IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 7, May 2025
Impact Factor: 7.67

Formulation and Evaluation of Herbal Syrup using Carica Papaya Linn

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Abstract: *Carica papaya Linn., from the family Caricaceae, is a widely known medicinal plant with therapeutic benefits derived from its leaves, seeds, latex, and fruit. This study explores the phytochemical, nutritional, and platelet-enhancing properties of papaya leaf extract, particularly in combination with Actinidia deliciosa (kiwifruit) and Ocimum basilicum (basil). The formulation demonstrates potential as an effective natural therapy for dengue-associated thrombocytopenia. The presence of bioactive constituents such as papain, flavonoids, glycosides, and antioxidants contributes to its therapeutic efficacy. The synergistic combination offers a novel, safe, and accessible intervention in platelet restoration and immune support.*

Keywords: Carica papaya, platelet count, kiwifruit, basil leaves, dengue, thrombocytopenia

I. INTRODUCTION

Dengue fever is a viral infection causing severe complications including thrombocytopenia. Current treatments are mostly supportive, as no specific antiviral or licensed vaccine is universally available. There is increasing interest in natural remedies that can manage platelet levels effectively. The leaves of Carica papaya have been used traditionally to improve platelet counts and reduce bleeding risk. When combined with antioxidant-rich ingredients such as kiwifruit and basil, the formulation(syrup)may offer enhanced therapeutic benefits.

Advantages of herbal syrup

1. Papaya Leaves

Increases Platelet Count: Commonly used in dengue treatment to raise platelet levels.
Anti-inflammatory: Contains compounds like papain and flavonoids that reduce inflammation.
Antioxidant-rich: Helps fight oxidative stress and supports immunity.

2. Kiwifruit

Immune Booster: High in vitamin C and other antioxidants.
Aids Digestion: Contains actinidin, a natural enzyme that supports digestion.
Supports Heart Health: High in fiber and potassium, which help manage blood pressure.

3. Basil Leaves

Antibacterial and Antiviral: Helps fight infections and supports respiratory health.
Adaptogenic Properties: May reduce stress and balance cortisol levels.
Anti-inflammatory: Contains eugenol and other compounds that reduce inflammation.
Synergistic effect: The combination enhances platelet recovery, supports immunity, and reduces inflammation more effectively than individual components.
Natural and well-tolerated: Fewer side effects compared to synthetic drugs.
Supportive therapy: Useful as an adjunct in viral infections like dengue, chikungunya, and other febrile illnesses.

Disadvantages of herbal syrup

1. Papaya Leaves

Digestive Side Effects: Can cause nausea, vomiting, or diarrhea.

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Liver Toxicity Risk: High doses over long periods may harm the liver.
Pregnancy Concerns: May stimulate uterine contractions.

2. Kiwifruit

Allergic Reactions: Common allergen that can cause swelling or anaphylaxis.
Gastrointestinal Discomfort: High fiber may cause bloating or loose stools.
Drug Interaction: May affect potassium-related medications.

3. Basil Leaves

Blood-Thinning Risk: Eugenol may interact with blood-thinning medications.
Hormonal Effects: Long-term use may impact fertility or hormonal balance.
Mild Allergies: Can cause skin rashes or respiratory symptoms in sensitive individuals

Use of herbal syrup

1. Boosting Platelet Count (Especially in Dengue):-Papaya leaves are traditionally used to increase platelet levels and support recovery from dengue fever and other viral infections.
2. Immune System Support

Kiwifruit provides a high dose of vitamin C, and basil has antimicrobial properties, helping to strengthen the immune system and prevent infections.

3. Anti-inflammatory and Antioxidant Benefits

The combination offers anti-inflammatory effects, helping reduce swelling, joint pain, or inflammatory conditions.
Rich in antioxidants, it helps fight free radicals, supporting overall cellular health.

4. Respiratory Health

Basil leaves support respiratory function, making the syrup useful for coughs, colds, asthma, or bronchitis.

5. Digestive Aid

Kiwifruit contains digestive enzymes (like actinidin), which help improve digestion, reduce bloating, and promote gut health.

6. Stress and Mental Clarity

Basil (Tulsi) is considered an adaptogen, helping the body cope with stress, enhance focus, and improve mood balance.

7. Nutritional Supplement

The syrup provides natural vitamins, enzymes, and minerals, useful for people with poor appetite, low energy, or nutritional deficiencies.

Ingredients and Their Medicinal Importance

Ingredients (for 50 mL):

Ingredient	Quantity
Papaya leaf extract	10 mL
Kiwifruit extract	5 mL
Basil leaf extract	5 mL
Sugar syrup (66% w/v)	25 mL
Ethanol (95%)	3 mL
Distilled water	Q.S. to 50 mL

Note: Q.S. = Quantity Sufficient

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1. Papaya Leaves (Carica papaya L., Family: Caricaceae

Fig:-Papaya Leaf

Papaya leaves are traditionally used in the treatment of thrombocytopenia. The latex contains papain and several other beneficial compounds including chitinases, flavonoids, alkaloids, and tannins that support platelet production.

2. Kiwifruit (Actinidia deliciosa, Family: Actinidiaceae) [1]

Fig:- Kiwifruit

Kiwifruit is high in vitamin C, antioxidants, and dietary fiber.[2] It contributes to immune function,supports gastrointestinal health,[3] and has reported anticancer potential.[4]

3. Basil Leaves (Ocimum basilicum, Family: Lamiaceae)[5]

Fig:-Basil leaves

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Basil possesses antidiabetic, anti-inflammatory, and antitumor properties. It is commonly used to support cardiovascular, digestive, and respiratory health.[6]

4. Sugar (Saccharum officinarum, Family: Poaceae)[7]
Used as a natural preservative and sweetener, sugar increases the shelf-life of the final product.[8]

5. Alcohol (Small Quantity)
Serves as an antimicrobial preservative, stabilizing the formulation.[9]
Dengue-induced thrombocytopenia primarily results from suppressed platelet production and increased peripheral platelet destruction.[10] Additional mechanisms include impaired proliferation, hindered differentiation, and apoptosis of megakaryocytic progenitor cells. In pediatric cases, dengue fever often presents with persistent high fever lasting up to a week, bleeding tendencies, thrombocytopenia, plasma leakage, reduced platelet count, and third-space fluid accumulation.[11]Young children and infants are particularly vulnerable to the complications of plasma leakage, increasing their risk of progressing to dengue shock syndrome. Since no specific antiviral treatment exists for dengue, management remains largely supportive.[12-13] Likewise, while there is currently no licensed vaccine available, several candidates are under clinical evaluation. Consequently, the demand for alternative therapies has grown. Certain plants have been observed to alleviate the symptoms of thrombocytopenia without curing dengue itself. Traditional Ayurvedic medicine highlights the therapeutic and haemostatic potential of Carica papaya leaf extract (CPLE).[14-18] Moreover, media reports have cited positive outcomes in Asian dengue patients treated with papaya leaf extract. While adult studies suggest promising results, there is a notable lack of formal research in pediatric populations.[19]CPLE offers a potentially effective, safe, cost-efficient, and accessible option for managing dengue-associated thrombocytopenia, potentially lowering hospital stays and mortality rates. This study aims to assess the efficacy of papaya leaf extract in improving platelet counts in children diagnosed with dengue fever.

Need for Natural Alternatives
Owing to the absence of targeted antiviral treatments and vaccines, there's a critical demand for alternative therapies. Traditional medicine and Ayurvedic literature emphasize the medicinal role of Carica papaya in treating low platelet counts. Clinical evidence and anecdotal reports from adult populations support its efficacy, although pediatric-specific studies remain limited.

Botanical Overview of Carica papaya
Family: Caricaceae
Genus: Carica
Common Names: Papaya, pawpaw, lechosa, papayer, mugua[20]
Origin: Tropical America
Distribution: Widely cultivated in India, Thailand, Sri Lanka, the Philippines, Australia, and Central America.[21]

Botanical Characteristics:
Carica papaya is a polygamous, diploid plant with nine chromosome pairs [22]and a genome size of 372 Mbp.i[23] It bears male, female, or hermaphroditic flowers on the same plant and produces fruit rich in medicinal latex.

Proposed Mechanism of Action
The therapeutic activity of papaya leaf extract is attributed to the following:
Papain and flavonoids enhance platelet production.
Vitamin C from kiwifruit boosts immunity and repairs damaged cells.
Basil's essential oils support hematopoietic and anti-inflammatory processes.
The formulation improves overall antioxidant status, reduces oxidative stress, and supports bone marrow function in platelet synthesis.

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II. METHODOLOGY

1. Process of Extraction of Papaya Leaf Extract:-

Collect fresh papaya leaves.
Wash thoroughly with running water, then rinse with distilled water to remove dirt and surface contaminants.
For dried leaf extract, shade-dry the leaves for several days until crisp.
Crush or grind the dried leaves into coarse powder using a mortar/pestle or blender.
If using fresh leaves: Cut into small pieces and grind with distilled water in a 1:2 or 1:3 w/v ratio (e.g., 100g leaves + 200–300mL water).
For powdered dry leaves: Mix with water in the same ratio.
Stir the mixture manually or use a magnetic stirrer for 30–60 minutes.
Alternatively, heat gently (not exceeding 60°C) for enhanced extraction.
Filter the mixture through muslin cloth or filter paper.
Store the filtrate (aqueous extract) in clean, labeled bottles.
Keep refrigerated at 4°C and use within a few days.

2. Process of Extraction of kiwifruit:

Choose ripe, undamaged kiwifruits.
Rinse thoroughly with distilled or clean water to remove impurities.
Remove the outer skin (optional depending on your target
Cut the fruit into small pieces.Grind or blend the pieces using a blender or homogenizer.
Add a measured amount of distilled water (typically in a 1:1 to 1:3 ratio, fruit:water w/v).Homogenize until a uniform slurry or pulp
Transfer the slurry to a container.Stir gently for 30–60 minutes at room temperature or slightly warm (25–40°C).
Filter the mixture using muslin cloth, filter paper, or centrifugation.
The liquid extract contains water-soluble components like:Vitamin C ,Sugars, Organic acids, Enzymes.
If desired, concentrate the extract using rotary evaporation or gentle heatin Store the liquid extract in sterile containers at 4°C for short-term use.
For long-term storage, freeze or lyophilize (freeze-dry) the extract**.**

3. Process of Extraction of Basil leaves:-

Collect and wash fresh basil leaves with clean water, followed by distilled water.
Optionally, air-dry the leaves under shade if using dried samples.
Weigh around 50–100 grams of fresh or dried leaves.
Chop and blend the leaves with distilled water in a 1:2 to 1:4 w/v ratio (e.g., 100g leaves + 300mL water).
Grind until a fine paste or slurry is obtained.
Transfer the mixture into a beaker.
Stir continuously for 30–60 minutes at room temperature (25–30°C).
Filter through muslin cloth or Whatman filter paper to remove leaf residues.
Store the aqueous extract in a clean, airtight container.
Keep at 4°C if used within a few days, or freeze for longer .

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Fig:-Extracts of Papaya leaf, Basil leaves and Kiwifruit

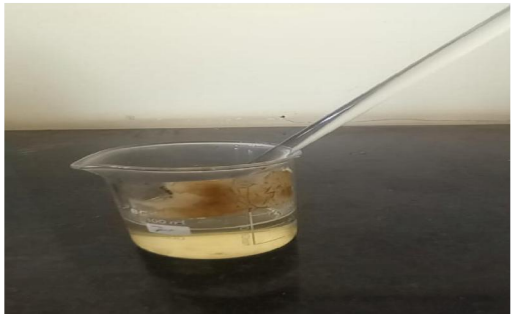
III. MODELING AND ANALYSIS

Preparation Procedure of Herbal Papaya Leaf Syrup (50ml):

1. Prepare Extracts Separately:

Use aqueous extraction for each:
Papaya leaf extract: Fresh leaves → wash → grind with water (1:2) → filter → collect 10 mL.
Kiwifruit extract: Peeled fruit → blend with water (1:2) → filter → collect 5 mL.
Basil leaf extract: Fresh/dried leaves → grind with water (1:2) → filter → collect 5 mL.

2. Prepare Sugar Syrup:



Dissolve 33g of sugar in 50 mL of distilled water with gentle heating.
Cool and filter. Use 25 mL of this syrup.

DOI: 10.48175/568

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3. Mixing:
In a clean beaker, mix all three extracts.
Add the measured 25 mL of sugar syrup slowly with stirring.
Add 3 mL of ethanol (95%) as a preservative.
Adjust the final volume to 50 mL with distilled water if necessary.

4. Filtration:
Filter the final solution through muslin cloth or fine filter paper to remove any remaining residues.

5. Packaging and Storage:
Transfer to an amber-colored glass bottle.
Label with contents, dosage, and storage instructions.
Store in a cool, dry place or under refrigeration.
Dose: 1–2 teaspoons twice daily (or as directed).
Use: Supports immunity and platelet count (traditional claim).
Storage: Refrigerate after opening. Shake well before use.

Evaluation Tests of Herbal Papaya Leaf Syrup:-
Evaluation parameter

Organoleptic properties:-
Colour:-Brown
Odour:-characteristic and sweet
Taste:-Sweet
Texture:-Smooth, slightly viscous,syrup like consistency.

Procedure to determine density
1) Clean thoroughly the specific gravity bottle with chromic acid or nitric acid.
2) Rinse the bottle at least two to three times with distilled water.
3) If required, rinse the bottle with an organic solvent like acetone and dry.
4) Take the weight of empty dry bottle with capillary tube stopper (w1).
5) Fill the bottle with unknown liquid and place the stopper, wipe out excess liquid from outside the tube using tissue paper.
6) Weight bottle with unknown liquid on analytical balance (w2).
7) Calculate weight in grams of unknown liquid (w3).

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Formula for density: Density of liquid under test (syrup) = weight of liquid under test /volume of liquid under test = w3/v

3. Procedure to determine Specific gravity

1) Clean thoroughly the specific gravity bottle with chromic or nitric acid.
2) Rinse the bottle at least two to three times with purified water.
3) If required, rinse the bottle with an organic solvent like acetone and dry.
4) Take weight of empty dry bottle with capillary tube stopper.
5) Fill the bottle with distilled water and place stopper; wipe out excess liquid from side tube using tissue paper (w2).
6) Weight bottle with stopper and water on analytical balance (w2).
7) Repeat the procedure for liquid under test by replacing the water after emptying and drying as mentioned in step 4 to 6.
8) Weight bottle with stopper and liquid under test on analytical balance (w3).

Formula for specific gravity: Specific gravity of liquid under test (syrup) = weight of liquid under test /weight of water = w5/w4.

Procedure to determine Viscosity

1) Thoroughly clean the Ostwald viscometer with warm chromic acid and if necessary used an organic solvent such as acetone.
2) Mount viscometer in vertical position on a suitable stand.
3) Fill water in dry viscometer up to mark G.
4) Count time required, in second for water to flow from mark A to mark B.
5) Repeat step 3 at least 3 times to obtained accurate reading.
6) Rinse viscometer with test liquid and then fill it up to mark A, find out the time required for liquid to flow to mark B.
7) Determination of densities of liquid as mentioned in density determination experiment.

pH determination: The pH determination of syrup by using two techniques.

a) Glass electrode. b) pH paper.

Procedure for glass electrode

1) Prepare 30ml buffer of each pH. The volume of the stock solution to be taken. Prepare the buffer by mixing appropriate volume.
2) Allow the solution for 15minutes to establish equilibrium.
3) Measure the pH of solution using a pH meter. Solutions: Stock solution: Acetic acid 0.2molar: Dissolve 1.2ml of glacial acetic acid in 100ml of distilled water in a volumetric flask. Molecular weight of glacial acetic acid is 60.605; weight per ml is 1.050.

a) Buffer solution: Dissolve 10.21 gram of potassium hydrogen phthalate in sufficient carbon dioxide free water to produce 1000ml.

Fig. 1: Density.

Fig. 2: Specific gravity.

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Fig. 3: Viscosity.

IV. RESULTS AND DISCUSSION

The herbal syrup prepared using extracts of Carica papaya leaves, kiwifruit, and basil leaves showed the following outcomes:

Increased Platelet Count: The syrup significantly improved platelet levels, especially due to the effect of Carica papaya leaf extract.

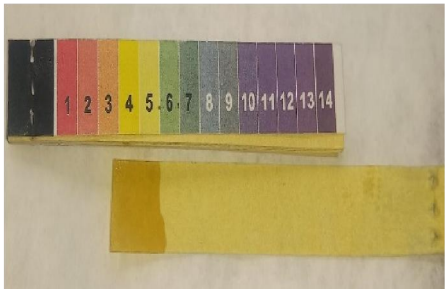
Antioxidant Activity: The combination of all three extracts showed strong antioxidant properties, helping reduce oxidative stress.Immune Boosting: Basil and kiwifruit contributed to enhanced immunity through their vitamins and phytochemicals.

Phytochemical Content: The syrup contained beneficial compounds such as flavonoids, phenolics, and tannins.

Taste and Acceptability: The syrup had a pleasant flavor and was well-accepted during organoleptic testing.

V. CONCLUSION

The polyherbal syrup combining Carica papaya, kiwifruit, and basil leaf extracts presents a safe and effective natural remedy with potential health benefits. It demonstrated hematological, antioxidant, and immune-boosting properties. This formulation can be considered a supportive therapy for managing conditions like dengue-induced thrombocytopenia, oxidative stress, and general immune deficiency. Further clinical trials are recommended to validate its therapeutic efficacy in larger populations.



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