INTERNATIONAL JOURNAL OF RESEARCHES IN BIOSCIENCES, AGRICULTURE AND TECHNOLOGY
© VISHWASHANTI MULTIPURPOSE SOCIETY (Global Peace Multipurpose Society) R. No. MH-659/13(N)
www.vmsindia.org

LYCOPENE ESTIMATION FROM SELECTED FRUITS AND VEGETABLES

Kalpana S. Jadhav and Manisha G. Kulsange
Department of Home Science, RTM Nagpur University, Amravati Road, Nagpur Maharashtra

Abstract
Lycopene, a bright red carotenoid pigment has attracted substantial interest among the health professional due to its high antioxidant properties. The Lycopene content of selected fruits and vegetables, commonly consumed was determined using calorimetric method at the wavelength of 510nm with the help of Hexane, acetone and ethanol solution in 2:1:1 concentration. The lycopene content in tomato was found to be from 24.27mg/kg (10 mins) to 31.14mg/kg(30 mins). In papaya lycopene content was found to be 15.45mg/kg (10min) to 20.04 mg/kg (30min) and lowest amount of lycopene was found in pomegranate (3.89mg/kg to 9.16mg/kg). Among the yellowish-red vegetables, i.e in pumpkin lycopene content ranged from 8.010mg/kg (10min) to23.58 mg/kg (30min). In a leafy vegetable, lycopene ranged from 22.668 mg/kg to 27.13mg/kg in red amaranth leaves .This study has shown that tomato is very rich in lycopene content followed by red amaranth leaves . Tomato, amaranth red leaves and pumpkin should be regularly included in the diet for an adequate supply of lycopene. Result of present investigation showed that longer standing time yield increased amount of lycopene content.in selected fruits and vegetables.

Keywords : Lycopene, antioxidant, carotenoid,, calorimetric, fruits and vegetables

Introduction:

Lycopene, a carotenoid without provitamin-A activity, is present in many fruits and vegetables. It is a red, fat-soluble pigment. Jack fruit, tomatoes and tomato products, including ketchup, tomato juice, and pizza sauce, are the more bioavailable sources of lycopene. Jack fruit contains 2,227 mcg/g lycopene; tomato contains 31 mcg/g. Lycopene is also found in watermelon, papaya, pink grapefruit, and pink guava. Lycopene is more bioavailable in processed and cooked tomato products than in fresh tomatoes. At least 85% of our lycopene intake comes from the consumption of tomatoes and tomato products (Bramley 2000).

Lycopene absorption from dietary sources is influenced by several factors, such as the break up of the food matrix containing lycopene, cooking temperatures and the presence of lipids and other lipid soluble compounds including other carotenoids. Lycopene, is very sensitive to heat and oxidation and is insoluble in water. There is a considerable scientific interest in the role of lycopene in the prevention of several degenerative diseases. Considering this point present investigation was carried out to know availability of lycopene in raw fruits and vegetables which form a major part of our diet.

Objectives-

- To select rich sources of lycopene
- To estimate the lycopene from selected fruits and vegetables by calorimetry.

Limitations-

- Only five fruits and vegetables were selected i.e. pomegranate, papaya, tomato ,pumpkin and amaranth leaves
- Lycopene estimation was carried out only from raw form of fruits and vegetable

Materials and Methods:

Pomegranate, Papaya, Tomato, Pumpkin and Amaranth leaves were purchased from the local Market. The edible portion of fruits and vegetables was washed and rinsed with water several times and then each sample was cut into smaller pieces, homogenized to obtain a uniform single composite sample of the same type of fruits and vegetables. Acetone, Hexane and Ethanol of HPLC grade were purchased from local supplier.

Method:

Calorimetric determination of lycopene from fruits and vegetables by extraction with hexane, ethanol and acetone and absorbance measurement at 510 nm was used.

- Two parts hexane to one part acetone and one part ethanol (2:1:1) mixture was prepared.
- 100 µL sample of well homogenized fruit and vegetable juice was used in a 15 mL screw cap centrifuge tube.
- Several blank samples with 100 µL water were prepared.
- Added 8.0 ml of hexane : ethanol : acetone (2:1:1) mixture using a pipetter. Tube was immediately capped and vortexed then incubated in dark chamber.

- After 10 minutes, (or as long as several hours later) 1.0 ml water to each sample was added and vortexed again.
- 10 minutes waiting period was given to allow phases to separate and all air bubbles to disappear.
- Rinsed the cuvette with the upper layer from one of the blank samples.
- Discarded it, then used a fresh blank to zero the colorimeter at 510 nm. Then at 510 nm absorbance, upper layers of the lycopene samples were measured.

Lycopene levels in the hexane extracts were calculated by using following formula:

Lycopene (mg/g fresh wt.) = (A510 x 537 x 8 x 0.55)/(0.10 x 172)

= A510 x 137.4

where 537 g/mole is the molecular weight of lycopene, 8 ml is the volume of mixed solvent, 0.55 is the volume ratio of the upper layer to the mixed solvents, 0.10 g is the weight of juice of fruit and vegetable added.

Statistical Analysis: Data were expressed as mean values ± SE and were analyzed by one way ANOVA using Analyze-it software.

Results and Discussion:

The present study was based on the examination of rich source of lycopene at 10 min and 30 min time intervals. To examine the lycopene content from each fruit and vegetable, extraction in the form of juice from each fruit and vegetable was carried out with the help of juicer and juice was properly sieved for removing the residues of fruits and vegetables. With the help of this extraction and other solvents such as hexane, acetone, and ethanol further examination was carried out with the help of calorimeter at the wavelength of 510 nm.

Lycopene content of selected fruits and vegetables was measured calorimetrically at 510 nm after extraction with hexane solution. From the table at 10 min interval it is observed that highest lycopene content was found in tomato 24.27mg/kg whereas lowest lycopene content was observed in pomegranate i.e. just 3.89 mg/kg furthermore, lycopene content of tomato was followed by amaranth leaves which was found to be 22.66mg/kg. Fair amount of lycopene concentration was observed in papaya (15.45mg/kg) and pumpkin (8.01mg/kg).

For extraction of lycopene 30 minutes standing time was given to all samples viz. papaya, pomegranate, amaranth leaves, pumpkin and tomato. The same trend was observed regarding lycopene concentration as that was observed in 10 min time intervals. Highest lycopene content was found in tomato (31.14mg/kg), whereas, lowest lycopene content was observed in pomegranate (9.16mg/kg). Furthermore, lycopene content of tomato was followed by amaranth leaves which was found to be 27.13mg/kg . Fair amount of lycopene concentration was observed in papaya (20.04mg/kg) and pumpkin (23.58mg/kg).

As far as lycopene extraction at 10 min and 30 min intervals is concerned significant difference was noted between amaranth and tomato results (F=1275.60). After 30 min extraction difference between fruits and vegetables for lycopene content was found to be significant which can be attributed to lower value of lycopene in pomegranate (F=887.43).

In papaya almost 30% of lycopene concentration was increased after 30min. In pomegranate the concentration of lycopene was increased almost three times. Same trend was observed in pumpkin, whereas marginal increase was observed in amaranth leaves and tomatoes.

When one way ANOVA was performed it showed significant difference in all food contents at p value <0.0001.

Selected fruits and vegetables were compared and contrasted for lycopene concentration the results obtained at 10 min and 30 min intervals are depicted in Table III.

When papaya and pomegranate were compared for lycopene concentration a difference of 11.563 at 10 min and 10.875 at 30 min was observed. Highest difference in lycopene concentration was observed when amaranth leaves were compared against pumpkin (14.658 at 10 min and 3.550 at 30 min. when papaya compared with pumpkin the difference was found to be 7.445 at 10 min and -3.454 at 30 min. When papaya compared with tomato the difference was found to be -8.815 at 10 min and -11.105 at 30 min. When pomegranate compared with pumpkin the difference was found to be -4.118 at 10 min and -14.420 at 30 min. When pumpkin compared with tomato the difference was found to be -16.260 at 10 min and -7.560 at 30 min. When amaranth leaves compared with tomato the difference was found to be -1.603 at 10 min and -4.010 at 30 min. All the differences were found to be significant.

The differences were due to time intervals at which analysis was performed because in present study it is clear that 30 min intervals shows increased amount of lycopene than the 10 min intervals. Hence, it can be

stated that as longer as absorption takes place increased amount of lycopene will be observed.

Table 1 Lycopene concentration of selected Fruits and Vegetables at 10 min intervals

Sr. No.	Fruits/ Vegetable	Lycopene(mg/kg) at 10min interval (4-trials)				Mean±S.E.	S.D.	'F' value
1.	Papaya	15.57	18.11	16.03	15.11	15.45±0.22	0.440	1275.60
2.	Pomegranate	3.4	4.12	4.12	4.12	3.89±0.22	0.455	
3.	Amaranth Leaves	21.52	22.9	22.9	23.35	22.66±0.40	0.794	
4.	Pumpkin	7.78	8.24	8.24	7.78	8.01±0.13	0.266	
5.	Tomato	23.81	24.47	24.73	24.27	24.27±0.18	0.376	

Table 2- Lycopene concentration of selected Fruits and Vegetables at 30 min intervals

Sr. No.	Fruits/ Vegetable	Lycopene(mg/kg) at 30min interval (4-trials)				Mean±S.E.	S.D.	'F' value
1.	Papaya	18.77	20.15	20.61	20.61	20.04±0.43	0.871	887.43
2.	Pomegranate	8.7	8.7	9.62	9.62	9.16±0.26	0.531	
3.	Amaranth Leaves	25.56	27.02	27.47	27.47	27.13±0.21	0.435	
4.	Pumpkin	24.27	23.35	23.35	23.35	23.58±0.23	0.460	
5.	Tomato	30.68	31.14	31.14	31.6	31.14±0.18	0.376	

Table 3: Difference in Lycopene concentration of selected fruits and vegetables at 10 min and 30 min intervals

Sr. No.	Fruits and Vegetables	Difference in lycopene Concentration	
		At 10min	At 30min
1.	Papaya Vs. Pomegranate	11.563	10.875
2.	Papaya Vs. Pumpkin	7.445	-3.545
3.	Papaya Vs. Tomato	-8.815	-11.105
4.	Pomegranate Vs. Pumpkin	-4.118	-14.420
5.	Pomegranate Vs. Tomato	-20.378	-21.980
6.	Pumpkin Vs. Tomato	-16.260	-7.560
7.	Amaranth leaves Vs. Papaya	7.213	7.095
8.	Amaranth leaves Vs. Pomegranate	18.775	17.970
9.	Amaranth leaves Vs. Pumpkin	14.658	3.550
10.	Amaranth leaves Vs. Tomato	-1.603	-4.010

Conclusion:

After analysing the results, highest lycopene content was observed in tomato followed by amaranth leaves ,then in pumpkin and papaya and lowest amount observed in pomegranate.

It is clear from the studies conducted by researchers that lycopene plays important role in protection of many diseases , hence there is a further scope that instead of providing lycopene in form of medicines, inclusion of lycopene rich foods in the diet may results in the protection against diseases .

References:

Bramely Peter M.(2000): "Is Lycopene beneficial to human health". Phytochemistry 54 (2000) 233±236

www.wikipedia.org/wiki/lycopene