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Titrimetric Estimation of Calcium Contents in Some Selected Fruits of Wurkum Market, Makurdi, Benue State

Yusuf E.Y.[1]*, Abdullateef A.[2], and Samuel O.[1]

[1]Federal university of Agriculture Makurdi, Benue state, Nigeria

[2]Gombe state university, Gombe state, Nigeria

Corresponding Author: emmanuelyila@gmail.com

ABSTRACT

The study was carried out, to investigate the concentration of calcium in five different fruits samples of locally produced and commonly consumed fruits namely pineapple, banana, pear, watermelon and plantain, within Makurdi, Benue state, North-Central Nigeria. The samples were analyzed in triplicates using the method of EDTA titration. The result showed highest mean level of calcium in banana (28.80mg/100g) followed by plantain (28.04mg/100g), watermelon (23.61mg/100g), pineapple(23.16mg/100g) and pear (25.13mg/100g), however it is advised that those who have Hypocalcaemia eat extra banana and plantain to increase their body's calcium level. A chronic calcium deficit can cause abnormalities in the teeth, cataracts changes in the brain and osteoporosis, which weakens the bones.

Keywords: Calcium content, calcium deficiency, EDTA

INTRODUCTION

Calcium, one of the essential minerals, is the most abundant mineral constituent of the human body, making up about 1-2% of the entire body weight of an average adult human (FAO,2010). It is the most important component of the skeletal system (Saini and Davar 2012); the most critical nutrient to skeletal health.

In addition to the vital roles it plays in the skeletal system where it helps in the development and maintenance of strong bones and teeth, calcium contributes to the effectiveness of various biological processes including mitosis, blood coagulation, cell adhesiveness, muscle contraction and glandular secretion (Muller and Ramallo, 2011). It is also important in the effective functioning of the heart and nerves, and for managing acid/base balance in the blood stream (UMMC, 2013). Deficiency of calcium in humans especially adults results in Osteoporosis, a condition of low bone mineral density, in which the bones become porous, fragile, and more fracture in adults.

It has been observed that one out of every two women over the age of 45 years, are afflicted by osteoporosis (Saini and Davar, 2012). It is also a serious public health problem for over 10 million adults above the age of 50 years in the United States of America (FANB, 2010).

Excess calcium in the body can have adverse effect on health as it can cause constipation, and high risk of kidney stone and prostate cancer in adults. Getting enough calcium in the body is helpful in preventing premenstrual syndrome and high blood pressure, lowering of cholesterol and in treating rickets in children (UMMC, 2013).

Nearly 99% of calcium in the body is present in the skeleton. About 850-950 grams of calcium is present in an average healthy man (Gueguen, 2020).

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The diets of some cultures and many people selecting fruit diets include many foods that contain significant amounts of calcium.

However, the criteria used to compile such lists are rarely expressed. Apparently, including a food on such a list is simply based on the fact that a commonly consumed amount of a fruit contains a significant amount of the particular nutrient.

Therefore, there is need to investigate the level of calcium in some selected fruits that we eat. This will contribute to the knowledge about nutrient composition of foods which, according to Sabahelkhier *et al* (2010), is very important in areas such as: health assessment, nutrition education, epidemiological research on relationship between diet and diseases, food regulation and consumer protection.

MATERIALS AND METHODS

Samples Collection

The fruits samples (watermelon, pineapple, banana, plantain and pear) were obtained from the Wurkum market, Makurdi, Benue State. The samples were separately kept in clean labeled polythene bags immediately on collection to avoid cross-contamination during transportation to the laboratory, where they were stored in the refrigerator. The samples were digested and analyzed.

Preparation of fruit sample for calcium determination

The fruits were thoroughly washed with tap water and then rinsed with distilled water. 5 grams of each sample was weighed using the digital weighing balance. The weighed samples were meshed to obtain the fruit solution of each of the fruit samples, using fruit juice extractor. Mahajan, (2008) method was used for Colour change and complexiometric titration.

RESULTS

From the results obtained, the pH of plantain ranged as 2.80; 2.90 banana; 2.40 watermelon, and 3.87 for pear.

Table 1: Mean Titre Value (cm^3) for the Titration of Ca^{2+} in Selected Fruits

S/N	Fruits	Mean volumes	Standard deviation
1	Watermelon	23.61	0.00005
2	Pineapple	23.16	0.0128
3	Banana	28.80	0.0002
4	Plantain	28.04	0.0018
5	Pear	25.13	0.00045

Table 2: Concentration of Calcium (mg/kg) in Selected Fruits Samples

S/N	Names of fruits	Botanical name	Conc. of Calcium (mg/kg)	Titre value Mean value	Standard deviation	Reference (WHO)
1	Watermelon	Citrullus *lanatus*	16.00 mg/kg	28.04	0.00005	167mg/kg
2	Pineapple	Ananas comosus	16.50 mg/kg	28.80	0.0128	165mg/kg
3	Banana	Musa *spp*	13.21 mg/kg	23.16	0.0002	176mg/kg
4	Plantain	Musa *parasidisiaca*	13.47 mg/kg	23.61	0.0018	172mg/kg
5	Pear	Pyrus	14.33 mg/kg	25.13	0.00045	162mg/kg

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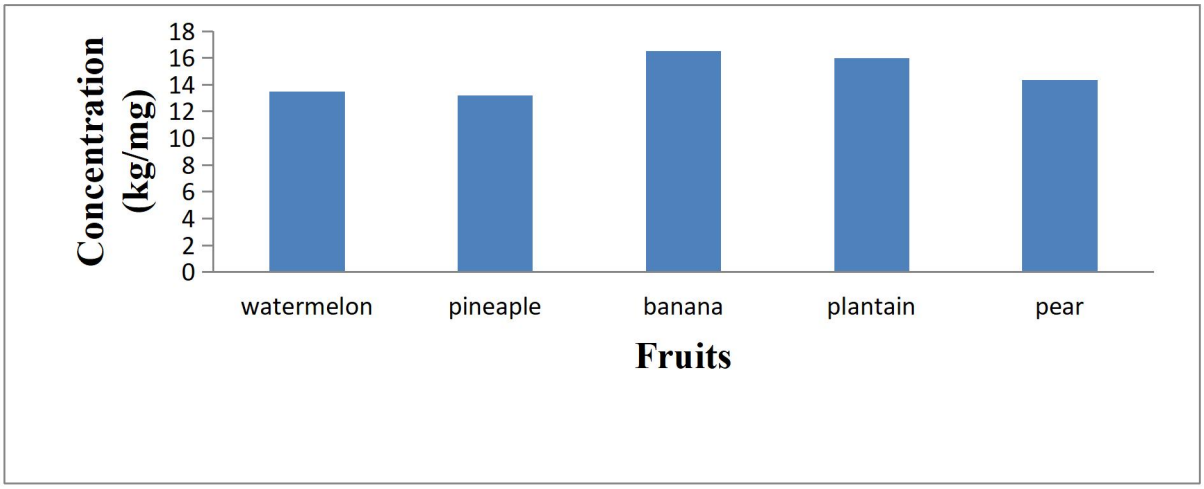

Figure 1: Bar chart showing the comparative concentration of calcium in different fruits sample.

DISCUSSION

Table 2; shows the concentration of calcium in watermelon, pineapple, banana, plantain and pear as follows watermelon 16.00mg/kg, pineapple 16.50mg/kg, banana 13.21mg/kg, plantain 14.47mg/kg and pear 14.33mg/kg. The concentration of calcium was higher in banana than any of the other fruits used. The mean value for watermelon was (28.04±0.00005)mg/kg compared with mean value of (7.26 ± 1.94)mg/kg (FAO 2010), while for Pineapple (28.80±0.00128)mg/kg, for Banana (23.16 ± 0.0002), also Plantain (23.61±0.0018)mg/kg and pear (25.13± 0.00045)mg/kg.

Calcium concentrations determined in the various fruits in this study are compared with others values reported in the literature. The mean calcium concentration of banana in this study was 23.16 mg/kg, which ware higher than 11.46 and 10 mg/kg reported by Saini and Davar (2012), and Freitas, *et al*. (2015). Also, the mean calcium content of watermelon obtained in this work (23.61 mg/kg) was lower than 51.1 mg/kg reported by Nelson *et al*,.(2006) using potassium permanganate titration methods. The difference in calcium concentration determined in the fruits, in this study, both of different sampling area and values reported by other researchers from different regions of the world could be attributed to several factors, these include differences in the species cultivated, farming methods and methods of chemical analysis, as well as the geochemical nature of the soils on which the crops were cultivated.

CONCLUSION

Calcium contents of five fruits from wurkum market makurdi were determined. The highest calcium concentration was found in banana followed by plantain and the lowest content was in pear. Knowledge of Calcium content in foods and diets allow a better food selection and estimation of calcium intake thereby improving mineral nutrition.

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