Formulation And Evaluation of Jelly Prepared by Adulsa Extract

Ms. Pratiksha Jadhav[1], Ms. Trupti Jagtap[2], Dr. Swati D. Burungale[3], Dr. Rajendra Patil[4]
[1,2,3,4] *Delonix Society's Baramati College of Pharmacy*

***Abstract*—This study aims to determine and describe how the results of the organoleptic test of Adulasa extract contribute to a jelly flavor. The known pharmacological activities of Justicia adhatoda are anti-tussive, anti-inflammatory, antimicrobial, antispasmodic, and bronchodilator, and it has minimal side effects even with the consumption of moderate doses. Justicia adhatoda is a medicinal shrub rich in various active phytochemicals like vasicine, vasicinone, and other alkaloids, offering multiple health benefits. Hence, the fortification of jelly with Adulasa extract provides an alternative model for the development of nutraceutical and functional food products.**

Justicia adhatoda extract is rich in bioactive compounds important for respiratory health and immune support. This review explores the use of Adulasa across various disciplines for its medicinal value and discusses its cultivation, nutritional content, and pharmacological properties. Overall, this plant represents a valuable herbal resource for food-based therapeutic applications.

***Index Terms*—Justicia adhatoda, jelly, phytochemicals, functional food.**

I. INTRODUCTION

Adulsa, also known as Vasaka or Malabar Nut, is a prominent medicinal plant in traditional Indian medicine, particularly Ayurveda. Its scientific name is *Justicia adhatoda* (synonym: *Adhatoda vasica*), and it belongs to the Acanthaceae family. This evergreen shrub is native to tropical regions of Southeast Asia, including India, Nepal, Sri Lanka, Bangladesh, and Myanmar.

- Botanical Description

Adulsa is a tall, herbaceous shrub that can grow up to 3 meters in height. It features lance-shaped leaves and bears white or purple flowers. The plant thrives in plains and sub-Himalayan tracts of India, ascending up to 1200 meters.

- Traditional and Medicin0al Uses

For over 2000 years, Adulsa has been utilized in traditional medicine systems like Ayurveda and Unani. Its leaves, flowers, and roots are employed to treat various respiratory ailments, including cough, bronchitis, asthma, and common colds. The plant exhibits antitussive, expectorant, bronchodilator, anti-inflammatory, and antimicrobial properties.

- Phytochemical Constituents

The therapeutic effects of Adulsa are attributed to its rich phytochemical composition. Key constituents include quinazoline alkaloids such as vasicine and vasicinone, which are known for their bronchodilatory and expectorant activities. Additionally, the plant contains flavonoids, saponins, tannins, and essential oils.

- Geographical Distribution

Adulsa is widely distributed across the Indian subcontinent and Southeast Asia. It is commonly found in countries like India, Nepal, Sri Lanka, Bangladesh, and Myanmar. The plant is also cultivated in other tropical regions due to its medicinal value.

- Historical Significance

The use of Adulsa in traditional medicine dates back over two millennia. Ancient Ayurvedic texts have documented its applications in treating respiratory disorders and other ailments. Its longstanding use underscores its importance in herbal medicine practices.

Pharmacological Activities of Adulsa Leaves

1. Anti-Asthmatic and Bronchodilator Activity

The alkaloids vasicine and vasicinone, present in *J. adhatoda*, exhibit significant bronchodilatory effects. Studies have shown that these compounds can alleviate bronchoconstriction induced by acetylcholine and histamine in guinea pigs, with effects comparable to the standard drug ketotifen. The mechanism is believed to involve H_2 and acetylcholine receptor blockade, leading to relaxation of bronchial smooth muscles.

2. Antimicrobial Activity

Methanolic extracts of *J. adhatoda* leaves have demonstrated potent antibacterial activity against pathogens such as *Staphylococcus aureus* and *Escherichia coli*. The antimicrobial efficacy is attributed to compounds like vasicine, which disrupt microbial cell walls and inhibit growth.

3. Antioxidant Activity

The plant exhibits strong antioxidant properties, primarily due to its rich content of alkaloids and flavonoids. Methanolic extracts have shown significant free radical scavenging activity in assays like DPPH and ABTS, indicating potential in mitigating oxidative stress-related disorders.

4. Anti-Inflammatory and Analgesic Effects

J. adhatoda leaf extracts have been effective in reducing inflammation and pain in animal models. In studies involving carrageenan and formalin-induced inflammation in mice, the extracts significantly decreased paw edema and pain responses, suggesting their utility in inflammatory conditions.

5. Anticancer Activity

Research indicates that *J. adhatoda* possesses anticancer properties. Methanolic leaf extracts have shown cytotoxic effects against various cancer cell lines, including breast and ovarian cancers. The extracts induce apoptosis and inhibit cell proliferation, highlighting their potential as complementary cancer therapies.

6. Antidiabetic Activity

The plant has demonstrated hypoglycemic effects in diabetic animal models. Methanolic extracts of *J. adhatoda* leaves have been shown to inhibit α-glucosidase activity, leading to reduced postprandial blood glucose levels. Compounds like vasicine and vasicinol contribute to this antidiabetic effect.

7. Abortifacient and Uterotonic Effects

Traditionally, *J. adhatoda* has been used to induce labor and abortion. Studies have confirmed that vasicine stimulates uterine contractions, similar to oxytocin, by promoting prostaglandin synthesis. However, due to its potent effects, caution is advised in its use during pregnancy.

Botanical Classification of Adulsa Leaves:

Category	Details
Kingdom	Plantae
Sub-Kingdom	Tracheobionta (Vascular plants)
Division	Magnoliophyta (Flowering plants)
Class	Magnoliopsida (Dicotyledons)
Order	Lamiales
Family	Acanthaceae
Genus	*Justicia*
Species	*Justicia adhatoda* (syn. *Adhatoda vasica*)
Common Names	Adulsa, Vasaka, Malabar Nut

Table No.1 Botanical Classification

Adulsa Leaves Advantages and Disadvantages:

1)Advantages of Adulsa Leaves

1. Respiratory Health Support

Adulsa is renowned for its efficacy in treating respiratory ailments such as cough, asthma, bronchitis, and sinusitis. Its bronchodilatory and expectorant properties help in clearing mucus and easing breathing.

2. Anti-Inflammatory and Analgesic Effects

The plant exhibits significant anti-inflammatory and pain-relieving properties, making it beneficial for conditions like arthritis and joint pain. ScienceDirect

3. Antimicrobial Activity

Adulsa possesses antimicrobial properties that help combat bacterial and viral infections, contributing to overall immune support.

4. Digestive Aid

It aids in improving digestion and alleviating gastrointestinal issues such as gas, bloating, and constipation.

2) Disadvantages and Precautions

1. Potential Side Effects
While generally safe in moderate amounts, excessive consumption of Adulsa may lead to side effects such as nausea, vomiting, and dizziness.
2. Contraindications in Pregnancy
Adulsa is known to have uterotonic properties, which can stimulate uterine contractions. Therefore, it is advised that pregnant women avoid its use to prevent potential complications.
3. Interactions with Medications
Adulsa may interact with certain medications, especially those related to blood pressure and blood sugar levels. Individuals on such medications should consult a healthcare provider before using Adulsa.

II. LITERATURE REVIEW

Tandon & Gupto, 2010; Sharma et al., 2006:
have identified major bioactive compounds in Adhatoda vasica such as vasicine, vasicinone, and essential oils. These compounds are responsible for its bronchodilator, expectorant, antitussive, and anti-inflammatory properties.

Dhuley, 1999:
Adhatoda vasica is a medicinal plant native to the Indian subcontinent. It belongs to the family Acanthaceae and is commonly found in tropical and subtropical regions. The plant is rich in alkaloids, especially vasicine and vasicinone, which are largely responsible for its pharmacological activity.

Chakraborty & Brantner, 2001:
Antitussive and Bronchodilatory Effects: Studies have demonstrated that vasicine shows potent bronchodilator activity comparable to theophylline

Reddy et al., 2001:
Antimicrobial Activity: Extracts of the plant have shown effectiveness against a wide range of bacteria and fungi.

Gupta et al., 2008:
Anti-inflammatory and Antioxidant: Leaf extracts also possess significant anti-inflammatory properties and free radical scavenging capacity.

Gogte, 2000:
Uterotonic and Abortifacient Activity: Vasicine is also reported to have uterine stimulant properties, which has both therapeutic potential and safety implications.
Aim:
"Formulation And Evaluation of Adulsa Leaves Extract as a Herbal Jelly"

Objective:
1) To Formulate Adulsa Leaves Powder.
2) Analyze the physicochemical properties and nutritional analysis of adulsa leaves by using standard
3) To develop value added product of adulsa leaves powder & their evaluation.

III. NEED OF STUDY

The need to study jelly preparation using Adulasa extract (commonly derived from Adhatoda vasica, also known as Malabar nut) stems from both nutritional and medicinal perspectives.
1. Functional Food Development
Adulasa is known for its expectorant, bronchodilator, and anti-inflammatory properties. Incorporating its extract into a jelly format can:
Create a palatable delivery system for medicinal compounds.
Make it easier for children and elderly patients to consume herbal remedies.
Promote functional foods that provide health benefits beyond basic nutrition.
2. Consumer Acceptability
The study can help assess:
Sensory characteristics (taste, texture, color) of jelly containing herbal extracts.
Market potential for herbal-based sweet products.
Acceptance and awareness of traditional medicines in modern, convenient forms.
3. Dosage Control
Jelly as a medium allows:
Precise dosage standardization per serving.
Controlled delivery of active compounds for therapeutic use.
4. Innovation in Herbal Product Development
Offers a new value-added product in the herbal and nutraceutical markets.
Supports indigenous knowledge integration into modern food tech.

Plan of Work:

↓

Literature Review

↓

Selection of Drug

↓

Sample Collection

↓

Extraction of Extract

↓

Formulation of Jelly

↓

Evaluation Test

a) General Parameters

b) Dispersion Time

c) Syneresis (%)

d)pH Determination

↓

Result

↓

Summary & Discussion

↓

Conclusion

↓

Referances

IV. MATERIAL & METHODOLOGY

1) Adulsa Leaves Powder

Fig.1 Adulsa Powder

🔹 Synonyms:

- Scientific name: *Justicia adhatoda*
- Other names:
  - Adhatoda vasica
  - Malabar nut
  - Vasaka (Sanskrit)
  - Adulsa (Marathi/Hindi)
  - Arusha (Ayurveda)
  - Vasa (Unani)

🔹 Biological Source:

- Dried or fresh leaves of the plant *Justicia adhatoda* Linn.
- Family: Acanthaceae

🔹 Geographical Distribution / Groups:

- Native to India and Sri Lanka
- Widely distributed across:
  - Tropical and subtropical Asia
  - India, Pakistan, Nepal, Bhutan
  - Sri Lanka, Myanmar, and Malaysia
- Commonly grown in gardens and found in the wild in hilly regions.

🔹 Morphology of Adulsa Leaves:

- Type: Simple, opposite, exstipulate
- Shape: Lanceolate (lance-shaped)
- Size: 10–15 cm long, 3–5 cm wide
- Color: Dark green on upper surface, lighter green on the lower surface
- Texture: Smooth, somewhat leathery
- Venation: Pinnate
- Margin: Entire (smooth)
- Apex: Acute
- Base: Attenuate or tapering

Chemical Constituents:

□ Alkaloids

- **Vasicine** *(main active alkaloid)*
- Vasicinone
- Deoxyvasicine
- Vasicol

✅ *These alkaloids are responsible for bronchodilatory, expectorant, and antimicrobial properties.*

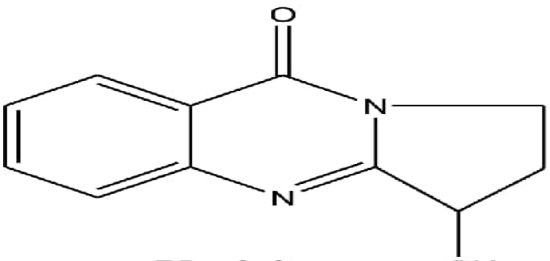
□ Flavonoids

- Luteolin
- Apigenin

- Quercetin
  ✅ *Known for antioxidant and anti-inflammatory activities.*

Tannins
✅ *Contribute to astringent properties.*
EssentialOils
✅ *Trace amounts; responsible for mild aromatic smell.*
Saponins
✅ *Contribute to expectorant action.*
PhenolicCompounds
✅ *Support antioxidant effects.*
Glycosides
✅ *Minor components with various physiological roles.*

Vasicine



Vasicinone

2)Agar:

Fig.2 Agar Powder

🔹 Synonyms:

- Scientific name: *Aquilaria agallocha* Roxb. (syn. *Aquilaria malaccensis*)
- Other names:
  - Agarwood
  - Aloeswood
  - Gaharu (Malay/Indonesian)
  - Oudh or Oodh (Arabic)
  - Chén Xiāng (Chinese – 沉香)
  - Jinkoh (Japanese)
  - Krisnaguru (Sanskrit)
  - Agaru (Ayurveda)

🔹 Biological Source:

- Resin-impregnated heartwood from diseased or infected trees of:
  - *Aquilaria agallocha* Roxb. (syn. *Aquilaria malaccensis*)
  - Family: Thymelaeaceae
- Resin formation is typically a result of fungal infection (e.g., *Fusarium* spp.)

🔹 Geographical Groups / Distribution:

- Native to South and Southeast Asia
- Major countries producing agarwood:
  - India (Assam, Arunachal Pradesh, Mizoram)
  - Bangladesh
  - Bhutan
  - Myanmar
  - Thailand
- Known as a "precious wood" and used in traditional medicine, perfumery, and incense.

🔹 Morphology of Agar Tree (Aquilaria species):

- Type: Evergreen tree
- Height: 15–30 meters
- Bark: Pale, smooth
- Leaves:
  - Shape: Lanceolate to oblong
  - Arrangement: Alternate
  - Size: 5–11 cm long
  - Surface: Smooth, leathery
  - Margin: Entire
  - Apex: Acute to acuminate
- Flowers:
  - Small, greenish-yellow or white
  - Fragrant, arranged in clusters
- Fruit: Capsule, woody, 2–3 cm long, splits open when ripe

- Heartwood: Dark, aromatic resin-impregnated part formed due to infection or injury

1.2) Polysaccharides:

1. Agarose
   - Structure: A linear polymer made of repeating units of D-galactose and 3,6-anhydro-L-galactose
   - Linkage: Alternating β-(1→4) and α-(1→3) glycosidic bonds
   - Properties:
     - Responsible for the strong gel-forming ability
     - Thermoreversible (gels when cooled, melts when heated)
     - Used in microbiological culture media and electrophoresis
   - Proportion in agar: ~70%
2. Agaropectin
   - Structure: A heterogeneous, sulfated polysaccharide containing:
     - L-galactose
     - D-galactose
     - Uronic acids
     - Pyruvic acid
     - Sulfate groups
   - Properties:
     - Highly branched
     - More soluble in water
     - Does not contribute much to gel strength
   - Proportion in agar: ~30%

3)Sugar:

Sugar that has undergone refining so that it is in the form of powdered sugar is called flour sugar. Sugar flour has a smooth nature; therefore, sugar flour is used to make cream or cakes, sprinkles for cakes, or sprinkles for pastries.

Fig.3 Sugar

4)Food Flavoring Agent:

Adulsa (Vasaka or Justicia adhatoda) has a naturally bitter and medicinal taste. Pineapple flavor is strong, sweet, and tangy, which helps to mask or balance that bitterness, making the jelly more palatable—especially for children.

Fig.4 Flavoring Agent

V. EXPERIMENTAL WORK

Method of Adulsa Leaves Powder:

1. Drying of leaves.
2. Collection: The leaves were collected from the university campus
3. Sorting: Fresh, green undamaged leaves were collected to produce the best quality powder.
4. Cleaning and washing: The stalk of the leaves was cut from the main branches and were washed 3-4 times with plenty of water to remove all the adhering dust, and dirt particles.
5. Blanching and Drying: Adulsa leaves were immersed in boiling water at 100 °C for 5 minutes and then it was immersed in cold water for 2 minutes. Blanched leaves were dried in neat and clean dust free dark shadow place at temperature ranged from 25-30 °C. The leaves were completely dried in 24-38 hours. Dried them till leaves became brittle and crushed easily.
6. Grinding of leaves: Dried leaves were ground into fine powder.
7. Storage: Adulsa leaves powder were stored in airtight containers protected from humidity, heat, and

light to avoid the growth of molds at room temperature.

Fig.5 Method of Preparation

Extraction Method: Cold Percolation Method:

Adhatoda vasica
↓
Destalking and washing
↓
Blanching
↓
Drying of leaves(40°C)
↓
(Sun drying followed by oven drying)
↓
Mechanical crushing (mesh size 40)
↓
Powder
↓
Extraction (Powder to water ratio 1: 5 g/ml)
↓
Cold percolation (at room temperature for 72 hours)
↓
Filtration
↓
Concentration (by using vacuum evaporator)
↓
Adulsa extract

Formulation Table:

Sr. No	Name of Material	Weights (gm)			
		A	B	C	D
1	Agar	1gm	1.5gm	1.8 gm	0.7 gm
2	Sucrose	6 gm	5.5gm	6.5 gm	5.5 gm
3	Extract	0.8 ml	0.8ml	0.8ml	0.8ml
4	Water	35ml	35ml	35ml	35ml
5	Flavouring Agent	0.1 ml	0.1ml	0.1ml	0.1ml
6	Food Colouring Agent	0.05gm	0.05gm	0.05gm	0.05gm

Table No.2 Formulation Table

VI. METHOD OF PREPARATION OF JELLY

1. The method of gummy preparation includes preparation of two solutions, i.e., a solution of water and sugar and a solution of agar and water.
2. In a beaker add 6 g sucrose and 4.5g to 8ml of water in a beaker. This solution was heated on medium high while being stirred with a glass stirrer.
3. Adjust the temp, to a point where the temp. of the solution doesn't rise above 130°C.
4. Keep heating until viscous sugar syrup is formed. Avoid overheating to prevent the caramelization of sugars.
5. Once a thick, consistent syrup is obtained, turn off the flame. Lower its temp. to 60°C.
6. In another beaker 1 gm of Agar was mixed with 3ml of water and heated for a few min. on low heat,
7. Then pour the Agar into the warm sugar solution & mix thoroughly, & than heat the mixture for a few seconds to 70°C
8. Add 0.8ml of adulsa extract to the above mixture and stir to form a uniform solution. Now add o.1ml of flavourant, add 0.05gm of colorant, to the solution & mix it thoroughly.
9. Lubricant the silicon mould with glycerine to avoid sticking. Pour the warm mixture into the mould & tap them on the shelf to even up the level of fillings.
10. Remove & wipe any excess solution from the mould.
11. Place the mould in a safe place at room temp. for 60 mins.

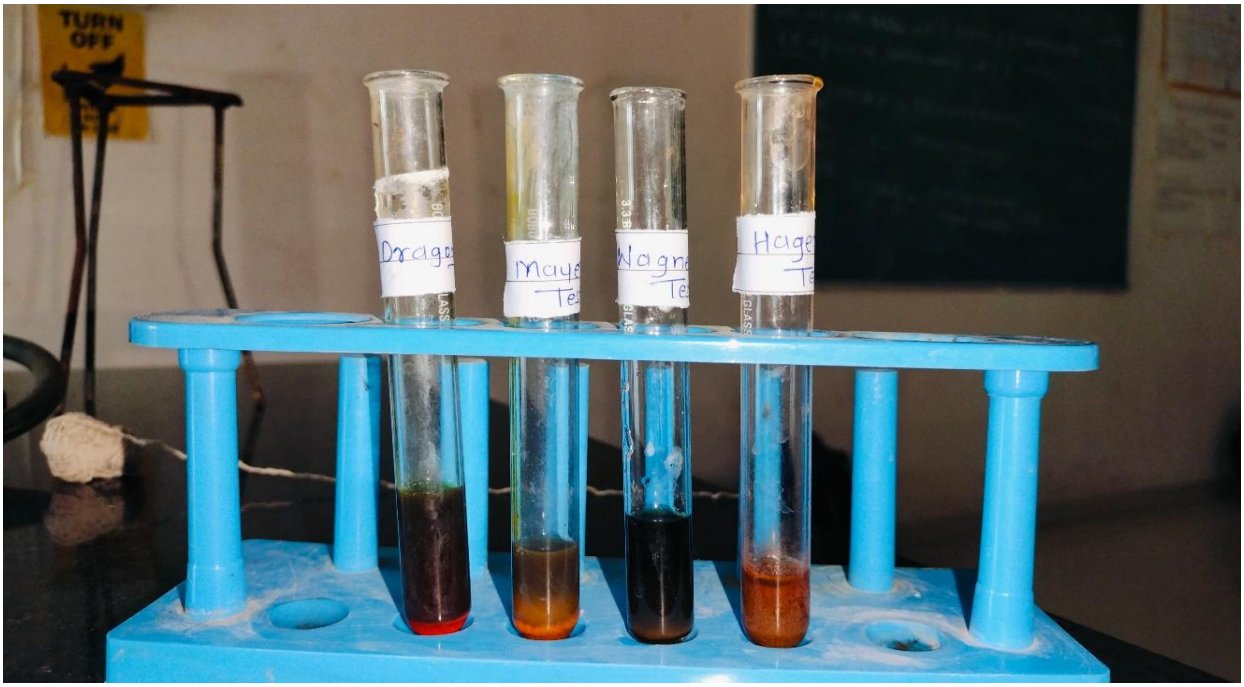
Fig.6 Adulsa Jelly

Evaluation Test:

Evaluation test for adulsa leaves extract:

Test
A)Test for Alkaloids
1.Dragendroffs reagent: Teast solution + few drops of Dragendroffs reagent (Potassium iodide + Bismuth nitrate)
2. Mayer's reagent: Test solution + few drops of Mayer's reagent (Potassium mercuric iodide solution).
3. Wagner's reagent: Test solution + few drops of Wagner's reagent (Iodine solution)
4. Hager's reagent: Test solution + few drops of Hager's reagent (Saturated solution of picric acid in cold water).
B)Test for Tannins
1. Test for Chlorogenic acid: Test solution + ammonia and then expose to air.
C)Test for Phenols
1. Liebermann's test for phenols: Test solution + Iml of sodium nitrite + few drops of dilute H,SO The solution is then poured into excess of dilute NaOH

Table No.3 Evaluation test for adulsa leaves extract



1.Test for Alkaloids

2.Test for Tannins

3. Test for Phenols

Fig.7 Evaluation of Extract

VII. EVALUATION PARAMETER OF ADULSA JELLY

1.General Characteristics:
Colour -
Taste -
Shape -
Odour -
Stickiness -
Grittiness -

2.Dispersion Test:
The dispersion test performed using a flask that contained 100 ml of purified water at 37°C. The CGT from each formulation was placed in the flask and constantly stirrer during a magnetic stirrer. The time it took for it to disperse completely was observed. The standard requires a dispersion time of 10-30 minutes for CGT.

3.Syneresis Test:
Syneresis occurs when water drains from a contracting or shrinking structure by extraction or expulsion, potentially reducing the CGT quality. This test performed at room temperature (25±5°C) hy weighing the samples. First, an absorbent paper was attached to the surface of each tablet, and then the final weights of the preparations were observed. A significant difference. between the initial and final weights indicates syneresis.

4.pH Measurement:
The acidity or alkalinity of a jelly was indicated by using a lab pH meter, a scale from 1 to 14 1% w solution of jelly was prepared by dissolving 1 gm jelly in 100 ml distilled water and its pH was recorded.

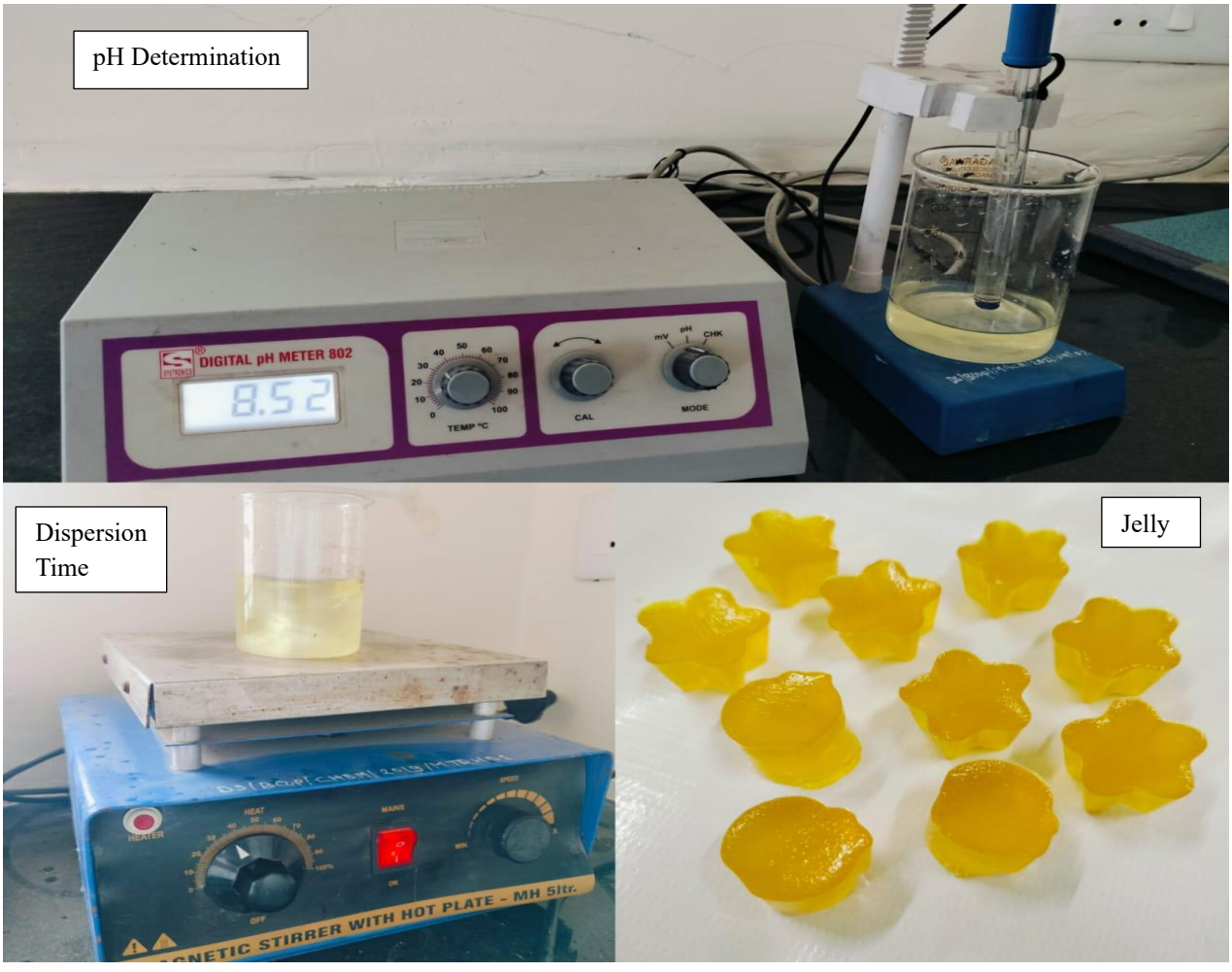


Fig.8 Batch F1

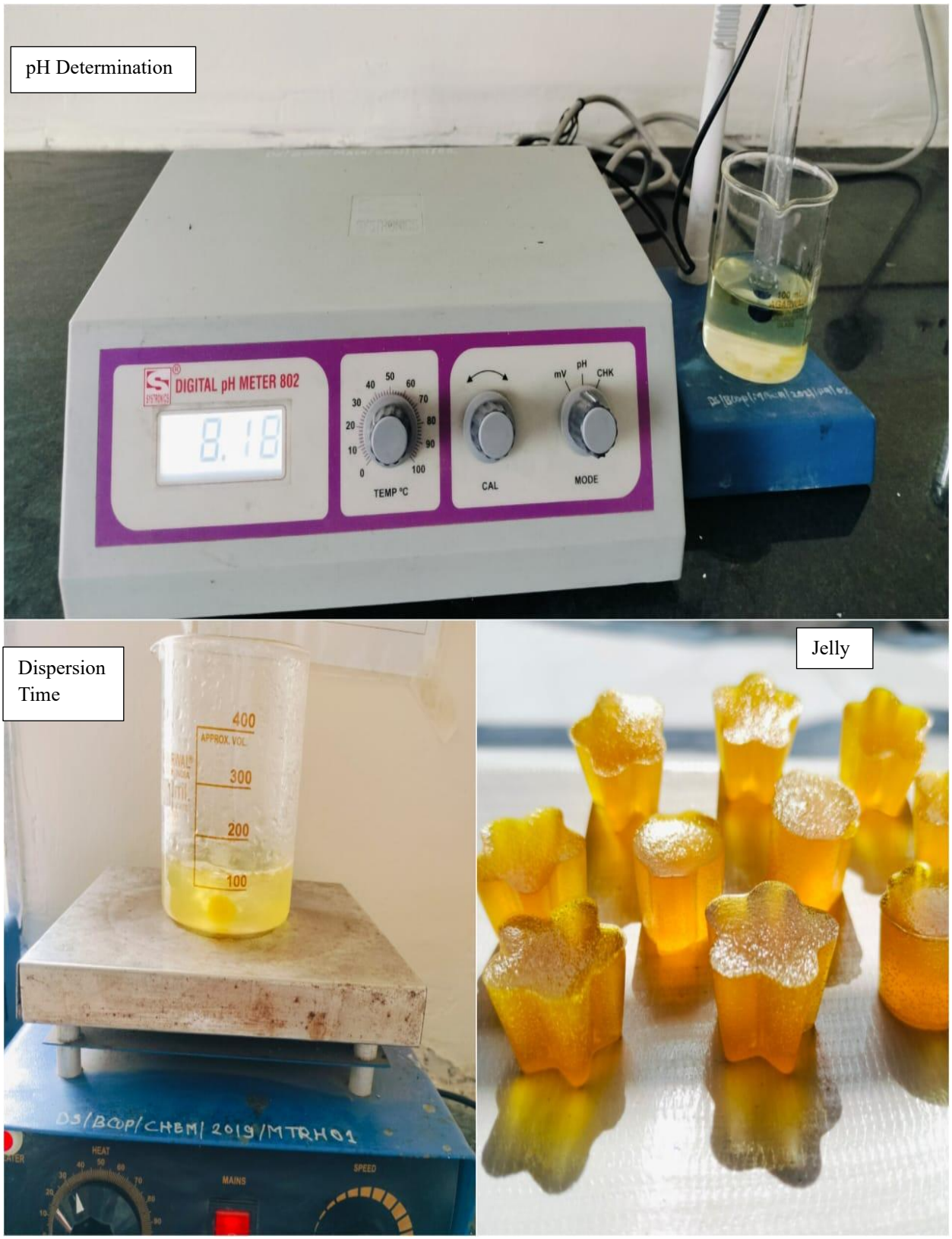


Fig.9 Batch F2

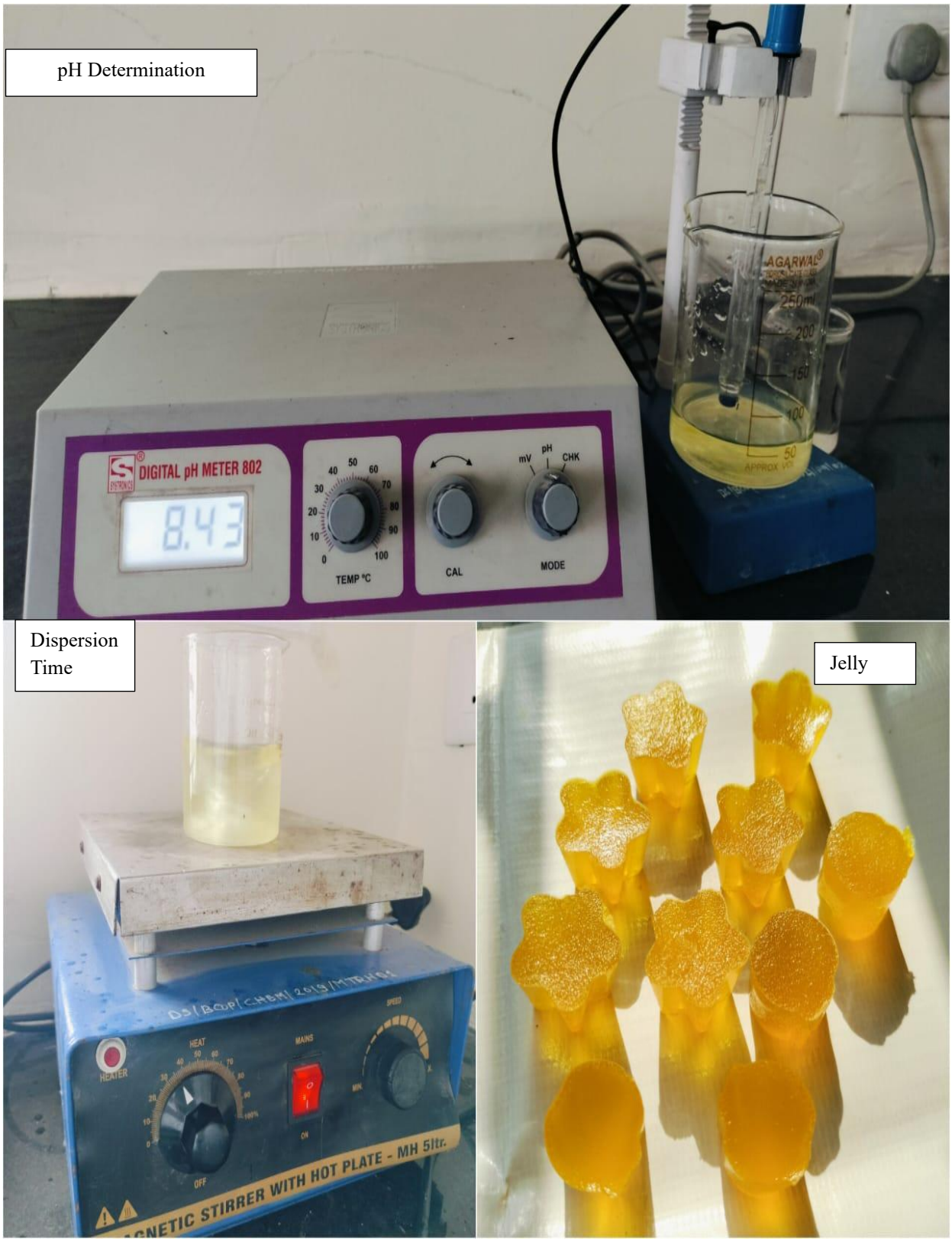


Fig.10 Batch F3

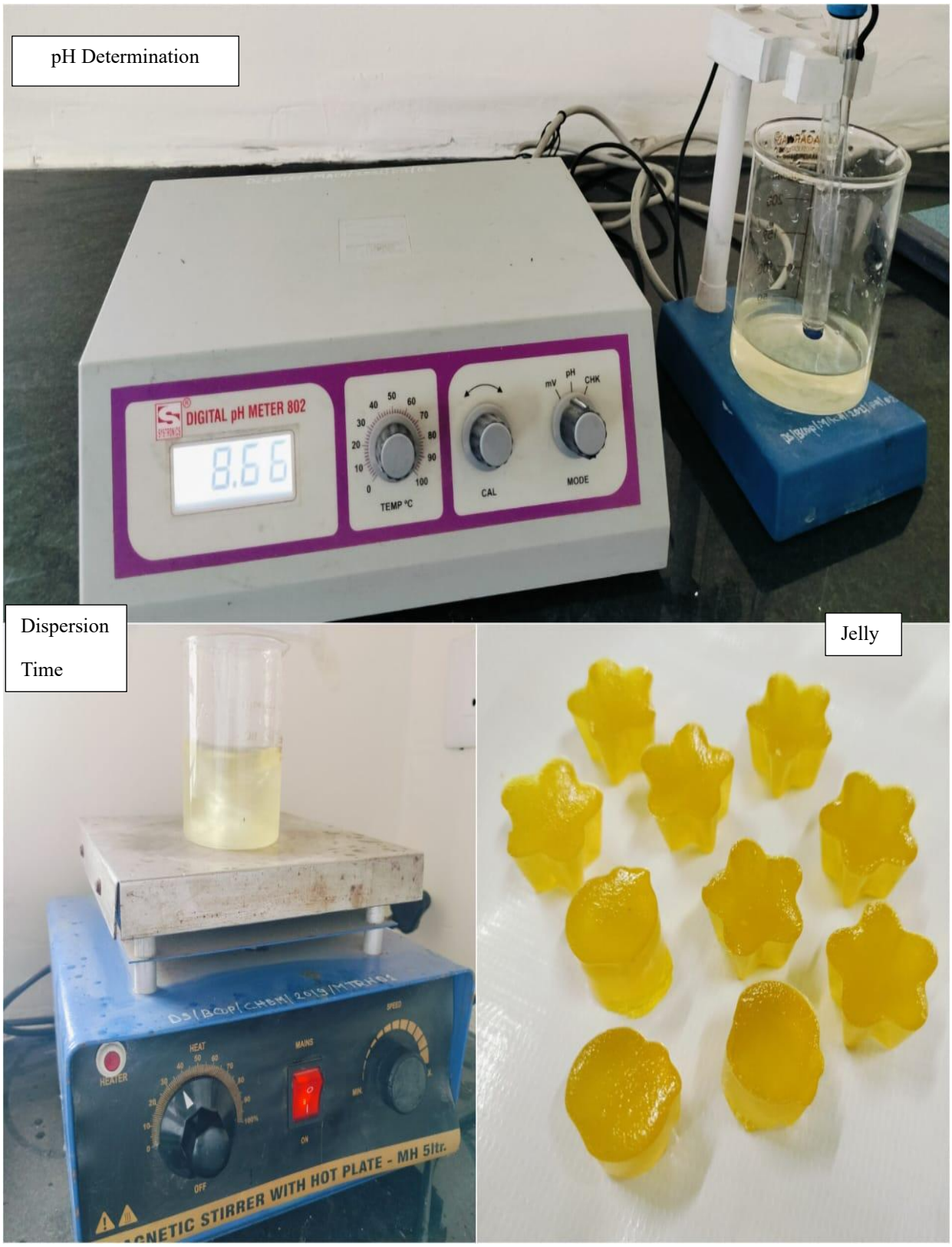


Fig.11 Batch F4

VIII. RESULT OF ADULSA EXTRACT

Test	Reported Observation
A) Test for Alkaloids	
1.Dragendroffs reagent Test	Orange Precipitate
2. Mayer's reagent Test	Yellow Precipitate
3. Wagner's reagent Test	Brown Precipitate
4. Hager's reagent Test	Characteristic Crystalline Precipitate
B) Test for Tannins	
1. Test for Chlorogenic acid	Green colour.
C)Test for Phenols	
1. Liebermann's test for phenols	Deep red or green or blue colour appears.

Table No.4 Result of adulsa extract

Result of Adulsa Jelly:

Sr. No	Parameters	F1	F2	F3	F4
1.	General Parameters				
	A) Colour	Yellow	Yellow	Yellow	Yellow
	B) Odour	Aromatic	Aromatic	Aromatic	Aromatic
	C)Taste	Sweet	Sweet	Sweet	Sweet
	D)Stickiness	Non-Sticky	Non-Sticky	Non-Sticky	Non-Sticky
	E) Grittiness	Smooth	Smooth	Smooth	Smooth
2.	Dispersion Time	15Min 17Sec	26Min	28Min	17Min
3.	Syneresis (%)	2.64	3.2	2.69	4.26
4.	pH	8.52	8.18	8.43	8.66

Table No.5 Result of Adulsa Jelly

IX. SUMMARY & DISCUSSION

Adhatoda vasica, commonly known as Adulasa, is a well-known medicinal plant valued for its antitussive, expectorant, and bronchodilator properties. To improve palatability and patient compliance, especially in children and the elderly, the plant extract can be formulated into a jelly dosage form.

Preparation Process:
The jelly is prepared by dissolving a suitable gelling agent (e.g., pectin, gelatin, or sodium alginate) in hot water, followed by the addition of sweeteners, preservatives, flavoring agents, and the Adulasa extract. The mixture is stirred uniformly, the pH is adjusted and the jelly is poured into molds to set.

Key Ingredients:
Adulasa extract (source of active compounds like vasicine)
Gelling agent (for structure e.g.,Agar)
Sweeteners (e.g., sucrose)
Flavoring and coloring agents (for better acceptance)

Evaluation Parameters:
The prepared jelly is evaluated for appearance, pH, Dispersion Time, Syneresis and organoleptic properties (taste, color, texture).
This jelly formulation offers a modern, user-friendly approach to delivering traditional herbal medicine, with potential application in respiratory care.

X. CONCLUSION

The formulation of jelly using Adulasa (Adhatoda vasica) extract successfully combined the therapeutic benefits of the plant with the sensory appeal of a jelly-based product. The optimized jelly demonstrated desirable physical properties such as good texture, color, while effectively masking the inherent bitterness

of the extract. Phytochemical analysis confirmed the presence of bioactive compounds like alkaloids and flavonoids, suggesting that the jelly retained significant medicinal properties of Adulasa. Therefore, Adulasa jelly can serve as an innovative functional food or nutraceutical product, offering a palatable and convenient means of delivering traditional herbal benefits to a wide range of consumers.

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