Nutritional Qualities of Three Common Tomato Cultivars (UTC, Dan-Eka and Dan-Masari) in Dutsin-ma Local Government Area Katsina State

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Abstract — This work investigates the nutritional qualities of three common local tomato cultivars UTC, Dan -Masari and Dan-Eka in Dutsinma Local Government using standard techniques. The proximate, mineral, vitamins and lycopene contents were determined using AOAC method of analysis and the values were as follows. The moisture contents of the tomatoes were 95.56 ± 0.16 %, 93.85 ± 0.12 %, 93.97 ± 0.61 % for UTC, Dan-masari and Dan-eka respectively. Ash content were 0.36 ± 0.03 %, 0.47 ± 0.06 %, 0.51 ± 0.09 % respectively. Protein content were 0.99 ± 0.04 %, 0.73 ± 0.07 %, and 0.79 ± 0.79 % in the same order. Total carbohydrate for UTC indicated values of 2.58 ± 0.24 %, Dan-eka indicated value of 4.72 ± 0.04 % and Dan-masari indicated values of 4.53 ± 0.38 %. While the fat content showed 0.19 ± 0.00 %, 0.73 ± 0.07 %, 0.188 ± 0.01 % in that order. For vitamin A, the results were 19.80 ± 0.73 mg/kg, 18.93 ± 0.71 mg/kg and 15.49 ± 0.24 mg/kg respectively. For vitamin B₂ and B₃ UTC has 0.003 ± 0.00 mg/kg and 0.05 ± 0.18 mg/kg in the same respect, Dan-eka showed B₂ 0.05 ± 0.08 mg/kg and B₃ 0.15 ± 0.20 mg/kg respectively while Dan-masari indicated B₂ 0.000 ± 0.00 mg/kg and B₃ 0.15 ± 0.20 mg/kg and vitamin C indicated values of 42.68 ± 8.93 mg/kg for UTC, Dan-eka showed 52.82 ± 3.60 mg/kg and Dan-masari showed values of 84.47 ± 1.67 mg/kg. The lycopene content UTC has the values of 116.01 ± 1.59 mg/kg, Dan-eka indicated 127.18 ± 3.65 mg/kg and Dan-masari showed 91.36 ± 2.24 mg/kg. The mineral content for potassium indicated values of 3.74 ± 0.28 ppm, 3.40 ± 0.16 ppm, 3.08 ± 0.61 ppm for UTC, Dan-eka and Dan-masari respectively. For the iron content, 0.008 ± 0.04 ppm, 0.002 ± 0.00 ppm and 0.004 ± 0.00 ppm of UTC, Dan-eka and Dan-masari respectively. Magnesium values were 0.27 ± 0.07 ppm, 0.22 ± 0.16 ppm and 0.25 ± 0.02 ppm correspondingly. For calcium, the obtained values were 0.26 ± 0.04 ppm, 0.26 ± 0.05 ppm, 0.38 ± 0.07 ppm respectively. The sodium contents were 0.18 ± 0.02 ppm, 0.18 ± 0.08 ppm, 0.30 ± 0.13 ppm in that order. These local varieties grown in Dutsinma are also good source of nutrient with no difference in the physiological quality parameters compared to the one been

imported. However, Dan-eka shows higher content of these nutrients in terms of lycopene and vitamin contents which makes it the best of these cultivars. However the results of this work suggest that three cultivars can provide good industrial raw materials for paste production because their total solids are within the range of specification and can meet daily recommended intake of lycopene and vitamin, moreover the low fat values for these samples gives it a positive nutritional implication.

Index Terms — Tomato, Nutritional, Lycopene, Minerals, Vitamins, Proximate Analysis.

I. BACKGROUND OF THE STUDY

Tomato is a fruit of the plant *Solanum lycopersicum*. The fruit has been noted as one of the most important nutritious crops consumed by humans. The word "tomato" comes from the Nahuatl word, literally known as "the swelling fruit" which belongs to the Solanaceae family. It is widely cultivated in many home gardens and in different fields due to its adaptation to broad range of soil types. It is usually cultivated in all climates and regarded number three top most produced fruit vegetables worldwide [1].

The tomato crop is relatively perishable and can maximally last for three weeks. In Nigeria, tomato is among the famous most utilized fruit vegetable, although it is produced very low in comparison to the yield of the temperate areas due to geographical differences, inadequacy of high yielding varieties and other practices such as traditional and cultural practices in its production [2], the production areas include most northern parts of the country which include Benue, Bauchi, Borno, Kano, Kaduna, Sokoto, Sokoto, Plateau, and also in few southern states including Kwara, Delta, and Oyo [3]. Tomato is considered as the most important vegetable superseded by onions and pepper [4]. The essential nutrients such as moisture, acidity, vitamin C, crude fibre, protein, and lycopene generally vary with cultivars, cultural and postharvest handling practices.

Organic acids containing foods highly resist the survival of most pathogenic microorganisms and state the condition of available dominant micro flora in foods. As the vegetables and fruits get matured, the levels of the acids also decreased, while the simple sugars levels increase. The vitamin C which also called ascorbic acid is an organic acid commonly found in almost all fruits and most vegetables. Tomato is among the important fruit vegetables source of ascorbic acid and many physiological, sensorial and storability of tomatoes is

Published on November 20, 2020.

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attributed to its ascorbic acid content. The reducing ability of the ascorbic acids facilitates its maintenance of the enzyme polyhydroxylate in an active state and making sure that the iron atom is in a reduced form. The presence of the acid also ensures the effective performance of the enzyme involved in the formation of collagen as a result of its ability to keep all vitamins in a soluble and stable form [5]. Moisture is a constituent of foods that play many vital roles more importantly in the aspect of food processing. In tomato processing, the moisture content serves many functionalities as it is an indicator that dictates its biochemical reactions, storability, and rheological changes in the tomatoes and its products. The ingestion of dietary fiber from variety of foods such as tomato prevents colon cancer, heart disease and normalizes blood lipids thereby reducing cardiovascular diseases. Therefore, the introduction of fiber rich foods in child's early life and continued consumption of these foods later in life has been encouraged [6].

Lycopene is the red pigment compound found in tomatoes. The compound is a hydrocarbon with elongated conjugate double bond as the carotenoids [7]. Being a fat soluble component, lycopene has absorption property similar to that of dietary fat. It is usually separated from the food matrix when ingested into the stomach and subsequently lower part of small intestine where it becomes dissolved in the lipid phase [8]. Processing of food industrially is among the factors that affect the bioavailability of many nutrients such as lycopene in tomato processing and hence increase absorption. This can be understood where the heat applied during processing induced the change of all *trans*-lycopene to *cis*-isomers in the process called isomerization which positively affects its bioavailability [9]. Adequate intake of lycopene and vitamin A rich foods or its dietary supplementation is helpful in patients suffering from asthma and rheumatoid arthritis diseases and has been studied to be harmless when used as additive in foods [10].

Tomatoes add to healthy and well-balanced diet [11] as they contained many essential micronutrients, amino acids, sugars, and dietary fibers in measurable quantity. Also in respect to the findings of the United State Department of Agriculture on National Nutrient Database, tomatoes are naturally loaded with various nutrients including fiber, vitamin A and C, potassium providing about one-fifth of the daily minimum requirement of vitamin A based on a 2 kilocalorie dieting plan. Also, a medium size tomato can provide about one-quarter of the daily recommended levels of vitamin C intake [12].

Although tomato is edible alone or added in salads or in related foods in its fresh form, Processing can be considered necessary due to its shorter storability and mostly as a result of high production which largely influences market glut especially in its cultivation season leading to greater loss by the producers. Therefore, it can be processed and exported to other nearby African countries or marketed within the country because of the high local demand. Varieties of products can be obtained through processing of tomatoes ranging from puree, Ketchup, powder to juice of various packaging designs. It serves a good component of most people's daily diet [13].

In recent times, the Dan-eka, Dan-masari and UTC cultivars have become very popular among farmers in Dutsin-ma local government and this study has been designed to ascertain the proximate composition of some key factors that can determine their use for both domestic and industrial purposes. Therefore, this research is based on the three common varieties of tomato (Dan-eka, Dan-masari and UTC) prevalent in Dutsin-ma local government. The common varieties are generally oval or cylindrical in shape, with significantly fewer locules (seed compartments) than standard round tomatoes (usually only two) and a generally higher solid content, making them more suitable for processing.

Dan-Masari tomato, is a medium-size, globe-type F1 hybrid, popular to home gardeners because of its early ripening characteristic. It is a cultivar of tomato with indeterminate growth, which means it produces flowers and fruit until it is killed by harsh weather or another external factor (contrast with a *determinate* cultivar, which would grow to a limited, predefined shape and be most productive for one large harvest before dying or tapering off with minimal new growth or fruit). It grows tall (1.6 to 2.0 m). Therefore, it needs support as the plant grows. Fruit maturity ranges from 50 to 62 days after transplanting, depending on the source, which appeals to growers in climates with shorter growing seasons. The ripe fruit is extremely standard for a tomato, about the size and shape of a tennis ball and weighing 4 to 8 ounces (110 to 230 g). The tomatoes have a bright color and good flavor.

Although knowledge has been acquired with regards to the level of vitamin C, lycopene and mineral content both on the qualitative and quantitative aspect on various types of tomato, but the local varieties have little or no information on proximate, lycopene and mineral content despite the abundance of these tomatoes, there is still problem of micronutrient deficiency in Nigeria. There is need to identify and evaluate the nutrient, and food toxicant levels of some of these tomatoes. Tomatoes could be integrated in the food-based approach for fighting micronutrient deficiency in Nigeria. This can also be useful information for food processors, nutritionist, and people of related fields.

This research work will expose the nutritional qualities of these tomato varieties to the rural community of Dutsin-ma locality where malnutrition is prevalent and the willing Industrial processors of the tomatoes. This study is limited to fresh tomato fruit (100% ripe) of the common tomato fruit in Dutsin-ma Local Government.

II. MATERIALS AND METHOD

A. Study Area and Description

Dutsin-ma became a local government (in 1976) of the federal republic of Nigeria under Katsina state. It is among the top five most developed local governments Area in the State. The LGA has an Area and a population of about 527 km² and 169,671 (2006 general census) respectively. It is located on co-ordinates 12.4545°N 7.4977°E. The inhabitants of the local government are predominantly Hausa and Fulani tribes. Their main occupation is agricultural practices [14].

B. Sample Collection and Preparation

Three varieties of fresh tomatoes fruit (100% ripe) were purchased from Trans-able farm in Ba-dole and Shongai farms of Dutsin-ma local government and the samples were properly washed and blended together using a food grade blending machine.

C. Lycopene Determination Using Official Method

Using [15] method of analysis, 1g of the tomato samples was weighed and homogenize with distilled water in a 100 ml volumetric flask and make up to mark. It was mixed well, and 10 ml of the solution was transferred into the separating funnel. 40 ml of distilled water was added into the separating funnel and shake. 25 ml of ether was added into the separating funnel and shake vigorously and leave for 15 minutes. The aqueous layer was run off into a beaker. It was poured into cuvette and read using a UV- spectrophotometer. Calculation:

$$ABSORBENT = \frac{X1000X100}{282X1.42X4XWT}$$

D. Mineral Analysis

The tomato samples were dry ashed using [15]. Sample analysis was done using AA240FS atomic absorption spectrophotometer (AAS) equipped with a hollow cathode lamp, current 10 mA, wavelength 217 nm, band pass 0.5 nm, with a flame type consisting of air/acetylene and stoichiometric fuel flow at 0.9-1.2 dm³/min. Levels of Minerals (Iron, Potassium, calcium, Magnesium, Sodium) in the tomato samples were determined by weighing 1.0 g of the ashed samples into a digestion tube and digesting it with 10 ml of a mixture of concentrated nitric acid (HNO₃) and concentrated HCl on a hot plate. On cooling, the digested sample was filtered using a whatsmann filter paper into a 50 ml volumetric flask and made up to mark with distilled water. The filtration was aspirated into the AAS and levels of the minerals were determined.

E. Moisture Content

A dried cooled platinum dish was weighed (w₁) and 2g of the test sample was introduced into the dish and weighed accurately (w₂). The dish and its content were transferred into an oven at 105 °C to dry for about 3 hours and the dish is removed and weighed (w₃) [15].

Calculation:

$$\text{Percentage moisture} = \frac{w_2 - w_3}{w_2 - w_1} \times 100$$

F. Determination of Total Carbohydrate Content

The percentage carbohydrates were obtained by difference [15]. The carbohydrate content was calculated using the following:

$$\text{Total carbohydrate} = 100 - (\% \text{moisture} + \% \text{ash} + \% \text{protein} + \% \text{fat})$$

G. Ash Content Determination [16]

0.2 g of the homogenized samples was placed in a porcelain crucible and ash in a muffle furnace at 600° C for exactly 3 hours. The crucible container was then allowed to cool, and the weight of the ash taken by using before and after weights of both the crucibles containing the samples and the weight of the crucible alone.

H. Crude Protein Determination

0.2 g of the blended homogenized samples were weighed into the digestion tubes followed by the addition of 5 g of Kjeldahl catalyst and 15 cm³ of concentrated H₂SO₄. Each tube was mixed thoroughly and then heated for 2 hours until the solutions became clear and 15 cm³ of 40 % NaOH was added to each of the samples. The mixture was allowed to cool and then transferred into 100 cm³ volumetric flask and diluted with distilled water to the mark. Another 10 cm of 2 % boric acid was measured into 100 cm³ Erlenmeyer flask and few drops of Methyl red indicator were added. Furthermore, 10 cm³ of digested aliquot was transferred into a distillation apparatus and then distilled into the boric/indicator for 15 minutes. The distillate was then titrated with 0.025M HCl to a pink end point [17].

I. Fat Content Determination Using (Schmidt Method)

2 grams of each of the samples was weighed into boiling tubes. 10 ml of concentrated HCl was added and put in a water bath until solid particles dissolve and until mixture becomes brown. It was then taken off and cooled, then transferred into a separating funnel. 10 ml of ethanol and 30ml of diethyl ether was added and shaken to dissolve; it was then allowed to stand for some minutes so to separate. A clean dried conical flask (w₁) is weighed, and the ether layer was transferred into the flask. The extraction was repeated twice with 25 ml of diethyl ether and the extract was evaporated in a water bath to remove the diethyl ether. The fat is dried at 105 °C in an oven, cooled and weighed (w₂).

J. Vitamin A Analysis

2 grams of the sample was weighed into the round bottom flask, 25 ml of 0.5 M alcoholic KOH was added to the sample, swirled and wrapped with foil paper. The solution was refluxed for 1 hour. After refluxing, 3 drops of phenolphthalein indicator were added to the solution and was titrated while hot with 0.5 M HCl until a colorless solution is obtained. 1 ml of 3M aqueous KOH was added to the neutralized sample and was transferred to a separating funnel. The amount of acid used to neutralize the sample (titre value) was subtracted from 50 ml and the resulting value of distilled water was added to the solution in the separating funnel. Extraction with 50 ml diethyl ether was carried out thrice with vigorous shaking on each addition of the diethylether. The ether layer was washed three times with 20 ml 0.5 M KOH. The resulting solution was washed continuously with 20 ml portions of water until it was no longer alkaline to phenolphthalein (i.e. no pink color was observed when tested with phenolphthalein). The washed extract was evaporated over the water bath and reconstituted with 4 ml of isopropanol. The absorbance was taken at 325 nm with the UV spectrophotometer. E₁ =953 [15].

K. Vitamin B2 and B3 Analysis

Using [15], 10 mg of the Vitamin B₂ (standard salt) was weighed into a 25 ml volumetric flask, dissolved, and made to the mark with buffer solution and labeled as stock. 4 ml of standard stock was transferred into 25 ml amber volumetric flask, made to the mark with buffer solution, vortexed and labeled as intermediate mixed stock. With the use of the intermediate mixed stock solution, serial dilutions were carried out by pipetting 1 ml, 2 ml, 3 ml, 4 ml and 5 ml of the intermediate into 5 different 10 ml volumetric flasks and made to the mark with the buffer solution, vortexed and labeled mixed working standard serially. They were then transferred into vials using syringe and a micro filter for each mixed working standards and then taken together with the samples to the HPLC for analysis. The same was carried out to determine the B₃ content of the samples.

L. Chromatographic condition

Elution: isocratic, Wavelength: 214 nm, Mobile phase: Methanol: potassium orthophosphate buffer (50:50),

Column: C18, 5 µm, ODS2, Flow rate: 1.2 ml/minute, Injection: 3 times.

M. Ascorbic Acid Determination

5 cm³ of the homogenized sample was added to 1 cm³ of acetic acid, using indophenol indicator it was titrated with 0.1 M NaOH to the end point. Another 5 cm³ of standard ascorbic acid in an erlenmeyer flask was titrated with the indophenol until a faint pink color remained unchanged. These were done three times. The volumes of NaOH were used to calculate the ascorbic acid levels in both the standard and the samples [17].

N. Statistical Analysis

The results were expressed as mean ± standard deviation. Significant difference was expressed by one way analysis of variance (ANOVA) followed by Duncan post-Hoc Descriptive Test using Statistical package for social science (SPSS) version 16.0.

III. RESULTS

A. Proximate Composition of the Samples

TABLE I: PROXIMATE COMPOSITION OF THE SAMPLES

Samples	Total Solid %	Ash %	Moisture Content %	Fat %	Protein %	T.CHO %
UTC	4.44±0.17 ^b	0.36±0.03 ^a	92.43±0.16 ^a	0.19±0.00 ^a	0.99±0.04 ^a	2.58±0.24 ^b
Dan-masari	4.12±0.14 ^a	0.47±0.06 ^a	90.75±0.12 ^b	0.21±0.74 ^a	0.73±0.07 ^a	3.72±0.04 ^a
Dan-eka	4.03±0.61 ^a	0.51±0.09 ^a	90.97±0.61 ^b	0.18±0.01 ^a	0.79±0.79 ^a	3.51±0.38 ^a

Data expressed as mean ± SD. The value with the same subscript shows that there is no significant difference (p < 0.05). T.CHO from the table means Total carbohydrate.

B. Lycopene and Vitamin Compositions of the Samples

TABLE II: LYCOPENE AND VITAMIN CONTENT OF THE SAMPLES

Samples	Lycopene (mg/kg)	Vitamin A (mg/kg)	Vitamin B2 (mg/kg)	Vitamin B3 (mg/kg)	Vitamin C (mg/kg)
UTC	116.01±1.59 ^a	19.80±0.73 ^a	0.003±0.00 ^a	0.05±0.18 ^a	42.68±8.93 ^b
Dan-masari	91.36±2.24 ^b	18.93±0.71 ^a	0.000±0.00 ^a	0.15±0.20 ^a	52.82±3.60 ^b
Dan-eka	127.18±3.65 ^a	15.49±0.24 ^b	0.05±0.08 ^a	0.07±0.08 ^a	84.47±1.67 ^a

Data expressed as mean ± SD. The value with the same subscript shows that there is no significant difference (p < 0.05).

C. Mineral Composition of the Samples

TABLE III: MINERAL COMPOSITION OF THE SAMPLES

Samples	K ppm	Fe ppm	Mg ppm	Ca ppm	Na ppm
UTC	3.74±0.28 ^a	0.008±0.04 ^a	0.27±0.07 ^a	0.26±0.04 ^a	0.18±0.02 ^a
Dan-masari	3.40±0.16 ^a	0.002±0.00 ^a	0.22±0.16 ^a	0.26±0.05 ^a	0.18±0.08 ^a
Dan-eka	3.08±0.61 ^a	0.004±0.00 ^a	0.25±0.02 ^a	0.38. ±0.07 ^a	0.30±0.13 ^a

Data expressed as mean ± SD. The value with the same subscript shows that there is no significant difference (p < 0.05).

IV. DISCUSSION

A. Proximate Composition of the Samples

Moisture, the mean moisture contents of the samples as shown in table 1 were found to range from 95.56 % to 93.85 %. The high moisture content of the samples was as expected with no significant difference at P<0.05 between the local varieties (Dan-eka and Dan-masari) and the imported UTC variety meaning they can equally serve the same purpose. Fresh fruits and vegetables are known to contain higher moisture relative to sun or shade dried samples [18]. The

moisture content of the samples is in conformity with the findings of [19].

Ash content gives an indication of the mineral composition preserved in the food materials [20]. The ash content of the samples ranges from 0.51 % to 0.37 % with no significant differences at P<0.05 between the local and the imported UTC variety samples have lower ash content which might be as a result of higher water content of the samples, the result in this research work is in agreement with that of [21], [22].

The total solids indicate the amount of solids in the samples aside water, the result was as expected as water been the major composition of the samples, the total solids which ranges from 6.12% to 4.44% at P<0.05 significant difference, the difference between the local varieties and the imported UTC varieties is little which shows that both can be utilized same way industrially or at home level. The work is in conformity with that of [23].

The samples contain fat component which ranges from 0.218 % to 0.188 % with no significant difference at P<0.05

between the control and the local varieties, The low fat content of the samples was not a surprised as fruit and vegetable are not good source of fat [24]. The fat values of the studied work are comparable to the observations of [19].

Fresh tomato proteins of the samples range from 0.99 % to 0.73 % with no significant difference at $P < 0.05$ between the imported UTC variety which is the control and local varieties. The low protein content of the tomato samples was as expected, and the high moisture content of the fruit sample was the major cause of low protein. It is known that the lower the moisture content of a given food the higher is the protein. As reported by [25], moisture affects nutrient content of fruits. Generally, all the fresh fruits are low in protein because they contain more moisture and less when they are dried. Similar result was reported by [26].

The total carbohydrate (T.C) of the samples ranges from 4.72 % to 2.90 % with UTC having the least and with significant difference at $P < 0.05$. The low carbohydrate value of the tomato samples may be attributed to its high moisture that lowered its dry matter of which carbohydrate belongs to them. This observation is in line with those of some researchers like [27] who reported that high moisture of a given food, affects its dry matter adversely of which carbohydrate is among. Similar report was recorded by [26].

B. Vitamins Composition of the Samples

The vitamin A values of the samples ranges from 19.80% to 15.49% with Dan Masari having the least and little significant difference between the control and the local varieties at $P < 0.05$. The high pro-vitamin A in the samples have many positive nutritional impacts; it showed that these particular tomato fruits could be good sources of pro-vitamin A mostly for the region where it is cultivated. The values found in the present study were similar to the ones reported by [17].

Vitamin B₂ of the samples ranges from 0.009 mg to 0.003 mg and Vitamin B₃ has values ranging from 0.46 mg to 0.07 mg, the low values of these vitamins can be as a result of Cultivars as well as sun light as it has effect in the vitamins formation. Nevertheless, the result seemingly tallies with the one obtained by [28].

The vitamin C values of the tomato samples ranges from 84.47 mg to 42.68 mg with little significant difference between the control and the local varieties at $P < 0.05$. The high ascorbic acid of the samples strongly suggest that it could be good cheap source of the nutrient to address ascorbic acid deficiency. As little as 5 to 10 mg ascorbic acid daily intake can combat scurvy. Tomato fruit can be used as a tool to easily meet 40 % of an adult's body requirement by providing 60 mg of ascorbic acid and two-third of the children's daily requirement that is about 40 mg per day [29]. This result is higher than those reported by [29] which can be as result of environmental factors.

C. Lycopene

Lycopene content of the samples includes Dan-eka having the highest lycopene content of 127.18 mg/kg followed by UTC with content of 116.01 mg/kg compared to Dan-masari having the least value of 91.36 mg/kg. This result is in conformity with that of [30]. According to [31], daily intake

of one or more serving of tomato, tomato product or lycopene supplement may play a role in the prevention of prostate cancer.

D. Mineral Composition of the Samples

The results for the sodium in the tomatoes samples ranges from 0.30 ppm to 0.18 ppm with no significant difference statistically between the imported UTC and the local varieties at $P < 0.05$. The low sodium values of the samples could be as a result of nutritional level of the soil. The varieties could be considered safe for hypertensive patient, thus should be included in their meals as higher sodium diets increases blood pressure. This result shows a lower concentration with regards to the one stated by [32]. The result values for potassium, iron, magnesium and calcium were comparatively low in UTC, Dan-eka and Dan-masari tomato samples which ranged from 3.74 ppm to 3.08 ppm, 0.008 ppm to 0.002 ppm, 0.27 ppm to 0.22 ppm and 0.38 ppm to 0.26 ppm respectively, the low values of these minerals might be due to the environmental factors. Although the result of this study is in line with the one discovered by [29], the amount of minerals contained in fruits and vegetables depend on variety, climate, cultivation methods and the potentiality of the soil [20]. Many research studies such as that of [33] who worked on different types of vegetables produced from various soil types had made similar observation as obtained in this work.

V. CONCLUSION

Current dietary guidelines to combat chronic diseases, such as cancer and coronary artery disease, recommend increased intake of plant foods, including fruits and vegetables, which are rich sources of antioxidants, and many studies have shown that a close relation exists between the intake of vegetables and cancer prevention. Therefore, tomato as one of the most versatile and widely used food plants could play an important role in human diet. These local varieties grown in Dutsin-ma are also good source of nutrient (Dan-eka and Dan-Masari) with no significant difference in the physiological quality parameters such as moisture, ash, fat, carbohydrate, protein, minerals vitamins and lycopene content with the one (UTC) been imported. However, all the three cultivars indicated high lycopene and vitamin content which can meet the daily intake for man, but Dan-eka shows higher content of the lycopene and the vitamin content which makes it the best of these cultivars. However these three cultivars can provide good industrial raw material for tomato paste production because their total solid are within the range of specification and also can meet daily recommended intake of lycopene and vitamin (A and C) and also the low fat values for these samples also has nutritional implication, as they could also be used as a component of low diet for many patients who are placed on low fat diets.

It is recommended that techniques and methods of preservation of these tomatoes should be developed to avoid wastage as a result of high market glut during its harvesting seasons. It is also recommended that there should be increase in the production of tomato in Dutsin-ma especially Dan-eka, Dan-masari and others because of the potency of the soil and

richness of other environmental factors in the area. Finally, a research is recommended to find out possible heavy metals in these varieties.

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