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STUDY ON THE DETERMINATION OF THE PHYTOCHEMICAL AND VITAMIN CONTENT OF PUREE PRODUCED FROM "*Trichosanthes Cucumerina" (SNAKE TOMATOES)*

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Abstract

Studies on determination of phytochemicals and vitamin content of puree produced from ***Trichosanthes Cucumerina*** *(snake tomatoes) were conducted or carried out to determine the phytochemicals and vitamin composition of snake tomatoes. Other parameter of interest like PH value, total solid and moisture content were also determined. These were carried out with the standard method of Harbole 1998 and Okwu 2004 respectively, of phytochemicals and vitamin analysis. The result of these assessments or analysis showed that* ***Trichosanthes Cucumerina*** *contained alk aloid (2.92±0.04 and 4.46±0.01), Phenoloic compound (1.31±0.01 and 1.11±0.01), saponin (0.11±0.01 and 0.09±0.01), tannin (0.07±0.01 and 0.04±0.01), phytic acid (0.13±0.01and 0.13±0.01), and flavonoid (0.33±0.01and 0.27±0.01) which indicate good medicinal properties. The content of vitamin contained by* ***Trichosanthes Cucumerina*** *in raw (Fresh) and puree are as follow:- thiamine (2.38±0.01and0.49± 0.01), Riboflovin (211.75±0.04 and 192.58±0.08), Niacin (2.86±0.03 and 1.12±0.02) and ascorbic acid (388.96±0.30 and 248±0.25) respectively. From the resource so far, it was proved that alkaloid was in high level when compared to other phytochemicals even though the some alkaloid are poisonous but not all and as well can be used as medicine – analgesic (pain relief). The amount of water soluble vitamin in* ***Trichosanthes Cucumerina*** *showed that the vegetable could be used as a veritable source of these vitamin more especially vitamin C, having (248.75 to 388.96 mg/100g). therefore, the presence of these chemical substance in this vegetable denotes*

that it is an important sources of essential nutrient and also possesses medicinal qualities or properties for human benefits. And it's consumptions should be highly encouraged.

KEYWORDS*: Snake tomatoes, phytochemicals, vitamins, puree and vegetables*

INTRODUCTION

Phytochemical are sometimes referred to as phytonutrient they are usually referred to compounds found in plant that are not required for normal functioning of the body but nonetheless have a beneficial effect on health or an active in the amelioration of diseases such as cancer. Thus, they differ from what are traditionally termed nutrients, in that they are not a necessity for normal metabolism, and their absence will not result in a deficiency disease, (Hollman, 2001). Although they are not nutrient for body functions, they are beneficial by reducing the risk of cancer due to antoxident and anti-implementory effect. They promote the functions of the immune system, act directly against bacteria and viruses. These phytochemical occur variously in fruits and vegetables. They include alkaloids and tannins (Murray 1996). Vegetables are characterized by their bright colours. They have cellular structures put together by a cementing material known as protopectin. As they mature, they becomes soft because the protopectin cementing material changes into pectin, which is a more soluble substance (Kordylas, 1990). Most vegetables contain about 85 percent water. They are highly esteemed as a sources of vitamin C and a significant sources of vitamin A and B (Robinson, 1977). Despite their high mineral and vitamin contents, some are known to contain toxicant such as Oxalate, tannins and alkaloids. These can be reduced by modern food processing techniques, including cooking (kardenize and Eski, 1999)

Trichosanthes Cucumerina (snake tomatoes) is a herbaceous climber cucurbit. It is a monoecious climbing vegetable and produce long cylindrical and narrow fruits that is yellow to red in colour when ripe. The crop usually receives little attention, except that it is often grown up with some support. (Onyeka, 2002) ***Trichosanthes Cucumerina*** is a vegetable which required high levels of soil moisture and a long growing season. Immature fruits are usually harvested

when they are 0.3 to 0.4m long, mature fruits can grow up to 1.5 m in length. The ripe fruits is used as a substitute to tomato in preparing sauce, stew, and soup in many localities (Lucas, 1988). As a vegetable, it is used in medicine as analgesic (pain relief) strong antioxidant and might prevent oxidative damage to bimolecules such as DNA, lipid and protein, which play a role in chronic disease such as cancer and cardiovascular disease (Hollman, 2001). Although, this vegetable is consumed in various localities as a substitute to tomato, there is little or no information about the nutritional properties this crop which has supposedly hindered it's wide cultivation and consumption.

The cucurbitaceae consist of nearly 100 genera and over 750 species. Although, most have old world origin, many species originated in the new world and at least seven genera have origin in both hemispheres (Jeffery, 1990). There is tremendous genetic diversity within the family, and the range of adaptation for cucurbit species include tropical and subtropical regions and temperate locations. A few species are adaptable to production at elevation as high as 2000m.

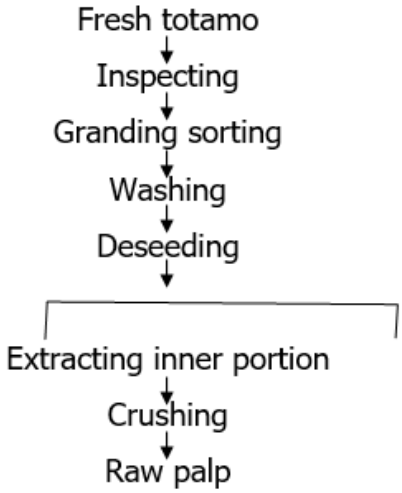
Archaeological evidence has indicated the cucurbit were present in ancient and pre-historic cultures. Archaeological expedition in the Oaxaca region of mexico have reported ***Cucumerina*** to be associate with man as early as 850Bc and cultivated by 450Bc . Written Chinese records describing use of cultivated cucurbit dates back to 685Bc. ***Trichosanthes Cucumerina*** occurs wild from India to Australia and a cultivated form of it has long been grown in India, Africa, and Fara East. It is now grown occasionally in the West India, Africa (Chakravarty, 1990).

Material and method

Materials: ***Trichosanthes Cucumerina*** used for this work was obtained from markets in Anambra State. The chemical were gotten from food technology laboratory, Federal Polytechnic Oko, Anambara State. **Sample preparation:** The ripe tomatoes were purchased, inspected goods ones sorted out, washed and deseeded manually. The meso carp was collected for preparation for analysis. The pulp or mesocarp was homogenized using NAKA blender (Model 248) The blended tomatos pulp was divided into two parts – One part of the pulp arising from the mesocarp was concentrated into puree using open-pan boiling method. To achieve this, different blanching temperature and time were

used. The preliminary processing was subjected to some sensory analysis using a 7 point hedonics sale to determine the best blenching temperature and time. But the 900c, 800c, for 1,3 minutes blanching temperature and time respectively were assumed to be the best. The puree resulting from 80c for 3 minutes blanching and raw sample were analyzed.

FLOWCHART FOR PRODUCTION OF PUREE



Methods

The blended pulp or mesocarp of snake tomato was subjected to Phytochemical and vitamin analysis in the food technology laboratory of federal Polytechnic Oko Anambra State.

Phytochemical Analysis

The Phytochemical analysis (Quantitative and Qualitative) were carried out to determine the presence or absence of Alkaloid, Flavonoid, Tannins, Saponins, phenoids and phytate. The quantitative involved the comprehensive and determination of the percentage of the crude content of this anti nutritional factor.

Alkaloid

The Alkaloid content of the samples was determined using Harbone (1973) method of analysis. About 5g sample, was mixed with 10% active acetic acid

solution in ethanol. In the ratio of 1.10 (W/V). The mixture was allowed to stand for 4 hours at room temperature with intermittent shaking (every 15 mins)
At the end of the 4 hours the moisture was filtered through Whatman No 42 filter paper. The filterate (Alkaloid extract) was concentrated by evaporation to it's original volume. Concentrated aqueous ammonia (NH20H) was added dropwise into the extract until full precipation was obtained. The precipate (Alkaloid) was recovered by filtration using a weighed filter paper. This residue was washed with 1% NH4OH solution and then dried in the oven at 1050c for 20 minutes, cooled in the desicator for 5 minutes and reweighed. The alkaloid content was calculated by difference and expressed as a percentage of the weight of the weight of sample analyzed. This is given by % Alkaloid =

Where
W= Weight of sample analyzed
W1= Weight of empty filter paper
W2= Weight of paper + Aalkaloid precipitate

Determination of Flavonoid.
This was also determined using the method of Harbone (1973). About 5g of the sample was dispersed in 2M Hcl solution and boiled under reflux for 40 mins. This was filtered through whatman no 42 filter paper. The filterated was treated with equal volume of acetyl acetate to precipitate the flavoniod. The filterate was recovered by filteration using a weighted filter paper. This was dried in the oven at 1050c for 20 mins, cooled and reweighed. This is given by
% flavonoid =
where ->
W = Weight of sample
Wi = weight of empty filter paper
W2 = Weight of filter paper + precitate

Determine of Tannin
The Folin – Dennis colorimetric method described by person (1976) and Kirk and swayer (1998) was employed. About 1.0g of each sample was dispersed in distilled water to form a 1:50 ratio (W/V). The mixture is allowed to stand at room temperature for 30 mins, before it was shaken well and filtered. An equal

volume of the filtrate (2ml) was put in a 50ml flask. The same volume of standard tannin solution (tannic acid) and an equal volume of distilled water were put in separate flask to serve as the standard and reagent blank respectively. 1 ml of the folin-Dannis reagent was added to each of the tubes followed by 2.5 ml of saturated NA2CO3 solution. The Mixture was allowed to incubate at room temperature for 1 ½ hrs (90mins) before their absorbance were measured at 760 NM using spectrophotometer. The tannin content was calculated using the formula below

% Tannin =

Where

W= weight of sample used

Au = Absorbance of the Sample

As = Absorbance of the standard tannin

Vf = Total volume of extract

Va = Volume of extract analyzed

Determination of Phenol

This was done by the folin- Gocaiteva colometric method AOAC (1990). About 0.2g of each sample was mixed with 10ml pure concentrated methanol and shaken well. The mixture was allowed to stand for 30 mins at room temperature before being centrifuged at 3000rpm for 30 minutes to remove the particle. A standard phenol solution was prepared and diluted to a chosen consent ration of 0.05ml. 1ml of the extract, and the same volume of the standard solution as well as 1 ml of distilled water were put in separate test tubes to serve as the sample standard and reagent blank respectively. 1.0ml of the folin- Gocaltena reagent was added to each of the tubes and mixed well before their absorbance were measured at 7600nm in a spectrophotometer. The phenol content was calculated using the formula below

% phenol =

Where

W= weight of sample used

Au = Absorbance of the sample

As = Absorbance of the standard phenol solution

C = Concentration of the standard phenol solution

Vf = Total volume of extract
Va = Volume of extract analyzed.

Determination of phytate.

The spectrophotometric method of hang and Lantzsch (1986) was used. About 1.0g of the sample was boiled in 100ml of 0.2NHcl solution for 15mins, cooled and filtered through Whatman No 42 grade of filterepaper. 0.5 ml of the filtrate was mixed with 1 ml of 0.1N fecl3 in 0.1 NHcl3 in test tube. The tube was covered and heated for 3 mins. This was allowed to cool to room temperature before being centrifuged at 3000 rpm

For 30 mins . 1 ml of the prepared phytic acid standard solution and the same volume (1ml) of distilled water were put in different test tubes. Each tube was treated with 1.5ml of bipyridine solution and their absorbance were read in a spectrophotometer at 519 nm wavelength. The phytic acid concentration was calculated using the formula below:

% Phytic acid =

Where –

W= weight of sample
Au = absorbance of the sample
As = absorbance of standard solution
C = concentration of standard solution
Vf = total volume of extract
Va = volume of extract analyzed

Saponin Determination

Skalar 918 method of analysis as describes by Okwu (2004), was used. About 5g of each sample was dispersed in 50ml of 20% ethanol. The suspension were shaken and heated over a hot water bath for 4hours with continuous stirring at about 550C. The mixtures were filtered with Whatman No 42 filter paper while their residues were re-extracted again with 50ml of 20% ethanol. The combined extracts were reduced to 40ml over water bath at 900C. The concentrate was transferred into a 100ml separatory funnel and 20ml of diethyl ether was added and shaken vigorously. The aqueous layer was recovered while diethyl ether was discarded. About 20ml of n-butanol and 10ml of 5% aqueous sodium chloride (NaCl) were added to aqueous layer in the separatory funnel, shaken

and aqueous layer was recovered again and the upper layer discarded. The remaining solution was heated in a water bath. After evaporation, the samples were dried in the oven to a constant weight. The saponnin content was calculated by difference and expressed as a percentage of the weight of sample analyzed. It was given by the expression below;

$$\% \text{ saponin} = \frac{(w2-w1)}{W} \times 100$$

Where

W = weight of sample analyzed
W1 = Weight of empty filter paper
W2 = weight of paper + precipitate

Vitamins Analysis / Determination

The vitamins analysis/ determination were carried out on the samples (raw and concentrate force) for the estimated/ determination of vitamins available or present in ***Trichosanthes Cucumerina***, the analysis were carried out thus, using methods described by using Okwu (2004).

Ascorbic acid (VIT. C) determination

Ascorbic acid was determined using scalar 918 method analysis as described by Okwu (2004). About 5g of each sample was weighed into a conical flask and 50ml of ethetylenediaminetetra-acetic acid (disodum salt)/ Tricholoric acetic acid (EDTA/ TCA), 2:1 extracting solution were mixed and the mixture was shaken for 30 mins. This was filtered with Whatman No 42 grade of filter paper 10ml of 30% potassium iodine (ki) and 12ml of 1 % starch indicator was added to the filtrate and titrated with 0.01m CUS04 solution to get a darken –point. The vitamin C content was calculated as vitamin C mg/100g =

Where W= Weight of sample

Determination of riboflavin

Riboflavin was determined using Skalar 918 method of analysis described by Okwu (2004). About 5g of each sample was mixed with 100ml of 50% ethanol in a conical flask and shaken for 1 hour. The mixture was filtered through Whatman No 24 filter paper. The filtrate was used for the analysis. An equal

volume of the extract (10ml) was dispersed into a volumetric flask and 10ml of 5% potassium pemamganent (Kmno4) solution was added to it followed by 10 ml of 30% H2O2. The mixture was allowed to start for 30 mins over a water bath. 2ml of 40% Naso4 solution was added to it and was diluted to 50ml with distilled water. Meanwhile, 10ml of dilute riboflavin solution and equal volume of distilled water were put in a separate funnel and treated as described above to serve as standard and reagent blank respectively.

The absorbance of the standard and the sample were measured in a spectrophotometer at 510nm wavelength with the reagent blank at zero. The riboflavin content was calculated as below:

Riboflavin mg/100g =

Where

W= weight of sample

Au = absorbance of the sample

As = absorbance of standard riboflavin solution

C = concentration of standard solution

Vf = total volume of filtrate

Va = volume of filtrate analyzed

Determination of Thiannin

This type of Vitamin thiamin was determined using Skalar 918 method analysis as described by Okwu (2004). About 5.0g of the sample was homogenized with 50ml of 1n-ethernolic sodium hydroxide. The homogeneity was filtered through Wathman number 42 filter paper and the filtrate was used for the analysis. The filter paper and filtrate was used for the analysis. A portion of the filtrate from each (10ml) was put in a flask. An equal volume (10ml) of standard thiamin solution and distilled water were put in separate flask to serve as standard and reagent blank respectively. 10ml of potassium dichromate (K2Cr207) solution was added to each and the absorbance was read at 360 nm wavelength in a spectrophotometer. The thiamin content was calculated as shown below:

Thiamin mg/100g =

Where

W= weight of sample

Au = absorbance of the sample

As = absorbance of standard solution

C = concentration of standard
Vf = total volume of filtrate
Va = volume of filtrate analyzed

Determination of Niacin

Niacin was determined using skalar 918 method of Analysis as described by Okwu (2004). About 5.0g of the sample was mixed with 50ml of 1N H2S04 and shaken for 30 mins. Three drops of Ammonia solution was added to it, mixed well and filtered. 10ml portion of the filtrate was dispersed into 50ml flask and 5ml of 1N-potassium cyanide (KCN) solution was added to it and mixed well followed by 5ml of 0.02N H2SO4 (to acidify it). 10ml of standard Niacin solution and the same volume of distilled water were put in a separate flask and treated as described above. The content of each tube was made up to the 50ml mark and their absorbance were measured in a spectrophotometer at 470nm wavelength with the reagent blank at zero (0). Niacin was calculated as follow.

Niacin mg/100g =
Where
W= weight of sample
Au = absorbance of the sample
As = absorbance of standard
C = concentration of standard
Vf = total volume of filtrate
Va = volume of filtrate analyzed

Determination of moisture content

The hot oven method (Pearson, 1976) was used in the determination. Petridishes were thoroughly washed and dried in the oven at 1000c for 30 mins and allowed to cool in the desiccator. Their respective weight were determined by weighing using mettler balance. About 5g of sample was weighed respectively into the dishes and placed inside the oven at 1000C for 4 hours when a constant weight was obtained.

The percentage moisture content was calculated from the weight loss of the sample. Thus % moisture = Initial weight of sample – Final weight of dried sample X 100

Initial weight of sample 1

Determination of PH value

This determination was done by the use of digital PH module 152k. The PH meter was standardized using buffer 4 and a solution at ambient temperature. The tip of the electrode was dried with soft tissue paper. The cleaned and dried glass electrode was inserted into the sample. The PH knob was then switched on and PH value read directly from the scale.

Determination of total solid

About 10g of sand was placed in a metal dish containing a flat ended glass rod. Dried in the vacuum oven at 700c for ½ an hour. Cooled in a desiccator and reweighed (m1). About 3g of the well mixed sample was weighed into the dish (m2). The sample was well mixed with the sand using the glass rod. Dried in the vacuum oven at 700c for 4 hours. Cooled in a desiccator and reweighed (m3)

% total solid =

Where

M1 = Weight of dish + glass rod + sand

M2 = Weight of dish + glass rod + sand + sample

M3= Weight after drying

RESULTS AND DISCUSSION

TABLE 1: PHYTOCHEMICAL COMPOSITION OF T CUCUMERINA.

Phytochemicals	Raw (fresh)	Puree
Alkaloid (%)	2.92 ±0.04	4.46 ±0.02
Saponin (%)	0.11 ±0.01	0.09 ±0.01
Phenol(%)	1.31 ±0.01	1.11 ±0.01
Tannin(%)	0.07 ±0.01	0.04 ±0.01
Flavonoid(%)	0.33 ±0.01	0. 27±0.01
Phytic acid(%)	0.13 +0.01	0. 13+0.01

Values are means of three replicates

Phytochemical composition of puree produced from ***T. Cucumerina***

The phytochemical composition determined from ***T. Cucumerina*** puree are shown in table above, the level of alkaloid are high both in raw sample and puree sample and when compared to other phytochemicals in the table.
Even though many alkaloid are poisonous such as strychnine or coniine. Some are used in medicine as analgesic (Pain reliever) particularly mophine and codine, (Jordan et al, 2005). Thus efforts should be made to reduce the alkaloid level during processing of ***T. cucumerina*** before it can be adequately utilized.
The level of saponin is low (0.09 – 0.11 %) and very important because it has a general characteristics of cholesterol binding properties and haemolytic activity (Sodipo et al, 2000) and the presence of phenolic compound in ***T. Cucumerina*** indicates that the vegetable might be anti-microbial in nature, since phenols and phenolic compounds such as flavonoids are extensively used in disinfection and remains the standard with which other bactericides are compared (Okwu, 2004).
The level of Tannins in ***T. Cucumerina*** is equally important because Tannins reduces protein quality by directly forming complexes and participate in oxidation-reduction reactions and thus, in the loss of ascorbic acid (Nget Hong et al, 1983) Tannins may be employed medicinally as anti diarrheal, haemostatic and antiheamorrhoidal compounds (Murray, 1996). The level of phytic acid did not change both in raw and puree simples. This phytic acid binds dietary essential minerals making them unavailable for absorption (Linner, 1973)

TABLE 2: VITAMIN COMPOSITION OF T. CUCUMERINA

Vitamins	Raw (Fresh)	Puree
Thiamin (Vitamin B1)	2.38 $\pm$0.01	0.49 $\pm$0.01
Riboflavin (Vitamin B2) mg/100g	211.75 $\pm$ 0.40	192.58 $\pm$0.08
Niacin (nicotinic acid) 100mg	2.86 $\pm$ 0.03	1.12 $\pm$ 0.02
Ascorbic acid (Vitamin C) mg/100g	388.96 + 0.30	248.75 + 0.15

Values are means of the three replicates.

Vitamin composition of puree produced from ***T. Cucumerina*** are good sources of ascorbic acid, Riboflavin, Niacin and Thiamin. The result of this study in revealed that the ascorbic acid content is (248.75 - 388.96 mg/100g). Naturally, ascorbic acid is very crucial for the body system performance. Ascorbic acid prevents scurvy, aids in wound healing, promote healthy immune system and

cardiovascular disease (Lee et al, 2000). Other beneficial roles of ascorbic acid apart from its anti scurvy property is that it facilitate the transformation of cholesterol into bile acid in the liver. The permissible level of intake of ascorbic acid for both adult and children ranges between 20-30 mg per day (FAO, 1988). Hunt et al (1980) reported that Riboflavin operate at vital reaction points in the respiratory chain of cellular metabolism. It plays a major role with thiamine and Niacin containing enzymes in a long chain of oxidation – reduction reactions by which energy is released. A deficiency of Riboflavin does not lead to any specific and identifiable disease. The symptoms are inflammation of the tongue, lesion at the eyes, lips and congestion of congestival blood vessel (Okwu, 2004). The safe and best level of intake of riboflavin for children and adult ranges from
0.5-1.8mg per day (FAO, 1988). In the body, Niacin are active as nicotinamide and serve as co-enzymes. Niacin is always active in the prevention of the disease called pellagra and very essential for the metabolism of the body (Hunt et al, 1980).
The permissible level of Niacin for both adult and children range from 5.4 – 19.8 mg per day, (FAO, 1988). Thiamin is very essential for the metabolism of the body and a deficiency of it diet is the cause of the diseases beriberi (Okwu, 2004). The recommended dietary allowance (RDA) of thiamin for both adult and children ranges from 1.1-1.5mg per day (FAO, 1988). This results revealed that ***T. Cucumerina*** contains high level/amount of ascorbic acid, which had been esteemed as a major vitamin contained in fruit and vegetables and a significant source of B complex vitamin such as Riboflavin.

TABLE 3: SOME SELECTED ATTRIBUTES OF T. CUCUMERINA

Sample description	Moisture(%)	Total Solid (%)	PH
STD	74.5	340	4.62
AT3	81.5	17.5	5.84
BT1	87.0	240	5.65

Values are means of duplicates

NOTES
STD = Standard pomo

AT3 = Puree blanched at 800c for 3 minutes
BT1 = Puree blanched at 90c for 1 minute

MOISTURE CONTENT

From the table above, the moisture level of ***T. Cucumerina*** sample varied from 81.5%-87%. The moisture content of pomo tomatoes paste is (74.5%) equally determined as a standard is less than that of puree produced from ***T. Cucumerina***

The puree from ***T. Cucumerina*** may not be stored for a long period. This is due to the percentage of moisture level contained in them which indicates that riped fruit of ***T. Cucumerina*** is highly perishable.

TOTAL SOLID

This expressed in percentage of puree ranges from 17.5% - 24%. Therefore, the puree could be classified as medium and heavy puree tomato (Harlod, 1963). And the pomo tomato paste has 34.0 which is classified as light tomato paste (Harlod, 1963). This shows that the total solid of the samples are within the recommended range.

PH

The PH of the ***T. Cucumerina*** samples ranges from 5.84 while that of pomo tomato paste is 4.62. The PH range from 5.5 – 5.6 has been recommended (Onyeka, 2002) for processed puree of ***T. Cucumerina.*** This shows that ***T. Cucumerina*** is an acid food, showing properties of conventional tomatoes.

TABLE 4: PRELIMNARY EVALUATION OF PUREE PRODUCED FROM T. CUCUMERINA

PARAMETER	AT1	AT2	AT3	BT3	BT2	BT1	LSD
Colour	5.3abc	4.5bc	6.5a	1.6d	1.3d	5.4ab	1.69
Texture	5.0abc	5.8ab	6.3a	2.9de	1.8e	4.4abcd	2.0
Taste	3.5a	4.8a	5.0a	4.4a	4.0a	5.3a	(NSD)
Flavour	5.5a	5.0ab	4.3abcd	4.3abcde	4.0abcde	5.0bcd	4.52
General	4.8abd	4.9abc	5.9a	4.0abcde	3.0cde	5.1ab	1.91
Acceptability							

AT1 = Blanched at 800C for 1 min
AT2 = Blanched at 800C for 2 mins
AT3 = Blanched at 800C for 3 mins
BT3 = Blanched at 900C for 3 mins
BT2 = Blanched at 900C for 2 mins
BT1 = Blanched at 900C for 1 min
NSA = No Significant Difference
LSD = Least Significant Difference

CONCLUSION AND RECOMMENDATION

This study showed that **Tricosanthes Cucumerina** puree contained certain amount of phytochemicals and water soluble vitamins especially ascorbic acid. Thus, it could serve as a good sources of these vitamins. Moreover, it has good properties just as convectional tomatoes. Also the presence of phytochemicals more especially alkaloid makes it serve as medicine for human beings since these chemical substances are used/found medicinally in the diet.

Therefore, it is being recommended that the small scale tomato processors should seriously embark on **Trichosanthes Cucumerina** puree and paste production since this vegetable could serve as a good culinary substitute to conventional tomatoes. And consumption of **Trichosanthes Cucumerina** (snake tomato) should be seriously encouraged to all since it produces medical qualities or medical properties.

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