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Chemical Analysis of Soups Prepared From Processed and Unprocessed Water-Leaf (*Talinium Triangulare*) and Fluted Pumpkin (*Teltaria Ocidentalis*) Vegetables

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Abstract

The general objective of this study was to investigate the nutrient content of soups prepared with water-leaf and fluted pumpkin leaves processed by two methods. Specifically, the study determined: proximate content of the two soups prepared with vegetables processed by two methods (squeezed and unsqueezed); nutrients contents of the two soups. This was done by the *preparation of edikang-ikong* (vegetable) soup meal using squeeze-washing method. Fluted *pumpkin (Teltaria ocidentalis)* and water leaf *(Talinum triangulare),* used were bought from watt market in Calabar. It was an experimental study. Two treatments unsqueezed and squeeze-washed were employed. Analysis of the nutrient content of the two treatments was done using AOAC, 2005. The findings revealed that there was significant difference in the proximate content of the soup meals. The moisture contents of the squeezed-washed soup meals reduced (UNSVS 18.02 vs 11.11%) and increased fat (36.49 vs 51.93%) and carbohydrate (nfe) (1.93 vs 7.97%). Nitrogen content was reduced (91.27 vs 85.91mg). Most of the mineral contents were reduced after squeeze-washing. The same trend was also observed in vitamin content of the soup meals. Squeeze-washing of the vegetables caused significant reduction in the nutrient contents of the soup meals. Recommendations: shade drying should be used as a processing method and vegetables should be produced using organic fertilizer rather than in-organic fertilizer.

Keywords: Vegetables, Methods, Soups, Nutrients, Squeezed, Unsqueezed

Introduction

A soup is a flavourful and nutritious liquid food served at the beginning of a meal or a stock (Cesarani and Kinton 2009). Certain soups are thick and creamy and they could be just pureed or thickened with flour and milk for example cream soups. Certain shellfish soups are thickened with rice and pureed such as bisques soup. A clear soup will be served crystal clear and thick creamy soups should have a smooth velvety finish. Soups are

broadly classified into two types: thick and thin soups.

The soups are further classified into various categories. This is done based on the texture of the coups. There are certain soups that are neither thin nor thick and so sometimes certain soups are classified into a category called international soups. These soups would essentially be the national soups of different countries. These soups represent the region or origin. This is where our soups (African) fall into because it is garnished or other ingredients are added to the soup. For example like the lobster bisque it is a shellfish based soup garnished with dices of seafood used traditionally. It is thickened with rice ad furnished with cream.

This is similar to the soups we consume in Nigeria especially Cross River State. We have soups like Afang soup (*Gnectum africanum*), Edikang-ikong (vegetable) soup, Ofe Owerri (Owerri soup), Ukazi/Achara soup (*Gnectum africanum*) soup southeast version. These soups are thickened with the addition of ingredients like vegetables, fish, palm oil, spices, fish/meat, etc. Hence, these traditional soups represent the places where it originated. Example, Edikang-ikong soup, Calabar (Cross River State), Ofe Owerri; (Owerri-Imo state), Ofe Ukazi/Achara (Ngwa/Umuahia) Abia state, etc.

Methods of preparing vegetables can lead to loss of nutrients (vitamins and minerals). This could occur during cutting, chopping or laceration, squeeze-washing or pounding. These methods are used mostly in the preparation of vegetables (fluted pumpkin, (Ikong leaves) water-leaf (*Talinium triangulare*), Afang (*Gnetcum africanum*), *Lasenthera africana* (Editan) for the preparation of popular soups meal such as Edikang-ikong: (vegetables soup). Afang soup (water leaf/*Gnetcum*), Editan soup (water leaf)/*Lasenthera africana*).

These methods remove bitter taste (*Lasenthera africana* (Editan), sour taste (water-leaf), reduces particle size (Afang), *Gnectum africanum*) and *Lasenthera africana* (Editan) vegetables respectively. They may lead to loss of micro-nutrients and minerals that are essential for health, and improve taste and make for nutrient bioavailability by reducing the anti-nutrient substances that are contained in the vegetables. The vegetables are consumed in soup every day especially in Cross River and Akwa Ibom States with the methods employed in the preparation of the vegetables. The continuous consumption of this soup meal may lead to micro-nutrient deficiency among the people of these states especially vulnerable groups (women, children and elderly people). Therefore, this research work was aimed at investigating the effect of some of these traditional processing methods on the processed water-leaf (*Talinum triangulare*)/Fluted pumpkin for soup meal preparation.

Green leafy vegetables constitute an indispensable constituent of human diet in Africa generally and West Africa in particular. Generally, they are consumed as cooked compliments to the major staples like cassava, cocoyam, guinea corn, maize, millet, rice and plantains. Most of the meals based on

these staples are considered in-complete without a generous serving of cooked green vegetables. The variety of green leafy vegetables utilized is as diverse as both the staples with which they are consumed. It has been estimated that perhaps over 50 species of green leafy vegetables are used in Nigeria alone. These range from leaves of annuals and shrubs and of the families amaranthaceae, compositae, protulacaceae and solanacea, of leaves of trees like the baobab. Many of these vegetables (e.g Amaranth) are common in all areas of the country but some (e.g baobab) are restricted in their natural distribution. Due to their wide adaptability, vegetables can fit into cropping systems under diverse agro ecological conditions. There is also seasonal variation in the availability of many of these vegetables (Oguntona, 1998).

Green leafy vegetables like other food stuffs used in Nigeria are subjected to quite a variety of processing procedures, include rising, cutting, chopping, or lacerating, washing, squeeze washing drying, blanching, boiling and a combination of some of these, (Oguntona, 1998). The main objective is to reduce the particular size of the vegetables. Keshinro and Ketiku (1979) pointed out the aim, is to eliminate most of the associated "bitter taste" in the tough vegetables. This procedure is quite severe and leads to considerable losses of nutrients (Keshinro and Ketiku, 1979) and Latunde Dada (1990).

The methods of processing vegetables can lead to loss of food nutrients (vitamins and minerals). This could occur during cutting, chopping squeezing washing or pounding. This method especially is used in the preparation or their processing certain commonly consumed vegetables such as (*Gnetcum africanum*) (Afang), vegetable soup (*Edikang-ikong* soup), water-leaves (*Talinum triangular*e), "*Editan*" (*Lasinthera africanum*). These vegetables mentioned are either squeeze washed, blanched or pounded before usage. This method may remove bitter taste and reduce particle sizes as in Edikang-ikong and Afang. It also removes sour taste especially in water leaf, before they are used for soup meal preparation. The processing of the vegetables may improve the taste and nutrient bio-availability.

The two vegetables are commonly consumed in soups called "*Edikang-ikong* and the processing of the vegetables involved squeeze-washing, this may lead to leaching out of essential micronutrients such as vitamin A, C, E and other nutrients such as Folate, Iron, Zinc etc. Since this soup meal is popularly consumed in Cross River State and Akwa-Ibom State, it means that most of the people of these states may be suffering from micro nutrient deficiencies such as mental retardation (iodine deficiency), night blindness (vitamin A deficiency) Iron deficiency and eventually death. These may cumulate to high maternal and infant mortality in Akwa-Ibom and Cross River State and in Nigeria in general. Therefore this research work was aimed at finding out the nutrient content of the fresh (unsqueezed) and processed (squeezed) vegetables water-leaf (*Talinum triangular*e) and fluted

pumpkin (*Teltairia occidentalis*) used in soup meal preparation.

This research work would be very important to the citizens of Cross River and Akwa Ibom States who consume this soup meal regularly and other people that enjoy this soup meal. This is because they would know the proper processing technique that should be used in the preparation of the vegetables for the soup meal.

Secondly, using the appropriate method of processing will reduce micro nutrient deficiency diseases prevalent among the people since the nutrient contained in the vegetables are retained using this appropriate technique and the traditional method that had been held strongly by the people would be changed to the appropriate method that conserve nutrients in soup meal.

Purpose of the Study

The general objective of this study was to investigate the nutrient content of the soups prepared with water-leaf (*Talinum triangular*e) and fluted pumpkin (*Teltairia occidentalis*) leaves processed by two methods. Specifically, the study determined:

1) proximate content of the two soups prepared with vegetables processed by two methods (squeezed and unsqueezed);
2) nutrients contents of the soup;

Materials and Methods

***Design of study*:** Experimental method was used for this research. Fluted pumpkin and water- leaves (vegetables) were purchased plucked, washed and divided into two. One group of the vegetables was shredded and used for soup meal preparation (Edikang-ikong) soup while the other group was squeezed, washed after cutting and used for soup preparation.

***Materials*:** The food crops whose leaves were used in this study were fluted pumpkin (*Teltairia occidentalis*) and water-leaves (*Talinum triangulare*). These vegetables were bought in the market (Watt market).They were bought fresh from the market. The fresh tender vegetables were analyzed for their chemical contents using standard methods. (AOAC, 2005).

Preparation of Materials (ingredients for the soup meals): The vegetables, fluted pumpkin (*Teltairia occidentalis*) and water-leaves (*Talinum triangulare*) were plucked, washed and shredded. It was then divided into two groups of fluted pumpkin 400g and water-leave 500g each. The meat was cleaned by removing fat linings and dirt (sand) and washed with salt and kept in a plate for use. For the fish, the finches were cut off using kitchen knife and the gills and intestines removed and washed and kept in a separate plate for use. The fresh cow skin was washed with salt and scrubbed with iron sponge to remove dirt and kept in a separate plate for use. The stock fish was scrubbed and washed with salt and kept also for use. For the onions, the inedible part was cut off and washed and then chopped into cubes for use. The fresh pepper the inedible part were cut off using knife then washed and put into a blender for 5 minutes and poured into a plate for use. The crayfish was selected and dirt and other things that are not editable were removed and then blended and kept in a plate. The same ingredients

was used except that the vegetables used for the second soup meal was not squeezed. All other ingredients were the same quantity.

***Processing of vegetables*:** The leaves fluted pumpkin (*Teltairia occidentalis*) and water- leaves (*Talinum triangulare*) were plucked, washed, shredded and divided into two groups. The first group being (sample I) was unsqueezed and kept for soup preparation. The second sample (sample II) was squeezed-washed, that is, was put in a large bowl of water and squeezed by removing the sliming substances from the waterleaf and fluted pumpkin ad used for soup preparation.

Preparation of Ingredients Dishes

Table1: **Recipe for unsqueezed vegetables soup meal preparation (Edikang-Ikong soup)**

	Ingredients	Measurements
1	Pumpkin leaves	400g
2	Water-leaves	500g
3	Macrel, ice fish	200g
4	Beef meat	200g
5	Cow skin	200g
6	Stock fish	100g
7	Onions	200g
8	Fresh pepper	50g
9	Crayfish	50g
10	Palm oil	3 medium soup spoon
11	Water	1 ½ medium water cup
12	Star magi	4 cubes
13	Salt	1 tea spoon

The same recipe was used for the squeezed vegetables.

Chemical/Proximate Analysis

The moisture, crude fat, ash, fibre, carbohydrate ad energy content of the samples of the fluted pumpkin and water leaves soup meals were analyzed using AOAC, (2005). The moisture content of the samples was determined using air oven method of AOAC, (2005). The crude protein content of the samples was determined by automated micro-kjeldahl as described by AOAC, 2005. Fat was also determined by using the soxhlet extraction method AOAC, (2005). Ash content was also determined using AOAC, (2005). Crude fibre was also determined using AOAC, (2005) and carbohydrate was determined by difference. The sum of percentages of protein, fat, ash, fibre and moisture were subtracted from 100% to obtain the value of carbohydrate. The nutrients were determined as follows: folate, copper, iron, zinc, carotene, calcium, potassium, nitrogen and phosphorus were determined by the method of mineral analysis of atomic absorption, spectro photometer of IITA, (2002).The vitamins, vitamin A, C, and E were determined by AOAC, (2005).

Data Analysis

Data generated from work would be subjected to student t-test to compare means between the pre and post treatment, mean, standard deviation standard error of the mean (SEM), P value (0.05) would be an indicative of significance and Duncans Multiple Range Test (DMRT) was used to compare and contrast means.

Findings

Result of Chemical Analysis

Table 2: Proximate Composition of Soups prepared from Processed and Unprocessed Vegetables

CHO	UNSVS	SVS
Moisture (%)	18.02 + 1.88[a]	11.11 ± 1.01[b]
Fat (%)	36.49 + 0.51[a]	51.93 ± 0.9[b]
Protein (%)	20.33 + 0.77[b]	9.46 ± 0.6[a]
Ash (%)	2.02 ± 0.28[a]	17.83 ± 0.6[a]
Fibre (%)	2.02 + 0.28[a]	1.7 ± 0.34[a]
Nfe (%)	1.93 ± 2.31[b]	7.97 ± 2.78[a]

Table 2 shows the proximate composition of fluted pumpkin (*Telfaira occidentalis*) vegetable and water-leaves (*Talinum triangulare*) used in soup meal preparation of "Edikang-ikong" (vegetable). The proximate composition of the unsqueezed vegetables soup (UNSVS), were as follows: Moisture (%) 18.02, Fat (%)36.4, Protein (%)20.33, Ash (%)2.02,Fibre (%)2.02 and Nfe (%)1.93 as against the nutrient composition of unsqeezed vegetable soup Moisture (%)11.11, Fat (%)51.93, Protein (%)9.46, Ash (%)17.83, Fibre (%)1.7 and Nfe (%)7.97, respectively.

Table 3: Nutrient composition of soups prepared from processed and unprocessed vegetables

Mineral	UNSVS (mg)	SVS (mg)
Folate (mcg)	10.95 ± 1.6[a]	9.18 ± 0.92[a]
Copper (mg)	12.04 ± 1.75[a]	13.05 ± 0.15[a]
Iron (mg)	0.92 ± 0.05[b]	0.68 ± 0.06[a]
Zinc (mg)	0.35 ± 0.02[a]	0.35 ± 0.03[a]
Calcium (mg)	25.07 + 1.04	26.49 ± 0.47[a]
carotene (mcg)	125.13 ± 40.75[b]	91.57 ± 0.47[a]
Potassium (mg)	361.06 ± 1.019[a]	342.77 ± 8.01[b]
Nitrogen (mg)	91.27 ± 1.78[a]	85.91 ± 8.01[b]
Phosphorus	45.13 ± 3.58[b]	40.76 ± 2.18[a]

Table 3 shows the nutrient composition of fluted pumpkin (*Telfaira occidentalis*) and water-leaves (*Talinum triangulare*) used in soup meal preparation of "*Edikang-ikong*" soup (Efik), (vegetable). The proximate composition of the unsqueezed vegetables soup (UNSVS), were as follows: Folate (mcg) 10.95, Copper (mg) 12.04, Iron (mg) 0.92, Zinc (mg) 0.35mg, Calcium (mg) 25.07, Carotene (mcg) 125.13, Potassium (mg) 361.06, Nitrogen (mg) 91.27, Phosphorus (mg) 45.13 as against the unsqueezed vegetables; Folate (mcg) 9.18mg; Copper (mg) 13.05mg, Iron (mg) 0.68mg, Zinc (mg) 0.35mg, Calcium (mg) 26.49mg, Carotene (mcg) 91.57mg, Potassium (mg) 342.77mg, Nitrogen (mg) 85.91mg and, Phosphorus (mg) 40.76mg, respectively.

Table 4: Vitamin composition of soup meals prepared from processed and unprocessed vegetables

Vitamin	UNSVS	SVS
A(iu)	201.02 + 2.95[a]	166.75 ± 3.72[b]
C(mg)	4.18 ± 0.95[b]	2.66 ± 0.39[a]
E (mg)	0.84 ± 0.07[a]	0.65 ± 0.07[a]

Table 4 shows the vitamin composition of fluted pumpkin (*Telfaira occidentalis*) and water-leaves (*Talinum triangulare*) used in soup meal preparation of "Edikang-ikong" soup (Efik), (vegetable). The proximate composition of the unsqueezed vegetables soup (UNSVS), are as follows: Vitamin A(iu) 201.02, Vit C (mg) 4.18 and Vit E (mg) 0.84 while that of squeezed vegetables were as follows: Vitamin A(iu) 166.75iu, Vit C (mg) 2.66mg and Vit E (mg) 0.65mg.

Discussion of Findings

There was a significant difference in the moisture content of unsqueezed (UNSVS) (18.02%) and the squeezed (SVS) vegetables used in the preparation of Edikang-ikong (vegetable) soup meals. This difference was due to the removal of water (Udofia and Obizoba, 2005; Watchap, 2005; and Oguche, 2010, 2012).The fat content of the soup meals was also different. The value of the fat content of the squeezed vegetables soup meal (51.93%) was higher than that of the unsqueezed soup meal (36.49%). This also was due to reduction in moisture content which led to increase in dry matter (fat) (Southgate, 2001). The protein content of the soup meals was different at $p<0.05$ in their protein content UNSVS (20.39%) and SVS (9.6%) respectively. This is due to the fact that fresh vegetables contain nutrients in abundance and the effect of processing (squeezed – washing) (Southgate, 2001 and Ene-Obong 2001). The ash content of the soup meals was also different. The ash content/value of the UNSVS was 21.2% while that of the SVS soup meals was 17.83%. This is showing the adverse effect of squeezed – washing (processing) on the ash content of the vegetables (Udofia and Obizoba, 2005). Fibre content of the UNSVS (2.02%) was higher than that of SVS (1.7%). This is due to the adverse effect of squeezed – washing (that broke the fibres of the vegetables into tiny pieces. (Udofia and Obizoba, 2005; Southgate, 2001).Carbohydrate values of the UNSVS (1.93%) and that of the SVS (7.97%) was significantly different. This was due to the moisture reduction and consequent increase in dry matter (Udofia and Obizobia, 2005, Oguche 2010, 2012).

The mineral value of the vegetables (folate) was not significantly different (UNSVS 10.95mcg vs SVS 9.18mg). This implied that squeezed washing did not reduce folate value. Copper (cu) value of the soup meals was not also different (UNSVS, 12.04mg and 13.05mg). This may be due to the fact that processing (squeezing-washing) does not affect minerals because they are fairly stable (Southgate, 2001). There was also no significant difference between the zinc content of the soup meals (UNSVS 0.3 mg and SVS 0.35mg). Similarly, there was no significant different in the calcium content of the soup meals (UNSVS 25.07mg and SVS 26.49mg). There was a significant difference in the value of carotene of the soup meals (UNSVS, 125.13mg and SVS 91.57mcg). This is due to the fact that carotene is easily affected during processing (Udofia and Obizoba, 2005, Watchap, 2005).

The potassium value of the soup meals differed significantly (UNSVS,

361.06 vs SVS, 342.77mg). This means that processing (squeezed – washing) had effect. This is contrary due the fact that processing does not have effect on minerals. The phosphorus values of the soup meals were significantly different (UNSVS, 45.13 vs SVS, 40.76 mg). Processing reduced phosphorus mean value in the soup meals. Nitrogen mean values of the soup meals (UNSVS, 91.27 mg vs SVS, 85.91mg). There was due to the fact that fertilizer was used in the production of the vegetable. Processing method reduce the nitrogen content. The effect of this processing method reduced nitrogen content of the squeezed vegetables. This is good because nitrogen has effect on health of humans. Plants produced from nitrogen fertilizers, upon consumption, convert to toxic nitrates in the industries. These harmful nitrites react with the hemoglobin in the blood stream to cause methaeglobinaemia, which damages the vascular and respiratory system, causing suffocation and even death in extreme cases. (http://homeguides.stgate.com).

Processing (squeezing-washing) decreased the vitamin. A mean values of the soup meals (UNSVS 201,22vs SVS 166.75 lu). This effect on the soup meals was because vitamins are easily affected during processing (Udofia and Obizoba, 2005, Southgate, 2001). The vitamin C content of the soup meals were significantly different UNSVS, 4.18mg vs SVS 2.66mg). This was because vitamin C is water soluble; as such squeeze washing reduced the vitamin c content of the SVS vegetable soup meal (Watchap, 2005, Oguche 2010 & 2012). Vitamin E content of the soup meals did not significantly differ (UNSVS, 0.84 vs SVS, 0.65mg). This was because vitamin E is not easily affected by processing method (Southgate, 2001).

Conclusion

Squeeze-washing of the vegetables had effect on the nutrient content of the soup meals. This was because it reduced the nutritional content of the soup meals. However, this method also reduces the nitrogen content of the vegetables, which is the major reason for this processing. However, fresh vegetables contain most of the nutrients in abundance, it should be consumed fresh. Therefore washing as a processing method for fluted pumpkin (*Teltairia occidentalis*) and water-leaf (*Talinum triangulare*)is not good while organic fertilizer is encouraged to be used instead of inorganic fertilizer that have effect on the human body (homeguides.stgate.com, 2017).

Recommendations

1. Vegetables are at their best for consumption when fresh.
2. Farmers should use organic fertilizers (animal dungs) to produce these vegetables for health purposes.
3. squeeze-washing should not be used as a processing method for water leaves and fluted pumpkins.
4. shade-drying should be used, since it retains more nutrients.

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