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FORMULATION AND EVALUATION OF HERBAL SYRUP FOR THE TREATMENT OF JAUNDICE FROM *RICINUS COMMUNIS* AND *CARICA PAPAYA*

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ABSTRACT
This research paper is focused on formulation and evaluation of herbal syrup containing extracts of *Ricinus communis* and *Carica papaya. Carica papaya L.* commonly known as the papaya or pawpaw, is native to the tropical regions of the Americas. Contains many biological active compounds, important two are papain and chymopapain, known to aid in digestion. *Ricinus communis*, commonly known as the castor oil plant, is native to Africa and the Middle East. *Ricinus communis* extract has hepatoprotective action and it used to treat jaundice. Jaundice indicates the hyperbilirubinemia and that excessive level of bilirubin may be in conjugated or unconjugated form. Herbal syrups have been a cornerstone of traditional medicine for centuries, offering a natural and effective way to promote overall health and wellness. Carica papaya and Ricinus communis give the synergistic effect when combined their leaves extract to treat the jaundice. This type of syrup having several advantages including patients which have difficulty in swallowing. This type of syrup is evaluated for physical appearance, pH, density, specific gravity, viscosity, sedimentation, clarity.

KEYWORDS: *Ricinus communis*, *Carica papaya*, herbal syrup, hepatoprotective action, jaundice.

1. INTRODUCTION

- Herbal syrups, in particular, have been used for centuries in traditional medicine to treat various ailments, including liver disorders.
- These syrups are typically made from a combination of herbs that are carefully selected for their medicinal properties.
- In the case of jaundice, certain herbs have been found to possess anti-inflammatory, antioxidant, and hepatoprotective properties, which can help alleviate symptoms and support liver health.

Herbal syrups have been a cornerstone of traditional medicine for centuries, offering a natural and effective way to promote overall health and wellness. These sweet, flavorful liquids are made by infusing herbs, fruits, and flowers in a sugar or honey base, creating a delicious and nutritious supplement that can be easily incorporated into daily life.

With their rich history, versatility, and growing popularity, herbal syrups are an excellent choice for those seeking a holistic approach to health. Whether you're looking to boost your energy, soothe a sore throat, or simply indulge in a tasty treat, herbal syrups offer a wealth of benefits that are sure to delight.

A) *Carica papaya*: *Carica papaya*, commonly known as papaya, is a tropical plant native to Central and South America. It is a member of the *Caricaceae* family and is widely cultivated for its edible fruit, leaves, and seeds. Papaya is rich in vitamins A, C, and E. Papaya is a good source of potassium, magnesium, and iron. Papaya contains various antioxidants, including flavonoids and carotenoids. Papaya contains digestive enzymes like papain and chymopapain. Papaya's digestive enzymes can help alleviate digestive issues like bloating and indigestion. Papaya's antioxidants can help protect against oxidative stress and inflammation. Papaya's vitamin C content can help boost the immune system. Papaya's antioxidants and enzymes can help improve skin and hair health. *Carica papaya* has been used to treat various liver disorders, including jaundice.

B) *Ricinus communis*: *Ricinus communis*, commonly known as castor oil plant, is a flowering plant native to the Mediterranean region and Africa. It is a member of the *Euphorbiaceae* family. Castor oil, extracted from the seeds, has been used for centuries to treat various ailments, including digestive issues, skin problems, and inflammation. *Ricinus communis* has been used to treat various liver disorders, including jaundice. Castor oil is used in the production of soaps, lubricants, and cosmetics. Castor oil is used as a food additive and

flavoring agent. Castor oil may help alleviate digestive issues like constipation and diarrhea. Castor oil may help improve skin and hair health due to its moisturizing and anti-inflammatory properties. Castor oil may help alleviate menstrual cramps and other symptoms associated with PMS.

Advantages

1. Cost effective
2. Less side effect
3. Environmentally friendly
4. Natural and safe
5. Effective in reducing bilirubin levels
6. Supports liver health
7. Easy to consume
8. Holistic approach
9. Broad spectrum benefits
10. Customizable
11. Promotes healthy digestion
12. Can be used in combination with certain medications
13. Fast absorption
14. Pleasant taste
15. Supports immune function
16. Digestive health

DISADVANTAGES

1. Potential interactions
2. Limited shelf life
3. May interact with certain medications
4. Can't avoid first pass metabolism
5. Variable bioavailability
6. Herbal syrups can be contaminated with heavy metals, pesticides, or other pollutants.
7. Some herbal syrups can be expensive, especially if they are made from rare or exotic herbs.
8. Herbal syrup may vary in composition and concentration of active ingredient, which can make it difficult to determine their effectiveness.

2. What is jaundice ?

- Jaundice is a medical condition characterized by the yellowing of the skin and eyes due to an increase in bilirubin levels in the blood. Bilirubin is a yellow pigment produced during the breakdown of old red blood cells.
- Jaundice is defined as a serum bilirubin level greater than 2.5 mg/dL, which is above the normal range.

Fig. 1: Jaundice.

- Jaundice is a clinical manifestation of disorders of underlying bilirubin metabolism, hepatocellular dysfunction, or biliary obstruction.
- As clinical presentations of yellowing of eyes or skin can be somewhat nonspecific for the underlying etiology of disease, a stepwise approach to evaluation is necessary for accurate diagnosis and effective treatment plan.
- Jaundice indicates the hyperbilirubinemia and that excessive level of bilirubin may be in conjugated or unconjugated form.
- High plasma bilirubin level can cause various manifestations involving satiety, gastrointestinal bleeding, diarrhoea, anaemia, oedema, weight-loss and can be fatal because it can cause psychosis, lethargy, seizures, coma or even death.
- High bilirubin level can help in the diagnosis of Jaundice. Differential diagnosis of various variants of Jaundice can be carried out on the basis of bilirubin level (conjugated and unconjugated),

- **Causes of jaundice**

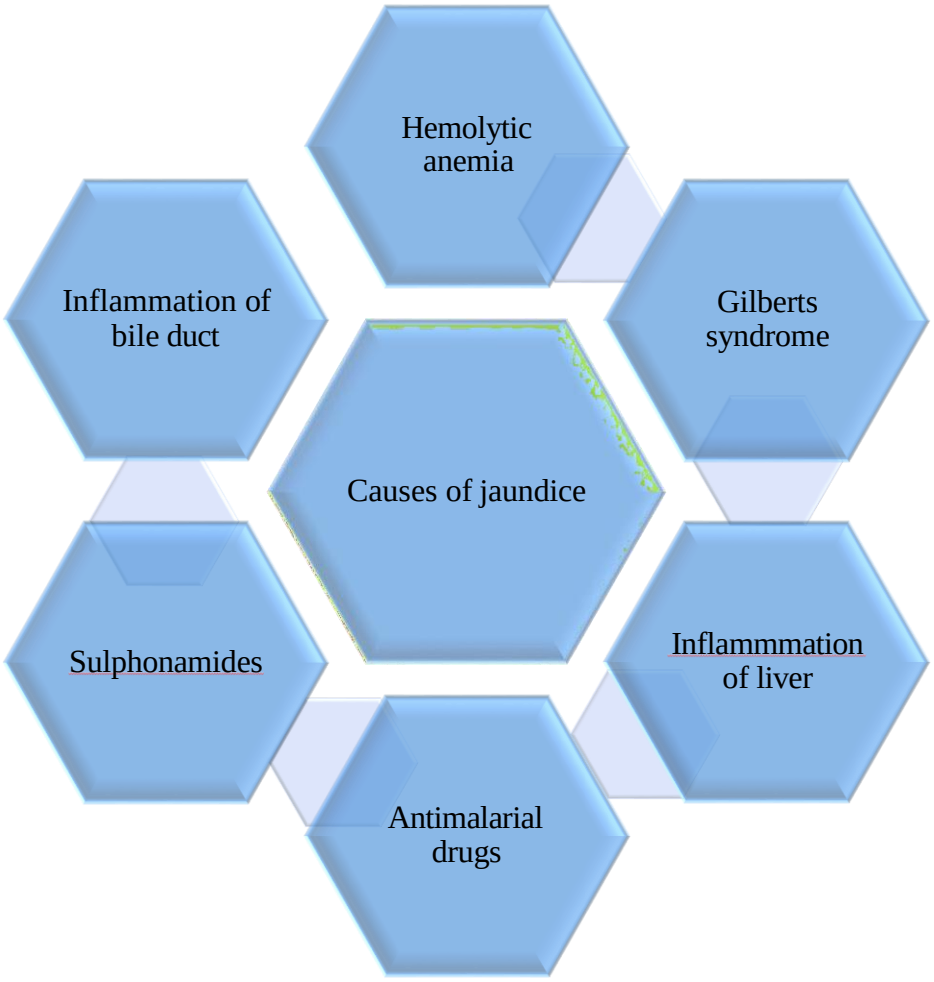


Fig.2: Causes of jaundice.

- **Symptoms of jaundice**

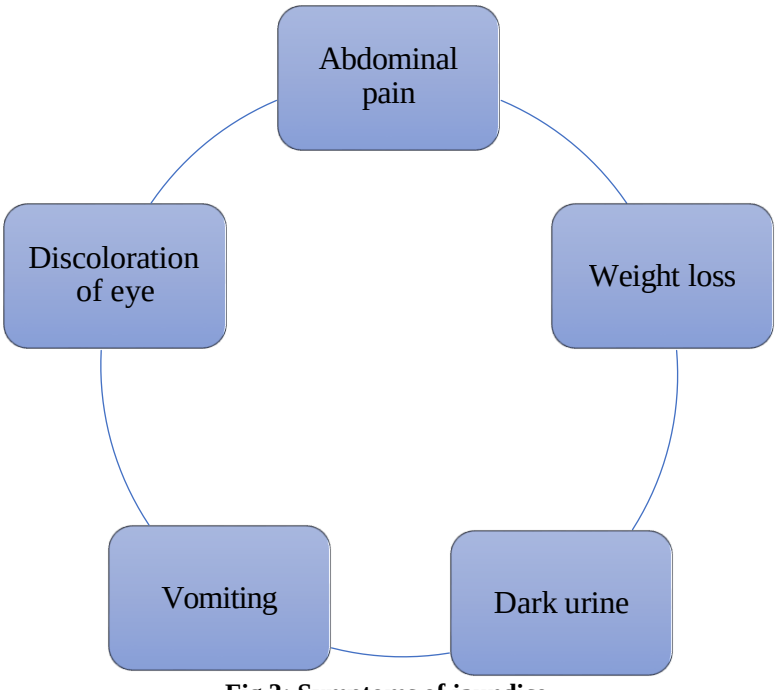


Fig.3: Symptoms of jaundice.

- **Diagnosis of jaundice**

1. Physical examination.
2. Medical history.
3. Laboratory tests: blood tests to measure bilirubin levels, liver function tests.
4. Imaging tests: ultrasound, CT scan, MRI to evaluate liver and bile ducts.

- **Complications**

If left untreated, jaundice can lead to complications, such as.

1. Kernicterus: a condition that can cause brain damage in newborns.
2. Liver failure: if the underlying cause is not treated.
3. Bile duct obstruction: can lead to infection, inflammation, or liver damage.

- **Types of jaundice**

1. Pre – hepatic / Hemolytic jaundice
2. Hepato – cellular jaundice
3. Post- hepatic / Obstructive jaundice

➢ **Pre-hepatic jaundice**

Pre-hepatic jaundice is a type of jaundice that occurs due to an increase in bilirubin production or a decrease in bilirubin uptake by the liver.

➢ **Hepatocellular jaundice**

Hepatocellular jaundice is a type of jaundice that occurs due to liver cell damage or dysfunction, leading to impaired bilirubin processing and excretion.

➢ **Post-hepatic jaundice**

Post-hepatic jaundice, also known as obstructive jaundice, occurs when there is a blockage or obstruction in the bile ducts, preventing bilirubin from being excreted into the intestine.

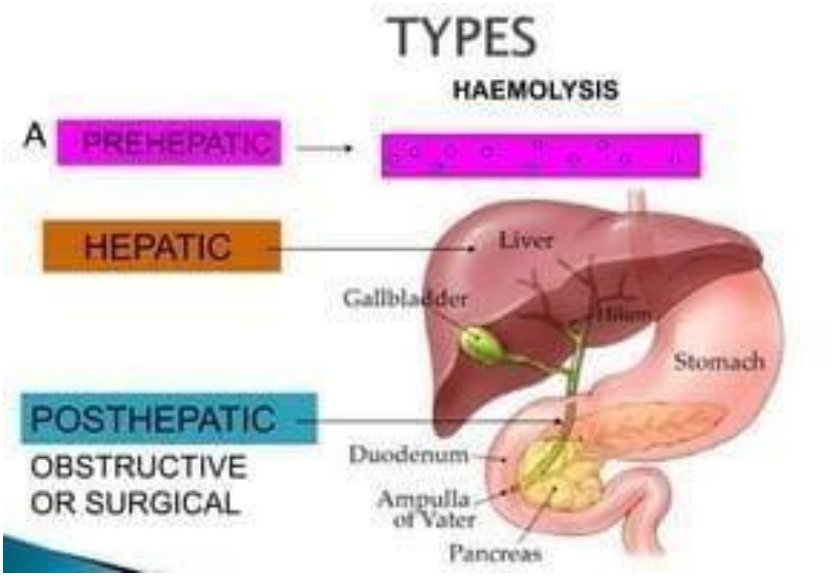


Fig.4: Types of jaundice.

3. Plant profile

A) *Ricinus communis*

- **Synonym :** Castor plant, Oleum ricini, Yeranda
- **Biological source :** Castor oil is fixed oil obtained by cold expression of the seeds of *Ricinus Communis*
- **Family :** *Euphorbiaceae*

- **Geographical Source**

Ricinus communis, commonly known as the castor oil plant, is native to Africa and the Middle East. However, it has been widely cultivated in tropical and subtropical regions around the world due to its oil-rich seeds. The plant thrives in well-drained soils and can grow in a variety of conditions, making it adaptable to different environments.

In terms of its geographical distribution, you can find Ricinus communis in regions such as.

1. Africa: It is commonly found in countries like Ethiopia and Sudan.
2. Middle East: Countries like Egypt and Israel also have native populations of this plant.
3. India: It is extensively cultivated and has become an integral part of the agricultural landscape.
4. South America: The plant has been introduced and is grown in several countries, including Brazil and Argentina.
5. Mediterranean Regions: It can also be found in parts of southern Europe.

Fig.5*: Ricinus communis.*

- **Scientific Classification**

Kingdom: Plantae
Clade: Angiosperms (flowering plants) Clade: Eudicots
Clade: Rosids Order: Malpighiales
Family: *Euphorbiaceae* (spurge family) Genus: Ricinus
Species: communis
Binomial Name: *Ricinus communis L.*

- **organoleptic characters of Ricinus communis**

➢ Morphological Characters

1. Appearance: A shrub-like plant with large, palmate leaves and a distinctive, prickly stem.
2. Leaf shape: Palmate, with 5-12 lobes.
3. Leaf size: 15-45 cm in diameter.
4. Flower: Small, yellowish-green, and clustered in terminal panicles.
5. Fruit: A spiny, greenish-brown capsule containing 3-5 seeds.

➢ Sensory Characters

Taste: Bitter and unpleasant.

1. Odor: Characteristic, unpleasant, and slightly nutty.
2. Texture: Seeds are hard and brittle.

➢ Other Characters

1. Oil content: Seeds contain approximately 40-60% oil.
2. Toxicity: Seeds and leaves contain toxic compounds, including ricin and ricinine.

-

- **Chemical constituent**

➢ Castor oil contains Triglyceride and ricinoleic acid 80 %
➢ Other glycerides are isoricinoleic , linoleic , stearic and Isostearic acid
➢ It contains heptaldehyde , undecanoic acid , & Sebacic acid

- **Uses**

1. Antibacterial activity
2. Anti-asthmatic activity
3. Antioxidant activity
4. Mosquicidal activity
5. Wound healing activity
6. Hepatoprotective activity
7. To treat jaundice

B) *Carica papaya*

- **Synonym :** Papayotin, vegetable pepsin, tromasin, arbuz
- **Biological source :** Papain is the dried and purified latex of the green fruits and leaves of *Carica Papaya.*
- **Family :** *Cariaceae*

- **Geographical source of *Carica papaya***

Carica papaya L., commonly known as the papaya or pawpaw, is native to the tropical regions of the Americas. Specifically, it is believed to have originated in southern Mexico and Central America. Over time, the cultivation of papaya has spread to various tropical and subtropical regions around the world due to its popularity and adaptability.

Today, papaya is widely grown in.

1. Caribbean Islands: Countries like Jamaica and the Dominican Republic have significant papaya production.
2. South America: Brazil and Peru are among the leading producers of papaya.
3. Southeast Asia: Countries such as India, Indonesia, and the Philippines have extensive papaya plantations.
4. Africa: It is also cultivated in various parts of Africa, including Nigeria and Kenya.
5. Australia: The northern regions of Australia grow papaya as well.

Fig. 6*: Carica papaya.*

- **Scientific Classification**

Kingdom: Plantae Phylum: Angiosperms Sub phylum: Dicotyledons Division: Lignosae
Order: Brassicales Family: *Caricaceae* Genus: Carica Species: papaya
Binomial Name: *Carica papaya L.*

- **organoleptic characteristics of *Carica papaya***

➢ Morphological Characteristics

1. Fruit shape: Oval or spherical
2. Fruit size: 15-30 cm in length, 10-20 cm in diameter
3. Skin: Smooth, thin, and green or yellow when ripe
4. Leaves: Large, palmate, and 30-60 cm in diameter

➢ Sensory Characteristics

1. Taste: Sweet, musky, and slightly bitter
2. Odor: Sweet, fruity, and slightly musky
3. Texture: Soft, juicy, and slightly grainy
4. Juiciness: High water content, making it juicy and

refreshing.

- **Chemical Constituent**

➢ Contains many biological active compounds, important two are papain and chymopapain, known to aid in digestion.
➢ Phenolic compounds more in male trees Leaf, fruit, stem and root yield a proteolytic enzyme, propain(papayotin), malic acid, phtokinase and calcium maliate.
➢ Its fresh latex gives chymopapain.
➢ Its fruit yields saccharose 0.85%, dextrose 2.6%, levulose 2.1%, pectin, malic acid, citrate and papain.
➢ Volatile oil obtained from its seeds.

- **Uses**

1. Inflammation
2. Diabeties
3. Wound healing
4. Antiparasitic activity
5. Heart disese
6. To treat jaundice
7. Anti- aging

3. Drug and excipients profile

Table no. 1: Drug and excipients.

Sr.no.	Name	Role
1.	Carica papaya leaf extract	To treat jaundice
2.	Ricinus communis leaf extract	To treat jaundice
3.	Beet root juice	Coloring agent
4.	Honey	Sweetening agent
5.	Liquorice	Preservative
6.	Orange juice	Flavoring agent
7.	Water	Vehicle

4. Pre formulation study

Pre formulation study is an important phase in the development of pharmaceutical products. It involves evaluating the characteristics of the drug substance and its compatibility with excipients before creating the final formulation.

a) Bulk density
b) Tapped density
c) carr's index
d) Hausner's ratio
e) Angle of repose
f) %Ash value
g) Solubility

a) BULK DENSITY

The bulk density of a powder is the ratio of the mass of an untapped powder sample and its volume including the contribution of the inter-particulate void volume.

FORMULA

$$\text{BULK DENSITY} = \frac{\text{MASS}}{\text{BULK VOLUME}}$$

b) TAPPED DENSITY

The tapped density is an increased bulk density attained after mechanically tapping a container containing the powder sample.

FORMULA

$$\text{TAPPED DENSITY} = \frac{\text{MASS}}{\text{TAPPED VOLUME}}$$

c) CARR'S INDEX

Carr's Index of any solid is calculated for compressibility of a powder which is based on true density and bulk density.

FORMULA

$$\text{CARR'S INDEX} = \frac{\text{TAPPED DENSITY} - \text{BULK DENSITY}}{\text{TAPPED DENSITY}} X100$$

d) HAUSNER'S RATIO

Hausner ratio is defined as the ratio of a powder's tapped bulk density to its poured (loose) bulk density

FORMULA

$$\text{HAUSNER'S RATIO} = \frac{\text{TAPPED DENSITY}}{\text{BULK DENSITY}}$$

e) ANGLE OF REPOSE

Angle of repose powder poured from a vessel forms a cone-like pile. The angle of repose- the angle between the slope of the pile and the horizontal correlates with the strength of particle- particle interactions and, therefore, is measured to infer flowability.

FORMULA: $\Theta = \tan^{-1}(h/r)$ Where,

h : the height in cm r : the radius in cm

ɵ : the angle of repose

f) % ASH VALUE

The ash values usually represent the inorganic residues such as phosphates, carbonates and silicates present in herbal drugs

FORMULA:

$$\%\ \text{ASH VALUE} = \frac{W2-W0}{W1} X100$$

Where,

W2: weight of crucible ash

WO: weight of crucible

W1: weight of sample

g) SOLUBILITY

Solubility is the ability of a solid, liquid, or gaseous chemical substance (referred to as the solute) to dissolve in solvent (usually a liquid) and form a solution. We are going to check solubility of our sample in water, acidic and alkaline solution.

5. Evaluation Test

1. Physical appearance
a) Colour
b) Odor
c) Texture

2. pH
3. Density
4. Specific gravity
5. Viscosity test
6. Clarity test
7. Sedimentation Test

1. Physical appearance

The physical appearance tests help ensure the herbal syrup meets the required standards for quality, safety, and efficacy.

a) Colour Test

To evaluate the colour of the herbal syrup. Compare the colour of the syrup with a standard colour reference or a previously approved batch.

b) Odor Test

To evaluate the odor of the herbal syrup. Smell the syrup and compare it with a standard reference or previously approved batch.

c) Texture Test

To evaluate the texture of the herbal syrup. Observe the texture by pouring the syrup onto a surface or by feeling it with the fingers.

2. pH Test

To evaluate the pH of the herbal syrup. Measure the pH using a pH meter. The pH should be within the specified range (typically 4.5-6.5)

3. Density test

To determine the density of the syrup, which is an important physical property that can affect its stability, texture, and overall quality. The density of the syrup should be within the specified range (typically 1.2-1.4 g/mL).

Density = (Weight of syrup-filled pycnometer – Weight of empty pycnometer) / Volume of pycnometer

4. Specific gravity

To determine the specific gravity of the syrup, which is the ratio of the density of the syrup to the density of water.

Specific Gravity = (Density of syrup) / (Density of water)

5. Viscosity test

To evaluate the viscosity of the herbal syrup.

Measure the viscosity using a viscometer or by observing the flow rate.

6. Clarity test

To evaluate the clarity of the herbal syrup.

Hold the syrup up to a light source and observe its clarity.

B) Sedimentation Test

To evaluate the sedimentation of the herbal syrup.

Allow the syrup to stand for a specified period and observe for sedimentation.

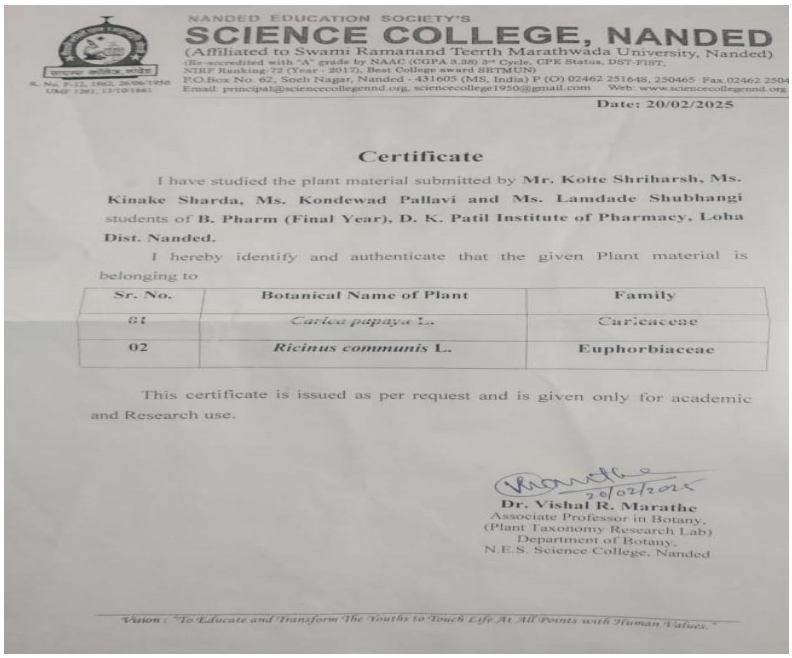
7. RESULT AND DISCUSSION

A. Collection of sample

Sample is collected from the local areas from Loha, dist – Nanded.

B. Authentication letter

The sample was authentified by Dr.Marahthe, HOD (botany dept.) of NES Science College, Nanded.



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Date: 20/02/2025

Certificate

I have studied the plant material submitted by **Mr. Kolte Shriharsh, Ms. Kinake Sharda, Ms. Kondewad Pallavi and Ms. Lamdade Shubhangi** students of **B. Pharm (Final Year), D. K. Patil Institute of Pharmacy, Loha Dist. Nanded.**

I hereby identify and authenticate that the given Plant material is belonging to

Sr. No.	Botanical Name of Plant	Family
01	*Carica papaya* L.	Caricaceae
02	*Ricinus communis* L.	Euphorbiaceae

This certificate is issued as per request and is given only for academic and Research use.

20/02/2025
Dr. Vishal R. Marathe
Associate Professor in Botany,
(Plant Taxonomy Research Lab)
Department of Botany,
N.E.S. Science College, Nanded

Vision : "To Educate and Transform The Youths to Touch Life At All Points with Human Values."

Fig.7: Authentication letter.

C. Pre- formulation study

Table no.2: Pre- formulation table of *Ricinus communis.*

Parameters	A (Sieve no.46)	B (Sieve no.60)	C (Sieve no.80)	D(Sieve no.100)
Bulk density (g/ml)	0.25	0.26	**0.23**	0.20
Tapped density (g/ml)	0.30	0.32	**0.28**	0.31
Car's index (%)	16.66%	18.75%	**17.85%**	32.25%
Hausner's ratio	1.2	1.23	**1.21**	1.55
Angle of repose	8'97	14'03	**12'99**	18'43
Ash value	13%	13%	**13%**	13%

Table no.3: Pre- formulation table of *Carica papaya.*

Parameters	A (Sieve no.46)	B (Sieve no.60)	C (Sieve no.80)	D(Sieve no.100)
Bulk density (g/ml)	0.30	0.31	**0.33**	0.31
Tapped density (g/ml)	0.33	0.35	**0.41**	0.4
Car's index (%)	9.09%	11.42%	**19.51%**	22.5%
Hausner's ratio	1.1	1.12	**1.24**	1.29
Angle of repose	12'38	10'71	**8'74**	15'25
Ash value	14%	14%	**14%**	14%

In this pre-formulation study of sample we observed that, the Batch C (sieve #80) has good flow property and other parameters then can be utilized have final preparation of herbal syrup.

D. Solubility

Table no. 4: Solubility table of *Ricinus communis.*

Batch	Solubility in water	Solubility in NaOH (0.1N)	Solubility in Ethanol
A	Sparingly soluble	Soluble	Slightly soluble
B	Sparingly soluble	Soluble	Slightly soluble
C	**Sparingly soluble**	**Soluble**	**Slightly soluble**
D	Sparingly soluble	Soluble	Slightly soluble

Table no. 5: Solubility table of *Carica papaya.*

Batc	Solubility in water	Solubility in NaOH (0.1N)	Solubility in Ethanol
A	Slightly soluble	Soluble	Soluble
B	Partially soluble	Soluble	Soluble
C	**Sparingly soluble**	**Soluble**	**Soluble**
D	Sparingly soluble	Soluble	Soluble

In this pre-formulation study of *Carica papaya* and *Ricinus communis* sample we observed that, the Batch C sample was Sparingly soluble in water, soluble in NaOH and slightly soluble in ethanol.

E. Extraction of sample:- Extraction *of Carica papaya* leaves and *Ricinus communis* leaves is done in D. K. Patil institute of pharmacy, Loha, Nanded by decoction method.

Fig. 8: Extraction of *Ricinus communis* and *Carica papaya* leaves by decoction method.

Fig. 9: Extract of Ricinus communis and Carica papaya.

F. Formulation Table

Table no. 6: Formulation table.

Ingredients	B1	B2	B3	B4	B5
Carica papaya leaves extract	5.5ml	6.5ml	7.5ml	8.5ml	9.5ml
Ricinus communis leaves extract	5.5ml	6.5ml	7.5ml	8.5ml	9.5ml
Orange juice	1ml	1ml	1ml	1ml	1ml
Honey base	10ml	10ml	10ml	10ml	10ml
Beet root juice	2ml	2ml	2ml	2ml	2ml
Liquorice	0.50ml	0.50ml	0.50ml	0.50ml	0.50ml
Water	q. s	q. s	q. s	q. s	q. s

Fig. 10: Formulation batches.

G. Evaluation table

Table no. 7: Evaluation table.

Sr.no	Test	B1	B2	B3	B4	B5
1.	Physical appearance					
	a)Colour	Reddish brown	Reddish brown	**Reddish brown**	Reddish brown	Reddish brown
	b) Odour	Pleasant	Pleasant	**Pleasant**	Pleasant	Pleasant
	c) Texture	Smooth	Smooth	**Smooth**	Smooth	Smooth
2.	pH	6.5	6.6	**6.5**	6.2	6.5
3.	Density	1.1g/ml	1.2g/ml	**1.3g/ml**	1.3g/ml	1.4g/ml
4.	Specific gravity	1.2	1.3	**1.4**	1.4	1.5
5.	Viscocity	5000cp	5000cp	**5000cp**	5000cp	5000cp
6.	Sedimentation	No sediment	No sediment	**No sediment**	No sediment	No sediment
7.	Clarity	Clear	Clear	**Clear**	Clear	Clear

SUMMARY

Herbal syrups have been a cornerstone of traditional medicine for centuries, offering a natural and effective way to promote overall health and wellness. Papaya

contains digestive enzymes like papain and chymopapain. *Carica papaya* has been used to treat various liver disorders, including jaundice. Castor oil, extracted from the seeds, has been used for centuries to treat various ailments, including digestive issues, skin problems, and inflammation. *Ricinus communis* has been used to treat various liver disorders, including jaundice. Pre-formulation study was performed by using different parameters like bulk density, tapped density, Hausner's ratio, car's index, angle of repose and ash value. The selection of batch was done on pre- formulation basis and different formulation batches are prepared. On this batches evaluation test was performed and finally get the most optimized batch.

CONCLUSION

The *Ricinus communis* leaves extract is useful to treat jaundice. The *Carica papaya* leaves extract are also useful to treat jaundice. Both plants give the synergistic effect when combined their leaves extract. On the above observation of the tests and results it is concluded that the *Ricinus communis* and *Carica papaya* leaves extract are effectively treats the jaundice. After pre- formulation sieve no.80 batch of both plants was selected and extracted. Formulation was done and after that Batch B3 is most optimized batch observed after evaluation.

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