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Protein and mineral element levels of some fruit juices (*Citrus spp.*) in some Niger Delta areas of Nigeria

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Abstract: The experiment carried out on grape, lime, orange and lemon fruit juices show that orange juice has the least acidic pH value of 4.09, while lime juice has the highest value of 2.09. Grapefruit had the highest percent of protein content at 0.92% while orange juice recorded the least percentage protein content at 0.51%. Mineral elements analyzed show that lemon juice had the highest potassium and calcium content with value of 195.45ppm and 3.52ppm respectively, while orange juice recorded the highest value of magnesium at a value of 0.426ppm. Lime juice recorded the highest iron content with a value of 2.998ppm. This finding compares the concentration of mineral element and protein level of some fruit juices commonly consumed in some Niger Delta areas of Nigeria, as well as determining their pH values. From the results obtained, citrus fruits are therefore highly recommended for consumption as a result of their high mineral element and low protein contents with exception to lime which might increase the acidity of the body.

Keywords: Citrus, Element, Fruit, Grape, Juice, Lemon, Lime, Mineral, Orange

1. Introduction

The human body's overwhelming need for vitamins and minerals can most often be naturally met by eating fresh fruits. In addition to these minerals and vitamins, fruits contain phytochemicals that carry out important preventive and healing functions. Considering the composition of fruits representing a small proportion of the whole, it is therefore possible to consume greater quantity of fruits than more concentrated foods like meat, eggs and cheese.

Fruit juices (unprocessed) are diuretics (due to their high potassium and flavonoid content), alkalizers (in spite of their own acidity they reduce the acidity of the blood and tissues), mineralizers (because of their high mineral content) and have invigorating effects. Natural fruit juices are the fastest and best way to obtain nutrient necessary for wellness (Sify Food, 2007).

1.1. Minerals

Minerals refer to element in their simple inorganic form. In nutrition, they are referred to as mineral elements or inorganic nutrients. These are elements other than hydrogen, oxygen and nitrogen, which normally form salts that are left when a food material is burnt in a furnace, hence the term "ash constituents" as the organic nutrients, mainly protein, carbohydrates and fats are oxidized. According to the education and health library, "once these elements are correctly put into place in an individual, the victory over disease and limitation to health and vitality has begun (McDowell, 1989).

Minerals are vital to health. Like vitamins and amino acids, minerals are essential for regulating and building the trillions of living cells which makes up the body. They help draw chemical substances in and out of the cells and they keep the blood and tissue fluid from becoming either too acidic or too alkaline. Minerals help retain and maintain water necessary for life's processes in the body.

1.2. Mineral Elements

Nutritionally, mineral elements are of great importance to the body. Some like calcium, phosphorus, and magnesium are important constituents of bones and teeth. As soluble salts, mineral elements like sodium, chloride, potassium, magnesium and phosphorus help to control the composition of body fluid and cells.

This research is aimed at comparing the concentration of

mineral element and protein level of some fruit juices commonly consumed in Niger Delta as well as determining their pH values.

2. Materials and Method

2.1. Sample Preparation

All samples (grape, limes, lemon and orange) were washed and peeled, after which the juice of each sample was obtained by squeezing with a manual juice squeezer. The juice was then sieved to remove particles (seeds and pulp).

2.2. pH Determination

The glass electrode pH meter was used to determine the pH of the samples. The electrode was first placed in a buffer solution respectively before it was used/ placed in the samples.

2.3. Mineral Element Determination

Mixed acid digestion was carried out on the samples to liberate the organometals to their various ionic forms before the digest samples were analyzed by using an Atomic Absorption Spectrophotometer (AAS).

3. Results

Table 3.1: *pH values of some fruit juice*

Sample	*pH value*
Lemon Juice	2.39 ± 0.17
Orange Juice	4.09 ± 0.03
Lime Juice	2.07 ± 0.16
Grapefruit Juice	3.27 ± 0.08

Values are means ± standard deviation of triplicate determination.

Table 3.2: *Protein levels of some fruit juice*

Sample	*Protein levels g/100g(%)*
Lemon Juice	0.85 ± 0.18
Orange Juice	0.51 ± 0.22
Lime Juice	0.67 ± 0.5
Grapefruit Juice	0.92 ± 0.13

Values are mean ± standard deviation of triplicate determination

Table 3.3: *Mineral element composition of some fruit juice*

Minerals	*Grapefruit*	*Lime juice*	*Oranges juice*	*Lemon juice*
Magnesium (ppm)	0.194	0.357	0.426	0.257
Iron (ppm)	0.803	2.998	0.465	1.329
Potassium (ppm)	24.504	31.670	47.839	195.452
Calcium (ppm)	1.615	2.294	2.244	3.524

4. Discussion and Conclusion

4.1. pH Determination

From the results obtained in study, it shows that these fruit juices are low acidic juices as seen from the pH values with lime juice having the highest acidic value of 2.07±0.16, followed by lemon juice with a pH value of 2.39±0.17, then grapefruit juice with 3.27±0.08 and finally orange juice has the least acid value with a value of 4.09±0.03 (Table 3.1). It shows that the fruits can be consumed but with consideration to their acidic content (pH) in relation to their effect on the gastrointestinal tract, the stomach and the intestine's (duodenum) as the case may be.

4.2. Protein Composition

The results also indicated low protein levels from the various fruit juice samples after analysis, with the highest (%) amount recorded in grapefruit juice containing 0.92g % protein, followed by lemon juice with 0.85g % protein, lime juice with 0.67g % protein and orange juice with 0.51g % protein, indicating that the fruits are very safe for consumption with respect to protein content.

4.3. Mineral Element Composition

The result of the mineral element composition of the samples as shown in Table 3.3 illustrates thus;

Magnesium levels were represented in a descending order as thus; orange juice (0.426ppm) > lime juice (0.357ppm) > lemon juice (0.257pmm) > grapefruit juice (0.174ppm).

Iron levels followed in a descending order as thus represented; lime juice (2.998ppm) > lemon juice (1.329ppm) > grapefruit juice (0.803ppm) > orange juice (0.465ppm).

Potassium were represented as thus; lemon juice (195.452ppm) > orange juice (47.839ppm) > lime juice (31.670ppm) > grapefruit juice (24.504ppm).

Finally, Calcium levels were represented in the order; lemon juice (3.524ppm) > lime juice (2.294ppm) > orange juice (2.244ppm) > grapefruit juice (1.615ppm).

However, the result indicates that the fruits are highly rich in the mineral elements analyzed, hence can be a very good source of mineral nutrients as they are of great importance and contributes to the well being of the body.

5. Conclusion

Conclusively, from the findings of the research carried out on the following fruit juices (grape, lime, orange and lemon), obtained from some Niger Delta polluted area were observed to still posses their mineral contents, hence are so far recommended to be safe for consumption as they aid digestion and providing the body with essential mineral elements needed for proper body function and development.

Abbreviations

AAS- Atomic absorption spectrophotometer, ppm- part per million.

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