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Comparative Study of Dragon Fruit Seed Oil with Other Edible Seed Oils

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Abstract:- Varieties of edible oil are known and consumed around the globe. Among these many have lots of health benefits but on the other hand are somewhat harmful too. Can one imagine the Dragon fruit seed oil? Yes, in this study we will study, extract and evaluate Dragon fruit seed oil. In this fast growing world where our lives our step away from haunting and deadly diseases, we need options to sustain healthy living. This oil can be one of the options and can become the best alternative to the other oils present in the market. In this paper we will compare Dragon seed oil with other edible oils and study their composition; so that we can find out how this Dragon fruit seed oil can be beneficial. Here, we compared myristic acid, palmitic acid, cis-vaccenic acid, stearic acid, palmitoic acid, oleic acid, linolenic acid, linoleic acid of various edible oils with respect to Dragon fruit seed oil and found the total Tocopherol content in our extracted oil.

Keywords:- *Dragon Fruit, MUFAs, PUFAs, Tocopherols.*

I. INRTRODUCTION

Dragon fruit was recently introduced in India as super fruit is an exotic tropical plant that has multiple benefits for human health and is considered to be a promising, remunerative fruit crop. This fruit is of very vibrant and attractive colour and mellow melting pulp with black colour edible seeds embedded in the pulp. Dragon fruit has very high nutritive content due to which it's market demand has increased, this attract the cultivators from different part of India to cultivate this fruit crop which originally originated from Mexico and Central and South America [1,2,3]. It has great adaptability and tolerance to a wide range of environmental conditions such as salinity adaptation, drought resistance, and favours light intensity. It is a long day plant having beautiful night blooming flowers and is also known as Night Blooming Cereus, Conderella, Belle of the night, Jesus in the cradle, Pithaya. The main advantage of this fruit crop is that; once planted it will grow for approximately 20 years and a hectare area can enough to produce around 800 Dragon fruit plant. The plant produces fruit in the 2nd year after it's plantation and attains full production within five years [4].

A. Tocopherols

Tocopherols are the major forms of vitamin E; a group of fat soluble phenolic compounds. Each tocopherol is made of chromanol ring along with 16-carbon phytyl chain [5]. The major dietary sources of tocopherols are edible oils. Tocopherols have been suggested to reduce/decrease the risk of cancer [6]**.** It is reported in several studies that a lower vitamin E nutritional status is associated with an increased risk of certain cancers [7,8]**.** α-Tocopherol is considered as classic source of vitamin E as it is the major form of tocopherols found in blood and tissues [9]**.** High amount of tocopherol content was determined in the oil having highest percentage of α -tocopherol (71.9%).

B. Fatty Acids

Acids that combines with glycerol in naturally occurring fats are called fatty acids. These acids are made up of even number of carbon atoms linked together to form long chains, generally un-branched. Moreover, fatty acids are carboxylic acids attached to the alkyl chains.

Fatty acids are sources of energy and are also membrane constituents. They have several role in biological activities as they influence cell and tissue metabolism, function, and responsiveness to hormonal and other signals. Fatty acids can be divided into following categories: saturated, monounsaturated and polyunsaturated.

- *Saturated Fatty Acids*

Saturated fatty acids (SFAs) are the fatty acids having no double bonds between the carbon atoms. Saturated fatty acids in common dietary include stearic acid, palmitic acid, myristic acid.

- *Monosaturated Fatty Acids*

Monounsaturated fatty acids are unsaturated fatty acid containing single double bond. Monounsaturated fatty acids (MUFA) include palmitic acid, oleic acid and vacentic acids.

- *Polyunsaturated Fatty Acids*

Fatty acids containing more than one double bond (C=C) are termed as polyunsaturated fatty acids. Dietary intake of some PUFAs can have beneficial effects on blood pressure, inflammation and serum lipids. PUFAs includes linolenic acid and linoleic acid.

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Fig. 1. Picture of fresh Dragon fruit.

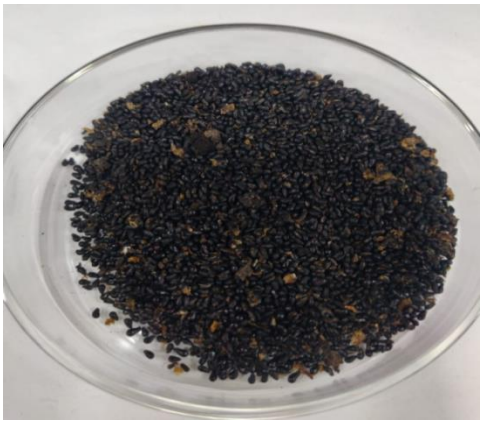


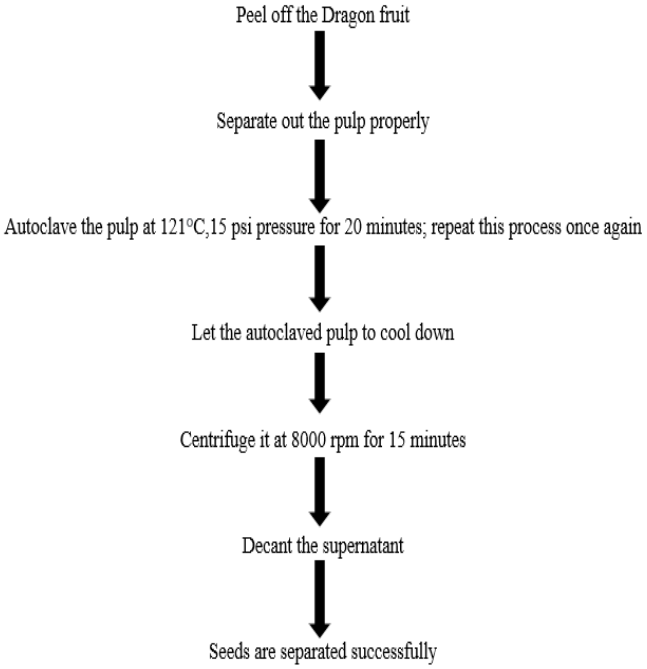
Fig. 2. Seeds isolated from dragon fruit pulp.

II. MATERIALS AND METHOD

A. Sample Preparations:

The fresh Dragon fruit is washed using normal tap water properly after which the outer skin of the fruit was peeled off and the pulp was autoclaved. We had to wait until the autoclaved pulp cooled down to continue the further process by centrifuging it. Followed by centrifugation the supernatant was decanted and the seeds were separated.

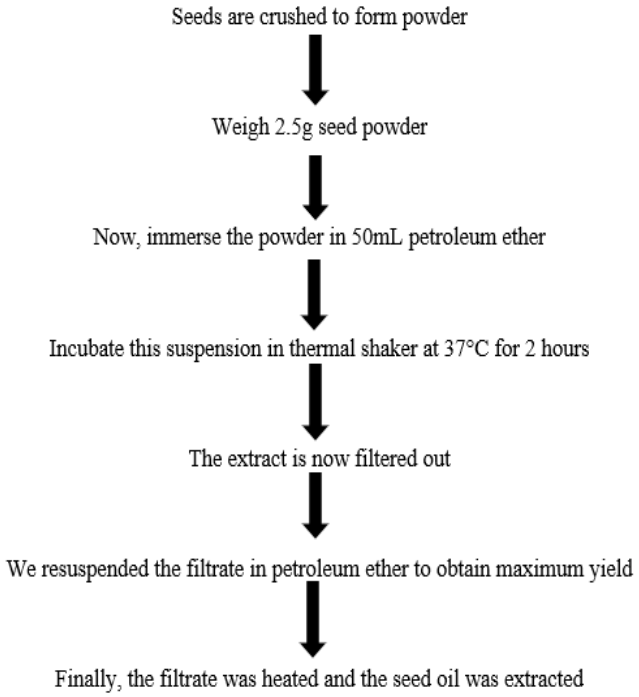
The detailed procedure of sample preparation is as follows:



B. Extraction

Now, as the sample (seeds) is obtained the extraction process starts. In this extraction process the seeds are crushed down in order to obtain powder, this powder is then soaked/mixed in petroleum ether so that oil can be separated from the seed powder. The extract is then filtered and is subjected to heat so that petroleum ether evaporates, leaving behind the oil extract.

The process of extraction is mentioned in the flowchart below:



C. Tocopherol Estimation

High Performance Liquid Chromatography (HPLC) was performed to determine the amount of tocopherol present in the sample. Procedure used for estimation of tocopherol content is referred from [10] having 0.06 L/hour flow rate in which the solvent used was prepared using hexane and dioxane.

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III. OBSERVATION

After the analysis we estimated the content of polyunsaturated fatty acids i.e., 51.08%. This value was appreciably higher than many other edible oils. Whereas the tocopherol content in white-fleshed dragon fruit seed oil was estimated around 407.26 mg/Kg which is very high as compared to olive oil having tocopherol range between 160-378 mg/Kg. We also compared Dragon fruit seed oil with other edible oils such as Soyabean oil, Sunflower oil, Rice bran oil, Olive oil, Groundnut oil, Mustard oil, and Sesame oil.

The extracted white dragon fruit oil had 0.3 mg/Kg Myristic acid, 17.1 mg/Kg Palmitic acid and 4.37 mg/Kg Stearic acid which formed total saturated fatty acid content of 21.77mg/Kg, that is more than most of the edible oils but less than mustard oil (27 mg/Kg).

Palmitoleic acid was found to be 0.61 mg/Kg and Oleic acid around 23.8 mg/Kg in the white dragon fruit oil that made total monosaturated fatty acid content of 27.22 mg/Kg, which is more than Soyabean (23 mg/Kg) and Mustard oil (18 mg/Kg) but less than other edible oils.

Linolenic acid was found to be 0.98 mg/Kg and Linoleic acid to be 50.1 mg/Kg which constituted total polyunsaturated fatty acid content of 51.08mg/Kg, which is more than Rice bran oil (36.6 mg/Kg), Olive oil (35.21 mg/Kg), Groundnut oil (33.4 mg/Kg) and Sesame oil (41 mg/Kg) but is slightly less than Soyabean oil (57.4 mg/Kg), Sunflower oil (59 mg/Kg), and Mustard oil (55 mg/Kg).

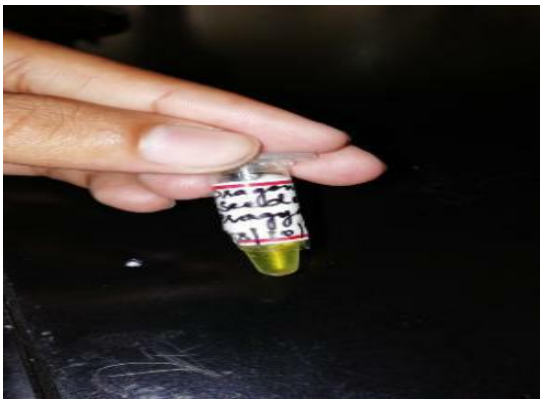

Fig. 3. Picture depicting extracted Dragon fruit seed oil.

Table 1: Comparision of Fatty Acids Content of Dragon Fruit Seed Oil with Other Edible Oils (In Mg/Kg).

Composition	**Dragon Fruit Oil**	**Soyabean Oil**	**Sunflower Oil**	**Rice Bran Oil**	**Olive Oil**	**Groundnut Oil**	**Mustard Oil**	**Sese-me Oil**
Myristic Acid	0.32	-	-	0.61	-	-	-	-
Palmitic Acid	17.2	9	5.0	21.3	7.5-19	9.7	26	19.8
Stearic Acid	4.39	3.9	6.1	2.7	0.4-5.1	-	2.1	5.2
Total Saturated Content	21.91	12.9	11.1	24.61	7.9-24.1	9.7	28.1	25
Palmitoic Acid	0.62	-	-	-	-	-	0.42	-
Oleic Acid	23.6	23.1	30.3	38.6	54.5-82	46.5	17.3	38.5
Cis-Vaccenic Acid	2.83	-	-	-	-	-	-	-
Total Monosaturated Content	27.05	23.1	30.3	38.6	54-82	46.5	17.3	38.5
Linolenic Acid	0.97	7-10.2	-	2.5	-	-	0.35	-
Linoleic Acid	50.4	52	59.2	34.3	3.5-19.8	33	54.9	41.7
Total Polyunsaturated Content	51.37	59-62.2	59.2	36.8	3.5-19.8	33	55.25	41.7

Whereas, the total tocopherol content of white Dragon fruit seed oil resulted 407.26 mg/Kg, having 292.94 mg/Kg was alpha-tocopherol content; 75.62 mg/Kg was gamma-tocopherol and 38.7 mg/Kg delta-tocopherol.

Table 2: Tocopherol Content of White Dragon Fruit Seed Oil (In Mg/Kg)

TOCOPHEROLS	**CONTENT IN DRAGON FRUIT SEED OIL**
Alpha-tocopherol	292.94
Gamma-tocopherol	75.62
Delta-tocopherol	38.7
Total Tocopherol	407.26

IV. RESULT

With 2.5g Dragon fruit seeds we extracted 2 mL of oil. The analysis (separation and quantification) of different fatty acids of categories including saturated, monosaturated, polyunsaturated in various edible oils was done. Along with these we also estimated tocopherol(s) content like alpha, gamma and delta with the help of HPLC technique.

V. CONCLUSION

In this research, we successfully extracted oil from Dragon fruit seed and different types of fatty acids present in the oil were compared quantitatively with other edible oils such as Soyabean oil, Sunflower oil, Rice bran oil, Olive oil, Groundnut oil, Mustard oil, and Sesame oil. The total tocopherol content was also estimated in this paper. Now, as we know the capacity of different fatty acids present in white pitaya oil, but still we have to work for more information in quantitative assessment of these acids in future so that we can maintain the content of these fatty acids to control depletion when the oil gets refined. Also, on how we can reduce the amount of fatty acids to avoid excess intake of harmful fatty acids present in white pitaya oil to make the consumption of this oil healthy. Moreover, to make this oil pocket friendly we have to increase the rate of fruit production and work to minimise it's manufacturing cost. This oil can be used as an alternative to saturated fats that are being used, to benefit our health and reduce the risk of heart diseases. The tocopherol content and the composition of fatty acids having almost half of the linoleic acid composition gives us the liberty to shift our focus towards the dragon fruit oil as potent edible oil.

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CONFLICT OF INTRESTS

Authors declare that they do not have any conflict of interest.

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