

**Identification of citrus (*Citrus sinensis*) Postharvest Pathogens
from Ethiopia and their Control**

By

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DECLARATION

I, the under signed hereby declare that the work reported herein is the result of my original research findings.

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Samuel 22: 15 Vs 3

DEDICATION

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SUMMARY

From a world prospective, the continuous application of chemical pesticides has serious long-term effects on human health and environmental pollution, and can result in resistant pathogen strains. However, postharvest diseases cause major losses on the markets and need to be controlled effectively. The search for biopesticides using microbial antagonists and natural plant products has subsequently become more important as viable alternatives to control postharvest diseases. Currently, little information exists in terms of citrus production practices, disease management measures and postharvest losses in Ethiopia. The aim of this study was therefore to determine what the current situation in the country is in terms of production, disease management and postharvest disease incidence, disease management practices in Ethiopia and to develop an effective and safe disease control strategy for the industry. Citrus production in Ethiopia is mainly done by Government enterprises with little technical expertise. Disease control strategies are ineffective with postharvest losses exceeding 46%. The most important postharvest pathogen identified was *Penicillium digitatum*. In development of biopesticides, three yeast antagonists [*Cryptococcus laurentii* (strain MeJtw 10-2 and strain TiL 4-3) and *Candida sake* (TiL 4-2)] and plant leaf extracts of *Acacia seyal* and *Withania somnifera* were found to have some potential to

control *Penicillium* in *in vitro* and *in vivo* trials and ensure fruit quality. The modes of action of the yeast antagonists were not based on antibiosis. Instead, it involved competitive colonization where the antagonists inhibited *P. digitatum* spore germination and reduced mycelial growth by 75-100%. Extracts from the two plant species showed broad-spectrum antimicrobial activity against a range of several fungal and bacterial pathogens. The semi-commercial application of the antagonists and plant extracts improve fruit quality and the integration of these biopesticides were found effective in semi commercial trials and may provide a commercial solution for the citrus industry.