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EVALUATION OF pH OF COMMON CARBOHYDRATE FOOD STUFF CONSUMED IN SOUTHERN SENATORIAL DISTRICT OF CROSS RIVER STATE OF NIGERIA

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ABSTRACT

This work evaluates and provides data on the seasonal pH of common carbohydrate food stuff in major communities of Southern Senatorial districts of Cross River State. The result shows that most of the locally consumed food items within these communities are mostly acidic within a mean value of pH of 4.6 and conductivity of 48.6 Siemens for the wet season and pH of 4.8 and conductivity of 27.4 for the dry season which causes a lot of ailments. A balanced diet or a combination of food substances to keep an optimal body pH balance is recommended so as to discourage the growth of microforms and organisms which give rise to these problems. It is recommended also that other non-carbohydrate food items such as proteins and vegetables be increased in the menu, or the starchy content of food substances can be reduced during the manufacturing process by manufacturing companies. Government can legislate and monitor these companies to comply with such standards as to improve the health conditions of the rural communities and other consumers.

KEY WORDS: Acidity, alkalinity, pH, conductivity, carbohydrate foods.

INTRODUCTION

Common food items like garri, yam, cocoyam, cassava, plantain are rich in carbohydrates; meat, fish, beans are fairly rich in proteins; the cereals and legumes like rice, groundnuts, peanuts, cashew, contain appropriate fats and oils; vegetables and fruits contain micro nutrients and vitamins. A balanced diet contains all these in their correct ratios. A combination of these food items in their correct amounts guarantees a fair optimal pH balance of the body. This aids the elimination of such maladies as pain, arthritis, cramps, diabetes mellitus, respiratory problems, anti social behavior and suicidal tendencies among others (Susan, 2000).

Carbohydrate foods such as cassava, yam, cocoyam, plantain, bananas, maize in their raw form, semi-processed and processed forms like garri, cassava (flour), yam flour (amala), maize flour, are a common feature of the diet of most Nigerian communities. These foods are acidic. There is a general tendency among living organisms especially humans, towards the consumption of acidic food items. (Susan, 2000; Young and Young, 2002). However the human race, in its quest for longevity, struggles, just as the cells do, to maintain a safe pH balance until death (Halprin and Goldstein, 1999).

Some materials have been in circulation dealing with healthy living through a conscious pH balance. Chemically, this is a struggle for adequate pH control of the aging process which is a natural process of acid generation and acid waste breakdown and disposal (Halprin and Goldstein, 1999; Young and Young, 2002).

The feeding habits of people within a community dictate to a large extent their body pH balance and the food they eat is the source of the ingredients that facilitate the metabolic processes that lead to the generation and breakdown of acidic/basic by products (Hall, 1976; Remer and Manz, 1994).

The combination therefore, of the various food substances to check this imbalance depends on the availability of alternative food and the purchasing power of the people, including of course their traditional beliefs (Oyenuga, 1968; Hall, 1976).

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Cross River State like most other States of Nigeria is “an assemblage” of peasant communities that rely mostly on carbohydrate food stuff for their sustenance. The soil that supports the growth of these food substances contributes the trace metals which are a necessary accompaniment of their menu (Eneobong, 2001). These metals cause the hydrolysis of foods to form acidic or basic end-products which accumulate in body cells during various metabolic processes (Hall, 1976; Harris, 1975; Susan, 2000).

This research therefore is aims at building up data on pH levels in some common food items available within our local communities (Anon, 1962, Susan, 2000), as a base of information to aid a balance diet in order to achieve an optimal body pH balance, which is known to be a remedy for many body ailments common to people in our local communities (Green and Kleeman, 1991; Young and Young, 2002).

The developed nations of the world, like the United State of America have enough of this type of data management, for their food items and balance diet. However, when they recommend recipes to third world countries like ours, we are at a loss to what their local equivalents are. Here lies the yearning for such data and justification for this work, which cannot be overemphasized (Young and Young, 2002).

MATERIALS AND METHODS

The raw food items, the semi-processed and processed food items were collected from the Southern Senatorial District of Cross River State which comprises Calabar Municipality, Odukpani, Calabar South, Akamkpa, Biase, Akpabuyo and Bakassi Local Government Areas. The collection centres were grouped into three Stations, namely Calabar in Calabar Municipality Local Government as Station I, Ikang in Akpabuyo Local Government as Station II, and Biase in Biase Local Government Area as Station III.

The raw food items include cassava, yam, cocoyam, sweet/bitter yam, rice, banana, plantain, maize/corn, sesame, sugar cane, mango, grape fruit, lemon, cucumber, paw paw, coconut, avocado; while the semi-processed/processed food items include garri, fufu, bread, yam flour (amala), cassava flour, wheat flour, plantain flour and spaghetti/macarroni, semovita/semolina.

All samples were collected at six points in a rectangular grid method in each of these stations to ensure good representation (Osuala, 1980). Samples collected from each station were thoroughly mixed to form a composite sample. About 12 raw samples were collected to include cucumber, plantain, rice, maize, banana, pineapple, yam, tomato, cassava, grape, orange, mango and potato.

Treatment of samples: For raw yam, cassava, potato, rice, banana, plantain and cocoyam, peeling was done for each using a properly cleaned kitchen knife. About 10g of each sample was cut to small pieces and placed into a 1 litre-cup Kenwood Model no KW10 blender and 30ml of water added. The samples were then pulverized for 5 min. Subsequent samples were treated the same way after thorough cleaning of the blender.

For oranges, grapes and other citrus fruits, the liquid juice was squeezed into beakers and their concentrated juice covered and kept for analysis.

For the semi-processed and processed food items like cassava flour, akpu and garri, about 10gm of each sample was weighed using a Mettler Top-loading balance and placed into separate beakers. 100 ml of distilled water was added to each of them and stirred and kept for sample analysis. Care was taken to ensure that the collected samples were not wounded to avoid any fast enzyme activity. For samples like cassava flour and akpu, the cassava was grated and fermented for two days after which they were washed with water and later sieved to collect the wet akpu samples. The other fermented portion was washed and then dried under sunlight and ground to form the cassava flour (Akinrele, 1976; Eka, 1986; Achinewhu, 1998).

Preparation of garri: The cassava tubers was peeled and properly washed. It was then grated and tied overnight in bacco bag for some of the water to drain off. The pressed dry portion was loosened and sifted to remove the unwanted fibers. It was now ready for frying with locally-made ceramic frying pan. (Akinrele, 1976; Eka, 1986).

Laboratory analysis of samples: A digital pH meter, pH indicator papers and a conductivity meter Model No. 4510 were used to determine acidity. Due to seasonal variations,

determinations were carried out in two phase. The first phase covered the dry season (November to April) while the second phase covered the rainy season (May to October). The indicator papers and conductivity measurement formed the preliminary test for determining acidity, digital pH meter gave the precise results (Krist and Rump, 1988).

About 10gm of each sample was weighed into three 250 ml beakers; 100 ml of distilled water was added. The sample was stirred for 5 min with a clean glass rod and allowed to equilibrate. The sample was then covered with a watch glass to avoid exposure to the atmosphere and kept overnight.

The supernatant liquid in the first beaker was tested using pH indicator paper to give the approximate pH. The solution in the second beaker was tested for conductivity by placing the dip cell of the meter into it at the ambient temperature. In the third beaker the pH was determined electronically using a pH meter of +0.1 percent sensitivity Model No WTW 422. The instrument was carefully calibrated using Buffers of pH 4, pH 7 and pH 9 (Krist and Rump, 1988).

The use of filter papers to blot the electrode after each calibration was meticulously followed to reduce memory effect. The pH of the samples was thus determined and the results are shown in Table 1 and 2 for the rainy season and dry season period.

RESULTS AND DISCUSSION

The seasonal mean value of the pH of common carbohydrate food items is shown in Tables 1 and 2. The result shows that the mean value of pH of 4.6 and conductivity of 48.6 Siemens was obtained for rainy season while that of dry season was pH of 4.8 and conductivity of 27.4 Siemens. It can be inferred from these results that carbohydrate food substances generate acidic waste products (Susan, 2000).

By design the human body is alkaline but the intake of carbohydrates either in their raw state or processed form renders them ultimately acidic. Available evidence shows that this tendency on increasing body acidity by

Table 1: Rainy Season May-October Mean pH and Conductivity in Siemans ± standard deviation.

Sample	Mean pH	±	STD	Conductivity	±	STD
Cucumber	4.31	±	0.01	49.8	±	0.3
Plantain	4.15	±	0.01	52.9	±	0.2
Rice (white)	6.02	±	0.01	35.8	±	0.2
Maize	6.53	±	0.02	32.3	±	0.7
Banana	4.95	±	0.03	42.9	±	0.4
Pineapple	3.30	±	0.02	60.7	±	0.3
Yam	4.69	±	0.02	45.8	±	0.3
Tomato	4.16	±	0.02	51.2	±	0.8
Cassava	6.20	±	0.01	34.3	±	0.5
Grape	2.82	±	0.02	72.3	±	2.9
Mango	4.50	±	0.12	47.3	±	0.6
Orange	3.62	±	0.01	57.3	±	0.5

Note: Mean for three stations i.e. STI: Calabar in Calabar Municipal LGA, ST II: Ikang in Akpabuyo L.G.A ST III: Biase in Biase LGA.

Table 2: Dry Season Nov-April Mean pH and conductivity in Siemens ± Standard Deviation.

Sample	Mean pH	±	STD	Conductivity	±	STD
Cucumber	4.40	±	0.09	27.4	±	1.0
Plantain	4.62	±	0.12	24.2	±	4.1
Rice (white)	6.20	±	0.20	22.2	±	1.2
Maize	6.42	±	0.12	20.9	±	1.4
Banana	4.57	±	0.15	23.8	±	1.4
Pineapple	3.48	±	0.12	40.8	±	1.0
Yam	4.34	±	0.16	24.6	±	0.5
Tomato	4.25	±	0.06	25.6	±	0.6
Cassava	6.04	±	0.30	24.0	±	2.2
Grape	2.22	±	0.10	27.9	±	1.8
Mango	4.64	±	0.16	27.0	±	0.1
Orange	3.62	±	0.16	36.9	±	0.1
Cocoyam	4.85	±	0.21	25.3	±	3.5
Potato	4.38	±	0.08	26.5	±	0.2
Akpu (process cassava)	3.63	±	0.21	28.9	±	0.6
Cassava	9.37	±	0.14	33.8	±	2.9
Flour	4.64	±	0.16	23.7	±	0.2
Garri	4.13	±	0.13	25.7	±	0.2
Paw paw sugar cane	3.42	±	0.12	32.3	±	1.0

Note: Mean for three stations i.e. STI: Calabar in Calabar Municipal LGA, ST II: Ikang in Akpabuyo L.G.A ST III: Biase in Biase LGA.

the consumption of carbohydrate rich food items dislocates the pH balance of the body system and gives rise to innumerable health problems (Cleave, 1974; Susan, 2000; Young and Young, 2002). The rise in acidity is exacerbated by the hydrolysis of the food substances, which are consumed, by our local communities on a daily bases. This effect can be reduced either by the combination of other non-carbohydrate food substances in their appropriate quantities such as the proteins or by the increased in take of vegetables and fruits or by the fortification of these carbohydrate food substances with acids decreasing food substances or vitamins. A case in point is the treatment of raw cassava with a pH of 6.2 and akpu (cassava meal) of pH of 3.6 to cassava flour with a pH of 9.37. Government and Non-Governmental agencies should be advised

to carry out a sensitization campaign in the rural populace on the effect of consuming too much acidic foods and ways of minimizing it. Also, it is possible for government to legislate to the food manufacturing companies on the acid levels of their products and monitor them for comply. This will improve the health condition of the people especially the rural communities.

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