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A REVIEW ARTICLE ON: FORMULATION AND EVALUATION OF PAPAYA (CARICA PAPAYA) HERBAL SYRUP FOR DENGUE

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Abstract:

Dengue fever is a mosquito-borne viral disease that poses a major threat in tropical and subtropical regions. Due to the absence of specific antiviral therapies, herbal medicines have gained attention as supportive treatments. Among them, Carica papaya leaf extract has shown potential in elevating platelet counts and reducing disease severity. This research focuses on the formulation and evaluation of a papaya-based herbal syrup enriched with vitamin B12, selenium, and essential excipients. The syrup was subjected to various physicochemical evaluations, including pH, viscosity, refractive index, solubility, aroma, and stability testing. Results revealed that the formulated syrup exhibited acceptable organoleptic properties, physicochemical stability, and suitable pH and viscosity profiles, suggesting its potential as a supportive herbal remedy for dengue. However, clinical trials are necessary to validate its therapeutic efficacy in dengue patients.

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1. INTRODUCTION:

Dengue fever is an acute febrile illness transmitted primarily by Aedes aegypti mosquitoes. Clinical manifestations include high fever, severe headache, retro-orbital pain, myalgia, arthralgia, rashes, and thrombocytopenia. Severe complications, such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), may prove fatal if untreated. The absence of targeted antiviral drugs has increased interest in natural therapeutic alternatives.

Carica papaya has been widely used in traditional medicine across tropical regions. Phytochemicals such as flavonoids, alkaloids, glycosides, phenolic compounds, and enzymes like papain and chymopapain contribute to its therapeutic potential. Previous studies have suggested that papaya leaf extract may elevate platelet counts and accelerate recovery in dengue patients.

This study aims to formulate an herbal syrup containing papaya leaf extract and evaluate its physicochemical properties to ensure its stability, quality, and potential suitability as a supportive therapy for dengue.

1.1 Importance in Pharmaceutical Sciences

Herbal formulations play a crucial role in modern pharmaceutical sciences, especially in the development of safe, effective, and affordable therapeutic products. The formulation and evaluation of *Carica papaya* herbal syrup for dengue highlights several important pharmaceutical principles:

1. Development of Alternative and Complementary Therapeutics

Pharmaceutical sciences focus not only on synthetic drugs but also on exploring natural plant-based remedies. Papaya leaf extract has shown potential to support platelet elevation and immune modulation, making it a promising complementary therapy for dengue. Its integration into a syrup dosage form demonstrates how herbal actives can be standardized into modern pharmaceutical products.

2. Standardization of Herbal Medicines

A major challenge in herbal drug development is ensuring consistency and reproducibility. Pharmaceutical evaluation of the papaya syrup—including pH, viscosity, stability, refractive index, and organoleptic properties—ensures that the formulation is standardized. This aligns with pharmacopoeial guidelines and increases reliability, safety, and therapeutic predictability.

3. Enhancement of Patient Compliance

Syrup is a preferred dosage form for pediatric, geriatric, and critically ill patients who may struggle with tablets or capsules. Converting papaya leaf extract into a sweet, palatable syrup increases compliance and acceptability, fulfilling a key pharmaceutical objective.

4. Ensuring Safety, Quality, and Stability

Pharmaceutical sciences emphasize rigorous safety and quality testing. Evaluation of physicochemical parameters ensures that the herbal syrup remains stable, non-contaminated, and therapeutically active throughout its shelf life. Ingredients such as sodium benzoate (preservative) and sucrose (sweetening and viscosity agent) also contribute to product stability.

5. Improving Bioavailability and Therapeutic Potential

Formulating herbal extracts into a liquid dosage form can enhance the absorption rate of active phytochemicals. The syrup also includes vitamin B12 and selenium, which work synergistically with papaya extract, potentially enhancing therapeutic effects. This demonstrates how pharmaceutical sciences optimize formulations to improve bioavailability and efficacy.

6. Research, Innovation, and Future Drug Development

Herbal formulations like papaya syrup encourage scientific research into plant-based therapeutics. By conducting systematic formulation and evaluation, pharmaceutical sciences contribute to:

- new potential drug candidates,
- safer alternatives to synthetic chemicals, and
- integration of traditional medicine into evidence-based practice.

7. Addressing Public Health Needs

Dengue is a major global health concern, especially in developing countries where pharmaceutical access may be limited. Affordable herbal products can help reduce the burden on healthcare systems. Developing such formulations supports public health by offering accessible and cost-effective supportive treatments.

2.1 Early Developments

1. Traditional Use:

Papaya leaves were traditionally used in Ayurveda and folk medicine for treating fevers, digestive issues, and inflammation.

2. Recognition During Dengue Outbreaks:

Increased dengue cases in the early 2000s prompted interest in alternative therapies, bringing papaya leaf extract into focus.

3. Initial Clinical Observations:

Early doctors and researchers noticed that patients consuming papaya leaf juice showed improved platelet counts.

4. Phytochemical Identification:

Initial research identified key bioactive components such as flavonoids, alkaloids,

glycosides, saponins, tannins, papain, and chymopapain.

5. First Scientific Studies (2010–2012):
Early structured studies on dengue patients demonstrated platelet-boosting potential, encouraging deeper research.

6. Use of Crude Juices Initially:
Early trials involved consumption of raw papaya leaf juice, but issues like strong bitterness, inconsistent doses, and short shelf life were common.

7. Shift Toward Standardized Extracts:
Researchers began using aqueous and solvent extracts to ensure consistent concentrations of active compounds.

8. Initial Formulation Efforts:
Scientists explored converting papaya extract into syrups to improve palatability, stability, and dosing accuracy.

9. Pharmaceutical Evaluation Begins:
Early developments included checking pH, viscosity, stability, and microbial safety of papaya syrup formulations.

10. Foundation for Modern Herbal Syrup Development:
These early steps laid the groundwork for modern formulation techniques and clinical studies for papaya-based dengue therapies.

3.MATERIALS AND METHODS:

Materials

1. Plant Material:
Fresh Carica papaya leaves (healthy, disease-free).

2. Chemicals & Reagents:
* Distilled water
* Sucrose (pharmaceutical-grade)
* Sodium benzoate (preservative)
* Vitamin B12
* Selenium
* Natural flavoring agents (optional)

3. Equipment Used:
* Ultrasonicator
* Hot plate
* pH meter
* Ostwald viscometer
* Refractometer
* Amber-colored storage bottles
* Filter paper & funnel
* Weighing balance

Methods

1. Preparation of Papaya Leaf Extract
- Fresh papaya leaves were washed thoroughly with distilled water.
- Leaves were shade-dried for 5–7 days to avoid sunlight degradation.
- Dried leaves were powdered using a grinder.
- 30 g of powdered leaves were mixed with 300 mL of distilled water.
- The mixture was subjected to ultrasonication for 2 hours at 37°C.
- Extract was filtered through muslin cloth and Whatman filter paper.
- Filtrate was concentrated and dried at 70°C to obtain solid extract.

2. Preparation of Syrup Base
- Sugar syrup was prepared by dissolving sucrose in warm distilled water.
- The syrup was heated gently (not boiled) until fully dissolved.
- The solution was cooled to room temperature.

3. Formulation of Herbal Syrup
- Papaya leaf extract was mixed with the prepared syrup base.
- Vitamin B12 and selenium were added as supportive therapeutic agents.
- Sodium benzoate (0.1% w/v) was added as a preservative.
- Distilled water was added to make up the final volume.
- The mixture was stirred continuously for uniform blending.
- The final syrup was filled into **amber-colored bottles to protect from light.

4. Evaluation of Syrup

A. Organoleptic Characteristics
* Color
* Taste
* Aroma
* Clarity

B. Physical Parameters
- Determined using a calibrated pH meter.
- Measured using an Ostwald viscometer at room temperature.
- Refractive Index:
- Determined using a refractometer.
- Observed in water and aqueous media.

C. Stability Testing
- Samples stored at room temperature and observed for:

* Precipitation
* Color change
* Crystallization
* Phase separation

4. RESULTS:

1. Phytochemical Findings Across Studies
Most reviewed studies consistently reported the presence of the following phytochemicals in *Carica papaya* leaves:
* Flavonoids (e.g., quercetin, kaempferol)
* Alkaloids (e.g., carpaine)
* Glycosides
* Saponins
* Phenolic compounds
* Enzymes: papain and chymopapain

These compounds contribute to antioxidant, immunomodulatory, and platelet-enhancing properties.

2. Therapeutic Outcomes in Dengue Patients**

Across clinical and preclinical studies:

Significant increase in platelet count was observed within 24–72 hours of papaya leaf extract administration.

Reduction in hematocrit levels, suggesting improvement in plasma leakage.

Improvement in white blood cell (WBC) count.

Faster recovery time compared to standard supportive care alone.

Findings were more consistent with **fresh juice and aqueous extracts** but promising for standardized syrups as well.

3.Formulation Studies on Herbal Papaya Syrups

evaluating papaya syrup formulations

Physicochemical Attributes

* pH range: 5.5 – 7.0(acceptable for oral syrups)
* Viscosity: suitable for easy swallowing
* Appearance: greenish to brownish depending on extraction method
* Good solubility in aqueous media
* Stable during short-term and accelerated storage conditions

Stability Indicators

* No significant sedimentation or phase separation
* No microbial growth when preservatives like sodium benzoate were used

4. Clinical and Pharmacological Evidence**

The following therapeutic effects were frequently reported:

Platelet-enhancing activity

* Antiviral potential (inhibition of dengue virus serotypes in vitro)
* Anti-inflammatory and antioxidant effects
* Immune modulation** (increase in IL-6, TNF-α regulation)

*Hepatoprotective effectsduring dengue infection

5. Safety Profile

* No major adverse effects reported at therapeutic doses
* Mild nausea or bitterness in some patients (mostly with raw juice, not syrup)
* Syrup formulations improved palatability and compliance

6. Summary of Literature Findings

* Papaya leaf extract consistently shows platelet-boosting and immune-supportive activity.
* Syrup formulation enhances stability, taste, and **patient acceptability.
* More standardized, large-scale clinical trials are required to confirm efficacy and optimize dosage.

5.CONCLUSION:

The review of existing scientific literature clearly demonstrates that *Carica papaya* leaf extract possesses significant therapeutic potential in the supportive management of dengue fever. Numerous preclinical and clinical studies report benefits such as enhanced platelet production, improved immune response, antioxidant protection, and faster recovery times. The presence of bioactive phytochemicals—including flavonoids, alkaloids, glycosides, saponins, and papain enzymes—supports its pharmacological activity.

Formulating papaya leaf extract into a **herbal syrup** offers several pharmaceutical advantages, including improved palatability, accurate dosing, better stability, and increased patient compliance compared to raw leaf juice. Evaluations across studies indicate that papaya herbal syrups exhibit acceptable physicochemical properties such as suitable pH, viscosity, clarity, and stability, making them appropriate for oral administration.

Though findings are promising, current evidence is limited by small sample sizes, variability in extraction methods, and lack of long-term clinical trials. Therefore, more standardized research—including controlled clinical studies, dosage optimization, safety profiling, and mechanistic investigations—is essential to validate its therapeutic effectiveness.

SUMMARY

This review highlights the growing importance of *Carica papaya* leaf extract as a supportive herbal remedy in the management of dengue fever. Traditional medicinal practices have long utilized papaya leaves for their healing benefits, and modern research confirms that the plant contains valuable phytochemicals such as flavonoids, alkaloids, saponins, tannins, and enzymes like papain, all of which contribute to platelet elevation, immune enhancement, and antioxidant protection.

Studies evaluating papaya-based herbal syrup formulations show that converting the extract into a syrup improves palatability, stability, and patient compliance. Physicochemical evaluations—including pH, viscosity, clarity, solubility, and organoleptic properties—demonstrate that the syrup is stable, safe, and suitable for oral use. Clinical findings across literature also indicate faster recovery and improved platelet counts among dengue patients who received papaya leaf preparations.

While the therapeutic potential is promising, the review emphasizes the need for more standardized extraction methods, dosage optimization, and well-designed clinical trials. Overall, papaya herbal syrup

represents a safe, accessible, and pharmaceutically valuable approach to supporting dengue management and contributes meaningfully to the advancement of herbal drug research.

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