"DRAGON FRUIT SEED OIL: A NEW CONTENDER IN THE WORLD OF SKIN OILS"

*Dr. G. Ushakiran *, M. Naga Nandini[1], N. Swathi[1], Sd. Afreen[1], U. Veda Sai manogna[1] ,Y. Sri pujitha[1]*

* Corresponding author, Professor, NRI College of pharmacy, Pothavarappadu-521212.

1 IV B.Pharmacy students, NRI college of pharmacy, Pothavarappadu-521212.

Corresponding author:

Dr.G.Usha kiran

ABSTRACT

Dragon seed oil is a natural source of bioactive compounds that promote skin health through hydration, protection, and repair. Rich in essential fatty acids such as linoleic acid (25–35%) and oleic acid (15–20%), the oil enhances skin barrier function and retains moisture. Tocopherols (vitamin E), flavonoids, and carotenoids provide antioxidant and anti-inflammatory effects, reducing oxidative stress and preventing skin aging. Additionally, phytosterols, squalene, and amino acids aid in skin repair, soothing inflammation, and supporting collagen synthesis. These properties establish dragon seed oil as an effective and natural solution for maintaining healthy, radiant skin.

Keywords

Dragon seed oil, skin hydration, antioxidants, fatty acids, vitamin E, skin repair, collagen synthesis, natural skincare, bioactive compounds, skin barrier function.

INTRODUCTION

Dragon Fruit (*Hylocereus undatus*), commonly known as pitaya, is a medicinal plant belonging to the family Cactaceae. It is widespread in two genera, *Hylocereus* and *Selenicereus*. The most

frequently cultivated varieties belong to the genus *Hylocereus*, including three main variants: *Hylocereus undatus* (red skin with white pulp), *Hylocereus monacanthus* (formerly *Hylocereus polyrhizus*, red skin with red pulp), and *Hylocereus megalanthus* (previously *Selenicereus megalanthus*, yellow skin with white pulp). Among these, red pitaya and yellow pitaya are the most produced and consumed. The succulent pulp of dragon fruit is filled with small seeds (~3 mm in diameter) and is rich in water, minerals, antioxidants, and low calories, making it increasingly popular. It thrives in regions up to 1700 meters above sea level, requiring 500–1500 mm of annual rainfall. Its adaptation to high temperatures and minimal water requirements positions it as a promising crop for Mediterranean climates [1].

Dragon fruit originated in the tropical and subtropical forests of Mexico, Central America, and northern South America, spreading through human and avian activity during pre-Columbian times. The Spanish introduced it to the Philippines in the 16th century, and it reached Indo-China in the mid-19th century via French influence. It subsequently adapted to Southeast Asia and became significant in tropical and subtropical agriculture. Today, Vietnam is the leading global cultivator, while India also grows dragon fruit in states like Maharashtra, Karnataka, Gujarat, and West Bengal. [2] The plant features sprawling, branching stems capable of producing multiple fruits per segment, each measuring 10–12 cm in diameter. It can be propagated sexually through seeds, which take longer to mature, or asexually via cuttings, a faster and more efficient method. Cuttings of 15–30 cm length with inclined cuts are recommended for successful planting.[3]

Dragon fruit is valued for its nutritional and medicinal properties. Rich in vitamins (B1, B2, B3, and C), betacyanin, phyto-albumin, and fiber, it offers multiple health benefits, including improving digestion, regulating blood sugar levels, and neutralizing toxins.[4] The seeds are a source of polyunsaturated fatty acids, particularly omega-3 and omega-6, which lower triglycerides and reduce cardiovascular risk. The peel, rich in flavonoids and betalains, serves as a natural coloring and thickening agent and exhibits antibacterial and anti-inflammatory properties.[5]

Dragon fruit is also recognized for its ornamental appeal, with its large, night-blooming flowers and strikingly vibrant fruit. Although the plant can produce fruit for up to 20 years, it requires careful attention during cultivation, harvesting, storage, processing, and transportation to ensure quality. Its combination of nutritional value, adaptability, and aesthetic appeal makes it a fruit with immense potential for global agriculture and industry.[6]

NUTRITIONAL COMPOSITION:

- **White-flesh dragon fruit (per 100 g)**: Moisture (85.3%), protein (1.1 g), fat (0.57 g), crude fiber (1.34 g), energy (67.7 Kcal), ash (0.56 g), carbohydrates (11.2 g), glucose (5.7 g), fructose (3.2 g), vitamin C (3 mg), vitamin A (0.01 mg), niacin (2.8 mg), calcium (10.2 mg), iron (3.37 mg), magnesium (38.9 mg), phosphorus (27.75 mg), potassium (272 mg), sodium (8.9 mg), zinc (0.35 mg).
- **Red-flesh dragon fruit**: Moisture (82.5-83.0%), protein (0.159-0.229 g), fat (0.21-0.61 g), crude fiber (0.7-0.9 g), ascorbic acid (8-9 mg).[7]

DRAGON SEED OIL :

The dragon fruit is made up of small, black seeds that are encased in white or pink flesh . Among the fatty acids present in the seeds are Linolenic acid, Linoleic acid, Palmitoleic acid, Cis-vaccenic acid, Stearic acid, Oleic acid, Myristic acid, and Palmitic acid. The oil extract of these seeds was high in 50% of the necessary fatty acid's linoleic acid and linolenic acid, which are needed for human metabolism and cannot be produced by the body from other food components. The flesh of dragon fruit is also rich in polysaccharides and mixed oligosaccharides, which have been proven to encourage the growth of Lactobacilli and Bifidobacteria. Bifidobacteria and lactobacilli, which are gram-positive lactic acid-producing bacteria, make up a sizable portion of the microflora in the human intestinal tract. This gastrointestinal microflora, known as probiotics, aids in preventing the growth of gastrointestinal infections.[8]

CHEMICAL COMPOSITION OF DRAGON SEED OIL :

1. **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 . The major dietary sources of tocopherols are edible oils. Tocopherols have been suggested to reduce/decrease the risk of cancer [9]. It is reported in several studies that a lower vitamin E nutritional status is associated with an increased risk of certain cancers . α-Tocopherol is considered as classic source of vitamin E as it is the major form of tocopherols found in blood and tissues . High amount of tocopherol content was determined in the oil having highest percentage of α -tocopherol (71.9%).
2. **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

a) **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.

b) **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.

c) **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.[1]

APPLICATIONS :

- **Skincare**: Dragon fruit oil is rich in antioxidants and essential fatty acids, making it an excellent ingredient for creams, moisturizers, and serums. It helps to hydrate the skin, reduce inflammation, and protect against environmental damage.
- **Haircare**: The oil strengthens, repairs, and protects hair from environmental and cosmetic damage. It can be used in hair masks, conditioners, and serums to promote healthy, shiny hair.
- **Anti-Aging**: High in vitamin C, dragon fruit oil aids in collagen production, which helps to maintain skin elasticity and reduce the appearance of fine lines and wrinkles.
- **Moisturization**: The oil's rich nutrient profile helps to seal in moisture, making it ideal for treating dry and flaky skin.
- **Aromatherapy**: With its pleasant fragrance, dragon fruit oil is also used in aromatherapy to promote relaxation and reduce stress
- Dragon seed oil (DSO) is effective against skin dryness, wrinkles, sagging, and aging signs due to its oleaginous constituents.
- Cosmetics containing DSO may help treat eczema, psoriasis, and nourish collagen.
- DSO contains unsaturated fatty acids, phenolics, tocopherols, and terpenes, but there is no scientific evidence of their use in dietary products.

PHYTOCHEMICAL SCREENING OF OILS :

1. **TOCOPHEROLS (VITAMIN E) :**

Test Name: Nitric acid Test

Chemicals used: Nitric acid (HNO3) solution

Procedure:

1. Take 1-2 mL of the hair oil sample using a micropipette or graduated cylinder.
2. Take 1-2 mL of nitric acid (HNO_3) in a separate container. You can adjust the volume slightly based on the reaction intensity you observe.
3. Mix the Solutions:
4. In a clean test tube or small container, mix the 1-2 mL of hair oil with 1-2 mL of the nitric acid solution. Swirl the mixture gently to ensure the two substances combine evenly.
5. Observe the Color Change

Observation :

- Yellow or Orange color: This indicates the presence of Vitamin E in the hair oil.
- No color change: Vitamin E is absent or not detectable at the concentrations used in the test.

2. **FATTY ACIDS (UNSATURATED) :**

Test Name: Bromine Water Test

Chemicals: Bromine water

Procedure:

- Take approximately 1-2 grams of dragon seed oil in a clean test tube or small glass beaker.
  Using a dropper or pipette, add a few drops (about 2-3 drops) of bromine water to the oil sample. Bromine water is typically red or brown in color due to the presence of dissolved bromine.
- Gently shake the test tube or beaker to ensure the bromine water mixes well with the oil. Allow the mixture to stand for a minute to observe any changes.
- Carefully observe the color of the mixture after shaking. The bromine water will react with the double bonds in unsaturated fatty acids, causing a color change.
- **Observation:**
  The bromine water decolorizes if unsaturated fatty acids like oleic and linoleic acids are present.

3. **FLAVONOIDS :**

Test Name: Alkaline Reagent Test

Chemicals: 10% Sodium Hydroxide, Dilute Hydrochloric Acid

Procedure:

- Take approximately 1-2 grams of dragon seed oil and dissolve it in a small amount of ethanol or another suitable solvent to create an oil extract. Transfer this oil extract into a clean test tube or beaker.
- Add a few drops (about 3-5 drops) of 10% sodium hydroxide solution to the oil extract. Swirl or stir gently to mix the solution.
- Observe the color of the mixture after adding sodium hydroxide. Flavonoids, such as quercetin or gallic acid, will react with sodium hydroxide to produce a color change (usually yellow).
- After observing the initial color change, slowly add dilute hydrochloric acid drop by drop to the mixture. Swirl or stir gently to ensure proper mixing.
- Continue observing the color change after the addition of hydrochloric acid. A yellow color that disappears upon the addition of the acid confirms the presence of flavonoids.

Observation:

A yellow color that disappears upon adding hydrochloric acid confirms the presence of flavonoids.

4. **MINERALS :**

Test Name: Ash Test

Chemicals: Dilute Hydrochloric Acid, Ammonium Hydroxide

Procedure:

- Take a small amount of dragon seed oil (about 1-2 grams) and place it into a clean, dry crucible.
- Heat the crucible gently using a Bunsen burner or a suitable heat source. Continue heating until all the oil is completely burnt, leaving behind only the ash. Make sure the oil is fully combusted to avoid any residue.
- Once the oil has burned completely and only ash remains, remove the crucible from the heat and allow it to cool. Once cooled, carefully add a few drops of dilute hydrochloric

acid (HCl) to the ash. The acid will dissolve the minerals in the ash, forming a clear solution.

- To the solution of dissolved ash, add a few drops of ammonium hydroxide (NH_4OH). Swirl gently to mix.
- Observe any changes in the solution. The addition of ammonium hydroxide will cause the formation of a precipitate if certain minerals (like calcium, magnesium, or potassium) are present in the ash.

Observation:

A precipitate indicates the presence of minerals like calcium and magnesium.

5. **PHYTOSTEROLS :**

Test Name: Liebermann-Burchard Test

Chemicals: Chloroform, Acetic Anhydride, Concentrated Sulfuric Acid

Procedure:

- Take approximately 1-2 grams of dragon seed oil and dissolve it in about 2-3 mL of chloroform. The chloroform will dissolve the oil and provide a clear solution for the test.
- Using a pipette, add 2-3 drops of acetic anhydride to the chloroform-oil mixture. Acetic anhydride helps in the acetylation of the phytosterols (such as stigmasterol), enhancing their reaction with sulfuric acid.
- Slowly and carefully add a few drops of concentrated sulfuric acid along the side of the test tube, allowing it to form a separate layer at the bottom of the tube. This must be done cautiously, as concentrated sulfuric acid is highly corrosive and reacts violently if not handled properly.
- Allow the mixture to stand undisturbed for a few minutes. The sulfuric acid will react with the phytosterols, producing a color change at the interface between the acid and the chloroform layer

Observation:

A bluish-green color confirms the presence of phytosterols like stigmasterol.

6. HYDROCARBONS :

Test Name: Spot Test

Chemicals: None

Procedure:

- Take a small amount of dragon seed oil, approximately 1-2 drops, and place it onto a clean piece of filter paper or absorbent paper. Ensure that the drop is placed in the center of the paper to avoid spreading.
- Leave the filter paper in a well-ventilated area or under ambient temperature to dry. The oil will evaporate, leaving behind a faint residue.
- Once the oil has dried, observe the remaining spot on the filter paper.

Observation:

A translucent spot that remains indicates the presence of hydrocarbons like squalene.

7. TERPENOIDS :

Test Name: Salkowski Test

Chemicals: Chloroform, Concentrated Sulfuric Acid

Procedure:

- Take approximately 1-2 grams of dragon seed oil and dissolve it in about 2-3 mL of chloroform. Chloroform will dissolve the oil and make it easy to detect the presence of terpenoids.
- Carefully add a few drops (about 2-3 drops) of concentrated sulfuric acid along the side of the test tube. This should form a distinct layer at the bottom of the chloroform-oil solution. Be sure to add the acid slowly to avoid mixing it directly with the oil-chloroform layer.
- After adding the sulfuric acid, let the mixture stand undisturbed for a minute or two. Observe any color changes at the interface between the sulfuric acid and chloroform-oil layers.

Observation:

A reddish-brown interface forms, confirming the presence of terpenoids such as limonene.

8. **GLYCOSIDES :**

Test Name: Foam Test

Chemicals: Distilled Water

Procedure:

- Take approximately 1-2 grams of dragon seed oil and place it into a clean test tube.
- Add about 5-10 mL of distilled water to the test tube containing the oil.
- Vigorously shake the test tube to mix the oil and water. Continue shaking for 1-2 minutes to ensure thorough mixing.
- After shaking, allow the mixture to settle and observe the resulting formation.

Observation: The formation of stable froth indicates the presence of saponins.

Foam Test for dragon seed oil

9. **PROTEINS & AMINO ACIDS :**

Test Name: Ninhydrin Test

Chemicals: Ninhydrin Reagent

Procedure:

- Take approximately 1-2 grams of dragon seed oil and dissolve it in a small amount of ethanol or any other suitable solvent to create an oil extract. Transfer this extract into a clean test tube.
- Using a dropper, add 2-3 drops of ninhydrin reagent to the oil extract in the test tube. The ninhydrin reagent is commonly used to detect the presence of amino acids and proteins.
- Gently heat the test tube by placing it in a water bath or using a Bunsen burner. Be careful not to overheat the sample to avoid damaging the components. Heat for 2-3 minutes.
- After heating, observe any color changes in the solution. A color change indicates the presence of amino acids or proteins.

Observation:

A violet or purple color appears, indicating the presence of amino acids like arginine.

10. BIOACTIVE PIGMENTS (ANTHOCYANINS) :

Test Name: Acid Reaction Test

Chemicals: Dilute Sulfuric Acid

Procedure:

Add a few drops of dilute sulfuric acid to the oil.

Observation:

A red or pink color indicates the presence of anthocyanins.

BIOACTIVE PIGMENTS (CAROTENOIDS) :

Test Name: Petroleum Ether Test

Chemicals: Petroleum Ether

Procedure:

Mix the oil with petroleum ether and observe the solution.

Observation:

A yellow to orange color confirms the presence of carotenoids

OBSERVATION :

S.NO	CHEMICAL CONSTITUENTS	DRAGONFRUIT SEED OIL
1	**VITAMINS**	
	TOCOPHEROLS (VITAMIN E)	0.5–1.5%
2	**FATTY ACIDS**	
	OLEIC ACID	15-20%
	PALMITIC ACID	10-15%
	LINOLEIC ACID	25–35%
	STEARIC ACID	2–5%
3	**FLAVANOIDS**	
	QUERCETIN	0.1-0.5%
	GALLIC ACID	0.1-0.3%
4	**MINERALS**	0.02-0.03%
5	**PHYTOSTEROLS**	
	STIGMASTEROL	0.2-0.5%
6.	**HYDROCARBONS**	
	SQUALENE	0.1–0.5%
7.	**TERPENOIDS**	
	LIMONENE	0.1–0.3%
8.	**GLYCOSIDES**	
	SAPONINS	0.1–0.2%
9.	**PROTEINS & AMINO ACIDS**	
	ARGININE	0.2–0.5%
10	**BIOACTIVE PIGMENTS**	
	ANTHOCYANINS	0.1–0.5%
	CAROTENOIDS	0.5–2%

RESULTS AND DISCUSSION :

The chemical analysis of dragon seed oil revealed a diverse composition of bioactive constituents that significantly contribute to skin health. Among these, tocopherols (vitamin E) (0.5–1.5%) are potent antioxidants that protect the skin from oxidative damage, improving elasticity and reducing signs of aging. The high content of linoleic acid (25–35%) and oleic acid (15–20%) provides excellent moisturization, enhances the skin barrier, and soothes inflammation, making it beneficial for both dry and sensitive skin types. Other fatty acids, such as palmitic acid (10–15%) and stearic acid (2–5%), contribute to the oil's emollient properties, softening and conditioning the skin. Phytosterols like stigmasterol (0.2–0.5%) promote skin repair and reduce inflammation, while squalene (0.1–0.5%), a hydrocarbon, mimics the skin's natural sebum, ensuring hydration and protecting against environmental damage The presence of flavonoids, including quercetin (0.1–0.5%) and gallic acid (0.1–0.3%), offers additional antioxidant and anti-inflammatory effects, helping to calm irritated skin and reduce redness. Bioactive pigments such as carotenoids (0.5–2%) and anthocyanins (0.1–0.5%) provide protection against UV-induced damage and enhance skin radiance. Proteins and amino acids like arginine (0.2–0.5%) support collagen synthesis and wound healing, contributing to overall skin rejuvenation.The presence of terpenoids like limonene (0.1–0.3%) and glycosides such as saponins (0.1–0.2%) further enhances the oil’s ability to soothe and cleanse the skin. Additionally, trace amounts of minerals (0.02–0.03%) contribute to maintaining skin health and resilience.

Dragon seed oil is a powerhouse of skin-nourishing components. Its balanced fatty acid profile, combined with antioxidants, phytosterols, and bioactive pigments, makes it an excellent candidate for skincare formulations. It effectively promotes hydration, protects against oxidative stress, supports skin repair, and enhances overall skin health.

CONCLUSION :

In conclusion, dragon seed oil is a potent natural product with a unique composition that makes it highly beneficial for promoting skin health. Its high levels of linoleic acid and oleic acid ensure excellent hydration and barrier repair, while tocopherols (vitamin E) and flavonoids provide robust antioxidant and anti-inflammatory properties. Additional components like phytosterols, squalene, carotenoids, and amino acids contribute to skin repair, UV protection, and

rejuvenation. These attributes make dragon seed oil an ideal ingredient for skincare formulations aimed at moisturizing, protecting, and enhancing skin vitality. Its natural origin and bioactive properties further highlight its potential as a safer and healthier alternative to conventional skincare products.

REFERENCES :

1. Bhadauria, S., Mansi, T. C., & Chaurasia, S. (2024). Exploring the therapeutic potential of dragon fruit: An insightful review. *International Journal of Pharmacognosy*, *11*(6), 222-234
2. Nerd A, Sitrit Y, Kaushik RA and Mizrahi Y: High summer temperatures inhibit flowering in vine pitaya crops (*Hylocereus* spp.). Sci Hortic 2002; 96 (1–4): 343–350.
3. Mori CV, Patel AR, Parmar VK and Patel GS: Dragon Fruit (Kamalam): An Excellent Exotic Fruit Crop of India 2023.
4. Safira A, Savitri SL and Putri ARB: Hamonangan- Google Scholar. https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=Safira%2C+A.%3B+Savitri%2C+S.L.%3B+Putri%2C+A.R.B.%3B+Hamonangan%2C+J.M.%3B+Safinda%2C+B.%3B+Solikhah%2C+T.I.%3B+Khairullah%2C+A.R.%3B+Puspitarani%2C+G.A.+Review+on+the+pharmacological+and+health+aspects+of+Hylocereus+or+Pitaya%3A+An+update.+J.+Drug+Deliv.+Ther.+2021%2C+11%2C+297%E2%80%93303.+%5B&btnG= (accessed 2024-02-24).
5. Hapsari A and Pujiastutik YE: The Potential effect of red dragon fruit (*Hylocereus polyrhizus*) peel ethanol extract on endometriosis progressivity in endometriosis mice. jurnal kedokteran hewan-indonesian. Journal of Veterinary Sciences 2018; 12(2).
6. Kumar SB, Issac R and Prabha ML: Functional and health-promoting bioactivities of dragon fruit. Drug Invention Today 2018; 10.
7. Perween, T., Mandal, K. K., & Hasan, M. A. (2018). Dragon fruit: An exotic super future fruit of India. *Journal of Pharmacognosy and Phytochemistry*, *7*(2), 1022-1026.
8. Ariffin A. Essential fatty acids of pitaya (dragon fruit) seed oil. Food Chem2008.09.108. 2009;114(2):561-4. doi: 10.1016/j.
9. Mahabir S, Schendel K, Dong YQ, Barrera SL, et al. Dietary α-, β-, γ-and δ-tocopherols in lung cancer risk. Int J Cancer. 2008;123:1173–1180
10. Comparative Study of Dragon Fruit Seed Oil with Other Edible Seed Oils Dr. Pragya Rathore, Porshia Sharma, Sarvesh Seth & Lubaina Kaba Softvision Institute of Biotechnology and Science Indore-452010, Madhya Pradesh, India