I J R S S I S, Special Issue (V) Oct. 2025: 181-183
A Double-Blind Peer Reviewed Journal
OPEN ACCESS
e-ISSN 2347 – 517X
Original Article

INTERNATIONAL JOURNAL OF RESEARCHES IN SOCIAL SCIENCE AND INFORMATION STUDIES
 www.ijrssis.in

PHYLLOPLANE MYCOFLORA AS NATURAL BIOCONTROL AGENTS ON SUGARCANE LEAVES IN GONDIA DISTRICT

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Communicated : 05.09.2025 | Revision : 15.09.2025 | Accepted : 25.09.2025 | Published: 15.10.2025

ABSTRACT:

The present study deals with the diversity of fungal communities associated with the leaf surface of sugarcane. Phylloplane mycoflora, the community of fungi residing on leaf surfaces, play a crucial role in maintaining plant health by suppressing foliar pathogens. Sugarcane (*Saccharum officinarum L.*) is a major crop in Gondia district, Maharashtra, which faces various foliar diseases affecting yield. The present study investigates the diversity of phylloplane fungi on sugarcane leaves and evaluates their potential as natural biocontrol agents. Leaf samples were collected from multiple sugarcane fields and both direct (Microscope observation) and indirect (culture-based isolation) methods were employed. Fungal isolates were identified morphologically and microscopically. Antagonistic activity against known sugarcane pathogens was tested using spot innoculation culture techniques. This study provides insights into the ecological role of phylloplane fungi and explores sustainable biocontrol strategies for sugarcane disease management.

Keywords: *Phylloplane mycoflora, Sugarcane, Biocontrol, Fungal diversity, Pathogen suppression.*

INTRODUCTION :

The phylloplane represents a unique microhabitat on the leaf surface that harbors a diverse microbial community, including fungi, bacteria and yeasts. Fungal species on the phylloplane may act as saprophytes, pathogens or antagonists. Phylloplane fungi are particularly significant as natural antagonists against foliar pathogens, contributing to ecological balance and plant defence mechanisms. Sugarcane (*Saccharum officinarum L.*) is widely cultivated in Gondia district. However, the crop is susceptible to several foliar diseases, including anthracnose, red rot and leaf scald, which reduce both yield and quality. The number of other Colletotrichum species such as C. gloeosporioides (Verma, 1973), C. acutatum (Kaur and Singh, 1990), and C. coccodes (Oh *et al.*, 1988; Yu *et al.*, 1987) have been associated with the disease in different geographical areas. Conventional disease management often relies on chemical fungicides, which can have environmental and economic drawbacks. Exploring indigenous phylloplane mycoflora as potential biocontrol agents provides a sustainable alternative for integrated disease management.

MATERIALS AND METHODS:

Screening of phylloplane mycoflora on sugarcane for study of natural biocontrol Agents by both direct and indirect methods.

Direct Method:

a) **Field Observation**: Survey has been carried out monthly to observe the disease and photographs were taken with the help of a Nikon digital camera (6.0 megapixels). It gives direct images of objects on the screen.

b) **Laboratory Observation**: Infected leaves observed and collected in sterile segregate polyethylene bags as per infected morphological appearance from different areas randomly within a month interval. The Laboratory section is done by section cutting of infected yellow and green

leaves. 1% aqueous solution of lactophenol cotton blue was used as a stain and microscopic photographs also taken.

Indirect Method: Infected leaf is cut into 2 cm pieces and washed with tap water then transferred into 0.1% mercuric chloride (HgCl2). Infected leaf pieces transferred into flask containing 100 ml sterile distilled water and washed serially for 5 – 6 times with changing sterile distilled water in aseptic condition these small leaf pieces about 2 cm long were transferred on sterile filter paper so as the blot dried for inoculation.

Culture of Fungi: Washed and blot dried leaf pieces transferred on to surface of culture media (Zapak Agar Dox) in Petri dishes by spot inoculation method (Adams,1990) were incubated at room temperature 25± 20C for 9 days or till the antagonistic activity appear to get uniform result three replicate plates were prepared for each 24 sample. microscopic characteristics were used for identification.

Assessment of Biocontrol Potential: Spot inoculation culture examines were performed to evaluate antagonistic activity against sugarcane pathogens such as *Colletotrichum falcatum* and *Fusarium sacchari*. Inhibition zones and overgrowth patterns were recorded to determine antagonistic efficiency.

Isolation and identification of dominant phylloplane fungi its depend on temperature and rainfall (fig.1 and fig.2.) such as *Aspergillus*, *Penicillium*, *Cladosporium*, *Alternaria*, *Fusarium*, and *Trichoderma*. Seasonal variation of fungal diversity with higher abundance during rainy and humid periods. During the study antagonistic action of certain fungal isolates act as natural biocontrol. Particularly *Trichoderma*, *Penicillium rubrum, Alternaria alternata, Botrytis cinerea*, *Pestalocea macrotricha* (Fig.3.) are exhibit strong antagonistic activity against sugarcane pathogens act as natural biocontrol agent. Recommendations for using phylloplane fungi as eco-friendly biocontrol agents in sugarcane disease management.

Discussion: Phylloplane fungi play a crucial role in the natural suppression of foliar pathogens. Previous studies have demonstrated the antagonistic properties of *Trichoderma*, *Penicillium rubrum, Alternaria alternata, Botrytis cinerea*, *Pestalocea macrotricha* (Fig.3.) saprophytic fungi in controlling foliar diseases in various crops. The present study highlights the diversity and ecological significance of sugarcane phylloplane mycoflora in Gondia district. Identification of effective biocontrol fungi can reduce reliance on chemical fungicides, minimize environmental impact and promote sustainable agriculture practices.

CONCLUSION:

The study of sugarcane phylloplane mycoflora in Gondia district provides valuable insights into fungal diversity and their potential application as natural biocontrol agents. Certain isolates are expected to exhibit strong antagonistic activity against foliar pathogens, indicating their utility in integrated disease management strategies. This research contributes to the development of eco-friendly and cost-effective approaches for sustainable sugarcane cultivation.

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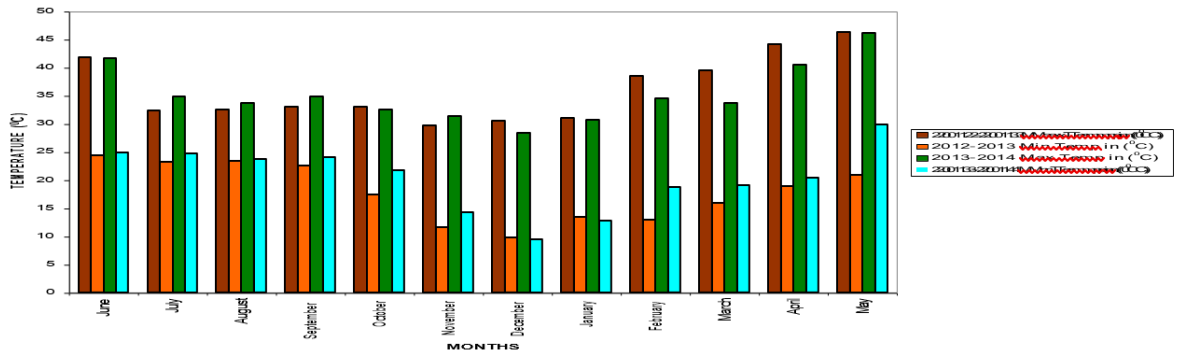


Fig.1.Temperature in an average of Gondia district during 2012-13 to 2013-2014 in ⁰C (max/min).

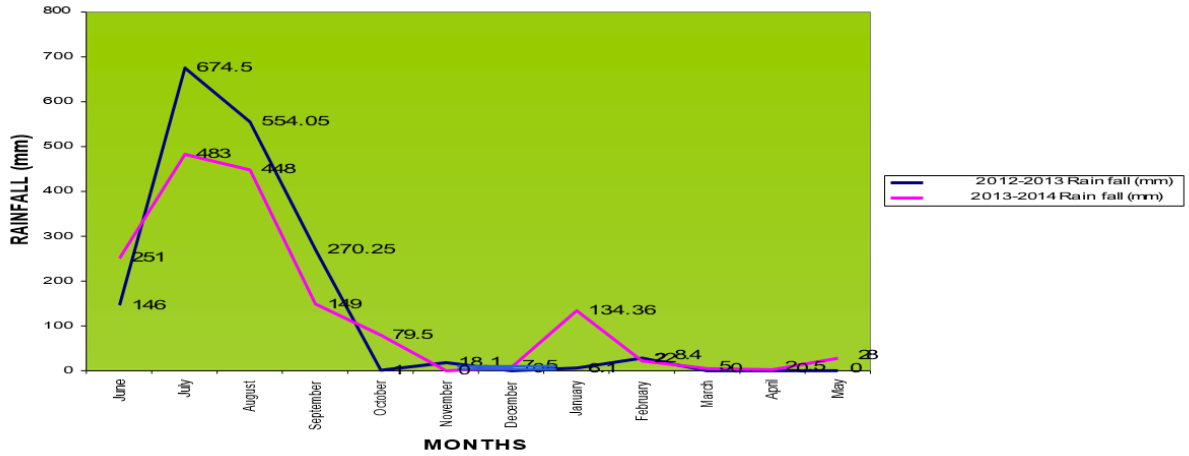
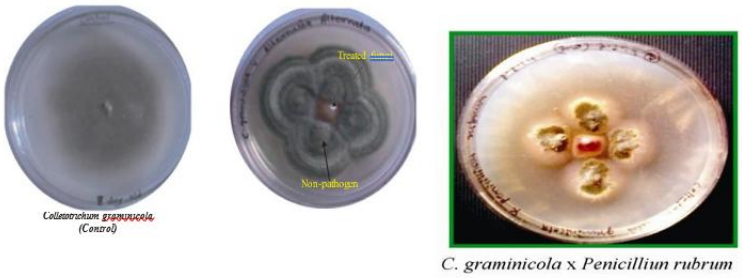


Fig.2. Rainfall in an average of Gondia District During the Year 2012 – 14 in mm



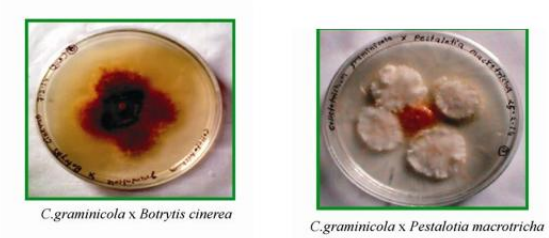


Fig.3. Antagonistic Action (Biocontrol)