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ASSESSMENT OF LYCOPENE AND POTASSIUM CONTENTS IN TWO TOMATO VARIETIES AND WATER-MELON

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ABSTRACT
Lycopene and potassium content were isolated from tomato juice of two varieties, the cylindrical and round shaped species and water-melon. The paste of the separated juice was dehydrated with methanol and the lycopene was extracted from the residue with methanol and carbon tetrachloride. Purification of the products was carried out by recrystalization from benzene to give high purity. The result showed that the water-melon contains an average of 14.05mg/250g of lycopene while the cylindrical and round shaped tomatoes species contain 13.55mg/250g and 13.12mg/250g, respectively. The potassium content for cylindrical and round shaped tomatoes species as well as water-melon are 123mg, 125.5mg and 112.75mg respectively.

Key Words: Tomatoes, water-melon, lycopene, cylindrical, round shapes.

INTRODUCTION
Lycopene from the neo-letin lycopersuim, is a bright red carotene and carotenoid pigment found in tomatoes and other red fruits and vegetables, such as red carrots, water-melon and papayas, but not in straw berries, red-bell peppers or cherries (Basu and Imrhan. 2007). Although lycopene is chemically a carotene, it has no vitamin A activity (Berneburg *et al*., 1999).

Lycopene is an open-chain unsaturated carotenoid that impacts red colour to tomatoes, water-melon, guava and grape (Stahl and Lycopene. 1996). Lycopene is a proven antioxidant (Gerster. 1997). Antioxidants neutrelise free radicals, which may damage the body cells. According to Giovannicci (1995), lycopene in tomatoes and water-melon can be absorbed more effectively by the body if processed into juice, sauce, effectively by the body if processed into juice, sauce, paste and ketchup. Again it is deposited in the liver, lungs, prostrate gland, colon and skin while in the body. In the body tissue, its concentration is higher than all other carotenoids. (Zhang and Tang. 1997).

Mills, (1989) recommended regular high consumption of fruits and vegetables as part of healthy eating. Epidermiological studies have shown that high intake of lycopene – containing vegetables especially tomatoes and water-melon is inversely associated with the incidence of certain type of cancer.

For example habitual intake of tomato products has been inversely associated with the risk of cancer of the digestive tract among Italians. (Mills. 1989).

Recent research has shown that the lycopene content of water-melon also remains very stable overtime. When two much cubes of fresh cut water-melon were stored in the refrigerator at 2^oC over 48 hours, researchers found virtually no deterioration in lycopene content. The deterioration did not start to become significant until about seven days of storage. (Amany *et al*., 2009). Water-melon is an unusual fruit source of the carotenoid lycopene and a rich source of phenolic anti-oxidants. It contains cucurbitacin E, a triterpene anti-inflammatory – phytonutrient and unusual amounts of the amino acid citrulline. A good source of Vitamin C and Panthenic acid, copper, biotin, potassium (K), Vitamin A (as carotenoids, Vitamin B_1, B_2 and Magnesium (Edward *et al*., 2003).

Potassium and manganese regulate blood pressure as well as having antioxidant ability to maintain the health of blood vessels against sclerosis which helps to ease the passage of materials through blood vessels, thus reducing high blood pressure (Yung. 2001). Potassium is an essential macro mineral in human nutrition. It provides major cation (positive ion) inside animal cells, and thus, it is important in maintaining fluid and electrocyte balance in the body.

This work therefore determine the lycopene content in two varieties of tomatoes and water-melon as well as quantifying the potassium content in the samples given the same weight so that the consumers would be in a better position to make a choice.

MATERIAL AND METHODS

Fresh matured red ripe fruits of the two varieties of tomatoes, (cylindrical and round shaped species) and water-melon were harvested at Oganaji farm settlement area of Anyigba in Dekina Local Government Area of Kogi State and immediately washed with tap water prior to analysis. These were ground separately with a 424 national electric blender without addition of water. It was then allowed to run until a homogenous paste was obtained.

Extraction of Lycopene

Davis, (2003), method was employed with little modification. To each of 250g paste of the water-melon and tomato variety, 3.8 ml of methanol was added in a 5 litre container. The mixture was shaken vigorously to prevent the formation of hard lumps. The mixture allowed to stand for 2 hrs followed by vigorous shaking. The mixture was filtered using a large Buckner funnel (20cm) using Whatman fast flowing filter paper. The yellow filtrate was discarded after filtration.

The red residues (about 10 L) was extracted with 163 mL of carbon tetrachloride and shaken to extract the lycopene. However, pressure was not allowed to build up in the container. The suspension was shaken mechanically for 30min. The mixture was thereafter filtered and the residue crushed and re-extracted with methanol/CCl_4 mixture.

The extracts were homogenized and the methanol layer (the upper layer) was transferred to a 4-litre separating funnel. An equal volume of water was added. A white emulsion forms in the upper layer. The upper layer was siphoned off to leave the lower red CCl_4 layer containing the

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lycopene along with some methanol. The extract was filtered into a 2 litre round bottom standard taper flask. The solvent was then evaporated to about 25 mL on a rotary evaporator under vacuum at approximately 60^{o}c. The extract was transferred to a smaller flask and the solvent removed under vacuum.

Purification

The residues were diluted with 2 mL of benzene and evaporated in order to eliminate the CCl_4. The dark residues were transferred into flasks using 75 mL of benzene. The solution was warmed in a hot water bath until it became clear. The boiling methanol (5 mL) was added dropwise with stirring. Impure crystals of lycopene appeared immediately. Crystallization was promoted by cooling the solution in an ice bath for 2hrs. The content was filtered through a small filter glass funnel. The lycopene crystals were therefore transferred to a 50 mL centrifuge tube and again recrystallized from 7 mL of benzene by adding 5 mL methanol. The content was cooled and allowed to stand in an ice bath for 2 hrs. The supernatant was discarded. The crystals were again treated with 7 mL of boiling methanol and separated by centrifugation. Washing of the crystals was repeated twice and dried under vacuum (Kalaivani, 2015).

Determination of Potassium (K)

One gramme (1g) of the dried sample was weighed into a digestion flask and 20 mL of acid mixture (650 mL conc. HNO_3, 80 mL perchloric acid and 20 mL conc. H_2SO_4) was added to it. The flask was heated in a fume cupboard until a clear digest was obtained. The clear digest obtained was transferred into a 100 mL volumetric flask and made up to the mark with distil water. The solution was used to determine the potassium content using a flame photometer. (Davis, 2003).

Five millilitre (5 mL) aliquote of the extract was again diluted to 50 mL with petroleum ether and then poured into a 1 cm cell at 503 cm in a spectrophotometer (model, 295 E) using petroleum ether as blank. Triple readings were taken for each samples.

Calculation

Lycopene has large absorbance at 503 nm. Molecular extinction coefficient of lycopene at 503 is 17.2×10^4. Molecular weight of lycopene is 536.85, when dissolved in 1 litre, its optical density (absorbance) is calculated to be 3.1212. Lycopene content in a sample is calculated using the relationship:

$$\text{mg of lycopene per 100g of juice} = \frac{3.1012 \times \text{OD of sample} \times \text{volume made up} \times \text{dilution} \times 100}{\text{Wt of sample} \times 100}$$

Optimal density, OD = Absorbance A = - log transmittance
Transmittance (T) for cylindrical specie = 1.623
Therefore mg of lycopene per 100g of cylindrical specie =

$$\frac{3.1212 \times 1.633 \times 30 \times 50 \times 100}{1 \times 10 \times 10 \times 100}$$

= 13.07mg of lycopene

This was also calculated for both round tomatoe specie and water-melon respectively.

RESULTS

Table 1: Triplicate Analysis Results for both Cylindrical, Round Tomatoes and Water-melon

Cylindrical Shaped Tomatoes			Round Shaped Tomatoes			Water Melon		
Transmittance		Absorbance Lycopene	Transmittance		Absorbance Lycopene	Transmitted		Absorbance
(T)	(A= -Log T)	(mg)	(T)	(A= -Log T)	(mg)	(T)	(A = -Log T)	(mg)
2.332	1.633	13.07	3.589	1.445	13.61	5.970	1.224	14.06
2.380	1.622	13.17	3.524	1.453	13.51	6.152	1.221	14.03
2.449	1.611	13.14	3.451	1.462	13.50	6.109	1.214	14.04
2.505	1.601	13.15	3.589	1.445	13.61	6.887	1.311	14.07
		Σ = 52.49			Σ = 67.74			Σ = 56.20
		X̄=13.12mg			X̄=13.55mg			X̄=14.05mg
		S = ±0.01			S = ±0.02			S = 0.00

Table 2: Potassium Content in Two Varieties of Tomatoes and Water-melon

Cylindrical Shaped Specie (mg)	**Round Shaped Species (mg)**	**Water Melon (mg)**
123	126	114
124	126	112
122	125	113
123	125	113
Σ = 492	Σ = 502	Σ = 451
X̄ = 123mg	X̄ = 125.50mg	X̄ = 112.75mg
S = ±0.00	S = ±0.00	S = ±0.00

DISCUSSION

Table 1 revealed the lycopene content as found in both the two species of tomatoes and water-melon respectively. Triplicate grand mean showed that water-melon of equal weight contained more of lycopene than the corresponding tomatoes species. According to the report published in June, 2000 issue of Agricultural Research Magazine (Agarwal, 2000), and the lycopene content in water-melon (Davis, 2003), raw water-melon contains as much or more lycopene than tomatoes, even when compared to tomatoe juice which has undergone heat treatment – said to improve bio availability of the chemical.

Lycopene is a red pigment that occurs naturally in certain plant and algae tissues. It gives water-melon and tomatoes their colour, but it is also thought to act as a powerful anti-oxidant. Lycopene scavenges reactive oxygen species, which are aggressive chemicals that react with cell components, causing oxidantive damage and loss of proper cell functioning.

Water-melon is a very good source of Vitamin C, Pantothenic acid, copper, biotin, potassium etc. Potassium and manganese are working on blood vessels against sclerosis which helps to ease the movement

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of the passage of blood, thus reducing the high blood pressure (Yung, 2001).

The triplicate grand mean showed that water-melon of equal weight contain much more lycopene than the two species of tomatoes while the potassium content is higher in the two tomatoe varieties than is found in water-melon.

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