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Research Article

Formulation And Evaluation of Ficus Carica Linn Leaves Ointment for Anti-Oxidant Activity

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ABSTRACT

The aim of this study was to formulate and evaluate an ointment containing Ficus carica Linn leaves for its potential antioxidant activity. Ficus carica leaves were collected, dried, and subjected to solvent extraction. The extract was then incorporated into a standard ointment base consisting of various pharmaceutical excipients. The formulated ointment was subjected to various physicochemical evaluations, including appearance, consistency, pH, spreadability, and homogeneity to ensure its suitability for topical application. The antioxidant activity of the ointment was determined using in vitro assays, primarily the DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay. The results showed that the Ficus carica leaf extract exhibited significant free radical scavenging activity, which was effectively retained in the formulated ointment. Additionally, the ointment demonstrated good stability under the tested conditions, with no noticeable changes in its physical appearance or texture. The formulation showed excellent spreadability, which is a desirable property for an effective topical application. The pH of the ointment was found to be within a skin-friendly range. Based on these findings, it can be concluded that Ficus carica Linn leaves possess strong antioxidant potential, making them suitable for incorporation into topical formulations aimed at reducing oxidative stress and protecting skin from damage. This ointment formulation could provide a natural alternative for antioxidant therapy in dermatological care. Further clinical studies are needed to confirm the efficacy and safety of this formulation for long-term use.

INTRODUCTION

Plants are acknowledged as the principal source in traditional healthcare systems owing to their therapeutic efficacy. Similarly, Ficus carica L., the

oldest fruit tree known to humans and a member of the Moraceae family of mulberry trees, has therapeutic value. ⁽¹⁾ Ficus carica is recognized by numerous names in different languages, including

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(Anjir-Urdu), (figs-English), (teen-Arabic), collective (fig-tree), (Hindi-angir), (Sanskrit-angira), (PashtoInzir), and (Punjabi-fagar).⁽²⁾⁽³⁾ There are around 800 species in the Genus Ficus from the family Moraceae. Numerous Ficus varieties have exceptional biological activities, essential genetic variety, and several selections.⁽⁴⁾ Ficus carica is grown for its tasty fruits all over the world. Its fruits are edible in a variety of preserved, dehydrated, and fresh forms. Ficus is a type of medicinal plant that primarily grows in tropical and subtropical regions of the world.⁽⁵⁾ Many plant parts, including wood, sap, soft branches, green leaves, and berries, are utilized medicinally and therapeutically. The plant produces nutrient-dense, highly valuable fruit. The fruit is rich in vitamins, minerals, calcium, fiber, lipids, and water. The plant contains a variety of flavonoids, polyphenols, and antioxidants and is cathartic.⁽⁶⁾ The plant contains a number of bioactive compounds, including arabinose, β -amyrins, β -carotenes, glycosides, B-sitosterol, and xanthotoxol.^(7, 8) According to certain reports, Ficus carica is an excellent antioxidant, powerful antiviral, antibacterial, antidiabetic, anti-cancer, and anthelmintic.^(9, 10) The plant is used locally to treat a variety of ailments, including indigestion-related stomach and throat issues as well as common stomach pain.⁽¹¹⁾ Both the fresh and dried fig fruit and leaves have been the subject of research.⁽¹²⁾ Different sections of Ficus carica have been subjected to a variety of biological activity.⁽¹³⁾ The current study examines the pharmacognostic, phytochemical, antioxidant, and antibacterial properties of the leaf powder of the therapeutic herb Ficus carica.

Antioxidant:

An antioxidant is any compound that can delay or stop the oxidation of a substance when present in small quantities compared to the substrate. Antioxidants, also known as free radical scavengers, act as protective molecules, helping to

prevent cellular damage caused by reactive free radicals. These free radicals can otherwise contribute to premature aging, trigger inflammation, and cause other skin-related problems.^(14, 15)

Various Types of Antioxidants:

Antioxidants counteract free radicals, which can harm cells by causing oxidative stress, through various mechanisms. These protective substances are commonly found in nature, particularly in herbs and plant-based foods like fruits, vegetables, nuts, and whole grains.

Antioxidants can be classified into several types, including

- ❖ Natural,
- ❖ Synthetic,
- ❖ Dietary,
- ❖ Endogenous, and
- ❖ Exogenous,

All of which play an essential role in safeguarding the body.⁽¹⁶⁾

3. MATERIALS AND METHOD

Collection Of Materials:

Ficus carica Linn. Leaves, Coconut Oil Cocos nucifera and Lavender Oil Lavandula angustifolia were gathered from the neighbourhoods of Bengaluru, Karnataka. The plants were identified and authenticated by taxonomist at Central Ayurveda Research Institute, Bengaluru, and Karnataka. Analytical grades of Beeswax, Petroleum Jelly and Vitamin E capsule were obtained for the formulation.

Drug Profile & Excipients:

1. Ficus Carica Linn Leaves:

Botanical Name: Ficus carica Linn.

Family: Moraceae

Common Names: Fig, Common Fig, Anjeer (in India)

Chemical constituents: Flavonoids, phenolic compounds, carotenoids, saponins, steroids, vitamins, amino acids. It mainly contains quercetin, caffeic acid.⁽¹⁷⁾



2. Coconut Oil:

Botanical Name: *Cocos nucifera*

Family: Arecaceae (Palm family)

Common Names: Coconut, Coco Palm, Cocconut, Indian Nut.

Chemical constituents: Coconut oil is primarily composed of saturated fatty acids, including: Lauric acid (C12:0): 45-50%, Myristic acid (C14:0): 16-18%, Palmitic acid (C16:0): 8-10%, Caprylic acid (C8:0): 6-8%, and Capric acid (C10:0): 4-6%. It also contains small amounts of unsaturated fatty acids, vitamins (such as Vitamin E), and polyphenols. ⁽¹⁸⁾

3. Lavender Oil:

Botanical Name: *Lavandula angustifolia* (commonly known as English Lavender)

Family: Lamiaceae (Mint family)

Common Names: Lavender oil, Lavender essential oil.

Chemical constituents: Lavender oil is rich in volatile compounds, that they including: Linalool: 25-45%, Linalyl acetate: 25-38%, Camphor: 1-10%, 1,8-Cineole (Eucalyptol), Borneol, Terpinen-4-ol, and other monoterpenes.

4. Beeswax:

IUPAC Name: Triacontanyl palmitate

Synonyms: White beeswax, Yellow beeswax, Cera Alba, Cera flava, Hydoxin, Rodex.

Molecular formula: $C_{15}H_{31}COOC_{30}H_{61}$

Molecular weight: 169.178 g/mol

Colour: Yellow or white

Odour: Odour of honey

Taste: Faint balsamic

Melting point: 62-65°C

Density: ~0.96 g/cm³

Solubility: Insoluble in water, but soluble in organic solvent like chloroform and ether.

Uses: In cosmetics and skincare, it is used in products like lip balms, moisturizers, and hand salves due to its ability to create a protective barrier that locks in moisture

5. Petroleum Jelly:

Synonyms: Petrolatum, Mineral oil jelly, Soft paraffin, White petrolatum (when refined), Vaseline (a commercial brand name)

Molecular formula: $C_{18}H_{36}$ to $C_{18}H_{38}$ (for long – chain hydrocarbons).

Molecular weight: It ranges between 400 and 700 g/mol.

Colour: Refined form - Colourless to pale yellow, Unrefined form - brown.

Odour: Mild, faint or almost odourless.

Taste: Tasteless

Melting point: 37°C to 60°C

Density: ~0.8 to 0.9 g/cm³

Solubility: Insoluble in water, but soluble in organic solvent such as chloroform, ether and benzene.

Uses: It is used to treat minor cuts, burns, and skin irritations by providing a protective barrier that keeps moisture in and dirt out.

6. Vitamin E Capsule:

IUPAC Name: 2R,4'R,8'R-2-(4-hydroxy-3,5-ditert-butyl-2-hydroxyphenyl)-6-chromanol

Synonyms: Alpha-Tocopherol, Tocopherol, Alpha-Tocopherol Acetate (when in the form of acetate ester), Vitamin E Acetate (for synthetic version)

Molecular formula: $C_{29}H_{48}O_2$

Molecular weight: ~430.7 g/mol

Colour: Yellow to amber colour

Odour: Mild, slightly oily or neutral odour

Taste: Neutral or slightly bitter taste

Melting point: ~29.5°C to 30°C

Density: ~0.95 g/cm³

Solubility: Insoluble in water, but soluble in oils, fats, and organic solvents such as ethanol and acetone.

Uses: Vitamin E is widely taken as a dietary supplement for its powerful antioxidant properties, helping to neutralize free radicals and protect cells from oxidative stress.

Extraction Procedure:

1. Preparation Of Ficus Carica Linn. Leaves:



Collect fresh leaves of *Ficus carica* or purchase dried leaves. If using fresh leaves, rinse them thoroughly to remove dust and other contaminants. Dry the leaves (if using fresh leaves) by spreading them in a shaded area or using a dryer, until they are completely dry to prevent spoilage. Grind the dried leaves using a mortar and pestle or a blender to a coarse or fine powder, depending on the extraction method.

2. Extraction By Soxhlet Apparatus:

Place the powdered plant material in a thimble and position it in the Soxhlet extractor. Fill the round-bottom flask with an appropriate solvent (e.g., ethanol). Heat the solvent in the flask, allowing it to vaporize and condense over the plant material in the thimble. The solvent will repeatedly wash the material and extract the bioactive compounds. Continue the process for 6-8 hours. This ensures thorough extraction. After completion, remove the plant material, and filter the extract to remove any remaining solid particles.

4. Formulation Of Ointment:

Table 1: Composition of the Ointment Formulation

Ingredients	F ₁	F ₂
Fig leaf extract	2g	4g
Petroleum jelly	4g	4g
Beeswax	2g	2g
Coconut oil	1.5g	1.5g
Vitamin E capsule	0.2g	0.2g
Lavender oil	0.1g	0.1g

Preparation Of Ointment:

Procedure:

1. All the active pharmaceutical ingredients and excipients were measured accurately.
2. The oil phase was prepared by melting the Beeswax along with Petroleum jelly according to the desired ratio.
3. Melt the Petroleum jelly and beeswax mixture in a heat-resistant glass vessel using a water bath or a heating mantle and stir the mixture

until it reaches a uniform temperature (around 70-80°C).

4. Weigh the Coconut oil and add it to the melted ointment base mixture. Stir well to ensure uniform distribution.
5. Open the Vitamin E capsule and add the contents to the mixture. Stir well to ensure uniform distribution.
6. Add the Fig leaf extract to the mixture. Stir well to ensure uniform distribution.
7. Add the Lavender oil to the mixture. Stir well to ensure uniform distribution. Allow the mixture to cool to around 30-40°C.
8. The ointment was stirred well, packed and stored in a well closed container.
9. Allow it to cool and solidify completely.

5. Phytochemical Test:

S. No	Description	Result
1.	Test for phenols (ferric chloride test)	+
2.	Test for tannis (lead acetate solution)	+
3.	Test for flavonoids (alkaline reagent)	+
4.	Test for alkaloids (dragendorff's reagent)	+
5.	Test for terpenoids (salkowski test)	+
6.	Test for saponins (foam test)	+

6. Evaluation Parameters:

Physical appearance, Homogeneity, Washability, after feel, pH measurement, Acid value, Saponification value, Adhesion and Anti-oxidant property these are some of the evaluation parameters for *Ficus carica* Linn leaves ointment.

7. RESULT AND DISCUSSION:

1. Physical Appearance:

The ointments are tested for organoleptic properties, which provides valuable information about the sensory properties of an ointment and helps to ensure its quality and effectiveness.



Table 2: Organoleptic Parameters

Formulation	Colour	Odour	Texture	Homogeneity
F ₁	Light green	Aromatic	Smooth	Homogeneous
F ₂	Light green	Aromatic	Smooth	Homogeneous

2. Homogeneity:

The extract in the ointment was evenly distributed across all formulations. Both touch and visual appearance supported this. The ointment has a nice touch and appearance.

3. Washability:

Washability test was carried out by applying small amount of ointment on slide then washing with tap water. The observations are as follows:

Table 3: Washability Parameters

Formulation (F)	Washability
F ₁	Easily washable
F ₂	Easily washable

4. After Feel:

The ointment was applied to ascertain whether it's greasy or not.

Table 4: After Feel Effects

Formulation (F)	Results
F ₁	Greasy
F ₂	Greasy

5. Measurement Of pH:

A digital pH meter was used to measure the formulation's pH. The pH of the ointment composition is between 5.5 and 6.5.

Table 5: pH of ointment

Formulation (F)	pH
F ₁	6.29
F ₂	6.42

6. Acid Value:

Acid value is defined as the number of milligrams of KOH required to neutralize 1gm of oil or fat. It is a measure of the free fatty acid content in the ointment. A high acid value indicate rancidity or hydrolysis, while a low acid value may indicate a high level of neutralization. The result of acid value of all the

formulation of ointment are presented in below table and showed satisfactorily values.

Table 7: Acid value of ointment

Formulation (F)	Acid value (mg KOH)
F ₁	2.98
F ₂	3.21

7. Saponification Value:

Saponification value is defined as the number of milligrams of KOH or NaOH required to saponify 1gm of fat under the specified condition. It is a measure of the total fatty acid content in the ointment. A high saponification value may indicate a high level of fatty acid content, while a low saponification value may indicate a low level of fatty acid content. The result of saponification value of all the formulation of ointment are presented in below table and showed satisfactorily values.

Table 8: Saponification value of ointment

Formulation (F)	saponification value (mg KOH)
F ₁	146.98
F ₂	150.90

8. Adhesion:

The adhesion test of the ointment was performed to measure the stickiness of the ointment on the skin surface.

Table 9: Adhesion of ointment

Formulation (F)	Adhesion (time)
F ₁	4.76 sec
F ₂	4.45 sec

9. Anti-Oxidant Assay by DPPH Radical Scavenging:**Introduction**

The DPPH (2,2-diphenyl-1-picrylhydrazyl) assay is a widely used method for evaluating the



antioxidant activity of various substances, including plant extracts, foods, and pharmaceuticals. The assay is based on the ability of antioxidants to scavenge the stable radical DPPH.

Principle

The DPPH radical is a stable, purple-colored radical that absorbs light at 517 nm. When an antioxidant is added to the DPPH solution, it donates an electron to the radical, neutralizing it and causing the purple color to fade. The extent of the color change is proportional to the antioxidant activity of the substance being tested.

Reagents

DPPH, Methanol

Procedure

In the DPPH clearance test, the antioxidant activity of the *Ficus carica* Linn. leaves extract is measured. DPPH is a chemical that has a purple

color, but it turns yellow when it is neutralized by antioxidants. The more the DPPH loses its color, the stronger the antioxidant activity of the extract. To test this, different amounts of the extract (ranging from 50 to 5000 µg/ml) are prepared. For each test, 40 µl of the extract is mixed with 160 µl of a DPPH solution and left for 30 minutes in the dark at room temperature. Afterward, the sample's color change is measured by a device at 517 nm. Ascorbic acid, a known antioxidant, is also tested for comparison. Ethanol (70%) is used as a control group to ensure the results are accurate.

Calculation: Calculation percentage growth inhibition:

$$\% \text{ Inhibition} = \frac{A_{\text{Control}} - A_{\text{Sample}}}{A_{\text{Control}}} \times 100$$

RESULT:

Table10: Comparison between ascorbic acid & ointment antioxidant property

	Conc µg/ml	% inhibition	IC ₅₀ µg/ml
Ascorbic Acid	50	54.47	30.64
	100	72.02	
	200	85.99	
	500	89.63	
	1000	89.77	
	2000	92.95	
	5000	93.06	
Fig Leaves Ointment	50	11.36	3459.64
	100	21.48	
	200	22.35	
	500	24.59	
	1000	35.08	
	2000	42.90	

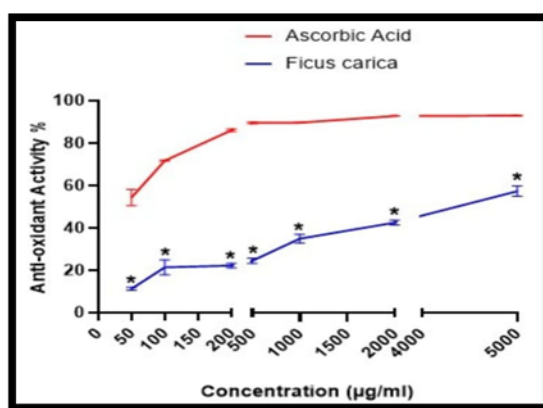


Fig. 10 Graphical representation of ascorbic acid & ointment antioxidant property.

8. CONCLUSION

The formulation and evaluation of the *Ficus carica* Linn leaves ointment demonstrated promising antioxidant activity, supporting its potential as a natural remedy for oxidative stress-related skin conditions. The formulated ointment exhibited favorable physical and chemical properties such as good spreadability, appropriate pH, and consistency, making it suitable for topical application. The ointment demonstrated antioxidant activity in the DPPH assay, with an IC₅₀ value of 3459.64 µg/ml. This indicates that the ointment has a high ability to neutralize the free radicals. The percentage inhibition of the ointment increases with concentration, reaching 58.50% at 5000 µg/ml. These results suggest that the ointment does possess antioxidant properties, it is less effective than ascorbic acid as standard, which showed high antioxidant activity with an IC₅₀ value of 30.64 µg/ml.

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