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Evaluation of Lycopene Contents from Various Fruits and Processed Food

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Abstract: The objective of the present study was to obtain a lycopene from ten different fruits and ten processed foods. The extraction of lycopene was carried out using hexane/acetone/ethanol as an extracting medium with spectroscopy. The lycopene content in fruits was ranged from 9.45 to 54.34 µg/g and 0.91 to 21.23µg/g in processed food. The higher value of lycopene was noticed in Pink guava (*Psidium guajava*) and lowest in Watermelon (*Citrullus lanatus*) in fruits. While higher value of lycopene was noticed in canned tomato paste and lowest in mango juice in processed food. This study highlights the scientific use of lycopene as a therapeutic agent.

Keywords: *Lycopene, fruits, processed food, therapeutic use.*

1 Introduction

Plants and plant products are most important natural sources of basic need of mankind. These are good sources of phytonutrients derived from plant essentials and important to health. Fruits and vegetables that are high in lycopene include autumn olive, gac, tomatoes, watermelon, pink grapefruit, pink guava, papaya, sea buckthorn, wolfberry and rosehip. The most important phytonutrient is lycopene found in various vegetables and fruits. Lycopene a carotenoid without pro-vitamin-A is present in many fruits and vegetables (Arab and Steck, 2000). Lycopene is more bioavailable in processed and cooked food products (Ganrtner *et al.*, 1997, Rao and Agarwal, 1999). No adverse events have been available in association with the consumption of lycopene containing foods.

Lycopene is used as safe coloring agents, food additives and plastic staining. It is the best free radical scavenger (Basu and Imrhan, 2007) and used in the sunscreen or burn blocks which improves the skin texture and protects sun burn. Some marketed sunscreen brands are including lycopene acts as anti-aging and anti-free radical. Also it is important in cancer treatment and male infertility treatments (Gupta and Kumar, 2002). It is proved that intake of tomato or tomato products are associated with reduction in prostate, digestive tract, breast, lung cancer (Leavy *et al.*, 1995, Dorgan *et al.*, 1998 and Khan, 2008). Intake of lycopene declined risk of cardiovascular diseases by preventing the LDL cholesterol oxidation (Torres *et al.*, 2006). Lycopene is

helpful in the endometriosis in female. This study insisted to authors to know the lycopene contents in some local fruits varieties and processed foods. These are the regular food stuff and fruits in diets which would be helpful to protect us from above mentioned diseases. This present study aims to evaluate the beneficial effect of rich source of lycopene, which is a relatively helpful contents which play an important role in human health and wealth.

2 Materials and Methods

Collection of samples:

Ten fresh fruits materials and ten processed foods were collected in clean polythene bag from local area/market. Collected materials were washed with distilled water. The materials were kept for boiling in distilled water for 10 minutes. Peels of fruits were removed and homogenization of puree was made with the help of mixture.

Isolation of lycopene:

The lycopene from fresh fruit products of fifteen was extracted with hexane: methanol: acetone (2:1:1) containing 2.5% BHT (butylated hydroxyl toluene). Optical density of hexane extracts was measured spectrophotometerically at 502 nm against hexane blank. Contents of lycopene was calculated using the extinction coefficient (E%). Results was expressed in µg/g and presented in table 1.

Data Analysis: The data was subjected to analysis of variance (ANOVA) using SAS (Statistical Analysis System). The mean was calculated and significant level was calculated at $p< 0.05$.

3 Results and Discussion

Lycopene is a phytonutrient and an antioxidant which is responsible for the characteristic deep red colour of fruits and their food products. The lycopene content of the fruits were analyzed in all ten fruits and ten processed foods. The lycopene content in fruits ranged from 9.45 to 54.34µg/g from fruits and 0.91 to 21.23µg/g from processed food. The higher value of lycopene was noticed in Pink guava (*Psidium guajava*) and lowest in Watermelon (*Citrullus lanatus*) in fruits. While higher value of lycopene was noticed in canned tomato paste and lowest in mango juice in processed food. This is comparable to values reported for fresh tomatoes (20.4 to 141 µg/g) on fresh weight basis (George *et al.,* 2004) and (25 to 2000 µg/g) on fresh weight basis (Shi and Magure, 2000) but lower than values (3110 to 6700 µg/g) reported (Dewanto *et al., 2002*) and (3310 µg/g) reported (Rao and Agarwal, 1999).

The lycopene activity in the body depends on its molecular and physiological properties and site of action within cell. Oxidative stress is an important contributor to the risk of chronic diseases. Antioxidants scavenge free radicals, otherwise known as reactive oxygen species (ROS) and prevent the damage they can cause. Free radicals have been associated with pathogenesis of various disorders and diseases such as cancer, cardiovascular disease, osteoporosis, diabetes and cataracts (Ratnam *et al.,* 2006). In a previous reported lycopene significantly restored the antioxidant enzymes superoxide dismutase (SOD), glutathione peroxidase (GSH-Px) and glutathione reductase (GR); reduced glutathione (GSH); and decreased levels of the lipid peroxide malondialdehyde (MDA) in hypertensive patients (Bose and Agarwal, 2007). The another study, revealed that lycopene was found to have a favorable effect in reducing MDA levels and increasing GSH levels in coronary artery disease in post-menopausal women (Misra *et al.,* 2006). Lycopene, also known as psi-carotene, is very sensitive to heat and oxidation and is insoluble in water. Because of the abundance of double bonds in its structure, there are potentially 1,056 different isomers of lycopene, but only a fraction is found in nature. In a study cis-isomers of lycopene were shown to be more

stable, having higher antioxidant potential compared to the all trans lycopene.

There is a variation in food stuff in peoples to people, area to area and country to country. Due to the variation of lycopene content in food sources, it has been difficult to estimate optimal daily intake. The diet ranges of 3.7 to 16.15 mg have been reported for the United States. The dietary values for Finland, the United Kingdom and Germany have been 0.7, 1.1, and 1.3 mg, respectively. A survey in Canada showed daily intake of lycopene to be 25.2 mg. However, a recent study in which healthy human subjects' ingested lycopene from tomato ketchup and supplements showed significantly increased serum lycopene levels and also significantly reduced lipid and protein oxidation. This level of intake can easily be achieved by ingesting several dietary sources of lycopene. The protective effect of lycopene on ischemic brain injury in rat brain homogenates has also been established. But the diet level of lycopene is not available for India and it is to be indeed.

Table 1. Showing lycopene contents in various fruits and processed food.

Sr No	Sources	Name of material	lycopene (μg/g)
1	Fruits	Tomato (Lycopersicon esculentum)	29.03
2		Watermelon (Citrullus lanatus)	09.45
3		Grapefruit (Citrus paradisi)	14.37
4		Pink guava (Psidium guajava)	54.34
5		Papaya (Carica papaya)	29.45
6		Carrot (Daucuscarota sativa)	14.32
7		Red cabbage (Brassica oleracea)	15.73
8		Sweet peppers (Capsicum annuum)	19.48
9		Gac (Monordica cochinchinensis)	15. 28
10		Asparagus (Asparagus officinalis)	11.11
11	Processed food	Canned tomato puree	19.28
12		Canned tomato juice	11.15
13		Sundried tomato	10.52
14		Canned tomato paste	21.23
15		Marinara sauce	07.11
16		Dried Apricot	04.34
17		Watermelon juice	04.11
18		Cherry tomato paste	02.17
19		Canned carrot juice	01.21
20		Mango juice	00.91
		Mean±SE	29.09±5.11
		CV%	11.34

Values with some subscripts in the same column are not significantly different at 5% level of significant.

Lycopene significantly reduced the levels of cholesterol, triglyceridesand free fatty acids, followed by a decrease in the levels of phospholipids in the serum and the liver. Also, lycopene significantly restored antioxidant liver enzymes, such as glutathione peroxidase, glutathione-s-transferase, against N-methyl-N′-nitro-N-nitrosoguanidine and saturated sodium chloride (S-NaCl)-induced gastric carcinogenesis. Animal and clinical studies suggest that lycopene may attenuate liver injury and possibly prevent the development of hepatocellular carcinoma.

The fruits are mostly reported highly lycopene than the processed foods. However, the present study recommended fresh fruits are better for health. Lycopene act as an antioxidant reduces oxidative stress. It may

play a significant role in many health concerns, including cardiovascular disease, diabetes, cancer, osteoporosis, liver disease, cataracts and male infertility. The appropriate dose and duration of lycopene supplementation remains to be determined. Some of the studies on lycopene have included other food supplements, making it difficult to discern lycopene's individual effects.

4 Conclusions

The fruits are mostly reported highly lycopene than the processed foods. However, the present study recommended fresh fruits are better for health. Lycopene act as an antioxidant reduces oxidative stress. It may play a significant role in many health concerns, including cardiovascular disease, diabetes, cancer, osteoporosis, liver disease, cataracts and male infertility. The appropriate dose and duration of lycopene supplementation remains to be determined. Some of the studies on lycopene have included other food supplements, making it difficult to discern lycopene's individual effects.

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