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DIFFERENT FORMULATION AND EVALUTION OF *CARICA PAPAYA LINN*

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ABSTRACT

Carica papaya Linn. is a medicinally important plant widely used in traditional systems of medicine due to its antioxidant, anti-inflammatory, antimicrobial, and wound-healing properties. The present study focuses on the formulation and evaluation of different dosage forms prepared from *Carica papaya* Linn. To enhance its therapeutic efficacy, stability, and patient compliance. Various formulations, including extracts, lozenges, syrups, and topical preparations (hand sanitizer gel), were developed using standardized plant material obtained from the leaves. Physicochemical parameters such as organoleptic properties, pH, viscosity, hardness, friability, weight variation, and disintegration time were evaluated in accordance with pharmacopeial standards. Photochemical screening revealed the presence of bioactive constituents including alkaloids, flavonoids, tannins, saponins, glycosides, and phenolic compounds, which contribute to the plant's pharmacological potential. *In vitro* evaluation studies, including antioxidant and antimicrobial assays, demonstrated significant biological activity across the different formulations. Stability studies indicated that the developed formulations maintained acceptable physical and chemical characteristics throughout the study period. The results suggest that *Carica papaya* Linn. Can be successfully formulated into multiple dosage forms without compromising its bioactivity. This study supports the potential of *Carica papaya* Linn. As a promising herbal candidate for pharmaceutical development and provides a scientific basis for its traditional use.

KEYWORDS: *Carica papaya* Linn, herbal formulation, physiochemical evaluation, *in vitro* studies.

1. INTRODUCTION

Lozenges

Lozenges are solid oral dosage forms containing one or more medicaments incorporated into a flavored and sweetened base, designed to dissolve or disintegrate slowly in the mouth. They can be prepared either by molding, using gelatin or fused sucrose and sorbitol bases, or by compression into sugar-based tablets. Molded lozenges are commonly referred to as *pastilles*, whereas compressed lozenges are known as troches. Lozenges are particularly useful for patients who have difficulty swallowing conventional solid oral dosage forms and for medications intended to be released slowly to maintain a constant drug concentration in the oral cavity or to bathe the throat tissues with the medicated solution. Historically, lozenges have been widely used for the relief of minor sore throat pain and irritation and have been extensively employed for the local delivery of topical anesthetics and antibacterial agents.

Classification of lozenges

Lozenges can be classified into different categories based on the following criteria:

A. According to the Site of Action

a. Local effect: e.g., antiseptics, decongestants

b. Systemic effect: e.g., vitamins, nicotine

B. According to Texture and Composition

a. Chewable or caramel-based medicated lozenges

b. Compressed tablet lozenges

c. Soft lozenges
d. Hard lozenges

Pharmaceutical Syrup
Syrups are concentrated aqueous preparations of sugars or sugar substitutes, with or without flavoring agents and medicinal substances. Syrups that contain flavoring agents but no medicinal substances are known as **non-medicated or flavored syrups** and are primarily used as pleasant-tasting vehicles for medicinal substances. These syrups serve as bases for the extemporaneous compounding of prescriptions or for the preparation of standard formulations of medicated syrups, which contain one or more therapeutic agents. Due to the difficulty some children and elderly patients experience in swallowing solid oral dosage forms, pharmacists are frequently required to prepare oral liquid dosage forms of medications that are otherwise available only as tablets or capsules. In such cases, factors such as drug solubility, stability, and bioavailability must be carefully evaluated. Depending on the physicochemical properties of the drug and its solid dosage form, the compounded liquid preparation may be formulated as either a solution or a suspension. Syrups offer a convenient and palatable means of administering liquid formulations of unpleasant-tasting drugs. They are particularly suitable for pediatric patients, as their sweet and agreeable taste helps overcome reluctance to medication intake. Additionally, the absence or minimal presence of alcohol in syrups increases their acceptability among caregivers. Any water-soluble drug that remains stable in aqueous solution can be successfully incorporated into a flavored syrup.

Pharmaceutical Gel
Topical Drug Delivery System
Topical preparations are designed to produce localized effects at the site of application through the penetration of the drug into the underlying layers of the skin or mucous membranes. One of the major advantages of topical drug delivery systems is the bypassing of first-pass metabolism. Additional benefits include the avoidance of the risks and inconveniences associated with intravenous therapy, as well as the variability in absorption caused by factors such as pH changes, the presence of enzymes, and gastric emptying time. Semisolid formulations dominate topical drug delivery systems due to their versatility and ease of application. These include gels, creams, and ointments, although other dosage forms such as foams, sprays, medicated powders, solutions, and medicated adhesive systems are also used. Among these, gels are one of the most widely utilized semisolid dosage forms for topical drug delivery.

Gels as Pharmaceutical Dosage Forms
The term *gel* was introduced in the late 1800s to describe certain semisolid materials based on their physical and physiological characteristics rather than their molecular composition. The United States Pharmacopeia (USP) defines gels as semisolid systems consisting of dispersions of either small inorganic particles or large organic molecules, enclosed and interpenetrated by a liquid phase. Gels are substantially dilute, cross-linked systems that exhibit little or no flow under steady-state conditions. They are composed of a two-component semisolid system with a high liquid content. A distinguishing feature of gels is the presence of a continuous three-dimensional network that imparts solid-like properties. Due to their biocompatibility, network structure, ease of application, and ability to maintain the stability of incorporated bioactive agents; gels have become an important and widely used dosage form in topical drug delivery.

Advantages of topical drug administration
- Avoids gastrointestinal (GI) absorption difficulties caused by variations in GI pH, enzymatic activity, and drug interactions with food, beverages, and other orally administered medications.
- Serves as an alternative to other routes of administration (e.g., oral or intravenous) when those routes are unsuitable, such as in cases of vomiting, swallowing difficulties, uncooperative pediatric patients, or diarrhea.
- Offers better patient acceptability, as this drug delivery system is non-invasive and avoids the discomfort and inconvenience associated with parenteral therapy.

2. PLANT PROFILE

Papaya Leaf
Papaya, a juicy and nutritious fruit belonging to the family **Caricaceae**, is scientifically known as **Carica papaya Linn.** It is cultivated widely in tropical and subtropical regions of the world, including **India, tropical America, Africa, and parts of Europe**. Papaya is commonly known by various names such as **papaya melon tree, pawpaw, papau, kapaya, lapaya, papyas, papye, tapayas**, and **fan mu gua**. The papaya plant is **laticiferous**, as it contains specialized cells known as **laticifers**, which secrete **latex**. These laticifers are distributed throughout most of the plant tissues, including leaves, stems, and fruits. Papaya is a **fast-growing, short-lived herbaceous plant**, often referred to as a tree due to its tree-like appearance. Historically, papaya was considered an **exotic fruit** because of its **distinctive buttery taste, soft texture, and attractive appearance**. It is well known for its **nutritional and medicinal properties**, including digestive, antioxidant, and therapeutic benefits. Papaya was among the **first genetically modified fruits** approved for human consumption, primarily to improve resistance against viral diseases and enhance crop productivity.

Figure 1: *Carica papaya* Linn. Tree.

Figure 2: *Carica papaya* Linn. Fruit.

3. MATERIALS AND METHODS

3.1. Extraction of Carica papaya Leaf

A **Soxhlet extractor** is a laboratory apparatus invented in **1879 by Franz von Soxhlet**. It was originally designed for the extraction of **lipids from solid materials**. However, the Soxhlet extractor is not limited to lipid extraction and is widely used for the extraction of **phytoconstituents** from plant materials. Typically, Soxhlet extraction is employed when the **desired compound has limited solubility in a solvent**, while the impurities are insoluble in that solvent. If the desired compound is highly soluble, simpler techniques such as **maceration or filtration** may be sufficient. In this method, the dried and powdered *Carica papaya* leaves are placed inside a **thimble made of thick filter paper**, which is then loaded into the main chamber of the Sox let extractor. The extractor is mounted on a **round-bottom flask containing a suitable extraction solvent** (such as ethanol, methanol, or water) and connected to a **condenser**. The solvent is heated to **reflux**, causing solvent vapors to rise through the distillation arm and condense in the condenser. The condensed solvent drips into the chamber containing the plant material. The chamber gradually fills with warm solvent, allowing the **bioactive constituents of papaya leaves to dissolve** in the solvent. When the solvent level reaches the top of the siphon arm, the extract is automatically siphoned back into the distillation flask. This **cycle is repeated several times** over a period of hours to ensure **maximum extraction efficiency**. During each cycle, additional amounts of non-volatile phytoconstituents are extracted into the solvent. After completion of the extraction process; the solvent containing the extract is concentrated by **removal of solvent using a rotary evaporator**, yielding a **semi-solid or solid extract**. The insoluble plant residue remains in the thimble and is discarded. The obtained extract is then stored in an **airtight container** for further photochemical and pharmacological evaluation.

3.2. Preparation of Ethanolic extracts

Fresh whole plants of *Carica papaya* were collected and authenticated by a qualified botanist. The collected plant material was thoroughly **washed with water** to remove

adhering dirt and foreign matter and then **shade dried** at room temperature until a constant weight was obtained. The dried material was subsequently **powdered using a mechanical grinder** and passed through **sieve no. 40** to obtain a coarse powder. About **5 kg of the powdered material** was subjected to **defatting with petroleum ether** to remove fats, waxes, and other non-polar constituents. After defatting, the marc was dried and then extracted with **90% ethanol (v/v)** using a **Soxhlet apparatus** at a temperature of approximately **50°C** for **72 hours**. The ethanol extract obtained was filtered and concentrated by **evaporation of the solvent under reduced pressure** using a rotary vacuum evaporator. This process yielded a **dark brown semi-solid residue**. The final weight of the ethanol extract obtained was **525 g**. The extract was then transferred to an **airtight container** and stored in **desiccators** until further photochemical and pharmacological evaluation.

Flow Chart for Preparation of Ethanolic Extract

Collection and authentication of plant material (*Carica papaya*)
↓
Shade drying
↓
Pulverization (coarse powder, sieve no. 40)
↓
Defatting with petroleum ether
↓
Successive Soxhlet extraction with 90% ethanol
↓
Concentration of extract under vacuum
↓
Storage in desiccator

3.3. Formulation of Carica papaya containing dosage form

1. Herbal Lozenges

S.NO	INGREDIENTS	F1(g)	F2(g)	F3(g)
1.	Plant extract	1.25	1.25	1.25
2.	Sugar syrup	3.5	3.5	3.5
3.	Peppermint oil	0.3	0.3	0.3
4.	Methyl paraben	0.05	0.05	0.05
5.	Honey	0.5	0.5	0.5
6.	Agar	0.75	-	-
7.	Acacia	-	0.75	-
8.	Tragacanth	-	-	0.75
9.	Glycerol	Q.S	Q.S	Q.S
10.	Colouring agent	Q.S	Q.S	Q.S
	TOTAL WEIGHT	6gm	6gm	6gm

2. Herbal Syrup

S.NO	INGREDIENTS	F1	F2	F3
1.	Plant extract	10ml	10ml	10ml
2.	Hydroxyethyl cellulose	1gm	1.2 gm	1.4gm
3.	Glycerine	15ml	15ml	15ml
4.	Propylene glycol	3ml	3ml	3ml
5.	Peppermint oil	0.5ml	0.5ml	0.5ml
6.	Sodium benzoate	1gm	1gm	1gm
7.	Distilled water	Upto 100ml	-	-
8.	Simple syrup	-	Upto 100ml	-
9.	Honey	-	-	Upto 100ml

3. Herbal Hand sanitizer gel

S.NO	INGREDIENTS	F1	F2	F3
1.	Plant extract	1.25gm	1.25gm	1.25gm
2.	HPMC	1.5gm	2.25gm	3.0gm
3.	Glycerine	10ml	10ml	10ml
4.	SLS	1.25gm	1.50gm	1.75gm
5.	Methyl paraben	0.5gm	0.5gm	0.5gm
6.	Propyl paraben	0.03gm	0.03gm	0.03gm
7.	Triethanolamine	Q.S	Q.S	Q.S
8.	Isopropyl alcohol	40ml	40ml	40ml
9.	**Perfume**	**Q.S**	**Q.S**	**Q.S**
10.	**Distilled water**	**Up to 100ml**	**Upto100ml**	**Up to 100ml**

4. EVALUATION

HERBAL LOZENGES

Physical Parameters

The general appearance of the lozenges, including size, shape, color, taste, and surface texture, was visually examined. A good physical appearance is essential for patient compliance and consumer acceptance. Any physical changes during storage were monitored. The pH of the lozenges was determined using a calibrated digital pH meter, and the melting point was measured using a melting point apparatus to assess thermal stability.

Thickness and Diameter

The thickness and diameter of the formulated lozenges were measured using a Vernier caliper. Measurements were taken at three different points for each lozenge, and the mean value was calculated.

Weight Variation

The formulated lozenges were evaluated for weight uniformity as per pharmacopeial guidelines. Twenty lozenges were selected randomly, weighed individually, and the average weight was calculated. The individual weights were compared with the average weight to determine compliance with permissible limits.

Percentage weight variation was calculated using the formula:

$$\%\ \text{Weight Variation} = \frac{\text{Average weight} - \text{Individual weight}}{\text{Average weight}} \times 100$$

Hardness

The crushing strength of the lozenges, defined as the force required to break the lozenge by compression in the diametric direction, was determined using a Pfizer tablet hardness tester. The test was performed in triplicate, and the average hardness value was recorded.

Friability

The friability of the lozenges was determined using a Roche friabilator. Five pre-weighed lozenges were placed in the friabilator and rotated at 25 rpm for 4 minutes (100 revolutions). After the test, the lozenges were dedusted and reweighed.

Percentage friability was calculated using the formula:

$$\%\ \text{Friability} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

Moisture Content

The moisture content of the lozenges was determined by the desiccation method. The lozenges were crushed using a mortar and pestle, and 1 g of the powdered sample was accurately weighed and placed in a desiccator containing a suitable desiccant for 24 hours. After drying, the sample was reweighed.

Moisture content was calculated as:

$$\%\ \text{Moisture content} = \frac{\text{Initial weight} - \text{Final weight}}{\text{Initial weight}} \times 100$$

Percentage Yield

The percentage yield of the lozenges was calculated to determine formulation efficiency. An empty container was weighed, followed by weighing the container with the prepared lozenges. The difference between these weights gave the practical yield.

Percentage yield was calculated using the formula:

$$\%\ \text{Yield} = \frac{\text{Practical yield}}{\text{Theoretical yield}} \times 100$$

Drug Content Uniformity

For drug content estimation, 10 g of lozenges were accurately weighed and transferred into a 250 ml volumetric flask containing 20 ml of alcohol. The mixture was stirred for 30 minutes to ensure complete drug extraction. The volume was then made up to 100 ml with alcohol and filtered

From this solution

- 1 ml was diluted to 10 ml with alcohol
- Again, 1 ml of this solution was diluted to 10 ml with alcohol

The absorbance of the final solution was measured using a UV–Visible spectrophotometer at 260 nm.

Drug content was calculated using the formula

$$\text{Drug content} = \frac{\text{Absorbance}}{\text{Slope}} \times \text{Dilution factor} \times \frac{1}{1000}$$

In Vitro Drug Release Study

In vitro drug release studies were carried out using USP Dissolution Apparatus II (Paddle type). The dissolution medium consisted of 900 ml of distilled water, maintained at 37 ± 0.5°C, with a paddle speed of 100 rpm. Samples of 5 ml were withdrawn at predetermined time intervals and replaced with an equal volume of fresh dissolution medium to maintain sink conditions. The samples were analyzed using a UV–Visible spectrophotometer at 224 nm. The cumulative percentage of drug released was calculated and plotted against time.

HERBAL SYRUP

Physicochemical Parameters

The prepared herbal syrup was evaluated for various physicochemical parameters including physical appearance (color, odor, taste), pH, weight per milliliter (Wt/ml), and viscosity. These parameters were assessed to ensure product quality, consistency, stability, and patient acceptability. The pH of the syrup was measured using a calibrated digital pH meter. Weight per milliliter was determined using a pycnometer, and viscosity was measured using a suitable viscometer at room temperature.

Glucose Diffusion Study

The glucose diffusion study was carried out to evaluate the effect of the herbal extract on glucose diffusion, following a reported method with slight modifications. A total of 25 ml of glucose solution (20mmol/L) along with

1% plant extract was placed in a dialysis bag and dialyzed against 200 ml of distilled water. The assembly was maintained at 37°C in a shaker water bath. Samples were withdrawn from the external medium (dialysate) at 30, 60, 120, and 180 minutes. The glucose content in the dialysate was determined using a UV–Visible spectrophotometer. A control experiment was carried out using glucose solution without the plant extract. The results were used to assess the inhibitory effect of the extract on glucose diffusion.

✔ Added clarity: purpose of test + conditions
✔ Temperature unit corrected to °C
✔ Scientific flow improved

Stability Testing

Stability testing of the prepared herbal syrup was performed under accelerated and room temperature conditions to evaluate its physical and physicochemical stability. Nine portions of the final syrup formulation (F1A, F1B, F1C, F2A, F2B, F2C, F3A, F3B, and F3C) were transferred into amber-colored glass bottles and stored at 40°C, room temperature, and 47°C, respectively. The samples were evaluated for physicochemical parameters, turbidity, and homogeneity at 24, 48, and 72 hours to observe any changes. The absence of phase separation, precipitation, or significant changes in appearance indicated the stability of the formulation.

HERBAL HAND SANITIZER GEL

Physical Evaluation

Physical evaluation of the polyherbal hand wash gel, including color and odor, was carried out by visual observation and sensory evaluation. The results were compared with a marketed hand wash gel to assess consumer acceptability.

Grittiness

To evaluate grittiness, 1 ml of the gel was taken on the fingertips and gently rubbed between the thumb and index finger. The formulation was observed for the presence or absence of gritty particles. A smooth texture indicated good formulation quality.

pH Determination

One gram of the polyherbal hand wash gel was accurately weighed and dissolved in 100 ml of distilled water. The pH of the solution was measured using a previously calibrated digital pH meter. The pH value indicates skin compatibility of the formulation.

Spreadability

A sample of 0.5 g of each gel formulation was placed between two clean glass slides and pressed uniformly. The slides were left undisturbed for 5 minutes, after which the diameter of the spread gel was measured in centimeters. The experiment was performed in triplicate, and the average value was taken as the spreadability of the formulation.

Foam Height

One gram of the hand wash gel was dispersed in 50 ml of distilled water. The dispersion was transferred to a 500 ml measuring cylinder, and the volume was adjusted to 100 ml with distilled water. The cylinder was shaken with 25 uniform strokes and allowed to stand. The height of the foam formed above the aqueous layer was measured and recorded.

Foam Retention

For foam retention study, 25 ml of 1% hand wash gel solution was taken in a 100 ml graduated cylinder. The cylinder was shaken 10 times and allowed to stand. The volume of foam was recorded at 1-minute intervals for 4 minutes to assess foam stability.

Percentage Yield

The percentage yield of the hand wash gel was calculated to determine formulation efficiency. An empty container was weighed, followed by weighing the container with the prepared hand wash gel formulation. The difference between these weights gave the practical yield.

$$\% \text{ Yield } = \frac{\text{Practical yield}}{\text{Theoretical yield}} \times 100$$

Viscosity Measurement

The viscosity of the prepared gel formulations was determined using a Brookfield viscometer. The gel samples were rotated at speeds of 0.3, 0.6, and 1.5 rpm. At each speed, the corresponding dial reading was noted. The viscosity was calculated by multiplying the dial reading with the appropriate factor provided in the viscometer manual.

5. RESULT AND DISCUSSION

HERBAL LOZENGES

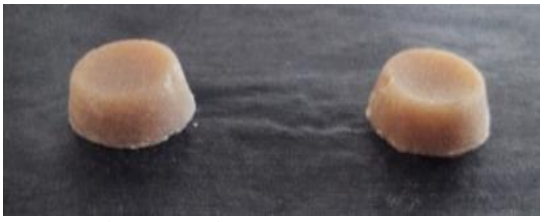
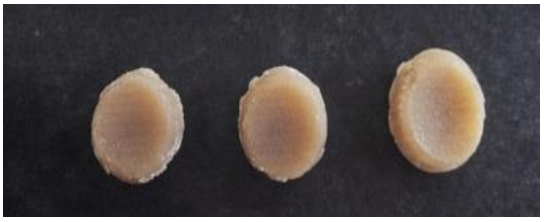


Figure 3: A) F1- Extract + Agar.

B) F2- Extract + Acacia.



C) F3- Extract + Tragacanth.

Physical Parameter

S.NO	PARAMETER	F1	F2	F3
1.	Colour	Brown	Whitish brown	Brownish white
2.	Odour	Aromatic	Aromatic	Aromatic
3.	Taste	Pleasant	Pleasant	Pleasant
4.	Thickness (mm)	5.23±0.05	5.20±0.06	5.21±0.03
5.	Drug content %	98.49 %	96.41%	91.81%
6.	PH	7.4	7.6	7.3
7.	Shape	Round	Round	Round
8.	Hardness (Kg/Cm²)	11.83±0.008	11.16±0.05	10.16±0.02
9.	Friability %	1.66±0.12	1.85±0.06	1.92±0.153
10.	Percentage yield %	89.56%	95.69%	93.31%
11.	Weight variation (gm)	2.97±0.004	2.89±0.005	2.83±0.005
12.	Moisture content %	0.6±0.005	0.6±0.100	0.7±0.002
13.	Disintegration test (min)	17min	15min	16min

In vitro Drug Release

S.NO	TIME (min)	FORMULATION PREPARATION		
		WITH AGAR	WITH ACACIA	WITH TRAGACANTH
1.	5	27.79	37.94	36.82
2.	10	38.43	51.18	49.46
3.	15	47.71	65.98	63.72
4.	20	60.09	80.19	72.03
5.	25	71.84	88.76	80.83
6.	30	82.05	91.24	87.29
7.	35	98.49	96.41	91.81

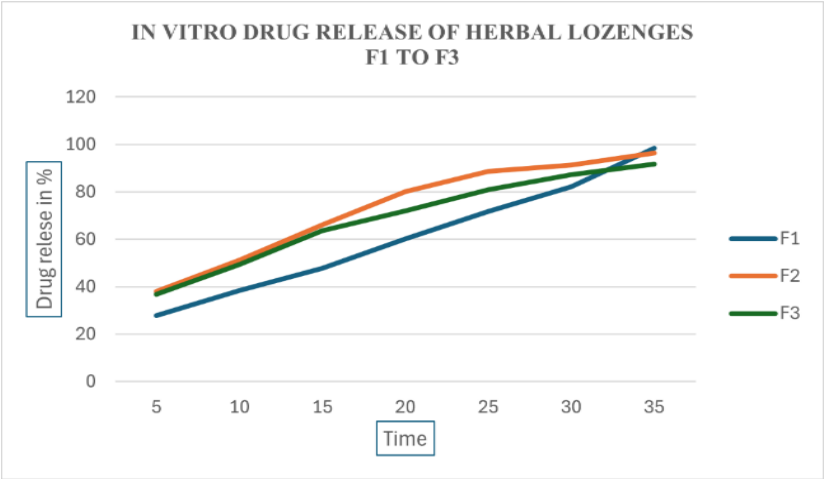


Figure 4: In vitro Drug Release.

HERBAL SYRUP

Figure 5:
A) F1- Extract with water B) F2- Extract with simple syrup C) F3- Extract with honey

Physical Parameter

S.NO	PARAMETER	F1	F2	F3
1.	Colour	Yellow	Brown	Brown
2.	Odour	Aromatic	Aromatic	Aromatic
3.	Taste	Slightly bitter	Slightly sweet	Sweet
4.	PH	5.25	7.11	8.23
5.	Viscosity	24.58 Centipoise	27.68 Centipoise	31.54 Centipoise

Glucose Diffusion

S.NO	CONCENTRATION OF GLUCOSE (µg/ml)	F1	F2	F3
1.	5	0.172	0.163	0.152
2.	10	0.163	0.150	0.139
3.	20	0.145	0.131	0.118
4.	50	0.137	0.126	0.102
5.	100	0.121	0.114	0.78

Stability Study

SAMPLE CODE	TIME IN HOUR	TEMP	PHYSICOCHEMICAL PARAMETERS			
			COLOR, ODOUR & TASTE	PH	WT/ML AT 25ºC	TURBIDITY/ HOMOGENEITY
F1A	24Hr	5ºC	+	5.25	1.1835 G	NO TURBIDITY
F1B		Room temp	+	5.25	1.1835 G	X
F1C		47ºC	+	5.25	1.1835 G	HOMOGENEITY
F2A	24Hr	5ºC	+	5.25	1.1835 G	NO TURBIDITY
F2B		Room temp	+	5.25	1.1835 G	X
F2C		47ºC	+	5.25	1.1835 G	HOMOGENEITY
F3A	24Hr	5ºC	+	5.23	1.1835 G	NO TURBIDITY
F3B		Room temp	+	5.23	1.1835 G	X
F3C		47ºC	+	5.23	1.1931 G	HOMOGENEITY

+ = No change X =Original condition

HERBAL HAND SANITIZER GEL

Figure 6: A) F1 B) F2

C) F3

Physical Parameter

S.NO	PARAMETER	F1	F2	F3
1.	Colour	Pink	Red	Pink
2.	Odour	Characteristic	Characteristic	Characteristic
3.	PH	6.81	6.88	6.82
4.	Grittiness	Non gritty	Non gritty	Non gritty
5.	Consistency (60 Sec)	5.7mm	5.8mm	5.6mm
6.	Spreadability	10.5	12	9.5
7.	Foam Height (ml)	80	89	98
8.	Foam Retention (ml)	13	20	22
9.	Homogeneity	Homogeneous	Homogeneous	Homogeneous
10.	Percentage Yield %	91.25%	95.31%	89.02%
11.	Viscosity (cP)	4790	6770	7131
12.	Moisture Content %	0.3	0.3	0.4

6. CONCLUSION

The present study involved the formulation and evaluation of different dosage forms of Carica papaya using papaya leaf extract prepared with 90% ethanol as the extraction solvent. Solid, liquid, and semisolid herbal dosage forms were successfully developed and subjected to various physicochemical and performance evaluations.

The formulated herbal lozenges were evaluated for weight variation, hardness, thickness, friability, drug content, disintegration time, and in vitro dissolution studies. All evaluated parameters were found to be within acceptable pharmacopeial limits. Among the formulations, F1 exhibited the highest drug release of 98.49% within 35 minutes, indicating better release characteristics.

The herbal syrup formulations were evaluated for physical appearance, viscosity, pH, and stability studies. The results demonstrated good physical stability and acceptable physicochemical properties throughout the study period.

The herbal hand wash/hand sanitizer gel was evaluated for pH, viscosity, foam height, and foam retention time. All formulations showed satisfactory results, indicating good foaming properties, and formulation stability.

Overall, the study confirms that Carica papaya leaf extract can be effectively formulated into multiple herbal dosage forms with acceptable quality, stability, and performance characteristics, suggesting its potential application in herbal pharmaceutical preparations.

7. REFERENCES

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2. B. Moulika Lakshmi et al. (2015) stated that lozenges are suitable for large-dose drugs and provide better patient compliance due to effective buccal absorption.

3. Dr. P. Shailaja et al. (2016) described the preparation of clear viscous sugar–dextrose syrup by heating dextrose solution to 110°C.
4. S. Sravani et al. (2016) reported that lozenges are popular innovative oral dosage forms used for both local and systemic drug delivery.
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6. Uma Shankar MS et al. (2017) reported that lozenges are widely used oral solid dosage forms designed to dissolve slowly in the mouth for soothing and effective drug delivery.
7. Madhusudan et al. (2017) stated that soft chewable candies effectively mask drug taste and serve as an acceptable drug delivery system.
8. Yamsani et al. (2017) reviewed the renewed popularity of lozenges, including their types, ingredients, and methods of preparation.
9. B. K. Sajeeb et al. (2017) reported that *Andrographis paniculata* (Kalmegh) is widely used in traditional medicine, with andrographolide as its major active constituent.
10. Rachana Maheshwari et al. (2017) stated that lozenges are solid unit dosage forms intended to dissolve slowly in the mouth or pharynx.
11. Dr. Deepa Shetty and Anita Manoj et al. (2016) studied the effectiveness of *Carica papaya* leaf extract in increasing platelet count in children with dengue.
12. Nadeem Sheikh et al. (2014) reported that thrombocytopenia is a serious and life-threatening condition, commonly associated with dengue fever.
13. Nisar Ahmad et al. (2011) demonstrated that aqueous extract of *Carica papaya* leaves improved platelet count in a dengue patient.
14. Noar Abbas El-Aouar et al. (2005) studied the effect of osmotic agents on papaya dehydration, reporting higher water loss and solids gain with sucrose than corn syrup.
15. Dewi Pertiwi et al. (2013) reported that papaya leaf ethanol extract gel (10–15%) showed significant antibacterial activity against *Propionibacterium acnes*.
16. M. R. Sharmin et al. (2015) reported that aloe vera gel coating influenced physicochemical properties and storage stability of papaya at room temperature
17. M. R. Sharmin, M. N. Islam and M. A. Alim et al. (2015) reported that aloe vera gel coating influenced the physicochemical properties and storage behavior of papaya at room temperature.
18. Aney Parven Md. Rezwan Sarker et al. (2020) reviewed that Aloe vera gel is a promising edible coating for papaya, improving post-harvest quality and shelf life due to its bio-preservative properties.