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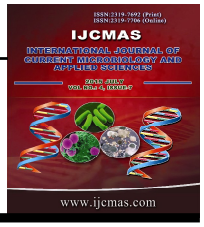

Original Research Article

Proximate Composition of Five Commonly Used Horticultural Products in Northern Nigeria

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Keywords

Horticultural product, Proximate composition, Storage facility, Soft loan

A B S T R A C T

The representative samples of five commonly used horticultural products: Carrot, Coconut, Garden egg, Pineapple and Sweet Orange, bought from Bauchi central market were analyzed for proximate composition at National Veterinary Research Institute Vom, Plateau State – Nigeria. The results indicated that Sweet orange (*Citrus sinensis* L. Osb) has the highest moisture content (87.12%) among the tested products and Coconut (*Cocos nucifera L.*) has the least moisture content. The analysis also shows that Garden egg has the highest Crude protein (18.48%) and this was followed by Carrot (*Daucus carota* L.) 12.81% and Pineapple (*Ananas comosus* L.Merrill) has the lowest Crude protein (2.77%). Coconut (*Cocos nucifera* L.) has the highest percentage of Crude fibre (14.00%) with eggplant (*Solanum melongena*) having the lowest content (2.28%). Coconut (20.55%) and Carrot (4.54%) has the highest Crude fat and ash respectfully. As enhancement and a guard against spoilage of products, provision of storage facility and soft loan to horticultural farmers were recommended among others.

Introduction

There are some basic characteristics of fruits that make them appealing to most people. All fruits are healthy when eaten in moderation. They are great sources of dietary fiber and most fruits are low in calories and fat. Those that have a high fat content, such as avocados, are actually good sources of healthy fats. Fruits are great snacks and they can also be used as combination of sugars: Fructose, glucose, and sucrose. Fructose is the principal sugar of many fruits and is considered to be the sweetest. Sucrose is the main sugar in several other fruits such as orange, melons and peaches. Water makes up 80% to 95% of fruits. The water content in fruits keep their caloric content low and also provides fruit juice. Almost all fruits can be eaten raw juiced for a beverage, used in frozen desserts, preserved, or dried. Fresh whole fruits are considered to be the most nutrition (Ogunlade *et al.*, 2011).

Fruits are an excellent source of nutrition and should be consumed in moderation as part of a healthy diet. Like vegetables fruits are a great source of vitamin, minerals, antioxidants, fiber and water. In the fruit group, several fruits are considered to be super foods (Yarima, 2008).

What determines a fruits (or any other plant food) to be a super food is its nutrient density. The super foods in the fruit group include berries citrus, coconut, mangoes, papaya and melons. All of these super foods contain a large supply of various nutrients. One of the most profound health benefits of fruits is that they are an excellent source of both types of dietary fiber (soluble and insoluble). Dietary fiber is made up of a variety of compounds that are beneficial to be digestive system and also provide health benefits to other functions in the body. Fiber compounds are found only in plant foods and are not broken down when they pass through the small intestines. Although fiber is generally known as passing through the digestive system undigested some types of fiber undergo digestion through the intestine or colon. Soluble fiber is what which is soluble in water. Insoluble fiber (also known as roughage) does not assimilate in to water. Most plant foods contain both types of fiber in varying amounts, but some plant foods provide a rich source of one or the other. Studies show that soluble fiber helps to lower blood cholesterol level thereby reducing the risk of heart disease (Abdullahi *et al.*, 2010). Soluble fiber is also beneficial in the management of diabetes. It helps to keep blood glucose (sugar) levels balanced. When consumed with adequate amount of fluids, insoluble fiber helps to prevent constipation. It adds bulk to stools and stimulates peristalsis (the involuntary contractions that move food through the intestinal tract). Research studies indicate that insoluble fiber plays a role in the prevention of colon cancer. Since high fiber foods are filling and tend to be low in fat, both types of fiber fruits also provide an excellent source of several vitamins, minerals and antioxidants. Fruits supply several minerals including potassium (especially in bananas, pears and oranges), iron (mostly in berries and diet fruits) and small amounts of calcium and magnesium. The main contribution that fruits make to the diets is vitamins, especially vitamins C and beta carotene. Tropical fruits: citrus fruits, berries, and melons are all good sources of vitamin C. Yellow and orange fruits such as apricots, cantaloupes, peaches nectarines and papayas are the best source of beta carotene (Ohiokpehia, 2003; Montoso Garden, 2007).

Materials and Methods

Procedures for data collection

The representative samples of five most commonly used horticultural products (Carrot, Garden egg, Sweet orange, Coconut and Pineapple) were bought from Bauchi Central Market in Bauchi State (9^0 30^1 and 12^o 30^1 N 8^0 50^1 and 11^0 E) and analyzed for proximate composition. The analysis was conducted at National Veterinary Research Institute, Vom, Plateau State – Nigeria.

Determination of moisture content

The moisture content of the samples was determined in accordance with AOAC (2000) in which the sample were introduced in to an oven maintained at 105°C for one to four hours until uniform weight was attained. The moisture value was obtained using the equation, thus:

$$MC = \frac{W_1 - W_2}{W_2} \times 100$$

Where MC= Moisture Content, W1= weight of original sample and W_2= weight of oven dry sample

Determination of Crude Protein (CP)

This analysis was conducted with an aid of micro Kjedhal system in accordance with AOAC (2000). A small quantity of the sample (Approximately 1gram) was introduced in to the digestion tube (Kjeltec 2200 FOSS) and, a catalyst (2 tablets of 5g K_2SO_4 and 5mg of Se) and 12ml of concentrated tetra oxosulphate VI acid (H_2SO_4) were added. The digestion was run for one hour at 420^oC. 80ml and 40ml of water and sodium hydroxide (NAOH) respectfully were used in the distillation using 2200 FOSS distillation unit and the distillate was collected in 4% Boric acid. Percentage Nitrogen was calculated thus:

$$\%N = \frac{(\text{Titre- Blank}) \times 14.007 \times 0.1 \times 100}{1000 \times \text{sample weight (mg)}}$$

$$\%CP = \%N \times 6.25$$

Determination of Crude Fiber (CF)

The crude fiber of the sample was determined according to AOAC (2000). 2g of the sample was defatted with petroleum ether and then boil under reflux for 30minutes with 200ml of a solution containing 1.25g of H_2SO_4 per 100ml of solution. The solution was then filtered through linen on a fluted funnel. It is then washed with boiling water until the washings are no longer acid. The residue was then transferred to a beaker and boils for 30minutes with 200ml of a solution containing 1.25g of carbonate free NaOH per 100ml. the final residue was then filtered through a thin but close pad of washed and ignited asbestos in a Gooch crucible and dried in an electric oven and weigh. It was then incinerated, cooled and weighed. The percentage crude fiber was calculated as:

%CF = Loss of weight after incineration x 100

Determination of Crude Fat

The fat contents were determined using Fat extractor with automated control unit (FOSS Soxtec 2055) according to AOAC (2000). The equipment has six extraction units with each unit carrying a thimble which accommodate the samples and aluminum cups for collection of the extracted fat. These units enable six samples to be analyzed within 75minutes. Percentage of fat is the differences between weight of the pre-weighed cups and after extraction. One gram of the samples was weighed into the thimble and its mouth plugged with defatted cotton wool, after which it was inserted in to the extraction unit. 80ml of petroleum ether were dropped in to each cup and maintained at 135^oC. Each cup was aligned with its corresponding thimble. The extraction and rinsing were done for 30minutes each, after which the sample was aerated for 15minutes and crude fat calculated as:

$$\%Fat = \frac{w_3 - w_2}{W_1} \times 100$$

Where w_1 = weight of sample, W_2 = weight of empty cup and W_3 = weight of cup with the extracted oil

Determination of ash

The instruction of AOAC (2000) was adhered to in the running of this analysis. Crucibles were rinsed and dried in hot air oven (SM9053) maintained for 30minutes at 105^oC. These were cooled in desiccators and weighed. 2.5g of the sample was burnt on a heater inside a fume cupboard to get rid of smoke. The samples were moved to pre-heated muffle furnace (SM9080) maintained at 550^oC until such a time when a light grey ash was noticed. The crucibles were cooled in desiccators and weighed. The ash content was calculated as:

$$\% \text{ Ash} = \frac{(\text{weight of crucible + Ash}) - \text{weight of empty crucible} \times 100}{\text{Weight of sample}}$$

Results and Discussions

As depicted in table 1, *Citrus sinensis* L. (orange) has the highest moisture content (87.12%) at the time of the analysis. This was followed by *Ananas comosus* L.Merill (86.12%), *Daucus carota* L. (80.10%), *Solanum melongena* (78.95%) and *Cocos nucifera* L. (42.92%) respectfully. These moisture values were higher than that of *Pachira glabra* (8.17%) as reported by Oni *et al.,* 2015. *Solanum melongena* has the highest protein content (18.48%) among the five fruits studied. Ogunlade *et al.,* 2011 and Oni *et al.,* 2015 reported 10.38% and 7.67% protein for *Pachira glabra*. This shows that *Solanum melongena* (garden egg) can be a good source of plant protein and hence may help in body building and repairs. Tabitha (2013) reported a protein content of same species (*Solanum melongena*) to be 16.25%. The variation may be attributed to the source of the species. The samples of this study were collected from Sudan Savanna ecological zone while that of Tabitha were collected from northern Guinea Savanna zone. *Daucus carota* has the second protein ranking (12.81%) among the fruits analyzed and was closely followed by Citrus sinensis (9.38%), *Cocos nucifera* (8.32%) and *Ananas comosus* has the least protein content even though higher than the report of Oni *et al.*,2015 which says that the protein content of *Pachira glabra* was found to be 7.67±0.82.

The result of the analysis also indicated that *Cocos nucifera* has the highest value of crude fiber (14%) and can therefore helps in the maintenance of cholesterol and lower blood sugar in addition to prevention of constipation among adults (Gopalan *et al.,* 1997). *Ananas comosus* has the second crude fiber value (7%) and was followed by *Citrus sinensis* (2.82%), *Daucus carota* (2.39%) and *Solanum melongena* (2.28%).

Table 1 reveals that *Cocos nucifera* has the highest value for crude fat (20.55%). Fat is good source of energy and a medium for dissolving vitamin A, B, E and K and its deficiency may results in suboptimal growth, fatty liver problem and susceptibility to respiratory disease (Tabitha, 2013; Ogunmoyela *et al.,2013*). *Ananas comosus* follows with 0.26 and *Daucus carota* has 0.16%. *Citrus sinensis* and *Solanum melongena* has equal crude fat value (0.06%). *Daucus carota* has the highest quantity of ash (4.54%) indicting high mineral composition. Adepoju (2009) worked on mineral composition of some wild edible fruits in Nigeria and reported that in three fruits: *Saponians mombim, Diallum guinense* and *Mordii whytii*, Magnesium was found to be higher and most especially in *Saponians mombim* (400.0±12.43). Rathod *et al.,* 2011 reported highest value of nitrogen, phosphorus and magnesium in *Grewia tiliifolia* and calcium, sodium and potassium in *Ficus racemosa* fruits. The same authour also reported the occurrence of micronutrients in higher values: Iron found in *Meyna laxiflora* fruits, zinc in *Elaeagnus conferta* fruits, while copper and manganese were abundantly found in *Flacourtia indica* fruits.

In conclusion, the results of the proximate analysis of the commonly used horticultural products indicated that, carrot, coconut, eggplant, pineapple and ora*nge* contain very useful quantity of food classes necessary for the maintenance of good body health. In order to improve on the present production level and for economic enhancement of the farmers involved, the following were recommended:

a. Government and Non-governmental Organizations should provide storage facility at different locations to guard against spoilage.
b. Soft loan be provided to the local farmers with little or no difficulty.
c. Extension services needed to adequately provide for enhanced production, and
d. For increased production, local varieties of horticultural crops should be improved.

Table.1 Proximate composition of some Horticultural products

Name of Fruit	Moisture Content	Crude Protein	Crude Fiber	Crude Fat	Ash
Solanum melongena (Garden egg)	78.95	18.48	2.28	0.06	0.24
*Ananas comosus (Pineapple)*L.Merill	86.76	2.77	7.00	0.26	0.34
Daucus carota(Carrot)L.	80.10	12.81	2.39	0.16	4.54
Cocos nucifera (Coconut)L.	42.92	8.32	14.00	20.55	1.03
Citrus sinensis (Sweet Orange)L.	87.12	9.38	2.82	0.06	0.62

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