



EXTRACTION OF LYCOPENE FROM TOMATO PASTE

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Abstract:

Lycopene is a red pigment carotenoid which mainly found in variety of food. Lycopene is a natural phytochemical which gives red colour to fruits and vegetables. Lycopene has antioxidant with many associated health benefits. It is only obtained through diet. Human body is unable to synthesize it. Lycopene is non-polar and non-toxic in nature. Lycopene is an important component extracted from distinct plant mainly red coloured; it is explored with a focus on extraction methodologies. The various application of lycopene such as skincare product, cancer treatment of prostate and breast cancer and its role as a natural food colorant.

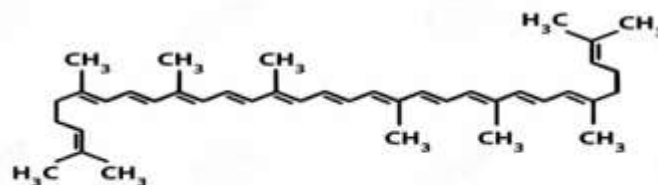
Lycopene is a carotenoid pigment and phytochemical found in tomatoes, water melon and other fruits mostly red coloured. Lycopene has deep red colour and non-toxic nature. Lycopene is a non-polar in nature. Since, lycopene is insoluble in water but soluble in organic solvent. Extracting lycopene from the natural source like tomato and water melon contain the highest amount of lycopene.

Keywords: Phytochemical, Antioxidant, Rotary Evaporator

Introduction:

Fruits and Vegetables are primary source of natural antioxidant. Antioxidant give strength against hazardous free radicals and minimize rate of cancer and heart disease. The most powerful carotenoid antioxidant is lycopene. Lycopene is one of the carotenoids that naturally founded in many fruits and vegetables. It is mainly found in Tomatoes and other red fruits and vegetables. Lycopene is a pigment principally accountable for the characteristic deep-red colour of ripe fruits and vegetables. In the synthesis of Vitamin-A lycopene plays an essential role as an intermediate and carotenoid like β -carotene and β -cryptoxent. Lycopene has antioxidant and anti-tumour quality. Regular intake of lycopene containing food diminishes the trouble of body tumour especially prostate cancer. It also reduces LDL (low density lipo-protein) cholesterol and cardiovascular disease. Like important amino acid, they are not synthesizing in the human body and thus, can only be obtained through diet or supplementation.

The chemical structure of lycopene is relatively simple, consisting of 40 carbon atoms and 56 hydrogen atoms. Its molecular formula is $C_{40}H_{56}$. Lycopene is a linear, open chain hydrocarbon with alternating single and double bonds, which gives it its attribute red colour.

Structure of Lycopene (C₄₀H₅₆)

Lycopene is a fat-soluble compound, so consuming it with a fat increases bio-availability which improves to absorb as it will release bile juice from gall bladder. Important concept related to lycopene that bio-availability of lycopene is affected by the processing the food in which it comes from. Tomatoes are the great source of lycopene, by processing the tomatoes into paste it allows the access of lycopene within the tomatoes. So, by increasing the bio-availability of lycopene, it will help to enhance the ability to absorb the lycopene.

Dietary sources of lycopene are which are red and orange coloured fruits and vegetables in nature. Sources of lycopene are Tomatoes, Gaji barriers, Grapefruit, Watermelon, Papaya, Guava, Pumpkin, Carrot. Tomato contains 2-5% lycopene which is abundant amount among the naturally found fruits and vegetables.

Percentage content of Lycopene with their sources

Lycopene Source	Lycopene %
Tomatoes (raw)	0.5-0.8
Tomato sauce	1-2
Tomato paste	2-5
Watermelon	0.1-0.3
Guava	0.05-0.15
Pink Grapefruit	0.1-0.3
Papaya	0.01-0.03

Lycopene has so many health benefits in which one of the majors is, it is antioxidant carotenoid. Antioxidant property supports cardiovascular health in which it protects cell from free radicals and helps to limit the oxidation of LDL (low density lipo-protein) cholesterol. Lycopene is also helps to minimize the risk of prostate enlargement. Consumption of lycopene appears to prevent disease progression of prostate cancer. Higher consumption and supplementing of lycopene are associated with a lower of prostate cancer. It may reduce threat of lung cancer. It has cardio-protective effect. It is anti-diabetic, anti-inflammatory.

Materials and Methods:

Materials:



Fig 1. Chemicals shown above

1. Methanol
2. Carbon tetrachloride
3. Tomato Paste

Method:

Extraction of Lycopene by Using Liquid-Liquid Extraction Method

1. Initial Dehydration:

20 ml of methanol is added to 100 gm of tomato paste to initiate the extraction process. Vigorous shaking prevents the formation of lumps. This mixture is allowed to settle for two hours.

2. Filtration:

After two hours, the thick suspension is filtered, resulting in a dark red cake.

3. Second Extraction:

The dark red cake is shaken for an additional 15 minutes with a mixture of 10 ml of a 1:1 ratio of methanol and carbon tetrachloride. The mixture is then filtered again.



Fig.2 Second Extraction

4. Phase Separation:

Two phase are formed which is raffinate and extract phase. Raffinate phase contain mixture of methanol and water. Extract phase contain mixture of lycopene and carbon tetrachloride.

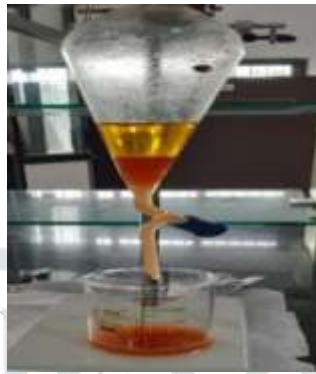


Fig.3 Phase Separation

5. Evaporation:

After phase separation, the mixture of lycopene and carbon tetrachloride is obtained which is separated by evaporation method by using rotary evaporator.



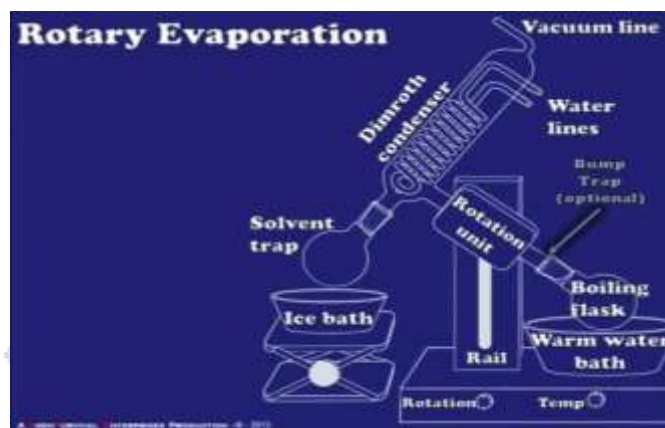
Fig.4 Mixture of methanol and carbon tetrachloride

6. Separation of lycopene from CCl₄

By using rotary evaporator, we obtain the final product Lycopene in the powder form.



Fig.5 Lycopene powder

Method:- Separation of Lycopene from CCl_4 **1) ROTARY EVAPORATOR****Fig.6 Rotary Evaporator****❖ Set Up the Rotary Evaporator:****1. Apply Vacuum:**

About 10-inch HG vacuum temperature decreases.

2. Apply Heat:

Set the water or oil bath to a temperature below the boiling point of CCl_4 (76.73 °C).

3. Monitor the Process:

RPM should be In between 20-30. As RPM increases the rate of evaporation increases only up to 40 RPM after that, rate of evaporation decreases.

4. Collect the Residue:

Once majority of the solvent has evaporated, you should be left with a concentrated product in the flask containing lycopene.

**Fig .7 Set-up of Rotary Evaporator**

Result and Conclusion:

This extraction method successfully isolates lycopene from tomato paste using a combination of methanol, carbon tetrachloride as solvents. Lycopene used for various applications in the food, pharmaceutical or cosmetic industries.

By using extraction method, we obtained 0.41 gm lycopene from 2 kg tomato paste.

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