

content (TPC) and 2,2-diphenyl-1-picrylhydrazyl (DPPH) measurement) at the beginning of the storage, to serve as control/baseline experiments. The packed polythene bags containing 50 g plantain flour were carefully placed on table so that approximately equal amount of white light can reach the twelve bags in the laboratory of Food Science and Technology Department, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti for 4 weeks. At 4 weeks of storage, samples were analyzed for minerals, vitamins and antioxidant properties.

Analytical reagents and polyethylene used were of analytical grade, sourced via Bisolamb Chemical and Pascal Scientific Equipment networks.

5.2 Minerals quantification

From each sample, 10 g was weighed into a crucible and ashed in a furnace at 600 °C for 8 h. The ash obtained was brought to 25 mL with HNO₃ 0.5 N under continuous stirring until the ash completely dissolved in the acid. Out of the product obtained, 1:10 dilutions were made in order to determine Fe, P, Ca and Zn. Atomic absorption spectrophotometry was used to determine Fe, Ca, and Zn. The determination was made using a “control AA 300” atomic absorption spectrophotometer with C₂H₂/air flame type. The standard solution was made with distilled water. The quantity of each metal was determined using the formula: $Me = m_{me} \times (25/m_p) \times D$ [mg/kg] where Me = the quantity of metal contained, in mg/kg; m_{me} = the quantity of metal read at the spectrophotometer, in mg/L; 25 = the volume of the solution of HNO₃ 0.5 N, in mL; m_p = the mass of the sample for analysis (10 g), in g; D = the dilution of the sample (1:10) (Nicoleta et al., 2006).

Phosphorus was determined and quantified by UV-Vis spectrophotometry (colorimetric method using Murphy and Riley reagents), and absorbance measurement at 660 nm wavelength. The results were expressed as mg P/kg of flour using a phosphorus standard curve (Salami et al., 2018).

5.3 Vitamins

Vitamin A quantification was done by measuring 0.2 g of the sample, 6 mL of ethanol and 0.6 mL of 5 % KOH into a test tube. The test tube was plugged with cotton wool and boiled for 25 min. 6 mL of distilled water was added. Hexane was then added to the water to separate vitamin A. The absorbance was measured at 400 nm using spectrophotometer (Kumar and Kamboj, 2021).

Also, for vitamin B6 measurement, 0.5 g of the sample was weighed into a test tube. 2 mL of 0.1 M sodium carbonate was added and shaken vigorously for 30 min. 100 mL of Folin was added and then the absorbance was measured at 580 nm using spectrophotometer (Khudhair et al., 2019).

For vitamin B9 measurement, 0.2 g of the sample was measured into a test tube. Two milliliters (2 mL) of KMnO₄ was added, and the mixture was left for 1 min. 2 mL of sodium nitrate was added to the mixture followed by 2 mL of 5% HCl, the mixture was shaken gently. 2 mL of sulphuric acid (5%) was then added as well as 2 mL of sodium acetate. The whole mixture was stirred and allowed to stand for 10 min. Finally, 2 mL of Azo dye (0.1%) was added to the mixture and allowed to stand for 10 min. Then the absorbance was measured at 550 nm. The quantity was determined using a standard curve (Najm et al., 2022).

5.4 Antioxidant measurement

The total phenolic content (TPC) in the sample was determined by using the method as described by Folin-Ciocalteu. The phenol in the food sample was extracted using methanol. The extracted mixture was allowed to incubate for 30 min after the addition of 1 mL of Folin-Ciocalteu and 1 mL of 0.5 M Na₂CO₃. The absorbance of the incubated mixture was measured at 750 nm and expressed in mg gallic acid equivalent (GAE) per gram of flour (Li et al., 2015).

The antioxidant 2,2-diphenyl-1-picrylhydrazyl, 0.5 mL of methanolic extract of plantain flour was mixed with DPPH solution and then kept in a dark place for 30 min (a purple chemical). If antioxidants are present, the purple colour fades. The change in colour was measured to know the antioxidant activity. After 30 min of incubation in the dark, absorbance was measured at 517 nm using a UV-Vis spectrophotometer (Sherma, 2017).