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Response of ginger (*Zingiber officinale*) genotypes to post-harvest management technologies in Ethiopia

Temesgen Laelago Ersedo[1], Tilahun Abera Teka[2], Sirawdink Fikreyesus Forsido[3]

[1] *Central Ethiopia Agricultural Research Institute Food Science Technology Researcher and Jimma University Ph.D Candidate, Post-harvest Managment, Ethiopia*
[2] *Jimma University, Post-harvest Managment,*
[3] *JImma University, Post-hervest Managment,*

Abstract

Ginger (*Zingiber officinale*) is a high-value spice and medicinal crop cultivated across various regions of Ethiopia, providing substantial income opportunities for smallholder farmers. However, the ginger value chain faces major challenges due to significant post-harvest losses and quality deterioration, largely caused by suboptimal processing, storage, and preservation practices. This study aimed to evaluate the response of selected ginger genotypes to a range of post-harvest management technologies under Ethiopian conditions, to identify genotype-specific strategies for quality retention and loss reduction. Four genotypes—one improved (Boziab), one hybrid, one local, and one candidate variety—were assessed under combinations of drying methods (fluid-bed, solar, oven, and sun drying), packaging materials (glass jars and high-density polyethylene), and storage durations up to 180 days. Key parameters measured included essential oil retention, nutritional content, antioxidant activity, and antimicrobial potential. Significant variation was observed among genotypes and processing methods. The improved genotype Boziab exhibited the highest stability in terms of nutrient and bioactive compound retention. Among drying methods, fluid-bed drying outperformed others in preserving nutritional and phytochemical quality. In terms of packaging, glass jars coupled with aerated curing and ventilated crate storage under cool, dry conditions were more effective in minimising losses compared to plastic packaging. This study underscores the importance of integrating genotype selection with appropriate post-harvest handling technologies to extend shelf life, reduce economic losses, and strengthen the resilience of ginger-producing communities. These findings support sustainable value chain development and contribute to Ethiopia's efforts toward food system transformation, in line with the Tropentag 2025 theme of sustainable resource use for global food and nutrition security.

Keywords: Bio-active compounds, drying methods, ginger genotype, nutrient retention, post-harvest technology

Contact Address: Temesgen Laelago Ersedo, Central Ethiopia Agricultural Research Institute Food Science Technology Researcher and Jimma University Ph.D Candidate, Post-harvest Managment, Durame, 45 Ethiopia, Ethiopia, e-mail: temesgenlaelago@yahoo.com