruning. Rainfall positively correlated with disease metrics, while wind speed showed a suppressive effect. Morphological and cultural characterization of 54 fungal isolates, coupled with multilocus phylogenetic analysis (ITS, actin, and histone H3), confirmed the presence of two distinct *Colletotrichum* morphotypes within the *C. gloeosporioides* species complex, potentially representing a novel lineage. Pathogenicity assays verified the virulence of representative isolates on grape leaves and fruits under both *in vitro* and *in planta* conditions. Furthermore, spore germination and lesion development were significantly inhibited by cell-free suspensions from *Pseudomonas fluorescens*, *Bacillus megaterium*, and ethanol extracts of *Azadirachta indica*, *Lantana camara*, *Vitex negundo*, *Stoechospermum marginatum*, and *Padina boryana*. These findings establish a members of new lineage of *C. gloeosporioides* complex as the primary causal agent of grape anthracnose in the region and highlight the promise of integrating biocontrol agents and botanical extracts into sustainable disease management programs.

1. Introduction

Grapevine (*Vitis vinifera* L.) is a perennial, deciduous plant of the family Vitaceae, cultivated globally for its fruit, which is highly valued in wine production, raisin processing, and fresh consumption [1]. Grape cultivation in Sri Lanka has a history spanning several centuries. It was introduced by the Dutch during their colonial rule (1658–1796). Due to its suitable climate and soil conditions, viticulture has since become established in the northern dry zone, particularly in Jaffna District. The initial grape cultivation in Sri Lanka began with the California green grapes variety in the Tholakaddy region of Jaffna. Over the years, various varieties were trialed by farmers and the Department of Agriculture; however, the variety locally known as Israel Blue, introduced in 1968, demonstrated high adaptability and became the preferred selection for commercial cultivation.

Despite its potential, grape cultivation in Sri Lanka faces significant challenges, particularly from fungal diseases and pests. Ramanathan [2]

reported four fungal diseases as major threats in Jaffna's grape farms: leaf spot, Powdery mildew, fruit rot, and Downy mildew. Farmers from certain region in Jaffna have recently reported an increasing threat from anthracnose disease, a severe fungal infection affecting grapevine health and productivity. In Sri Lanka, to our knowledge, there are no reports available on the causative agent of the recently emerging anthracnose disease.

Elsinoë ampelina was identified as the primary pathogen responsible for grape anthracnose [3]. However, recent research suggests that different *Colletotrichum* species are also associated with the grape anthracnose [4–10]. Despite these findings, many of these studies did not thoroughly assess the pathogenic potential of these isolates in causing anthracnose symptoms in the aerial parts of the grapevine [5,8]. Some research has demonstrated the pathogenicity of *Colletotrichum* isolates *in vitro*. [6]. Furthermore, several *Colletotrichum* species are known causative agents of grape fruit rot disease, which poses a significant problem across grape-growing regions worldwide [11,12]. A

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