

# Comparative Evaluation of Lycopene Content and Some Chemical Properties of Commonly Consumed Brands of Tomato Paste in Port –Harcourt, South-South, Nigeria

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**Abstract:** A comparative evaluation of lycopene content and some chemical properties of commonly consumed brands of tomato paste were investigated. Six double concentrate tomato paste and a locally processed sample (freshly milled and boiled tomato used as control) were reviewed. Chemical composition of the samples revealed that locally processed tomato was the least in total solids, pH, viscosity and lycopene, with Gino tomato brand having the highest lycopene content. All brands of tomato paste showed a significant difference ( $p > 0.05$ ) in the chemical parameters. Proximate analysis showed that moisture content ranged from 69.00 – 84.85%, while ash, protein and carbohydrate ranged from 1.11 – 2.80%, 2.95 – 4.87% and 7.91 – 18.58% respectively, with the locally processed sample being the least in all cases. The findings in this study showed that there exist significant difference between tomato products in terms of lycopene and other chemical parameters as a result of processing and varietal differences.

**Keywords:** Tomato Paste, Evaluation, Lycopene, Chemical, Brand, Nigeria

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## 1. Introduction

Tomato (*Lycopersicon esculentum* Mill) is a vegetable that occupies an important position in healthy daily family diet. It is grown extensively in home gardens and large farms for fresh consumption and commercial processing (Aditi *et al* 2011). It is consumed primarily for its color and the physical features it impacts on foods in addition to the provision of provitamin A. They are highly perishable and large quantities of tomato go to waste due to poor handling/storage facilities. As a summer fruit therefore, tomato must be preserved to be used throughout the annual cycle using concentration and heat treatment (Boumendjel *et al* 2011), giving rise to canning of tomato paste. Tomato, fresh or canned is primarily priced for its color which is due to the presence of the pigment lycopene. Lycopene is a terpen most abundant in the tomato fruit. It is a red pigment characterized by an acyclic symmetrical structure containing eleven conjugated double bonds and two unconjugated giving the molecule its red color (Nguyen *et al.*, 1999). The determination of lycopene gives an indication of a quality criterion of tomato paste that is the color.

Lycopene is a member of the carotenoid family of phytochemicals, a hydrophobic molecule located within the tomato matrix (Clinton 1998), a powerful antioxidant, with tomato as the richest source. Lycopene is the most prevalent carotenoid present in the human serum, accounting for roughly 50% of all plasma carotenoid content (Di Mascio *et al* 1989). Most of the dietary lycopene consumed by population in the Western World comes from tomato or their products (Khachik *et al* 2002 and Giovannucci 1999). It has been found to be beneficial in neutralizing harmful radicals, which are implicated in cancer, heart disease, macular degeneration and other age related illnesses (Agrawal *et al* 2000). The main quality parameters of tomato pastes perceived by consumers are color, consistency and flavor but less emphasis is laid on the nutritional and health benefits derived from consuming the processed tomato in terms of their lycopene content. The aim of the study was to compare the chemical properties of some tomato paste against the fresh unprocessed one with particular reference to the lycopene content.

## 2. Materials and Methods

Materials: 70g each of six different brands of tomato paste were purchased from a grocery shop in Port Harcourt. The brands of tomato paste were Gino, Pomo, Tasty tom, Sweet tomato, Frametta and De-rica. Fresh tomato seeds were also purchased from mill 3 market in Port Harcourt, milled and cooked to remove moisture to dryness and used for analysis.

Methods: Moisture content and ash were determined by the AOAC (1990) method. Viscosity measurement was done using a viscometer model MDJ/8S at 0.6rpm with spindle no 4 in duplicate. pH was determined using a pH meter model TS 625 Thomas scientific instrument. Total solid was obtained by difference (100- moisture content). Lycopene was determined by the method described by Ravelo-Perez *et al* (2000). Differences between means were assessed by analysis of variance and means separated by Duncan's Multiple range test according to the method of steel and Torrie (1980).

## 3. Results and Discussion

### 3.1. Chemical Composition of Tomato Paste Samples

Table 1 shows the chemical properties of the tomato paste. Total solids ranged from 15.15 - 30.99% with tasty- tom having the highest total solid and the locally processed sample having the least total solid. pH ranged from 3.99-4.38 with the locally processed sample having the least and sweet tomato brand the highest. The pH is a parameter indicating hygienic quality of tomato paste, its decline is interpreted as an improvement in conservation since they are classified as canned food plant at pH below 4.5, while Viscosity ranged

from 510.40- 1074.35Pa.S with locally processed having the least and De-rica brand the highest. Viscosity is an important technological factor that is related to the content of substances insoluble in alcohol, protein, pectins and polysaccharides (Gallais *et al* 1992). Sobowale *et al* (2011) also reported that the viscosity of tomato products depend on fiber, protein, fat and total solids. Furthermore Hawbecker (1995) said that viscosity is the combined effect of liquid soluble material, insoluble in suspension that contribute to the overall consistency of tomato paste. Lycopene content ranged from 104.78- 923.45mg/kg, with the locally processed having the least and Gino tomato paste having the highest. In agreement with the present findings, Nguyen and Schwartz (1998) reported that the availability of lycopene from tomato products is increased when these foods are processed at high temperature or packaged with oil. They also reported that mechanical treatment (homogenization) and heating enhance the release of lycopene from the tomato matrix and may explain the improved bioavailability seen with consumption of processed tomato products (cooked tomato, tomato paste). Furthermore, canned tomato and ketchup contain more lycopene than fresh tomato because cooking at high temperature breaks down cell walls, releasing and concentrating carotenoids. There was a significant difference ( $p>0.05$ ) in lycopene content amongst the brands under review and between the tomato paste brands and the locally processed sample. This is also in agreement with the findings of (Rao and Agarwal 1998) who reported that significant differences exist between different tomato products in terms of lycopene release and its gastrointestinal absorption of the commonly consumed tomato products.

Table 1. Chemical properties ( %) of some tomato paste brands.

Samples/ brands	Total solids%	pH	Viscosity Pa.s	Lycopene mg/kg
TASTY TOM	30.99 <sup>a</sup>	4.35 <sup>a</sup>	774.25 <sup>b</sup>	489.14 <sup>c</sup>
POMO	30.66 <sup>a</sup>	4.26 <sup>a</sup>	775.70 <sup>b</sup>	903.00 <sup>b</sup>
GINO	29.50 <sup>b</sup>	4.34 <sup>a</sup>	782.60 <sup>b</sup>	923.45 <sup>a</sup>
DE-RICA	28.56 <sup>c</sup>	4.24 <sup>a</sup>	1074.35 <sup>a</sup>	442.35 <sup>f</sup>
SWEET TOMATO	28.41 <sup>c</sup>	4.38 <sup>a</sup>	781.45 <sup>b</sup>	599.46 <sup>d</sup>
FRAMETTA	23.51 <sup>c</sup>	4.25 <sup>a</sup>	655.40 <sup>c</sup>	687.32 <sup>c</sup>
LOCALLY PROCESSED (Control)	15.15 <sup>d</sup>	3.99 <sup>b</sup>	510.40 <sup>d</sup>	104.78 <sup>e</sup>

Table 2. Proximate composition ( %) of some tomato paste brands.

Samples/ brands	Moisture content%	Ash%	CRUDE PROTEIN	TOTAL AVAILABLE CARBOHYDRATE(TAC)
TASTY TOM	69.00 <sup>c</sup>	2.51 <sup>a</sup>	4.63 <sup>c</sup>	18.58 <sup>a</sup>
POMO	69.34 <sup>c</sup>	2.80 <sup>a</sup>	4.87 <sup>a</sup>	17.12 <sup>b</sup>
GINO	70.47 <sup>d</sup>	2.70 <sup>a</sup>	3.31 <sup>c</sup>	16.34 <sup>c</sup>
DE-RICA	71.40 <sup>c</sup>	2.81 <sup>a</sup>	4.82 <sup>b</sup>	13.07 <sup>c</sup>
SWEET TOMATO	71.58 <sup>c</sup>	2.69 <sup>a</sup>	4.11 <sup>f</sup>	13.70 <sup>d</sup>
FRAMETTA	76.40 <sup>b</sup>	2.50 <sup>a</sup>	4.15 <sup>d</sup>	12.35 <sup>f</sup>
LOCALLY PROCESSED	84.85 <sup>a</sup>	1.11 <sup>b</sup>	2.95 <sup>e</sup>	7.91 <sup>g</sup>

### 3.2. Proximate Composition of Tomato Paste Samples

Table 2 shows the proximate composition of the tomato brands. Moisture content ranged from 69.00-84.85%, with tasty tom brand having the least and the control (locally processed sample) having the highest. In comparison with the

pre-treated and canned brands, control sample showed higher final moisture even after dehydration. Increase in moisture showed a decrease in total solid. Ash ranged from 1.11- 2.81% with control (locally processed tomato) having the least ash, while crude protein ranged from 2.95 – 4.87%. In

both ash and protein, the locally processed sample had the least value. There was no significant difference ( $p < 0.05$ ) in ash among the tomato paste brands, but a significant difference ( $p > 0.05$ ) between the brands and the locally processed sample. Total available carbohydrate (TCA) ranged from 7.91%- 18.58% with the locally processed sample as the least. Results in the present study showed that total available carbohydrate (TAC) decreased with an increase in moisture content. The protein level is a technological parameter, its variation does not affect the commercial quality products but affects the overall expression of refractive index expressed as brix (Boumendjel *et al* 2011).

## 4. Conclusion

Results of the present study have shown that all brands of commonly used canned tomato paste do not have the same quality in terms of lycopene, total solid, viscosity and other chemical parameters. Furthermore the study have also shown that lycopene content, moisture, ash, crude protein and total available carbohydrate improved with heat processing indicating better indices for storability.

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