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## Comparative Chemical Analysis of the Nutritional Values of Artificially and Naturally Ripened Banana and Pawpaw Fruits

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### ABSTRACT

Fresh fruits sample of banana (*Musa esculenta*) and pawpaw (*Carica papaya*) were collected from Shendam and Jos North LGA of Plateau State, Nigeria respectively and analyzed for the nutritional values and the mineral contents for the artificially and naturally ripened fruit using proximate method of Analysis. The results for Banana showed that the moisture content, crude protein and ash content for untreated was higher than that of the treated by 0.43, 1.14 and 0.10g/100g sample respectively, while that of the crude fibre fat, carbohydrate of the treated were higher than that of the untreated by 0.30, 0.02 NS 1.35g/100g sample respectively, for the calcium, phosphorus, the values of the treated were higher than the untreated with 0.11g/100g for both fruits. The results of the analysis for pawpaw also showed that the value for moisture content, crude protein and the crude fat for the untreated was higher than that of the treated by 1.57, 0.13 and 0.10g/100g sample respectively while that of the crude fibre, ash content and carbohydrate of the treated were higher than that of the untreated by 0.70, 0.02 and 0.09g/100g sample respectively, for the calcium and phosphorus, the values of the treated were higher than the untreated with 0.08g and 0.16g/100g respectively. Fruits which consist mostly of high moisture content indicated that the treatment on the fruits affect the nutritional values of the fruits and consequently posed a health risk. Based on these findings, the artificial ripening of fruits should be discouraged by the government and the general public be sensitized as these treatment reduce some contents the nutritional values of the fruits.

### INTRODUCTION

Fruits are the best natural food for all; generally rich source of carbohydrate, fibre and the present of antioxidant, but nowadays are deliberately being contaminated by chemicals causing serious health

hazards during the artificial process of repining. Toxic chemicals are indiscriminately used to grow, ripen and make fruits appear fresher or even last longer, particularly during early and off-season. Chemical analysis provides information about the components of plant fruits; the analysis of fruits provides a substantial amount of information generally about the fruits which vary in composition depending on the type of the fruit, variety, place of planting and the ripening processes. The fruits are the means by which these plants disseminate their seeds. Many of them that bear edible fruits in particular have been propagated by the movement of human being and animals in a symbiotic relationship as a mean of dispersal and nutrition respectively. In fact many animal and human being have become dependent on fruits as a source of food (Lewis and Robert, 2002).

Nutritional values of fruits refer to the amount of the beneficial nutrients that can be acquired through consumption of a certain type of fruits. Some fruits are generally rich sources of fibre and carbohydrate while some are not. Some are very healthy, wholesome foods to be enjoyed in moderation. Some fruits are high in calories carbs and /of glycerin index. For weight loss, the fruits to vegetable ratio should be 1 served of fruit for every 5 services of vegetable.

An important nutritional value of a fruits is its antioxidant content. In fact, some fruits have some of the highest antioxidant values of all food; antioxidants are found as supplement which neutralizes free radicals that are harmful to molecules to the body that damage the cells and causes inflammation. Antioxidant content is commonly measured as Oxygen Radical Absorbance Capacity- ORAE (Aprikian *et al* 2003). The nutritional value of fruits comes in a variety of forms; fibre, carbohydrate and powerful antioxidant some, which are found in very brightly colour fruits (Harvorsen, *et al*, 2002). Rahman,(2008),explained that there are two methods of ripening fruits; the conventional(natural) and the chemical(artificial) ripening. Both conventional and chemical

ripening methods are used in ripening of fruits. Synthetic chemicals are specially used for large scale and commercial fruits ripening immature and premature fruits are the main target for enhanced ripening to curtailed early price. While the conventional method use the application of heat e.g. polyethene covering and application of heat by lightning candles, fruit ripening. Chemical method involved ethylene ( $H_2C = CH_2$ ) a natural gaseous hormone, used for the ripening. An application of ethylene gas at a concentration of 0.1 – 1.0 N L/C for 4hrs is sufficient to hasten full ripening of climacteric fruits (Wills, 2004). Maria pan and Subramanian (2004) reported that higher quantity of calcium carbide-  $CaCl_2$  needed to ripen an immature fruit makes it tasteless, hence an alternative ripening agent for fruits were imperative. Further, the local industry is looking to replace the calcium carbide with any suitable alternative. Calcium carbide absorbs moisture and produces acetylene, which is a weak analog of ethylene responsible for triggering ripening process (Padmini & Prabha, 1997). Singh & Janes, 2001, reported that today or in future we will be able to find out some better alternatives for fruits ripening agents that have minimal or are without hazards. A Report by Bhviyan, (2009) indicated a research from Bangladesh that the nutritional values like protein content, vitamin C and between carotene decreases in artificially ripened pineapple and bananas. The critical finding was the present of Arsenic (As) lead (Pb) within the artificially ripened pineapples and bananas. Hakim *et al*, (2012) stated that in many development countries, the potential sources of chemical combination of fruits and vegetables includes the usage of pesticides during harvest process, preservatives at post harvesting process, therefore to correctly asses the health hazards related to ripening agent is not only essential to consider their effects on the fruits quality but also qualitative and quantitative analysis of the impurities associated with ripening agents. Other possible sources of chemical adulteration and their effect on nutrition values, taste were also reported.

The aim of this paper is to examine and compare the proximate / nutritional values of a naturally and artificially ripened banana and pawpaw fruits, and the effect of artificially method of using calcium carbide on the nutritional content of the fruits and to advise farmers and consumers on the health implication of the use of calcium carbide.

## METHODOLOGY

**Sampling :-** The samples of the fresh banana bunch were bought from a local market in Shendam LGA of Plateau State and the pawpaw samples were obtain in Jos, State capital market behind central bank of Nigeria Jos.

### Sample / Treatment

The bananas were kept for two hours for the latex to dry and it was transferred to the laboratory, washed and divided into two. Half of the bunch subjected to the normal environmental temperature for ripening which took 7days while the other half was ripened artificially using calcium carbide as the ripening agent.

The pawpaw samples were also subjected to normal environmental morning for 7days and the other sample was artificially ripened by calcium carbide for 3days.

Both ripe samples of the banana and the pawpaw were transferred to the National Veterinary Research Institute (NVRI) Vom in the department of Biochemistry for proximate analysis; determination of nutrition values of each of the samples which includes the following parameters; crude fat, crude fibre, crude protein, ash content, moisture content, Nitrogen Free Extract (NFE) that is the digestible carbohydrates, phosphorus and calcium were carried out. Using Analysis of the Association of Official Analytical Chemist (AOAC 2002, 2003).

## RESULTS AND DISCUSSION

The table 1 showed that the banana and the pawpaw treated with calcium carbide as ripening agent required less time to ripe completely than the natural ripening process which took 7days while the ripening with calcium carbide took three days (3) to ripe completely, which represent about 43% reduction in ripening time compare to the natural process. The results showed that the chemical treatment require less time, which can easily lead to spoilage of the fruit.

**Table 1: Banana and Pawpaw ripening under different conditions**

Ripening	Banana	Pawpaw
Natural	7days (168 hours)	7days (168 hours)
Artificial	3days (72 hours)	3days (72 hours)

**Table 2: Results of proximate Analysis of Banana fruit**

Nutritional value	Treated g/100g	Untreated g/100g
Moisture	71.07	71.50
Crude protein	0.26	1.40
Crude fibre	0.70	0.40
Crude fat	0.09	0.07
Ash content	0.60	0.07
NFE Carbohydrate	27.28	25.93
Calcium	0.19	0.08
Phosphorus	0.13	0.02

**Table 3: Results for Proximate Analysis of Pawpaw fruits**

Nutrition value	Treated g/100g	Untreated g/100g
Moisture	90.25	92.42
Crude protein	0.70	0.83
Crude fibre	1.60	0.90
Crude Fat	0.04	0.14
Ash content	0.28	0.08
NFE Carbohydrate	6.53	5.63
Calcium	0.18	0.10
Phosphorus	0.19	0.03

## DISCUSSION

**Table 2** showed the proximate composition of Banana sample. The moisture content for the untreated more than the treated sample by 0.43g/100g representing 1.0 percent different, indicating the use calcium carbide ( $\text{CaC}_2$ ) as a ripening agent slightly affect the moisture content. The crude protein of the untreated sample was more than the treated by 1.14g/100g sample representing 81.04 percent. This agreed with the results of Aride, 2012, that the values of crude protein for untreated sample were higher than the treated. Proteins are essential for the human body growth and development hence higher protein is bitter for the body. The crude fibre for untreated sample was more than the treated by value of 0.30g/100g of the sample which showed that the ripening agent has a direct effect on the level of crude fibre. Crude fibres are found in fruits and serve as residue that resists digestion in human body.

The crude fat for both the treated and untreated sample were of no significance variation in the values, showed that the chemical treatment has little or no effect on the crude fat of the banana sample. The Ash content is the remaining after the water and organic matter has be remove by heating in the present of an organic agent and the value for the treated was higher than the untreated by a value 0.10g/100g. This showed that the treatment has some effect on the ash content. Carbohydrate content for the untreated sample was less than the treated by a value of 1.33g/100g representing 5.12% which is ideal for a diabetic and hypertensive patients. Fruits consisting mainly of carbohydrate are none to have high nutritional values especially in time of micronutrient (Fatena, *et al*, 2003).

The Phosphorus content of the treated was higher than the untreated by value 0.11g/100g. This showed that the treatment has some effect on the phosphorus content. Phosphorus is a macro nutrient abundantly found in nature second to calcium and is required for the healthy formation of

bones and teeth. It also helps to maintain healthy blood sugar level. Its deficiency affects the energy level of the body.

**Table 3** showed the proximate composition of a pawpaw sample. The moisture content of the untreated sample was more than the treated by 1.7g/100g which represents 1.69% increase. This result indicated that the use of the ripening agent affected the moisture content. The crude protein for the untreated was more than the treated sample by a value of 0.13g/100g representing 15.66% indicating that the ripening agent reduces the value of the protein. Proteins are essential for human body growth and development as early mentioned hence, the higher the protein the better development of the body.

The crude fibre in the treated sample was more than the untreated by 0.70g/100g of sample. This showed that the ripening agent has a direct effect on the crude fibre. Adequate amount in fruits helps to prevent over absorption of water and formation of hard stool which can result to constipation though helps to maintain the health of the gastrointestinal tracts but in excess may bind trace elements leading to a deficiency in the iron and zinc of the body (Siddhuraju, 1996). The crude content for both the treated and the untreated did not show any significant variation. This showed that the chemical treatment could not have more effect on the crude fat of the pawpaw fruit.

The Ash content under normal condition, the value for the untreated was less than the treated by 0.20g/100g sample. The result showed that the ash content when treated has little or no variation for the body since the organic matter and water have been removed by heating. The carbohydrate content for the treated was more than the untreated by 0.90g/100g representing 15.98%. Calcium content for the treated sample was higher than the untreated by the value of 0.08g/100g; this result showed the ripening agent has an effect on the value of the calcium as reported by (Subukola and Dauro, 2007).

## CONCLUSION

The study has revealed that the artificial ripening method using  $\text{CaC}_2$  has an adverse effect on the ripening process of both banana and pawpaw fruits. This ripening chemical agent alters the values of the fruit nutrients thus make it unhealthy and unsafe for human consumption as this could cause cancer, food poisoning, gastric irritation headache, dizziness, sleeping, mental confusion memory loss, and seizure and mouth cancer. These results also indicated that the fruits treatment with  $\text{CaC}_2$  does not only affect the ripening process but also reduces the quality of some of the major parameters of the nutrition values and also increases the values of phosphorus and calcium of both the banana and the pawpaw fruits.

## RECOMMENDATIONS

Based on the findings obtained, the consumption of fruits ripened by artificial method via  $\text{CaC}_2$  is not healthy to the body because the chemical ripening process reduces the nutritional values of the fruits as well as posing a health-risk to the consumers and the researchers hereby recommends that:-

1. The usage of artificially ripening method should be discouraged.
2. The government should legislate and ban the use and the sale of  $\text{CaC}_2$  as a ripening agent.
3. The general public be sensitized on the health hazards these ripening agent when used on our fruits.
4. Researchers should look for best possible options.

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