

consumption helps reduce the risk of chronic illnesses such as cardiovascular disease and inflammation (Oladele and Adefegha, 2022). Furthermore, the matrix contains essential micronutrients, predominantly B-complex vitamins such as pyridoxine (vitamin B6) and folate (vitamin B9), which act as critical coenzymes in cellular metabolism and neurological functions (Oyeyinka and Afolayan, 2020). The presence of endogenous phenolic compounds imparts distinct antioxidant activity, neutralizing reactive oxygen species (ROS) and potentially mitigating oxidative stress-linked chronic pathologies (Rotimi and Adeyemi, 2023b). However, this nourishing food is highly susceptible to post-harvest handling, processing modalities, and environmental dynamics during storage (Ofosu et al., 2023).

In developing nations, post-harvest plantain losses remain critically high, driven by elevated initial moisture content, rapid senescent physiology, and susceptibility to microbial spoilage. Consequently, processing fresh pulp into shelf-stable flour is widely deployed as a post-harvest mitigation strategy (Pathare and Al-Dairi, 2022). Dehydration and subsequent particle size reduction diminish water activity (*aw*), thereby suppressing microbial proliferation and extending physical shelf life. Nevertheless, dehydrated plantain flour matrices remain highly susceptible to micronutrient degradation during storage (Mund  n  -Timoth  e et al., 2025). Photo-exposure, atmospheric oxygen, ambient relative humidity, and thermal fluctuations trigger the oxidative degradation of labile vitamins and systematically diminish radical scavenging capacity (Lalita et al., 2025). These biochemical transformations concurrently degrade the product's nutritional profile, functional properties, and organoleptic quality.

Sarkar and Kuna (2020) established that packaging configurations dictate the degree of product isolation from destructive vectors and some environmental factors. Polyethylene polymers are preferentially utilized as packing material globally in food supply chains due to their cost-effectiveness, low density, mechanical flexibility, and commercial accessibility (Saha et al., 2022). In small- and medium-scale food processing systems, particularly in low-resource settings, simple polyethylene bags are commonly used to package flours and dry food products (Garavito et al., 2024). Polyethylene films vary widely in color, thickness, light transmission and gas permeability. These properties influence energy transfer and biochemical processes in the packaged materials.

While many studies have documented the effects of storage kinetics on cereal and tuber flour quality (Solano and de Gante, 2014; Hemery et al., 2020; Awol et al., 2024), there is a paucity of data and literature, elucidating how discrete polyethylene characteristics influence the micronutrient retention in stored plantain flour. This research is therefore aimed at investigating the effects of the color and thickness of polyethylene on some vitamins and minerals retention in plantain flour, packed in polythene bags (of different colors and thickness) and stored in the laboratory environment for 4 weeks.

2 Results

The results of the effects of different polyethylene packaging materials on vitamin A, B6 and B9 preservation are shown in Table 1. The highest quantity (4 147.03 mg/kg) of preserved vitamin A in the stored flour was observed in the flour packed in TLP, although this quantity (4 147.03 mg/kg) was not statistically different from 4 033.99 and 3 929.31 mg/kg quantities of vitamin A observed in flour stored in THP and BLP respectively. Black high-density polyethylene bag preserved vitamin B6 better than the other packaging materials (TLP, THP and BLP) used. Flour stored in TLP, THP and BLP recorded 6.15, 9.72 and 8.78 mg/kg vitamin B6 respectively. These values (6.15, 9.72 and 8.78 mg/kg) were significantly lower than 10.77 mg/kg recorded in flour stored in BHP. Vitamin B9 preservation was significantly higher in flour stored in THP.

The results of the effect of colour and thickness of polyethylene packaging films on the DPPH content of stored plantain flour are presented in Figure 1. The highest DPPH was observed in flour stored in TLP. Flour stored in THP, BLP and BHP recorded 499.77, 597.58 and 396.67 mg/kg of DPPH respectively and these values were significantly lower than 664.65 mg/kg recorded in flour packed in TLP.