

*Review Article*

## Formulation and Evaluation of Anti-Acne Herbal Gel Using Lawsonia Inermis

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In recent years, herbal products have gained popularity due to their safety and fewer side effects. In this study, an anti-acne herbal gel was prepared using Lawsonia inermis extract. The gel was formulated using Carbopol as a base and evaluated for parameters such as pH, viscosity, spreadability, and stability. The results showed that the gel had good consistency and was suitable for skin application. Thus, the prepared gel can be used as a natural treatment for acne. Herbal formulations are increasingly preferred due to their safety and minimal side effects. In the present study, an anti-acne herbal gel was formulated using Lawsonia inermis extract, known for its antibacterial and anti-inflammatory properties. The gel was prepared using Carbopol 940 as a gelling agent and evaluated for parameters such as pH, viscosity, spreadability, and stability. The formulation showed satisfactory physical characteristics and was found suitable for topical application.

**Keywords:** Lawsonia inermis, Henna, Herbal Gel, Medicinal Plant, Pharmacognosy, Phytochemical Constituents, Antimicrobial Activity, Antioxidant Activity, Anti-inflammatory Activity, Antidiabetic Activity, Wound Healing Activity, Hepatoprotective Activity, Herbal Formulation, Ethanolic Extraction, Methanolic Extraction, Aqueous Extraction, Lawsone, Flavonoids, Tannins, Evaluation of Herbal Gel.

### INTRODUCTION



Acne vulgaris is a common skin condition caused by excess sebum, bacterial infection, and inflammation. Conventional treatments may cause side effects such

as irritation and dryness. Herbal remedies are considered safer. Lawsonia inermis (henna) has antibacterial and anti-inflammatory properties, making it useful for acne treatment.



### 1) Antimicrobial Activity

Lawsonia inermis, commonly known as henna, possesses significant antimicrobial activity. It contains important chemical constituents such as lawsone, tannins, and flavonoids which help in preventing the growth of harmful microorganisms. The extracts of henna leaves are effective against various bacteria and fungi. Due to these properties, henna is traditionally used for treating skin infections, wounds, and scalp problems like dandruff. Its antimicrobial action also helps in faster wound healing and protection against microbial contamination. Because of its natural medicinal properties, Lawsonia inermis is widely used in herbal medicine and cosmetic preparations.

### 2) Antioxidant Activity

Lawsonia inermis shows antioxidant activity due to the presence of flavonoids, phenolic compounds, and tannins. These compounds help in neutralizing free radicals and protecting body cells from oxidative damage. The antioxidant property of henna helps in reducing stress on tissues and may prevent various diseases caused by oxidation. It also supports healthy skin and promotes overall cell protection. Because of this activity, henna is considered beneficial in traditional and herbal medicine.

### 3) Anti-inflammatory Activity

Lawsonia inermis possesses anti-inflammatory activity which helps in reducing swelling, pain, and inflammation. The plant contains bioactive compounds that inhibit inflammatory reactions in the body. Traditionally, henna paste is applied on burns, wounds, and joint pain to provide relief. Its anti-inflammatory effect supports faster healing and reduces discomfort. Due to these properties, henna is widely used in natural remedies.

### 4) Wound Healing Activity

Lawsonia inermis has wound healing activity that helps in the faster repair of damaged tissues. Its antimicrobial and anti-inflammatory properties prevent infection and reduce swelling at the wound site. Henna paste is traditionally applied on cuts, burns, and skin injuries to promote healing. The plant also helps in improving skin regeneration and protecting the affected area. Therefore, it is considered an important medicinal herb for wound care.

### 5) Antidiabetic Activity of Lawsonia inermis

Lawsonia inermis also shows antidiabetic activity. Some studies suggest that the plant extracts may help in lowering blood glucose levels. The active compounds present in henna help improve the body's metabolic functions and support glucose control. Due to this property, it is used in traditional medicine for

managing diabetes. However, more scientific research is needed to confirm its effectiveness completely.

## 6) Analgesic Activity

*Lawsonia inermis* possesses analgesic activity which helps in relieving pain. The medicinal compounds present in henna reduce pain sensation and provide soothing effects. It is traditionally used to relieve headaches, body pain, and joint pain. Due to this property, henna is considered useful in traditional medicinal practices.

## 7) Antipyretic Activity

*Lawsonia inermis* has antipyretic activity which helps in reducing fever. The plant extracts assist in lowering body temperature during fever conditions. In traditional medicine, henna preparations are used for managing fever and providing cooling effects to the body. This activity makes the plant valuable in herbal treatments.

## 8) Hepatoprotective Activity

*Lawsonia inermis* possesses hepatoprotective activity which helps in protecting the liver from damage. The antioxidant compounds present in henna reduce harmful effects caused by toxins and oxidative stress. This activity supports proper liver function and helps maintain liver health. Therefore, henna is considered beneficial in herbal liver remedies.

## 9) Hair and Skin Care Activity

*Lawsonia inermis* is widely used for hair and skin care activities. Henna acts as a natural dye and conditioner for hair, making it smooth and shiny. It also helps in reducing dandruff and scalp infections. On the skin, henna provides cooling effects and is used in cosmetic and decorative applications.

## 10) Anticancer Activity

*Lawsonia inermis* shows potential anticancer activity due to the presence of bioactive compounds such as flavonoids and phenolic substances. These compounds may help inhibit the growth of certain cancer cells and protect body tissues from damage. Research studies are being carried out to understand its anticancer potential more effectively. Therefore,

henna is considered an important medicinal plant in herbal research.

## METHOD OF EXTRACTION

### 1) Activity wise extraction

#### A) Antimicrobial Activity Extraction

For antimicrobial activity, the leaves of *Lawsonia inermis* are dried, powdered, and extracted using ethanol. The ethanolic extract contains active compounds like lawsone and tannins which help inhibit the growth of bacteria and fungi.

#### B) Antioxidant Activity Extraction

For antioxidant activity, methanol is commonly used as the extraction solvent. The powdered leaves are soaked in methanol to obtain antioxidant compounds such as flavonoids and phenolic substances that protect cells from oxidative damage.

#### C) Anti-inflammatory Activity Extraction

The anti-inflammatory extract is prepared using water or ethanol. The leaf powder is mixed with the solvent and filtered to obtain compounds that help reduce swelling, pain, and inflammation.

#### D) Analgesic Activity Extraction

For analgesic activity, alcoholic extraction methods are used. The leaves are dried, powdered, and extracted with alcohol to obtain pain-relieving constituents present in the plant.

#### E) Antipyretic Activity Extraction

The aqueous extraction method is commonly used for antipyretic activity. Fresh or dried leaves are boiled in water to obtain extracts that help reduce fever and provide cooling effects.

#### F) Wound Healing Activity Extraction

For wound healing activity, fresh henna leaves are crushed into a paste. This paste is directly applied to cuts, burns, and wounds to promote healing and prevent infection.

### **G) Antidiabetic Activity Extraction**

Hydroalcoholic extraction is used for antidiabetic activity. A mixture of water and alcohol is used to extract active compounds that may help in controlling blood sugar levels.

### **H) Hepatoprotective Activity Extraction**

Methanolic extraction is mainly used for hepatoprotective activity. The methanol extract contains antioxidant compounds that help protect the liver from harmful toxins and oxidative stress.

### **I) Hair and Skin Care Activity Extraction**

For hair and skin care, dried henna leaves are powdered and mixed with water to prepare a paste. This preparation is used as a natural hair dye, conditioner, and skin cooling agent.

### **J) Anticancer Activity Extraction**

For anticancer studies, ethanol or methanol extraction methods are used. These solvents help isolate bioactive compounds that may inhibit the growth of cancer cells.

### **Different method of extraction**

Extraction is the process of separating active medicinal compounds from plant materials using suitable solvents. In *Lawsonia inermis* (Henna), different extraction methods are used to obtain bioactive constituents such as lawsone, tannins, flavonoids, and phenolic compounds. These extracts are used for various pharmacological activities like antimicrobial, antioxidant, anti-inflammatory, antidiabetic, and wound healing activities.

#### **1) Aqueous Extraction Method**

In the aqueous extraction method, water is used as the solvent. Fresh or dried leaves of *Lawsonia inermis* are washed, dried, powdered, and boiled or soaked in distilled water. The mixture is then filtered to obtain the aqueous extract.

#### **2) Ethanolic Extraction Method**

The ethanolic extraction method is widely used for antimicrobial and medicinal purposes. Ethanol helps extract active compounds like lawsone and tannins which are effective against bacteria and fungi. This method is commonly used in pharmaceutical research and herbal medicine preparation.

#### **3) Methanolic Extraction Method**

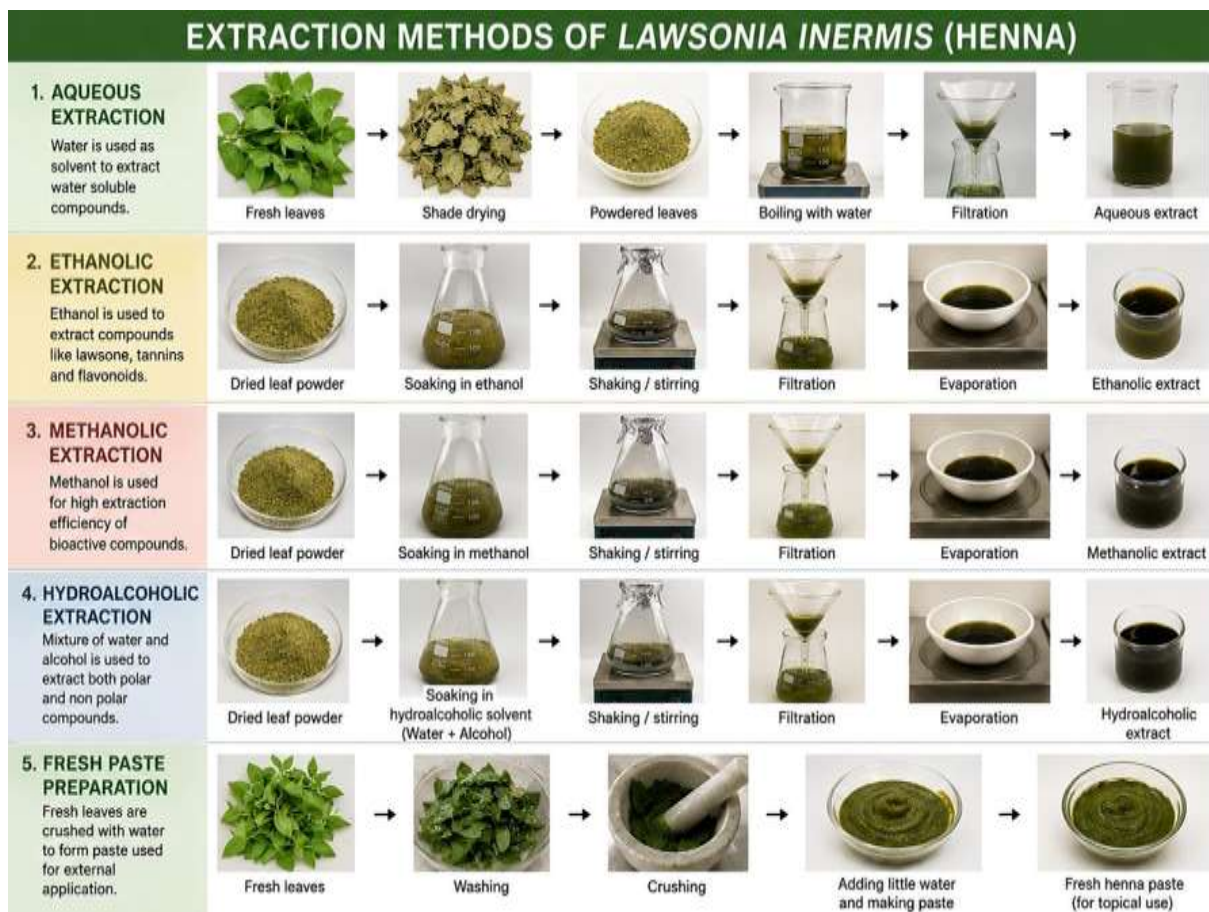
Methanolic extraction is mainly used in laboratory studies and phytochemical analysis. It helps obtain antioxidant and hepatoprotective compounds from the plant. This method is preferred because methanol dissolves a large variety of active constituents effectively.

#### **4) Hydroalcoholic Extraction Method**

Hydroalcoholic extraction is used for obtaining both water-soluble and alcohol-soluble compounds. It is commonly used for antidiabetic and therapeutic studies because it provides better extraction efficiency and medicinal value compared to single-solvent methods.

#### **5) Fresh Paste Preparation Method**

Fresh paste preparation is traditionally used for external applications such as wound healing, hair care, and skin care. Crushed henna leaves are directly applied to cuts, burns, scalp, and skin to provide cooling, healing, and coloring effects. This method is natural, safe, and easy to prepare.



## MATERIALS

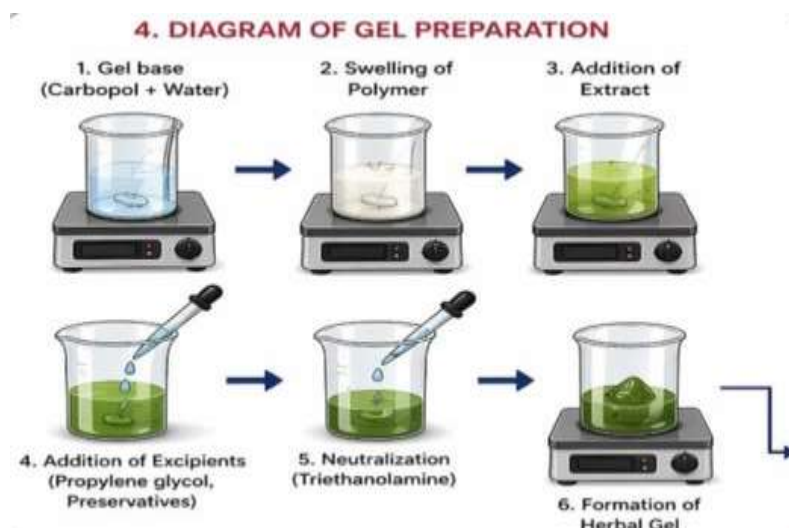
- Lawsonia inermis powder
- Carbopol 940
- Glycerin
- Distilled water
- Triethanolamine
- Methyl paraben

## Preparation of Extract:

- The dried powder of Lawsonia inermis was soaked in distilled water or ethanol for 24 hours. The mixture was then filtered to obtain the extract.

## Formulation: (Preparation of gel)

## METHODOLOGY

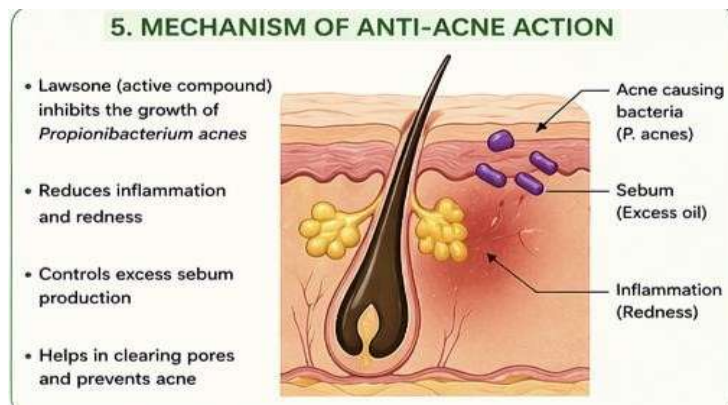


- Carbopol 940 was dispersed in distilled water with continuous stirring to form a gel base. Glycerin was added as a moisturizing agent. Then, the plant extract was mixed into the gel base. Triethanolamine was added to adjust the pH and obtain proper consistency. Methyl paraben was added as a preservative. The gel was mixed well to obtain a smooth product.

### Mechanism of Anti-Acne Action

Lawsone (active compound):

- reduces Inflammation
- inhibit bacterial growth



Controls:

- Sebum production
- Acne-causing microbes

### Evaluation of Herbal Gel

#### Physical appearance

Physical appearance is an important parameter in the evaluation of herbal gel because it gives information about the quality and acceptability of the formulation. The herbal gel is visually examined for color, odor, texture, clarity, and consistency. A good herbal gel should have an attractive appearance, smooth texture, and uniform consistency without any lumps or coarse particles. The color of the gel should remain stable and should not change during storage. The odor should be pleasant and free from any foul smell indicating spoilage or degradation. The gel should also be free from phase separation and air bubbles. Transparency or opacity of the gel is observed depending on the formulation ingredients. Proper physical appearance improves patient acceptability and ensures that the formulation is suitable for topical application.

#### pH Determination

The pH determination of herbal gel is carried out to ensure that the formulation is suitable for skin application and does not cause irritation. The pH is measured using a digital pH meter by dispersing the gel in distilled water. A good herbal gel should have a pH close to that of the skin, usually between 5 and 7. Proper pH helps maintain skin compatibility and stability of the formulation. Any significant change in pH during storage may indicate instability or degradation of active ingredients.

#### Homogeneity

Homogeneity is evaluated to check the uniform distribution of ingredients throughout the herbal gel. The gel is visually observed for the presence of lumps, coarse particles, or phase separation. A homogeneous gel should have a smooth and uniform texture without any aggregation. Proper homogeneity ensures equal distribution of active constituents in every part of the formulation. This parameter also improves the appearance and effectiveness of the gel.

#### Spreadability

Spreadability determines how easily the herbal gel spreads on the skin surface after application. It is evaluated by placing the gel between glass slides and measuring the spreading capacity. Good spreadability

ensures easy application and uniform distribution of the formulation on the affected area. A gel with proper spreadability improves patient comfort and therapeutic effectiveness. It also reduces the amount of force required during application.

### Viscosity

Viscosity is the measure of thickness and flow property of the herbal gel. It is determined using instruments such as a viscometer. Proper viscosity is important to maintain the consistency and stability of the formulation. A gel with very high viscosity may be difficult to spread, while very low viscosity may lead to leakage from the container. Therefore, optimum viscosity is essential for proper application and storage stability.

### Extrudability

Extrudability is evaluated to determine the ease with which the gel can be removed from the tube or container. The formulation should come out smoothly with slight pressure. Good extrudability indicates proper consistency and user-friendly application. Poor extrudability may create difficulty during use and affect patient acceptability. This parameter is important for packaging and handling of the herbal gel.

### Stability Study

Stability studies are performed to evaluate the stability of herbal gel under different storage conditions such as temperature and humidity. The formulation is observed for changes in color, odor, pH, texture, and consistency over a specific period of time. A stable gel should not show any significant

physical or chemical changes during storage. Stability studies help determine the shelf life and storage conditions of the product.

### Skin Irritation Test

The skin irritation test is performed to ensure that the herbal gel is safe for topical application. The gel is applied on a small area of skin and observed for redness, itching, swelling, or irritation. A good herbal gel should be non-irritant and should not produce any allergic reactions. This test is important to confirm the safety and compatibility of the formulation for human use.

### Washability

Washability is evaluated to determine how easily the herbal gel can be removed from the skin using water. A good gel should be easily washable without leaving excessive residue or stickiness. Proper washability improves user convenience and hygiene. This parameter also indicates the suitability of the gel for regular topical application.

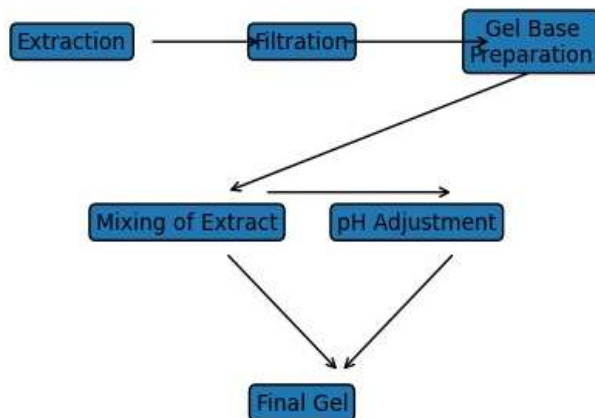
### Drug Content Determination

Drug content determination is carried out to measure the amount of active herbal ingredient present in the gel formulation. This test ensures uniform distribution and proper concentration of medicinal constituents throughout the gel. Accurate drug content is important for maintaining therapeutic effectiveness and quality of the formulation. Variations in drug content may affect the efficacy and stability of the herbal gel.

### Formulation Table

Ingredient	Quantity (%)
Carpool 940	1%
Lawsonia inermis extract	5%
Glycerin	5%
Methyl paraben	0.2%
Triethanolamine	q.s
Distilled water	up to 100%

### Flowchart



## RESULTS

Parameter	Observation
Colour	Green
pH	6.5
Consistency	Smooth
Spreadability	Good
Stability	Stable

## DISCUSSION

The prepared gel showed good physical properties. The pH was suitable for skin, indicating it will not cause irritation. The gel was smooth and easy to apply. *Lawsonia inermis* has antibacterial properties which may help in reducing acne-causing bacteria. Overall, the formulation was stable and effective.

## CONCLUSION

The study concludes that the herbal gel prepared using *Lawsonia inermis* extract has good properties and can be used for acne treatment. It is a safe and natural alternative to chemical-based products. Further improvements can be made in future studies.

## REFERENCES

- Sharma R., 2020. Herbal Gel Formulation. *Journal of Pharmacy Research*.
- Singh A., 2019. Evaluation of Topical Gels. *International Journal of Pharma Sciences*.
- Kumar S., Pandey A.K., 2013. Chemistry and biological activities of *Lawsonia inermis*. *Journal of Herbal Medicine*.
- Bansal D., Sharma M., 2019. Formulation and evaluation of herbal gel containing plant extracts. *International Journal of Pharmaceutical Research*.
- Gupta A., Mishra A.K., 2016. Topical gel: A review on formulation and evaluation parameters. *Asian Journal of Pharmaceutical Sciences*.
- Verma S., Singh S.P., 2014. Current and future status of herbal medicines. *Veterinary World*.
- Khandelwal K.R., 2008. *Practical Pharmacognosy Techniques and Experiments*. Nirali Prakashan.
- Kokate C.K. *Textbook of Pharmacognosy*. C.K. Kokate, A.P. Purohit, S.B. Gokhale.
- Pharmacognosy, Nirali Prakashan.
- Remington *The Science and Practice of Pharmacy*. Pharmaceutical Press. Remington: *The Science and Practice of Pharmacy*.
- Ansel's *Pharmaceutical Dosage Forms and Drug Delivery Systems*. Allen, L.V.
- Pharmaceutical Dosage Forms and Drug Delivery Systems*.
- Formulation and Evaluation of Anti-Acne Gel Containing Herbal Extracts. *International Journal of Pharmaceutical Sciences Review and Research*.

11. Preparation and Evaluation of Anti-Acne Gel Using Herbal Drugs *International Journal of Pharmaceutical Investigation*.
12. Lawsonia inermis – Review articles on its antimicrobial and anti-inflammatory properties.
13. World Health Organization WHO guidelines on herbal medicine and quality control.
14. *International Journal of Pharmacognosy and Phytochemical Research*.
15. Biren Shah and A.K. Seth. Textbook of Pharmacognosy and Phytochemistry.
16. Brahmkar D.M. and Jaiswal S.B. *Biopharmaceutics and Pharmacokinetics*.
17. United States Pharmacopoeia (USP).
18. British Pharmacopoeia (BP).
19. Indian Pharmacopoeia (IP).
20. *Journal of Herbal Medicine and Toxicology*.
21. *Pharmacognosy Reviews Journal*.
22. *International Research Journal of Pharmacy*.
23. Textbook of Herbal Drug Technology by S.S. Agrawal and Paridhavi M.
24. *Journal of Natural Remedies*.
25. *International Journal of Herbal Medicine*.
26. *European Journal of Medicinal Plants*.
27. *Journal of Pharmacognosy and Phytochemistry*.
28. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*.
29. *International Journal of Green Pharmacy*.
30. *Herbal Medicine: Biomolecular and Clinical Aspects*.
31. *Journal of Advanced Pharmaceutical Technology and Research*.
32. *Journal of Medicinal Plants Research*.
33. *International Journal of Pharmaceutical Investigation*.
34. *Natural Products Research Journal*.
35. *Journal of Applied Pharmaceutical Science*.
36. Ali B.H., Al-Wabel N., and Blunden G. (2005). Phytochemical, Pharmacological and Toxicological Aspects of Lawsonia inermis. *Phytotherapy Research*.
37. Chaudhary G., Goyal S., and Poonia P. (2010). Lawsonia inermis Linnaeus: A Phytopharmacological Review. *International Journal of Pharmaceutical Sciences and Drug Research*.
38. Mikhaeil B.R., Badria F.A., Maatooq G.T., and Amer M.M.A. (2004). Antioxidant and Immunomodulatory Constituents of Lawsonia inermis. *Zeitschrift für Naturforschung. Habbal O.A., Al-Jabri A.A., and El-Hag A.H. (2005). Antimicrobial Properties of Lawsonia inermis. Journal of Ethnopharmacology*.
39. Singh D.K. and Luqman S. (2014). Lawsonia inermis: Ethnobotanical, Phytochemical and Pharmacological Aspects. *Journal of Applied Pharmaceutical Science*.
40. Kirtikar K.R. and Basu B.D. (1999). *Indian Medicinal Plants. International Book Distributors*.
41. Evans W.C. (2009). *Trease and Evans Pharmacognosy. Saunders Elsevier. Kokate C.K., Purohit A.P., and Gokhale S.B. (2014). Pharmacognosy. Nirali Prakashan. Harborne J.B. (1998). Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis. Springer Publication*.
42. Khandelwal K.R. (2008). *Practical Pharmacognosy. Nirali Prakashan*.
43. World Health Organization (WHO). (2007). *Guidelines for Assessing Quality of Herbal Medicines. Geneva*.
44. Indian Pharmacopoeia Commission. (2022). *Indian Pharmacopoeia. Government of India Publication*.

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