

Research Report

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Effects of Polyethylene Color and Thickness on the Retention of Some Minerals, Vitamins, and Antioxidant Activities of Stored Plantain (*Musa paradisiaca*) FlourFolasade Kemisola Olufemi-Salami ¹✉, Olufemi Samson Salami ², John Isa ³, Omolola Victoria Adefela ¹, Mary Anuoluwapo Ajatta ¹¹ Department of Food Science and Technology, Bamidele Olumilua University of Education, Science and Technology, Ikere, P.M.B. 250, Ikere-Ekiti State, Nigeria² Department of Biotechnology and Molecular Biology, Federal University of Health Science, Ila-Orangun, P.M.B. 204, Osun State, Nigeria³ Department of Agricultural and Environmental Engineering, Federal University of Technology, Akure, P.M.B. 704, Ondo State, Nigeria✉ Corresponding email: kemisade@yahoo.comPlant Gene and Trait, 2026, Vol.17, No.4 doi: [10.5376/pgt.2026.17.0018](https://doi.org/10.5376/pgt.2026.17.0018)

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Abstract Food packaging is critical for sustaining nutritional and functional quality of stored food. Polyethylene serves as a major packaging material in food industries. However, empirical evidence regarding how specific polyethylene characteristics dictate micronutrient stability during storage remains scarce. This study evaluated the effects of polyethylene color (black vs. transparent) and gauge thickness (0.03 mm vs. 0.15 mm) on the retention of essential minerals (Fe, Ca, Zn, P), vitamins, and antioxidant properties in stored plantain flour. French plantain (*Musa paradisiaca*) fruits were obtained, processed into flour. Samples of flour were packaged and stored under ambient conditions of 25 ± 5 °C temperature and $75 \pm 5\%$ relative humidity for 4 weeks in the laboratory. After the storage period, standard assays were used to quantify Fe, Ca, Zn, P, vitamins, and antioxidant properties in stored plantain flour. The results showed that both packaging color and thickness significantly influenced ($p < 0.05$) nutrient retention in the stored flours. Vitamin B6 was better preserved in black high-density polyethylene (BHP), whereas vitamin B9 stability was maximized in transparent high-density polyethylene (THP). Flour stored in transparent low-density polyethylene (TLP) exhibited the highest 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity (664.65 mg/kg) but the lowest total phenolic content (36.86 mg/kg). The preservation of Fe, Ca, and P was observed to be better in BHP. These findings demonstrate that no single packaging configuration optimally preserved the entire nutritional indices monitored; rather, packaging optimization must be strategically aligned with the specific target micronutrients of interest.

Keywords Polyethylene; Color; Vitamins; Antioxidant activities; Plantain flour**1 Introduction**

Plantain (*Musa paradisiaca*) serves as a foundational staple crop across tropical and subtropical regions, particularly within West and Central Africa, the Caribbean, and South America (Ajijolakewu et al., 2021). The crop is vital to household food security, rural and peri-urban economic sustainability (Abiola et al., 2024). Plantains are regularly converted into various value-added products, including pastes, chips, and flours (Udomkun et al., 2021). Plantain flour has attracted considerable research and commercial interest due to its prolonged shelf stability, ease of transportation, nutritional value and versatility in food formulation (Mundéné-Timothée et al., 2025). Notably, it represents a functionally viable gluten-free alternative to wheat flour and is extensively utilized in traditional thick pastes (“swallow”), porridges, and functional bakery products. Moreover, its low glycemic content makes it appealing to diabetic patients (Mundéné-Timothée et al., 2025).

Biochemically, plantain is a rich matrix of carbohydrates, dietary fiber, essential minerals, and diverse bioactive compounds. It contains structurally and metabolically significant concentrations of iron (Fe), calcium (Ca), zinc (Zn), and phosphorus (P), which modulate hematopoiesis, skeletal mineralization, enzymatic catalysis, and systemic metabolic homeostasis (Rotimi and Adeyemi, 2023a). Plantain fruit is rich in nutrients, it provides carbohydrates, dietary fiber, vitamins A, C, and B6, and vital minerals like potassium and magnesium (Emmanuel et al., 2025; Taak and Awasthi, 2025). Beyond basic nutrition, plantains are exceptionally high in bioactive antioxidants, including carotenoids, flavonoids, and vitamin C. These powerful compounds combat oxidative stress by neutralizing harmful free radicals in the body, protecting cells from damage. Consequently, regular