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VITAMIN A AND SOME MINERAL CONTENTS OF PUMPKIN (*CUCURBITA MAXIMA*) SEED.

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ABSTRACT

Pumpkin (*Cucurbita maxima*) seed are important food materials used by most Nigerian families due to its delicious taste, aroma and appeal. In this study, changes between chemical composition of processed and unprocessed pumpkin seeds (*Cucurbita maxima*) was investigated. The nutritional compositions were analyzed by standard methods. The vitamin A contents of proceesed and unprocessed pumpkin seed were 36.83 µg and 33.72 µg. The copper, zinc, magnesium, phosphorus and iron contents of processed seeds were; 0.063, 0.43, 47.67, 58.19, 610.77 ppm while the values for unprocessed were; 0.047, 0.41, 36.73, 58.45 and 211.19 ppm respectively. The finding suggests that pumpkin seed is rich in this vitamin and minerals. If utilized efficiently, it can ameliorate micronutrients deficiency problem in population of all age groups.

Introduction:

In the maintenance of healthy life, food is one of the unique requirement without which the body can't fight diseases easily. In the present pandemic of COVID-19, boosting immunity is one of the measures taken to curtail its progress and managing of exposed individuals. Food processing aids in making nutrients such protein, carbohydrates, minerals, vitamins accessible at the same time reducing some of the negating nutrients i.e anti nutritional factors. Different plants parts namely leave, stem, roots and seeds contain various amounts of nutrients and anti-nutrients (Elinge *et al.,* 2012). *Curcubita maxima* (pumpkin), a medium sized plant from the *Cucurbitaceae* is grown for its fruits and seed for human consumption.

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Qamar *et al.,* 2019 have highlighted the tilt in recent years towards the seeds of pumpkin due to its nutritional and medicinal applications. The seeds of this plant that have unique flavor and nutty taste is consumed salted or as a roasted snack in some parts of the world; Canada, USA and China. It is also sold fermented, sprouted, baked among other forms because of its rich content of proteins, minerals such as manganese, magnesium, zinc, potassium, copper, phosphorus, PUFA (polyunsaturated fatty acid), tocopherol and carotenoids. The use of pumpkin in traditional medical practices in many countries; India, Brazil, Mexico and China, was not limited to its protein, mineral, antioxidant, vitamins but for its low fat and calorie contents (Karanja *et al.,* 2013). Vitamin A (beta carotene), a fat soluble vitamin, present in food, participates in retarding the ageing process, reduces tumor progression and development of cataract. Other important parts played is strengthening the immune system and making it an important requirement in food most significantly in the present covid-19 pandemic. It also helps in proper functioning of the heart, kidneys and other organs. The consumption of food that is rich in beta carotene, have been reported to lower individuals risk of certain kinds of cancer that include lung, prostate (NIH, 2019). The rich content of micro and macro element is another relevance of this seed. The numerous functions zinc in the body can be seen in such biochemical processes of healing, improving immune system and tissue maintenance. It is also required in DNA synthesis. Iron as an essential trace element is important for growth and survival of most living organism (Jaishankar *et al.,* 2014). It is a major factor in plant oxidation and reduction reactions. The structures of cytochromes, hemes and the electron transfer system are only efficient and complete when iron is part of it. In systemic management of lead, iron in hemoglobin assist greatly (Jan, 2015). The main role of iron is in hemoglobin formation in red cells that are responsible for oxygen carrying and transport. Manganese is part of many biochemical processes where it helps many enzymes system such thiamine, biotin and vitamin C (Lestari

et al., 2018). It also helps in the metabolism and utilization of proteins, fatty acids and cholesterol (Reilly 2002). Another important element in many plant enzymes is copper because it involved in many electron transfer processes, nerve conduction, immune and cardiovascular systems. Copper is also a part of estrogen metabolism and maintenance of pregnancy (Omer, 2015). Various chemical reactions are induced by roasting. Yoshida *et al.* (2002) reported that polyunsaturated fatty acids in vegetable oil is higher, the rate of quality deterioration of the oils to roasting was the greater. Besides, tocopherols are particularly sensitive to heating at high temperatures (Barrera-Arellano *et al.* 2002). As a result, most tocopherols are lost or destroyed during the roasting (François *et al.* 2006). Some reports suggest that nutrient retention is improved during roasting (Gould and Golledge 1989), however other studies indicated that nutrient retention is not much greater than that of unroasted seeds (Thompson 1982).

Hence, the availability of these factors, are either enhanced or diminished by the pre-consumption processing approach. This study evaluates the vitamin A and elemental composition of the most commonly used forms of pumpkin seeds i.e the roasted and unroasted forms.

Materials and Methods

Sample collection

The pumpkin seed was purchased from Dawanau market in Kano, situated at 12o 5' 23" North, 8o 24' 45" East in the month of September 2019. It sorted clean and stored in an airtight bag.

Materials/Instrument

Agilent 4200 MP-AES, Crosslab Atomic Emission Spectrophotometer, UV-Vis spectrophotometer LT-291/Labtronics, digestion flask, whatman filter paper No 1, muffle furnance (STXMF-1119/Genlab), Kjeldahl apparatus.

Sample preparation

The pumpkin seed was dried at room temperature and divided into two portions. The first half was roasted while the second half was left as it is

(unroasted). The sample were pulverized separately into fine powder. This was then stored in an airtight bag until further analysis.

Sample digestion

The digestion was carried out according to the AOAC 1984 method. Briefly, 2g of a sample was weighed into a clean beaker and digested with 15 ml of nitric acid and 10 ml of hydrochloric acid. The mixture was heated for an hour to 120oC. It was allowed to cool, filtered and made to 100 ml mark with distilled water.

Microplasma atomic emission spectrophotometer analysis.

Standard solutions of iron, magnesium, zinc, phosphorus and copper were prepared. Calibration standards were prepared from stock solutions. The absorbance of the standards, roasted and unroasted samples were measured using MP-AES 4200 spectrophotometer. The corresponding absorbance for each standard was plotted against its concentration for calibration. Sample response was compared directly with the calibration curve.

Extraction and determination of vitamin A

Vitamin A (Beta carotene) was determined by first soaking 1g of the sample in 5 ml of methanol for 2 hours at room temperature in the dark. The beta carotene layer was obtained by the addition of hexane in a separating funnel. The volume was made up to 10 ml with diethyl ether and then this layer was passed through sodium sulphonate to remove moisture from the layer. The absorbance of the layer was measured at 436 nm using diethyl ether as blank. The beta carotene was calculated using the formula

Beta carotene (µg/100g) = Abs (436nm) x V x D x 100 x 100/W x Y

Where V= Total volume, D = Dilution factor, W = Sample weight, Y= percentage dry matter content of sample.

Statistical analysis

SPSS version 2.0 was used to analyze the data obtained. Mean of 3 different experiments are presented with standard deviation. Statistical difference was evaluated using student t-test.

Results

Table 1; vitamin A and some mineral composition of treated and untreated pumpkin seed.

Parameter	Treated pumpkin seed	Untreated pumpkin seed
Vitamin A (µg)	36.83 ± 0.005^{a}	33.72 ± 0.013^{b}
Magnesium (ppm)	47.67 ± 0.0080^{a}	36.73 ± 0.0005^{b}
Iron (ppm)	610.77 ± 0.021^{a}	211.19 ± 0.011^{a}
Zinc (ppm)	0.43 ± 0.0005^{a}	0.41 ± 0.0004^{a}
Phosphorus (ppm)	58.19 ± 0.05^{a}	58.45 ± 0.153^{a}
Copper (ppm)	0.063 ± 0.0001^{a}	0.047 ± 0.00005^{b}

Mean $\pm$ SD, values with same superscripts are statistically not different ($p>0.05$), while values with different superscripts are statistically different ($p<0.05$).

The vitamin A content and some mineral composition of treated and untreated pumkin seed are presented in Table 1. From the table, treated pumpkin seed gave vitamin A value of 36.83 µg which is significantly higher ($p<0.05$) than 33.72 µg for the untreated seed. Vitamins are group of organic compound that are essential for normal growth and nutrition. They are also required in small amounts in the diet (Bardaa *et al.,* 2016.).

In a similar fashion, the magnesium (47.67 ± 0.080 ppm) and copper (0.063 ± 0.0001 ppm) content of the treated pumkin seed where significantly higher ($p<0.05$) than 36.73 ± 0.0005 ppm and 0.047 ± 0.00005 ppm the untreated seeds respectively. Magnesium is necessary for the release of parathyroid hormone and for its action in the backbone, kidney and intestine and for the reactions involve in converting vitamin D to its active form. Magnesium is important in tissue respiration, especially in oxidative phosphorylation leading to formation of Adenosine triphosphate (ATP). It is also involved in normal muscular contraction; calcium stimulates muscles while magnesium relaxes the muscles. Magnesium deficiency results in uncontrollable twisting of muscles leading to convulsion and tetanus, which may both lead to death (Ró˙zyło, 2014)

The iron (610.77 ± 0.021 ppm), zinc (0.43 ± 0.0005 ppm) and phosphorus (58.19 ± 0.05 ppm) contents of the treated pumpkin seed where on the other hand were not statistically ($p>0.05$) higher than (211.19 ± 0.011, 0.41 ± 0.0004 and 58.45 ± 0.153 ppm) the untreated seeds. Zinc is known for boosting the health of our hair, Payne, 1990 have documented its role in the proper functioning of some sense organs such as ability to smell and tastes. Zinc is also very important in protein and carbohydrate metabolism and also helps in mobilizing vitamin A from its storage site in the liver and facilitates the synthesis of RNA and DNA necessary for cell production.

Phosphorus is found bound to other substances especially in the blood and cells. It occurs in its inorganic in the form in nucleic acids, sugar phosphate and ATP which forms part of the non-skeletal phosphorus (Payne, 1990). Phosphates play important roles as buffers that prevent change in the acidity of body fluids because of their ability to combine with additional hydrogen ion. The addition of phosphates to sugar is an important step in carbohydrates metabolism because it makes it possible for such nutrients to cross the cell membrane (Guthrie, 1989)

Minerals are essential factors for proper functioning of the body system because they act in differing ways to improve enzyme activities, immune strength and uptake of vital molecules. The findings of the present studies suggest that pumpkin seed is rich in minerals such as magnesium, iron, zinc, phosphorus and copper (AlJahani and Cheikhousman, 2017).

The treatment has resulted in increase in some of the minerals. Similar findings were recorded where; Badifu (2001) reported that the contents of oils increased 3-7% in all *Cucurbitaceae* species. Due to the increase in the volume of intercellular spaces, oils were released from lipid bodies during heating (Ekpete et al., 2013). As for Artık (2004), the increase of oil content in hazelnut with roasting, proceeded from increase of oil content concentration due to the loss in moisture.

Conclusion

Pumpkin seeds are rich sources of nutrients. Processing affects the level of nutrients in pumpkin seeds. However, through roasting, the membrane layer surrounding the seed was removed, which then facilitate cracking

and brought some characteristics such as color, aroma and texture unique to the pumpkin seed, raw taste disappeared and it became more resistant to the proper storage conditions through reduction of the humidity.

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