



Evaluating the Efficacy of Plant Extracts and Synthetic Fungicides Against Selected Pathogenic Fungi in *Solanum lycopersicum* L. (Tomatoes)

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Introduction

Tomatoes belong to the Solanaceae family and are among the most important vegetables worldwide. As a relatively short-duration crop, they provide high yields, making them economically valuable and an essential part of the daily diet for many people in Nigeria. However, fungal pathogens seriously threaten agricultural productivity globally, leading to significant crop losses. In Nigeria, fungi such as *Fusarium* and *Aspergillus* significantly impact both pre-harvest and post-harvest quality, leading to considerable losses. The reliance on synthetic fungicides has raised concerns about environmental pollution, the development of fungal resistance, and health risks from fungicide residues. To address these concerns, there is a growing interest in exploring safer, environmentally friendly alternatives, particularly plant-based bio-fungicides. This study evaluates the antifungal efficacy of extracts from *Azadirachta indica* (Neem) and *Psidium guajava* (Guava) leaves compared to synthetic fungicides (Banzel® and Ultimax®) against plant pathogenic fungi isolated from infected tomatoes.

Materials and methods

In this study, tomatoes purchased from a local market were investigated for fungal contamination using microscopy and culture techniques. The infected fruit was cultured on Potato Dextrose Agar (PDA) to obtain fungal isolates. These isolates were then tested for susceptibility through the disk diffusion method, using ethanolic extracts of Neem and Guava leaves. The leaf extracts were prepared and tested at concentrations of 50 mg/ml, 100 mg/ml, and 150 mg/ml alongside synthetic fungicides (Banzel® and Ultimax®), and the zones of inhibition were measured. Phytochemical screening of the Neem and Guava extracts was conducted using standard methods.

Results and discussion

Banzel® showed the strongest antifungal activity, with inhibition zones of 41 mm against *Aspergillus* sp. and 47.5 mm against *Fusarium* sp. at 150 mg/ml. Neem and Guava extracts had moderate effects, with Guava exhibiting a 31.5 mm zone against *Aspergillus* sp. and Neem showing 18 mm against *Fusarium* sp. at the same concentration. Neem extract also displayed a 13.5 mm inhibition zone against *Fusarium* sp. at 50 mg/ml, while Ultimax® had minimal activity. Neem contains flavonoids, tannins, phenols, alkaloids, and terpenoids, while Guava is rich in glycosides and phenolic compounds, enhancing their antifungal properties. These compounds may inhibit fungal cell wall synthesis and disrupt spore formation, supporting the potential of Neem and Guava leaves as alternatives to synthetic fungicides.

Conclusions

This study found Banzel® to be the most effective fungicide, showcasing the largest inhibition zones against both fungi across all concentrations. It confirmed that synthetic fungicides are generally more effective than plant extracts. However, the efficacy of Neem extract increased with concentration, and Guava extract was notably effective against *Aspergillus* sp. at the same concentration. Both extracts showed dose-dependent activity, with minimal inhibition at 50 mg/ml, indicating that higher concentrations are needed for impactful fungal growth control. The findings support the potential of plant-based bio-fungicides as safer alternatives to synthetic options in sustainable agriculture.

Keywords: Fungal pathogens, *Azadirachta indica* (Neem), *Psidium guajava* (Guava), Bio-fungicides, Synthetic fungicides