

# Chemical Composition of Red Banana (*Musa acuminata*) Peeled and Unpeeled

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**Abstract.** The current state of agrophysical properties of irrigated soils of Syrdaryo district is analyzed in the **Abstract**

The study examined chemical composition of Peeled Red Banana Flour (PRBF) and Unpeeled Red Banana Flour (URBF). The aim of the study was to process and assess the nutrient potentials of red banana and discover the nutrient content of red banana peel. Red banana was purchased from Akpan Andem market in Uyo Local Government Area of Akwa Ibom State. Processed and milled to flour both peeled and unpeeled. The result of proximate composition moisture, ash, fiber, protein, CHO of PRBF showed  $1.63 \pm 0.02\%$ ,  $7.22 \pm 0.07$ ,  $6.17 \pm 0.04$ ,  $6.36 \pm 0.78$ ,  $78.08 \pm 0.45$  respectively while URBF were  $1.17 \pm 0.15\%$ ,  $9.04 \pm 0.07$ ,  $7.39 \pm 0.04$ ,  $7.53 \pm 0.02\%$ ,  $73.89 \pm 0.35$  respectively. The result of the antinutrient (HCN, Oxalate, phytate and tannin) of PRBF  $0.41 \pm 0.00$  mg / 100 g,  $14.33 \pm 0.00$ ,  $292.63 \pm 0.06$ ,  $3.69 \pm 0.00$  respectively while URBF were  $1.08 \pm 0.00$ ,  $20.21 \pm 0.00$ ,  $274 \pm 0.71$ ,  $12.99 \pm 0.00$  respectively. The values obtained for micronutrient (Calcium, iron, vitamin A and C) of PRBF were  $72.05 \pm 0.00$ ,  $0.01 \pm 0.00$ ,  $0.07 \pm 0.00$ ,  $11.82 \pm 0.01$  respectively while URBF were  $80.30 \pm 0.00$ ,  $0.00 \pm 0.00$ ,  $0.19 \pm 0.00$  and  $14.80 \pm 0.02$  respectively. The result implies that red banana can supply a essential nutrient required for various body functions and the peel is good source of vitamin A, C and calcium significantly higher ( $p > 0.005$ ) than PRBF. The result of the study showed that red banana is low in iron  $0.00 \pm 0.00$ . The banana peel is a good source of calcium, vitamin A and vitamin c.

**Keywords:** Chemical Composition, Red Banana (*Musa acuminata*), Peeled and Unpeeled

## Introduction

Red banana is available in the rural areas of Akwa Ibom State. It is cheap and affordable dietary source of energy which may improve the nutritional status of weaned infant, reduce and eliminate malnutrition due to hunger. In recent times, the use of natural products such as banana as therapy for disease prevention, weaning diet, and food for adult is highly recommended because it satisfy the energy needs, prevent malnutrition and non-communicable diseases.

Banana (*musa sp*) is a highly consumed fruit and the fifth most important crop in the world export market. It contained dietary fiber, minerals and vitamins, pro-vitamin and phenolic compounds that are important in lowering the risk of chronic disease. Red banana (*musa acuminata*), red dacca are a group of varieties of banana with reddish – purple skin. Banana is one of the oldest plant and all its parts have medicinal application Amarasingle *et al*, (2021).

Banana are consumed as fruits, it may also be processed to other forms like smoothies, banana pan cake, bread, nectar and baby food. At times, it is canned with syrup and used in bakery products. Banana peel is also rich in many high values health-promoting antioxidant phytochemicals, such as anthocyanins, delphinidin, cyanidins and a rich source of total phenolic compound which are responsible for the very high antioxidant activity Ogunlade *et al*, 2019, Rebello *et al*, 2014. Banana is one of the most affordable fruits in the market and can be found year round nearly everywhere in the world. It can be eaten alone or combine with groundnut, rice, other fruits, made into smoothie or milk shake and it is the largest herbaceous flowering plant (Picq and INIBAP, 2000). It is also used for the preparation of some popular traditional dishes consumed in Akwa Ibom State.

The development of low cost, high nutrient dense food supplements for infants complementary food is a constant challenge for developing countries where traditional foods used during the food transition process from exclusive breastfeeding to introduction of complementary foods are frequently characterized by low

nutrient density and high bulk, which can adversely affect infant's health ( Okeke *et al.*, 2016). Banana also addresses the energy and some micro nutrient deficiencies in the population.

Kookall, 2018 reported that the proximate composition, mineral and phytochemical composition of ripened and unripened banana flours were analyzed and the total soluble sugar in unripened banana range from 37.5 to 43.8 mg / 100 g of the samples. In addition to this they are rich sources of antioxidant potential phytochemical such as polyphenols, flavonoids, vitamin c and lesser in quantity of antinutritional factors such as phytate and oxalate.

Mosa et al, 2015 reported a chemical composition of fresh banana peels as protein 10.49 g /100 g, fat 5.32g /100 g, carbohydrate 54.01 g / 100 g, moisture 21.96 g / 100 g, ash 8.23 g / 100 g.

Amarasinghe *et al*, (2021) in their study reported that moisture content of  $8.84 \pm 0.43$ , these values were within acceptable limits (20.0 %) to reach a stable shelf life. According to Mahloko, Silunge, Mashau and Kgatla (2019) if the flours moisture content is less than 14 % it can resist microbial growth and contribute to storage. They also recorded protein content of  $5.88 \pm 0.19$ , fat content  $2.16 \pm 0.14$ , carbohydrate content was  $74.28 \pm 0.37$ . The ash content showed  $3.25 \pm 0.31$ , potassium 982 mg / 100 g dry matter. Protein is a main requirement for growth, repair, and maintenance of the human body as well as maintain fluids and protein acts as enzymes, hormones etc. Liyanag, et al (2016) observed in the proximate composition crude fat, crude fiber, crude protein, ash, carbohydrate dry matter content of banana blossoms were 6.54, 23.71, 18.30, 34.36 and 65.49 % respectively. Thus this study aimed at identifying those nutrients that make red banana and its peel essential food which can solve major nutritional problems in our communities.

### Collection of Samples

The fresh red banana (*Musa acuminata*) mature red banana bunches were purchased from Akpan Andem market in Uyo Local Government Area, Akwa Ibom State, Nigeria.

### Methods of Preparation and Treatment of Samples

The matured red banana bunches of about 200 kg were taken to the laboratory of the Department of Home Economics, University of Uyo, washed with distilled water and divided into two parts. First, the fruits were detached from the peduncle and each fruit was defigured into a bowl containing water to remove dirt and possible chemical residue which exuded from the cut surface of the crown. The washed fruits were peeled manually with the aid of a stainless kitchen knife and placed in a bowel containing water with 0.05 % sodium metabisulphate for 5 minutes to prevent browning before it was divided into two. It was peeled, sliced into 1mm thick slices for easy drying. The slices were washed with clean tap water and blanched in sodium chloride solution (1 %, w / v) at 8 °c for 5 minutes and oven dried at 60 °c temperature. The banana with peel was given the same treatment and dried to constant weight in an oven (Gallenkanp Bs Oven, 250) laboratory oven for 3 hours. The dried chips were milled with the aid of a reth mill model km 001 (0067070) to obtain flour sieve and packed in air tight well labeled containers. The same procedure was carried out for the unpeeled red banana. The fraction for proximate composition analysis was removed and taken to the Biochemistry laboratory of university of Uyo. The remaining fractions were stored in air-tight and well labeled containers for the experiment.

The flow chart for red banana flour production

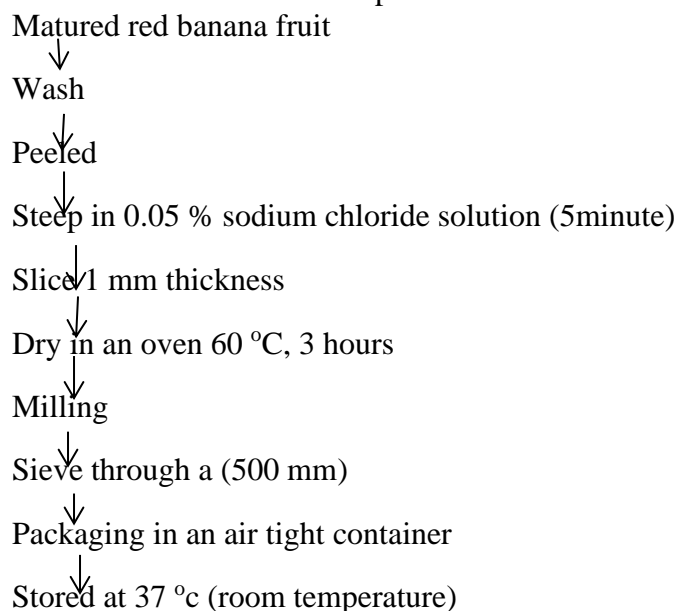


Fig.1: Flow chart showing the processing of red banana flour production

### Determination of Chemical Composition of the Foods

Proximate composition of the processed red banana (moisture, protein, fat, dietary fiber and ash, carbohydrate and calorie, were determined using standard methods by Association of Analytical Chemist (AOAC, 2005).

### Statistical Analysis

All experiments were conducted in triplicate and data obtained were analyzed with Statistical Package for Social Science (SPSS) version 20 software. Descriptive statistics: to determine the mean and standard error value of the nutrient composition of the food commodities. All values were expressed as mean  $\pm$  standard deviation for test and control groups. Analysis of variance (ANOVA) was used to determine the variation existing within the values of the nutrient composition parameters of the feeds. Post hoc and Duncan multiple range test was used to determine the significant difference existing within the variations nutrient composition parameters of the feed.

### Result

The proximate compositions are shown in table 1. The moisture content of the peeled red banana flour (PRBF) had the highest moisture content  $1.63 \pm 0.02$  while URBF had  $1.17 \pm 0.15$ . The URBF had the highest value of ash, crude fibre, and protein  $9.04 \pm 0.07$ ,  $7.39 \pm 0.04$ ,  $7.53 \pm 0.12$ . On the other hand PRBF was significantly higher ( $p < 0.05$ ) in lipid, CHO, and calorie  $2.17 \pm 0.15$ ,  $78.08 \pm 0.45$  and  $357.29 \pm 1.26$ . The mineral and vitamin composition are shown in table 2 URBF was significantly higher ( $p < 0.05$ ) in calcium, vitamin A and vitamin C  $80.30 \pm 0.00$ ,  $0.19 \pm 0.00$ ,  $14.80 \pm 0.02$ . The PRBF was significantly higher ( $p < 0.05$ ) in iodine. The antinutrient composition of the flour are shown in table 3, URBF was significantly higher ( $p < 0.05$ ) in HCN, oxalate and tannin  $1.08 \pm 0.00$ ,  $20.21 \pm 0.00$ ,  $12.99 \pm 0.00$  and phytate was significantly higher ( $p < 0.05$ ) in PRBF  $292.63 \pm 0.06$  than URBF  $274.62 \pm 0.71$ .

**Table 1: Proximate Composition of red banana flour**

Group Name	Moisture (%)	Ash (%)	Fibre (%)	Protein (%)	Lipid (%)	CHO (%)	Calorie (kcal)
PRBF	1.63 ± 0.02 <sup>a</sup>	7.22 ± 0.07 <sup>b</sup>	6.17 ± 0.04 <sup>b</sup>	6.36 ± 0.78 <sup>b</sup>	2.17 ± 0.15 <sup>a</sup>	78.08 ± 0.45 <sup>a</sup>	357.29 ± 1.26 <sup>a</sup>
URBF	1.17 ± 0.15 <sup>b</sup>	9.04 ± 0.07 <sup>a</sup>	7.39 ± 0.04 <sup>a</sup>	7.53 ± 0.12 <sup>a</sup>	2.07 ± 0.06 <sup>b</sup>	73.89 ± 0.35 <sup>b</sup>	344.67 ± 0.96 <sup>b</sup>

**Key: PRBF** – Peeled Red Banana Flour, **URBF** – Unpeeled Red Banana Flour.

**Table 2: Micro-nutrient Content Red Banana Flour**

Group Name	Calcium (%) mg /100 g	Iron (%) mg /100 g	Iodine (%) mg /100 g	Vitamin A (µg/g)	Vitamin C (µg/g)
PRBF	72.05 ± 0.00 <sup>c</sup>	0.01 ± 0.00 <sup>c</sup>	0.89 ± 0.00 <sup>a</sup>	0.07 ± 0.00 <sup>b</sup>	11.82 ± 0.01 <sup>b</sup>
URBF	80.30 ± 0.00 <sup>b</sup>	0.00 ± 0.00 <sup>d</sup>	0.76 ± 0.00 <sup>b</sup>	0.19 ± 0.00 <sup>a</sup>	14.80 ± 0.02 <sup>a</sup>

**Key: PRBF**

Peeled Red Banana Flour, **URBF** – Unpeeled Red Banana Flour.

**Table 3: Antinutrient contents of Red banana flour**

Group Name	HCN (mg / 100 g)	Oxalate (mg / 100 g)	Phytate (mg / 100 g)	Tannin (mg / 100 g)
PRBF	0.41 ± 0.00 <sup>c</sup>	14.33 ± 0.00 <sup>b</sup>	292.63 ± 0.06 <sup>a</sup>	3.69 ± 0.00 <sup>c</sup>
URBF	1.08 ± 0.00 <sup>a</sup>	20.21 ± 0.00 <sup>a</sup>	274.62 ± 0.71 <sup>b</sup>	12.99 ± 0.00 <sup>a</sup>

**Key: PRBF** – Peeled Red Banana Flour, **URBF** – Unpeeled Red Banana Flour.

## Discussion

Red banana is rich in vitamins, minerals and bioactive substances the proximate composition of PRBF and URBF were analyzed. The moisture content of URBF was significant low, moisture content in food is likely to have high stability rate. Almeida *et al*, 2011 had a higher value of 6.39%. The result of fibre in PRBF was 6.17 ± 0.04 mg, URBF was 7.39 ± 0.04 significantly higher (p < 0.05) than PRBF. Low fibre level of banana makes it a good weaning food for infants, though high fibre content are desirable in adult diet which are known to aid digestion, prevent constipation, help excretion of wastes and toxins from the body and also prevent colon cancer Obiageli *et al*, (2019). The protein level of URBF was 7.53 ± 0.12 % significantly higher (p < 0.05) than PRBF 6.36 ± 0.78. Banana peel is reach in protein. Protein helps in constructing and keeping up all tissues within the body, forms an important part of enzymes fluids and hormones and moreover helps antibodies to fight infections and supplies energy Mudambi, *et al*, 2014. The carbohydrate content of PRBF was 78.08 ± 0.45 significantly higher (p < 0.05) than URPF. The flours were adequate in the two groups. Carbohydrate is one of the principal source of energy. The value here is higher than the study by Sidhu *et al*, 2018 which was 22.84 g. New labeling regulation for carbohydrate fraction requires a complete capture of complex carbohydrate which are major part of dietary fibre including cellulose, pectin, glucans, gum mucilage Blenda, 2005. Carbohydrate will prevent the use of proteins for energy provision and allow proteins to perform. FAO and WHO jointly recommended that natural dietary guidelines set a goal of 55 – 75% total energy from carbohydrate (Joint WHO / FAO expert consultant, 2003, Mudambi *et al*, 2014. The result of hydrogen cyanide content of the test flour showed that PRBF was 0.41 ± 0.00 mg / 100 g and URBF was 1.08 ± 0.00 mg / 100 g. The mean HCN of URBF was significantly higher (p < 0.05) than PRBF. This was due to addition of the peel. The nutritive value of any food stuff is determined by its nutrient and toxicants (Akande *et al*, 2012). The recommended HCN concentration is 2. 0 – 4.0 mg per kg body weight (WHO, 2004). The result is within the acceptable range.

The vitamin C content of the URBF was significantly higher (p < 0.05) than the PRBF. The value reported in this study is more than the one reported by (Sidhu *et al.*, 2018) which was 8.7 mg. The chief function of vitamin C are collagen synthesis, strengthens blood vessel walls, form scar tissue, provides matrix for bone

growth, antioxidant, thyroxin synthesis, amino acid metabolism, strengthens resistance to infection, helps in absorption of iron. Prevention of scurvy, formation of collagen, healing of wounds, release of stress hormone, absorption of iron. Consumption of vitamin C amount greater than 2,000 mg /d are not recommended because it results to stomach upset and diarrhea ((Roth 2011, Wardlaw *et al*, 2021).

### Conclusion

The banana peel is a good source of calcium, vitamin A and vitamin C. It may be recommended to mothers and caregivers, to prevent malnutritional disorder as it's a suitable diet for family due to its nutritional content though should be eaten with caution due to the present of antinutrient.

### Recommendations

1. Campaigns should be at local and community levels to synthesize the public on the nutritional and health benefits of red banana.
2. Women gathering in churches and market places and household should be encouraged to utilize local food available in the communities such as red banana in promoting complimentary and other meals for the family.

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