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Smut Disease of Sugarcane and Its Management Strategy

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Smut disease of sugarcane, caused by Sporisorium scitamineum, is a major constraint to global sugarcane production, resulting in significant yield and quality losses. The disease is characterized by the formation of whip-like structures that release teliospores, facilitating rapid spread. This review synthesizes recent advances (2020–2025) in understanding the biology, epidemiology, and management of sugarcane smut. The pathogen survives primarily in infected planting material and soil, with environmental conditions such as high temperature and low humidity favoring disease development. Host resistance remains the most sustainable management approach, although breakdown of resistance in certain cultivars poses challenges. Cultural practices, including the use of disease-free setts and sanitation, are critical for disease prevention. Chemical treatments such as fungicidal sett dipping provide partial control but raise concerns regarding cost and environmental impact. Biological control using antagonistic microorganisms is emerging as an eco-friendly alternative, though field-level consistency remains limited. Integrated disease management (IDM), combining resistant varieties, clean seed, and targeted chemical or biological interventions, is recommended for effective control. Despite progress, gaps remain in understanding pathogen variability, molecular resistance mechanisms, and climate change impacts on disease epidemiology. Future research should focus on genomics-assisted breeding, precision agriculture, and sustainable disease management approaches to ensure long-term productivity.

Keywords: Sugarcane smut, Sporisorium scitamineum, disease management, resistant varieties, integrated disease management, epidemiology

Introduction

Sugarcane (Saccharum spp.) is a vital commercial crop contributing significantly to sugar and bioethanol production. Smut disease is among the most destructive diseases affecting sugarcane, particularly in tropical and subtropical regions. The disease reduces cane yield, juice quality, and ratoon performance. Understanding the pathogen's biology and developing effective management strategies are essential for sustainable sugarcane production.

Etiology and Pathogen Biology

Sporisorium scitamineum is a basidiomycete fungus that infects meristematic tissues. The pathogen produces teliospores that germinate to form basidiospores, initiating infection. The fungus remains systemic within the host plant.

Symptoms and Disease Cycle

Typical symptoms include the emergence of a black whip-like structure from the growing point, stunted growth, and excessive tillering. The disease cycle involves spore dispersal through wind and infection through buds.

Epidemiology

Environmental factors such as temperature (25–30°C) and low humidity favor disease development. The use of infected setts is the primary source of inoculum. Disease spread is rapid under conducive conditions.

Management Strategies

Integrated disease management includes resistant varieties, hot water treatment of setts, fungicide application, and biological control. Resistant varieties remain the cornerstone of management.

Critical Analysis and Discussion

While resistant varieties are effective, resistance breakdown is a concern. Chemical methods provide quick control but are not sustainable. Biological control shows promise but requires further validation.

Future Research Direction

Future work should focus on genomic studies, climate-resilient varieties, and precision disease monitoring systems.

Conclusion

Smut disease remains a major threat to sugarcane production. Integrated management strategies are essential for sustainable control.

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