Original Research Article

Comparative Analysis on Nutritional and Anti Nutritional Composition of Fresh and Dried Tomatoes Obtained from Gusau Central Market Zamfara State, Nigeria

Abstract:

Tomatoes are one of the essential fruit consumed throughout the world. Lack of storage facilities to mitigate the lost of post harvest still remain a greater problem. Drying is an important and traditional process to remove the moisture from the food. The basic principle of drying is to prevent microorganisms such as bacteria, fungi, mold which required water for their growth and multiplication, which causes food spoilage and decay. The aim of the study was to determine the proximate, mineral and anti nutritional compositions of dried and fresh tomato obtained from Gusau central market Zamfara State. Using A.O.A.C and statistical method. The result shown that moisture content reduces from 91.70% - 10.52%, Carbohydrate content increase from 7.60% - 76.4%**,** lycopene reduce from 89.52% - 70.91%, total energy increase from 32.68% - 317.67%, while protein, fiber, ash and vitamin c has no significance reduction from fresh to dried sample. There was no lose of mineral content from fresh to dried tomatoes, only reduction of content in mg/100g from fresh to dried sample; Calcium 30.06 – 25.35mg, Phosphors 28.52 – 20.60mg. The phytochemical screening showed the present of Tannin, Oxalate, phytate, Sapoin, Phenolic, flavonoid and alkaloid in both fresh and dried samples. Tanin has low concentration from 0.09 – 0.21mg, while alkaloid and flavonoid has 20.51 – 15.23mg and 28.62 – 20.51mg respectively. Traditional way of drying is still remained the available method for farmers to preserved post harvest lost of tomatoes, therefore, conducive environment has to be provided for the farmers to avoid possible contaminate.

Keywords: Tomatoes, Phytochemicals, Mineral Contents and Proximate Analysis

INTRODUCTION

Tomatoes (*Lycoperiscum esculentum, solanum Lycoperiscum.*) belong to the *solanacea* family and correspond to one of the most widely grown vegetable in the world. The fruit vegetable is typically produced in the spring summer season, but in many country including Nigeria, it is produced throughout the years with the help of irrigation farming (Arah. *et al*; 2015).

Nigeria, with a population of above 180 million, the demand for tomatoes over shadows the supply. The challenge is attributed to the seasonality and inadequacies in post-harvest handling of the tomatoes (Arah *et al.,* 2015; Adenegan & Adeoye, 2011). Thus accounts for 40-50% loss annually due to lack of proper storage (Adegbola *et al.*, 2012).

As a result, drying of tomatoes becomes the only way farmers can economically provide alternative to fresh one, which are available in most vegetables markets (Abdulmalik *et al.,* 2014, Akinmutimi, 2006).

Drying is an important and traditional process to remove the moisture from the food. The basic principle of drying is to prevent microorganisms such as bacteria, fungi, mold which required water for their growth and multiplication, which causes food spoilage and decay. Since water as a potential vehicle for

pathogens in the food chain and it has to be removed to increase the shelf life of the food products. Drying and dehydration is an ideal process applicable to all food materials such as tomatoes and other vegetable (Sheshma & John. 2014, Sagar & Kumar.2010, Jorge et,al; 2014).

MATERIALS AND METHOD

Samples collection: both fresh and dried tomatoes samples were obtained from Gusau central market, where various vegetable produced in this state were sold for every Monday and Friday.

The samples were stored in a cleaned polythene bags while the fresh sample were kept in the refrigerator before the analysis was carryout.

Chemicals/ reagents: All the chemicals used were of analytical grade and obtained from sigma and Co.

PROXIMATE ANALYSIS OF THE SAMPLES

Proximate analysis was carryout to determined moisture content, Ash content, fat/lipid, protein, fiber and carbohydrate.

Moisture content (%) and Ash content (%) were determined according to method adopted by AOAC, (2005).

Determination of crude protein content: crude protein content was determined using kjeldhel digestion flask with potassium sulphate and sulphoric acid to digest and distilled at 420^{o}c for 45minute and titrate the distillate with known concentration of hydrochloric acid (AOAC, 2005)

$$\%\text{crude protein} = \frac{titre\ blank \times normality \times 14.01 \times 6.25}{weight\ of\ sample \times 10}$$

Determination of fat/lipid

Fat contents were determined as crude ether extract using Automatic soxtech extraction unit

The extraction took place for 60 minutes after which the thimble containing samples were raised up to another 60 minutes and weighed (AOAC, 200).

Determination of crude fibre: the crude fibre content of samples was determined by boiling the samples with 1.25% of dilute sulphuric acid and washed with water and later boiled with dilute sodium hydroxide. The reaming residues are taken as crude fiber (AOAC, 1997).

Determination of carbohydrate content: carbohydrate contents were determined by subtracting the total value of moisture, fat, protein, ash, and crude fiber contents from 100 (AOAC, 1980)

i.e **carbohydrate content (%)** = 100 – (moisture + ash + protein + crude fiber).

Energy computation in (Kcal): this was determined by multiply protein, fat, and carbohydrate value obtained from the analysis by 4, 9, 4 respectively (AOAC, 1980).

Energy in Kcal = (protein×4) + (fat×9) + (carbohydrate ×4).

Determination of lycopene content

Acetone was used to extract lycopene in the both dried and fresh tomato sample, a mole of lycopene extract was dissolved in petroleum ether. Absorbance of lycopene was taken at 503nm and concentration of lycopene was estimated from standard calibration curve (Ranganna, 2003).

DETERMINATION OF ANTI NUTRIONAL FACTORS

Determination of Tannin: Tannin was determined using spectrometric method, after a series of extraction and the concentration was estimated from tannic acid calibration curve (Onuwka, 2005,Marklar et al; 1993).

Determination of oxalate content: oxalate was determined by titrimentry method after the extraction, the extract was titrated against 0.05M potassium permanganate.

Determination of phytate content: phytate content was determined by method discussed by (marklher et al; 1993). Using ammonium thiocynate as an indicator and the extract was titrated with standard iron chloride solution until brownish yellow was persisted for 5 minute as the end point. The phytate content was estimated as phytic acid.

Determination of phenolic acid: the samples were weighing and boiled with 25ml of ether with addition of ammonium hydroxide and alcohol. The solution was allowed to stand for 30 minute to developed color which was measured at 505nm using uv-spectrophotometer for the absorbance of the samples and estimated from standard curve (Sofowora, 1993)

Determination of saponin content: 20% of aqueous ethanol was added to the sample in the cleaned conical flask and placed in the water bath and heat for 4hours with continue starring at temperature of 55^{o}C, the solution was filter and the filtrate was concentrated at 90^{oC} before transfer to separating funnel with addition of diethyl ether, and the aqueous layer was discarded. The extract was washed with aqueous sodium chloride. This was now dried in oven and weigh, until constant weight was determine as the weight of saponin (Sofowora, 1990)

Determination of Flavonoid: 100ml of 80% aqueous methanol was used to extract 10g of sample repeatedly at room temperature and filtered through Whitman filter paper No 42 (125mm). The filtrate was evaporated to dryness in a crucible over a water bath until a constant weight was reached (Bohnm & Kocipal-Abyazan, 1994).

DETERMINATION OF MINERALS ELEMENT

The samples were analyzed for mineral elements such as potassium, sodium, magnesium, calcium, and zinc using atomic absorption spectrophotometric. 5g of samples were weighed and ashes using muffle furnace at 550^{o}C for 5 hours in platinum crucible. This was cooled in desiccators' and digest with 10% HCL and filtered. The filtrate was filled with deionized water to the mark, before analyzed for K, Na, Mg, Ca, and Zn (Onuwka, 2005,Marklar *et al*; 1993).

Phosphorus was determine using UV- visible spectrophotometer at 436nm after making ammonium vanadate molydate complex according to the method established by (perkin Elmer 1982).

RESULT AND DISCUSSION

Proximate analysis result as shown in table 1. The results indicated that moisture content of fresh tomatoes decreased from 91.70% to 10.525 during drying. This make the dired tomatoes to be free from microbial activities as reported by (Aliyu *et al.,* 2018) that microbial activity increased in a higher moisture content of food substance. Decreased in moisture content of dried tomatoes increased the carbohydrate content, this may be the reason of high calories of energy in the dried sample.

Using statistical tools to check the significance difference of nutritional value of dried and fresh tomato samples at 95% degree of confidence, the result indicate that known significance difference between the nutritional content of dried and fresh tomatoes. But it was reported by Aliyu *et al.*, 2018, that there is significant different in nutritional value of dried healthy and dried infected tomatoes. The fibre, protein and vitamin content of fresh and dried are 0.17% - 6.42, 2.5% - 0.23%, 14.32% - 12.12%. this indicate that both dried can also provide fibre content which is very essential to reduce circulation of cholesterol and increase in glucose tolerance level in body (opega *et,al*., 2018). Vitamin C is an antioxidant that removed free radicals and increase immune system can also be provided by dried tomatoes.

The mineral composition of both fresh and dried tomatoes samples as shown in table 2. Indicate a slight reduction in the dried sample but not significantly different from the fresh sample, this may attributed to the loss of the moisture or water content of the fresh tomatoes, as a result most of the soluble ions escape during drying as reported by (Turkan, A, *et,al*; 2010)

Calcium is an important constituent of bone formation and strong teeth, hence both fresh and dried tomato can provide enough calcium to the body tissue to prevent osteoporosis in adult and rickets in children and also colon cancer. All the essential mineral element are present in both fresh and dried tomatoes in a reasonable amount for bone formations, enzyme reactions, blood formation and other health body tissue (oyetayo,F,L.& Ibitoye, M.F.2012).

Phytochemicals compositions of fresh and dried tomatoes as shown in table 3,indicate the present of tannin, oxalate, phytate, saponin, phenolic, flavoid and alkaloid in both fresh and dried tomatoes but

shown a significance reduction in mg/100 during drying. These maybe attribute to the volatility of phytochemical that lead significances amounts escape during drying (Opega *el,al*; 2017)

Phytate concentration can influence the functional and nutritional properties of foods, depend on the concentration and also has ability to lower blood glucose and cholesterol, reduces the risk of cancer by absorbing the divalent and multivalent minerals required by cancerous cell to multiply, phytochemicals in the tomatoes neutralize the free radical and inhibit the oxidative activity (oyetayo, F. & Ibitoye, M. 2018, Opega *et,al.*,2017).

Table 1 Proximate Analysis

Samples	Fresh tomatoes %	Dried Tomatoes %	% Difference
Moisture	**91.70**	**10.52**	**81.18**
Ash	**0.21**	**3.93**	**3.72**
Carbohydrate	**7.60**	**76.4**	**68.80**
Protein	**2.50**	**0.98**	**1.52**
Fiber	**0.17**	**6.42**	**6.25**
Lipid	**0.20**	**0.23**	**0.03**
Vitamin C	**14.32**	**12.21**	**2.11**
Lycopene	**89.52**	**70.91**	**18.61**
Total Energy	**32.68**	**317.67**	**284.99**

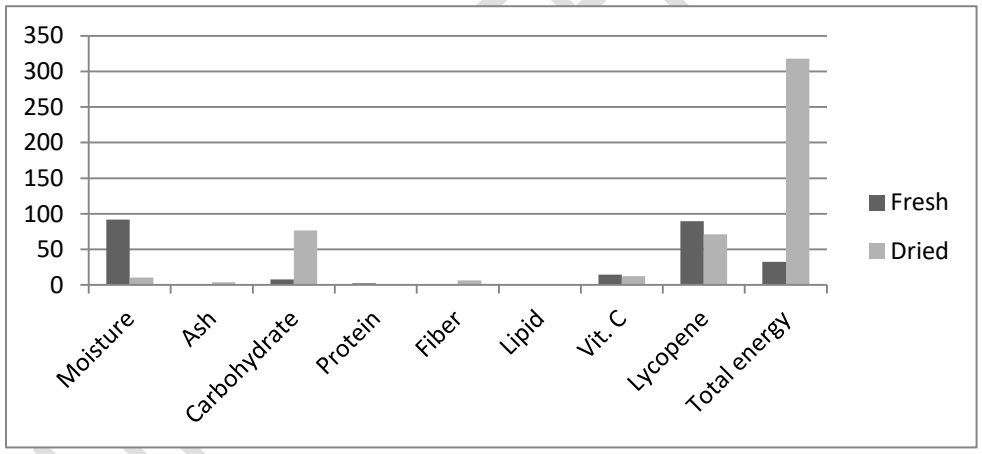

Fig: 1 graph of proximate

Table 2. Minerals Composition

Elements (mg/100g)	Fresh tomatoes	Dried tomatoes
K	**12.90±0.01**	**9.80 ±0.00**
Na	**4.45 ± 0.12**	**2.45 ±0.01**
Mg	**9.75 ±0.02**	**0.35 ±0.21**
Ca	**30.06 ±0.00**	**25.35 ±0.00**
Zn	**0.36 ±0.01**	**0.26±0.00**
P	**28.52 ± 0.15**	**20.60± 0.16**

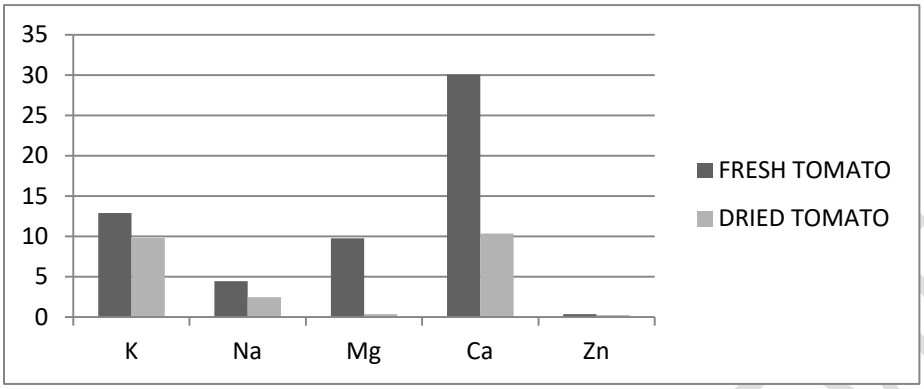

Fig: 2 graph of mineral elements

Table 3 Anti -Nutritional Factor (phytochemical)

Phytochemicals mg/100g	Fresh tomatoes	Dried tomatoes
Taninn	**0.09 ±0.00**	**0.21 ±0.00**
Oxalate	**0.68 ±0.00**	**0.42 ±0.00**
Phytate	**1.13 ±0.00**	**0.30±0.00**
Saponin	**1.31 ±0.00**	**0.13 ±0.00**
Phenolic acid	**1.25 ±0.00**	**0.94 ± 0.00**
Flavonoid	**28.62 ± 0.00**	**20.51 ± 0.00**
Alkaloid	**20.51 ± 0.00**	**15.23 ± 0.00**

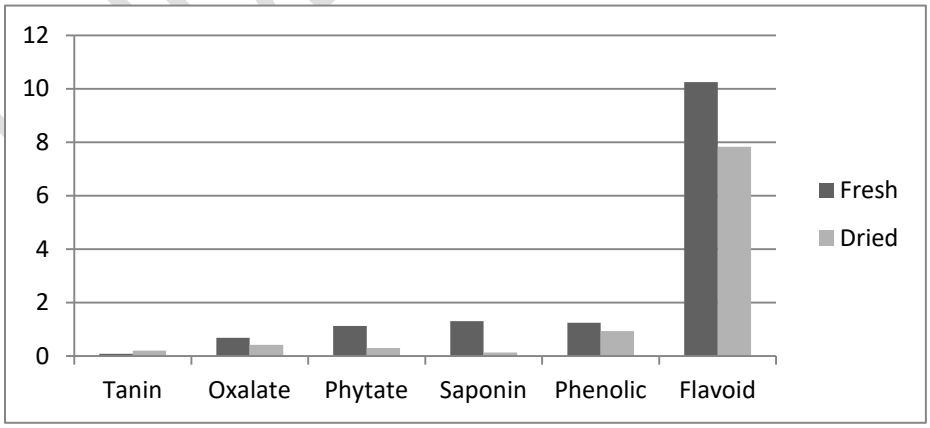

Fig: 3: graph of phytochemical

CONCLUSION:

Since the only available method of storing tomato post harvest season by farmer is traditional drying method. The study concluded that, despite the drying method was done in traditional ways by the farmers to prevent loses of post harvest tomatoes, there was known significance different lose of nutritional contents fresh and dried tomatoes. There is need to educate farmers and provide a conducive environment for drying process in order reduced possible contaminate to meet the global standard of food processing practice. And further research to check the amino acid contents of both fresh and dried tomatoes.

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