Reducing Postharvest Losses in Tropical and Subtropical Fruits: Strategies for enhanced Value Chains

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Introduction

Postharvest losses (PHL) of tropical and subtropical fruits remain a major challenge in sub-Saharan Africa (SSA), with estimated losses ranging from 20 to 50%. These losses are mainly attributed to poor handling practices, inadequate storage facilities, and limited access to appropriate preservation technologies. Such inefficiencies contribute to reduced food security, economic losses, and environmental impacts. Addressing these challenges requires integrated postharvest strategies. In addition, agro-processing and the valorization of fruit by-products into value-added products support circular economy principles by minimising waste and maximizing resource efficiency. Strengthening these interventions through research, innovation, and supportive policies is vital to building sustainable and competitive fruit value chains in South Africa and across SSA.

POSTHARVEST STRATEGIES

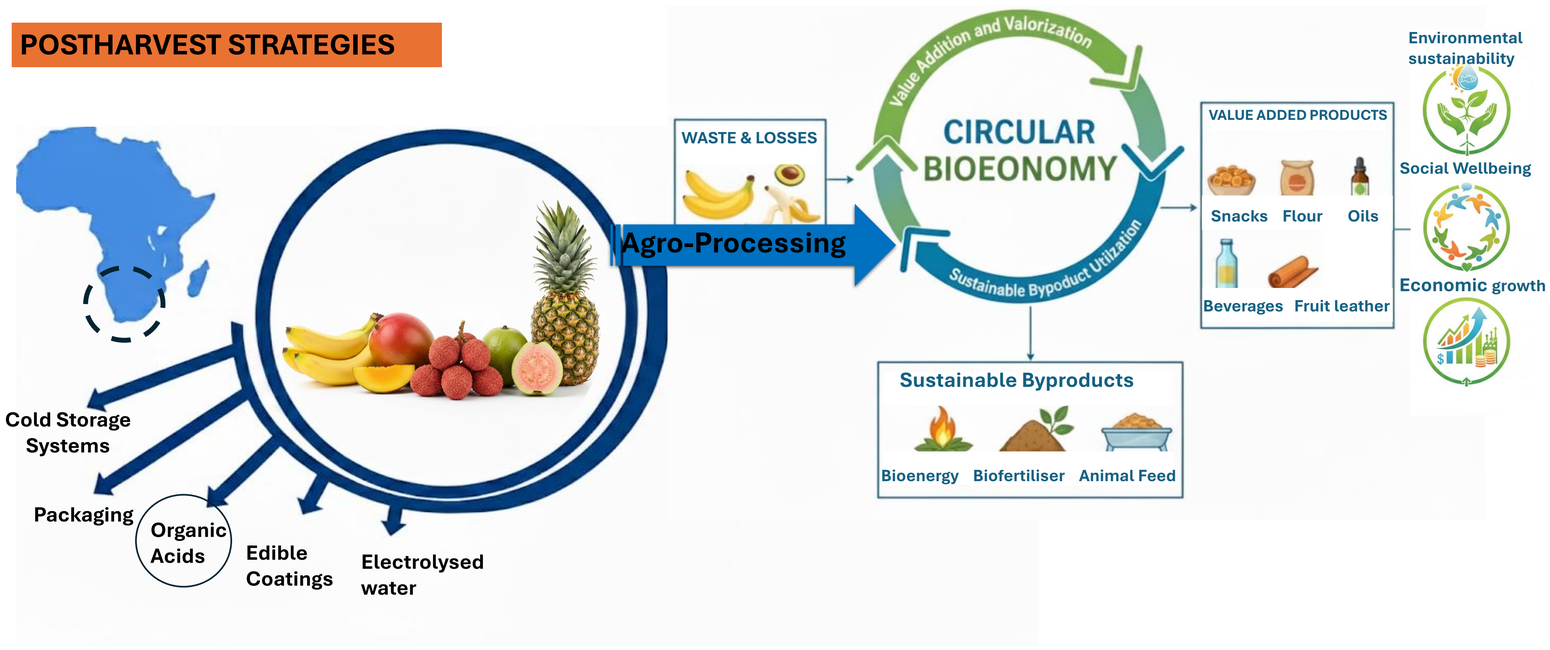


Figure 1: Schematic diagram summarizing the postharvest strategies for reducing food losses of tropical and subtropical fruits

CASE STUDY

Objective

The study focused on evaluating the potential of organic acids to maintain the quality of fresh and minimally processed (fresh-cut and dried) pineapple fruit during storage, thereby contributing to the reduction of postharvest losses.

Methodology

Harvesting and Sorting

- Fruits were harvested at commercial maturity at Agricultural Research Council, Hluhluwe, Kwa-Zulu Natal

Treatments and Storage

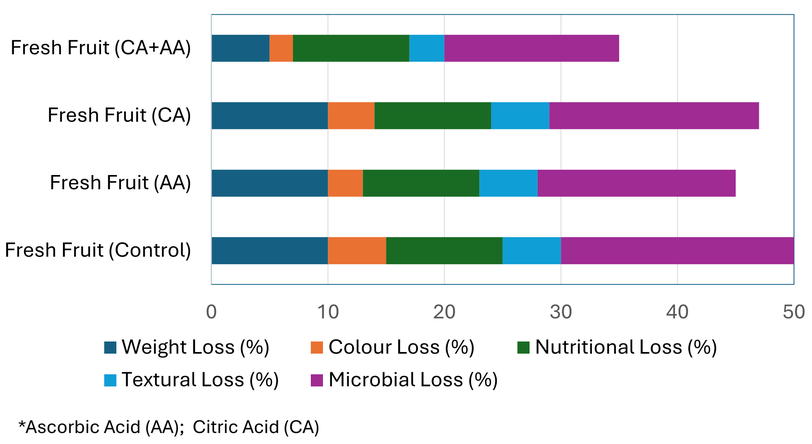
- Fruits were divided into **four batches**: control, citric acid, ascorbic acid, and citric + ascorbic acid
- Dipped in solutions for **10 min**
- Air-dried for **2 min** and packaged
- The fruits were stored at 5°C and evaluated at day 1, 3, 6 and 9
- Drying: samples were stored at -20°C and later subjected to different drying methods (oven and freeze dryer)

Quality Evaluation

- Weight loss
- Textural loss (Firmness)
- Microbial loss (decay)
- Colour loss (Colour values)
- Nutritional loss (Vit. C)

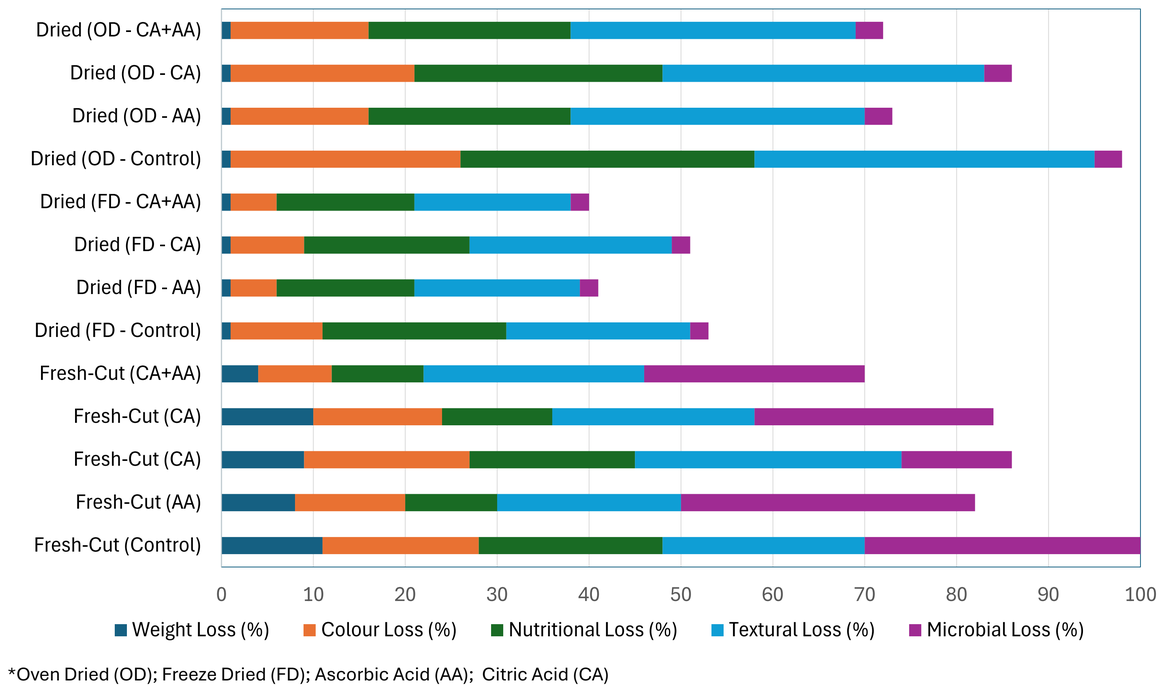
CASE STUDY

Results



*Ascorbic Acid (AA); Citric Acid (CA)

Figure 2: Postharvest losses in fresh pine-apple fruit



*Oven Dried (OD); Freeze Dried (FD); Ascorbic Acid (AA); Citric Acid (CA)

Figure 3: Postharvest losses in minimally processed (fresh-cut and dried) pine-apple fruit

Results

Table 1: Comparative Analysis of the postharvest losses in pine-apple fruit and treatment effect

Postharvest losses (%)	Treatment Effect (AA/CA)	Outcome Summary
Colour	↓ Significantly reduced	Ascorbic Acid inhibits the browning enzyme (PPO); Citric Acid enhances effect by lowering pH.
Nutritional	↓ Reduced vs. control	Ascorbic Acid acts as an antioxidant, maintaining Vitamin C and overall nutrient stability.
Microbial	↑ Remains the main cause	Organic Acids treatments show limited antimicrobial activity; microbial growth becomes the key shelf-life constraint.
Textural / Weight	↔ Slightly reduced	Minor effect on firmness and dehydration; limited control over physical deterioration.

Table 2: Visual Appearance of the fresh and minimally processed fruit, at respective days of storage

Discussion and Conclusion

- The study highlights the potential of combination of **organic acid treatments** (citric and ascorbic acid), as postharvest strategy with potential to maintained fruit quality and reduce postharvest losses
- **Value Addition & Waste Reduction:** Converting perishable whole fruit into various products, contributes to minimising post-harvest waste. Drying specifically allows for the utilisation of fruit surpluses or material that might otherwise be lost to decay.
- **Contributes to Circular Economy:** Strategic use of these treatments for stabilization and value addition (Fresh-Cut and Dried) represents a sustainable approach that extends shelf life and minimises post-harvest waste.

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