

**Title** Identification of citrus (*Citrus sinensis*) postharvest pathogens from Ethiopia and their control

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### **Abstract**

From a world prospective, the continuous application of chemical pesticides on plants has serious long-term effects on human health and environmental pollution, and can result in resistant strains. Postharvest diseases cause major losses in fresh fruit trade and need to be controlled effectively, to ensure adequate profit margins. To date, a fungicide has mainly been used to control these diseases, but has come under scrutiny as importing countries require stricter maximum residue levels. The search for biopesticides using microbial antagonists and natural plant products has become more important as viable alternatives to control plant 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 status in the country is in terms of production, disease management practices and postharvest disease incidence and to develop an effective and safe disease control strategy. 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* controlled *Penicillium* incidence in *in vitro* and *in vivo* experiments and ensure fruit quality in semi commercial trials. The modes of action of yeast antagonists were not based on antibiosis but involved competitive colonization inhibiting *P. digitatum* spore germination and mycelial growth by 73-100%. 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 improved fruit quality and the integration of these biopesticides were found effective in large scale trials and may provide a commercial solution for the citrus industry.