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# Nutritional and Anti-Nutritional Composition of Some Nigerian Fruits

V.O. Onibon, F.O. Abulude and L.O. Lawal
Federal College of Agriculture, Akure, Ondo State, Nigeria

**Abstract:** Studies were carried out on fresh fruits of banana (Musa esculentum), apple (Eugenia malascensis), guava (Psidium guajava), pawpaw (carica papaya), sweet orange (Citrus sinensis) to determine the nutritional and antinutritional composition in them. Chemical analysis of the extracts of the fruits revealed that moisture was 70.59 g 100 $g^{-1}$ DM in apple, to 91.28 g 100 $g^{-1}$ DM in sweet orange; ash content varied from 0.25 g 100 $g^{-1}$ DM in apple to 0.29 g 100 $g^{-1}$ DM in guava and dry matter was as low as 8.72 g 100 $g^{-1}$ DM in sweet orange to as high as 29.41 g 100 $g^{-1}$ DM in apple. Elemental analysis of minerals gave the range of concentrations as Ca 0.016-29.64 mg $g^{-1}$, Mg: 0.050-28.24 mg $g^{-1}$, K:27.12-398.56 mg $g^{-1}$, Zn:0.01-22.09 mg $g^{-1}$ and Fe:0.19-13.04 mg $g^{-1}$. Potassium was found to be the most abundant while Iron was least. Tannin contents of the fruits ranged between 3.40-48.16 mg 100 $g^{-1}$. Phytate contents were between 2.88-10.71 mg 100 $g^{-1}$, while the oxalate contents ranged between 1.89-4.50 mg 100 $g^{-1}$ dry matter. The result showed that the fruits have safe and adequate dietary nutrients if consumed in right proportion and the antinutrients compositions are within tolerable level.

**Key words:** Fruits, minerals, nutritional, anti-nutritional, analysis

## INTRODUCTION

Fruits have being part of human diet and food supplement over the years. They are considered as healthy food supplements because they contain high quantity of water, carbohydrates, proteins, Vitamins A, $B_1$, $B_2$, C, D and E, minerals such as Ca, Mg, K, Zn and Fe (Wenkam, 1990) and organic compounds which are required in small amounts, to make the body function properly (Wills, 1998). Studies on metals have revealed their function in plants and animals which includes their role in osmotic regulations of the body fluids, enhances growth, ensure healthy crops and animals, act as coenzyme and information of chlorophyll. Besides their dietary importance, they are also useful as nutrient supplements and recommended internationally as superior to processed foods. The rise in nutritional importance of fruit has been stimulated by a range of degenerative diseases (Wenkam, 1990) prevalent in many part of the world.

However, besides the nutritional advantages of fruits, they also contain certain antinutritional factors (Ewaidah, 1993; Lo-Voi *et al*., 1995) such as phytins, tannins and oxalates. Phytic acid is an antinutritional found in plant foods which has the ability to chelate divalent elements like calcium (Oberleas, 1983) thus decreasing their bio-availability. Tannins exhibit antinutritional potentials by precipitating dietary proteins and digestive enzymes to form complexes that are not readily digestible (Aletor, 1993) which could lead to poor w eight gain and lower protein efficiency ratio (Glick and Joslyn, 1970). Oxalic acid is corrosive to tissue, when ingested, it removes calcium from the blood in the form of calcium oxalate, thereby causing kidney damage. Lecitins and Saponin substances can combine with essential proteins in the intestinal tract (Jose, 1996) reducing their absorption. Presence of lecitins (Aletor, 1993) in diet can lead to reduced growth in man by interfering with the digestion and absorption of nutrients in the Gastrointestinal Tract (GIT).

In view of the nutritional and health benefits of fruits, their daily need in our diet and the effects of antinutritional factors, this study was designed to determine the nutritional and antinutritional factors in banana, apple, guava, pawpaw and sweet orange obtained from a market in Akure, Ondo State.

## MATERIALS AND METHODS

**Sample preparation:** Fresh ripe samples of banana (Musa esculentum), apple (Eugenia malascensis), guava (Psidium guajava), pawpaw (Carica Papaya) and orange (Citrus sinensis) were obtained at Oja-oba market in Akure, Ondo state, Nigeria. They were washed in distilled water and refrigerated for a day to prevent spoilage before extraction of juice and laboratory analysis. Banana, apple, guava and pawpaw were blended in moulinex blender separately and the juices were sieved into different clean beakers while the orange juice was extracted by squeezing the juice into a clean beaker before the analysis.

**Corresponding Author:** V.O. Onibon, Federal College of Agriculture, Akure, Ondo State, Nigeria

**Chemical analysis:** Determination of Tannins,Oxalic acid and Phytate.

Tannin was determined according to the method (Makkar *et al*., 1993) which is based on the ability of tannin-like compounds to reduce phosphorus tungstomolybdic acid in alkaline solution to produce a highly coloured blue solution. The absorbance was measured at 725 nm. The methods (Day and Under wood, 1986; Asiber, 1987) was used to determine Oxalic acid and Phytate, respectively.

**Determination of mineral composition:** Two gram of each sample of fruits was dried and ashed at 500°C. The ash was dissolved in 10% 25 mL HCl and made up to 100 mL with deionized water in a standard flask. Ca, Mg, K, Zn, Fe, contents were determined using Atomic Absorption Spectrophotometer (AAS) (Perkin-Elmer Model 372) Instrument according to AOAC, (1990) procedures.

**Proximate composition:** The ash, moisture and dry matter composition of samples were determined using the standard methods (AOAC, 1990).

## RESULTS AND DISCUSSION

Table 1 shows the proximate composition of the fruits investigated, moisture content varied between 70.59% in apple to 91.28% in orange with mean value 81.58%.The ash value ranged from 0.25 to 0.29 and had mean value 0.27% while the dry matter ranged from 8.72 to 29.41 with mean value 18.42. The ash content value were not highly varied and this compare favourably with most fruits value (Brain and Alan, 1992) but lower than those reported (Amoo and Lajide, 1999) for *Nauclea Iatifolia* fruits . The observed wide range in moisture and dry matter in the fruits are similar to those reported (Kohler and Bickoff, 1970) and this accounts for rapid deterioration of fruits if left unprocessed for long after harvesting.

Table 2 depicts the values of antinutirents in the fruits. Orange and guava had the highest phytates content of 10.7-8.65 mg 100 $g^{-1}$, apple and pawpaw are within the same range while banana had the minimum value. The results are in agreement with (Day and Underwood, 1986) but relatively low compared to (Fetuga and Balogun, 1988) for some wild, underutilized crop-seeds. The oxalate content was found to be higher in the banana sample, (4.50 mg 100 $g^{-1}$) and lower in pawpaw (1.89 mg 100 $g^{-1}$) . The presence of phytic acid in biological system may chelate divalent metals like calcium, magnesium or blocks the absorption of essential minerals in the intestinal tract (Dan Ighodalo, 2005) thus

Table 1: Proximate composition of fruits sample

| | Moisture (%) | Ash (%) | Dry matter (%) |
|---|---|---|---|
| Banana | 70.60 | 0.28 | 29.40 |
| Apple | 70.59 | 0.25 | 29.41 |
| Guava | 88.21 | 0.29 | 11.79 |
| Pawpaw | 87.20 | 0.27 | 12.80 |
| Orange | 91.28 | 0.26 | 8.72 |
| Grand mean | 81.58 | 0.27 | 18.42 |
| Standard deviation | 10.14 | 0.02 | 10.14 |
| Coefficient of Variation (%) | 12.43 | 7.41 | 55.05 |

decreasing their bio-availability (Oberleas, 1983; Jose, 1996). Phytate chelates with mineral elements thereby having significant effects on the utilization of the minerals and also react with basic residues of protein (Fergusion *et al*., 1993) Oxalic acid can remove calcium in form of calcium oxalate (Lori, 2001) in the blood and this may result to kidney damage .Tannins values ranges between 3.40 (mg 100 $g^{-1}$) in banana to 20.36 (mg 100 $g^{-1}$) in guava. Tannins in the biological system have the ability to chelate protein (Aletor, 1993) making it impossible or difficult to digest.

The mineral composition of the fruits are shown in Table 3. The concentration of the elements in fruits were found to agree with the standards (Berry, 1998). Calcium values ranged between 0.016 to 29.64 in pawpaw; Mg 0.050 to 28.24; K 27.12 to 398.56, Zn O.01 to 22.09 and Fe 0.19 to 13.04. Potassium was found to be the most abundant with a level as high as 398.56 mg $g^{-1}$ in banana and as low as 27.12 mg $g^{-1}$ in orange. Ca, Mg, Zn, Fe are fairly low in the fruits and compare with results. Pawpaw has the highest content of calcium and magnesium followed by guava, while banana, apple and orange contain calcium and magnesium in minute quantities. Guava contains the highest amount of iron, followed by orange and the other samples contain minute quantities of iron. Calcium is essential in bone and teeth formation (Wardlaw, 1999) but calcium intakes, especially from regular use of calcium supplements may be associated with increased risk of kidney stones (Gordon and Vaugham, 1986). Potassium is essential in the maintenance of cellular water balance, pH regulation in the body and it is also associated with protein and carbohydrate metabolism. Magnesium is an activator (Shils, 1973) of many enzyme systems and maintains the electrical potential in nerves.

Prolong consumption of more nutrients from fruits than the body needs can lead to a serious disease (Berry, 1998). For example iron overload can result to liver failure, too much of vitamin A may have a negative effects particularly in children and the excessive carbohydrate yield in nutrients is a principal cause of obesity. Long term obesity will predispose to illnesses (Anonymous, 2004) such as diabetes to heart disease and cancer.

Table 2: Antinutrients composition in the fruits

| | Samples | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parameters | Banana (A) | Apple (B) | Guava (C) | Pawpaw (D) | Sweet Orange (E) | Grand Mean | Standard Deviation | % CV |
| Tannin (mg $g^{-1}$) | 3.40 | 8.50 | 20.36 | 10.16 | 48.16 | 18.12 | 17.89 | 98.73 |
| Phytate (mg $g^{-1}$) | 2.88 | 4.08 | 8.65 | 3.29 | 10.71 | 5.92 | 3.53 | 59.63 |
| Oxalate (mg $g^{-1}$) | 4.50 | 3.15 | 2.43 | 1.89 | 2.48 | 2.89 | 1.01 | 34.95 |

Tannin (mg 100 $g^{-1}$dry matter), Phytates (mg 100 $g^{-1}$dry matter) and oxalate (mg 100 $g^{-1}$dry matter) composition of sample of fruits

Table 3: Mineral composition of fruits (mg $g^{-1}$ dry matter)

| Sample | Ca | Mg | K | Zn | Fe |
|---|---|---|---|---|---|
| Banana | 00.016 | 00.05 | 398.56 | 00.48 | 00.52 |
| Apple | 00.88 | 00.16 | 114.40 | 02.56 | 13.04 |
| Guava | 14.56 | 13.29 | 086.66 | 22.09 | 00.28 |
| Pawpaw | 29.64 | 28.24 | 044.54 | 00.01 | 00.19 |
| Sweet orange | 00.93 | 00.85 | 027.12 | 00.10 | 02.40 |
| Grand mean | 09.21 | 08.52 | 134.26 | 05.05 | 03.29 |
| Standard Dev. | 12.93 | 12.37 | 151.69 | 09.58 | 05.53 |
| C.V% | 71.23 | 68.88 | 088.51 | 52.71 | 59.49 |

## CONCLUSION

This study showed that, while fruits are essential to life, they also contain substances that are harmful when ingested in high quantity. But the quantity of these antinutrients in the fruits are not at alarming rate. The fact that the quantities of these non-essential substances are low in these samples, showed that they need little or no processing before they are consumed.

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