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DEVELOPMENT AND EVALUATION OF ETHANOL EXTRACT FROM CARICA PAPAYA IN VARIOUS DOSAGE FORMS: LOZENGES, SYRUP, AND SANITIZER GEL

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ABSTRACT
This study focuses on the formulation of various dosage forms containing *Carica papaya*, including solid (lozenges), liquid (syrup), and semi-solid (sanitizer gel) preparations. The ethanol extract of *Carica papaya* leaves was prepared using 90% ethanol. Lozenges were formulated using the heating and congealing method, with excipients such as agar, acacia, tragacanth, peppermint oil, and sucrose. These lozenges were evaluated for weight variation, hardness, friability, drug content, disintegration time, and in vitro dissolution, with the HL1 formulation releasing 98.49% of the drug in 35 minutes. For the syrup, bases like water, simple syrup, and honey were used, incorporating excipients such as hydroxyl ethyl cellulose and peppermint oil. The syrup underwent sensory evaluation, TLC analysis, viscosity, pH, and stability testing, all of which met standard limits. The sanitizer gel was formulated using HPMC polymer, with excipients like SLS, methyl and propyl parabens, and glycerin. The gel was evaluated for irritation, pH, viscosity, foam height, and foam time, all of which were within acceptable limits. All dosage forms containing *Carica papaya* were successfully prepared and evaluated, demonstrating promising characteristics for potential therapeutic use.

KEYWORDS: *Carica papaya*, Herbal Lozenges, Herbal Syrup, Herbal Sanitizer Gel.

1. INTRODUCTION

1.1 Herbal lozenges

Herbal lozenges are solid, oral dosage forms that are typically used for soothing the throat, relieving cough, or delivering herbal remedies in a controlled manner. These lozenges are designed to dissolve slowly in the mouth, allowing the active ingredients to be released gradually, providing a localized therapeutic effect. The popularity of herbal lozenges has increased due to the growing preference for natural and plant-based remedies, driven by their perceived safety, minimal side effects, and potential therapeutic benefits.

The formulation of herbal lozenges often involves a blend of natural extracts, such as those derived from *Carica papaya*, along with various excipients to ensure stability, texture, and controlled release. Ingredients such as agar, acacia, tragacanth, and peppermint oil are commonly used to enhance the lozenges' functionality, while sweeteners like sucrose and glycerol may be added for palatability and consistency. The incorporation of plant-based extracts in lozenges provides not only relief for common ailments like sore throat and cough but also offers the potential for additional health benefits like anti-inflammatory, antioxidant, and antimicrobial properties.

Herbal lozenges are a convenient and effective alternative for individuals seeking to manage mild throat irritation or respiratory issues. Their development involves careful selection of ingredients and manufacturing processes to ensure the quality, safety, and efficacy of the final product. The growing demand for herbal products highlights the potential of herbal lozenges as a practical solution for natural health care.

Fig. 1: Herbal lozenges.

1.2 Herbal syrup

Herbal syrup is a liquid dosage form that combines the therapeutic properties of plant-based extracts with a sweetened base to create an easily consumable remedy for a variety of health concerns. Traditionally used to treat ailments like cough, cold, sore throat, digestive issues, and inflammation, herbal syrups offer an effective way to deliver herbal medicine, particularly for children or individuals who have difficulty swallowing tablets or capsules.

The formulation of herbal syrup involves extracting active compounds from medicinal plants, such as *Carica papaya*, using solvents like ethanol or water, and then blending these extracts with natural sweeteners like honey, simple syrup, or sugar syrup. Excipients such as glycerol, sodium benzoate, and hydroxyl ethyl cellulose are often incorporated to enhance the syrup's viscosity, stability, and shelf life.

Herbal syrups are favored for their easy-to-administer liquid form and the ability to combine multiple herbal extracts in one dose, offering a holistic approach to health. The syrup's sweet taste also makes it more palatable, improving patient compliance. Additionally, many herbal syrups are formulated to preserve the natural properties of the herbs, providing therapeutic benefits such as antioxidant, anti-inflammatory, antimicrobial, and soothing effects.

The popularity of herbal syrups has surged due to the increasing demand for natural remedies and the preference for alternatives to synthetic pharmaceuticals. When properly formulated and evaluated for factors such as stability, pH, viscosity, and safety, herbal syrups represent a convenient and effective option in herbal medicine.

Fig. 2: Herbal syrup.

1.3 Herbal sanitizer

Herbal sanitizers are topical preparations designed to cleanse and disinfect the hands or skin by killing or inactivating harmful microorganisms, while incorporating the beneficial properties of natural herbal extracts. With growing concerns about synthetic chemicals and their potential side effects, herbal sanitizers offer a safer and more natural alternative, combining the antimicrobial benefits of plants with the convenience and effectiveness of modern sanitizing solutions.

Herbal sanitizers often contain plant-based ingredients like *Carica papaya* extract, known for its antibacterial and anti-inflammatory properties, along with other natural agents such as alcohol (usually isopropyl alcohol), glycerin, and essential oils. The alcohol content serves as the primary disinfectant, while the herbal

extracts contribute additional health benefits such as soothing, moisturizing, and skin protection.

These sanitizers are formulated to provide quick, on-the-go hygiene without the need for water, making them especially useful in settings where traditional handwashing is not feasible. Herbal sanitizers can also be more skin-friendly, as they often include moisturizing agents like glycerin to counteract the drying effects of alcohol, making them less harsh on the skin compared to conventional chemical-based sanitizers.

The popularity of herbal sanitizers has surged due to their perceived safety, effectiveness, and the growing consumer demand for natural, plant-based products. As the need for hygiene and sanitation continues to be a priority in public health, herbal sanitizers offer a promising solution for those seeking a natural, gentle, and effective way to keep hands and skin free from harmful microorganisms.

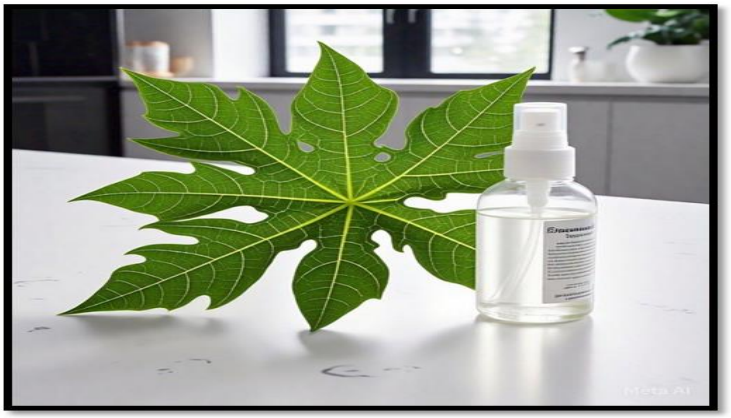

Fig. 3: Herbal sanitizer.

2. Plant profile

Papaya, a juicy and flavorful fruit, belongs to the Caricaceae family and is scientifically known as *Carica papaya* Linn. It is cultivated in various parts of the world, including India, tropical America, and Europe. Commonly referred to as the papaya melon tree, pawpaw, kapaya, lapaya, papyas, papye, tapayas, or fan mu gua, papaya is a laticiferous plant, meaning it contains specialized cells called laticifers. These laticifers secrete latex and are dispersed throughout most of the plant's tissues. The papaya tree is typically short-lived. Historically, it was considered an exotic fruit due to its buttery taste and unique appearance. Papaya was also the first genetically modified fruit to be consumed by humans, prized for its nutritional and medicinal properties.

2.1 Botanical classification

- Domain: Flowering plant
- Kingdom: Plantae
- Sub Kingdom: Tracheobionta
- Class: Magnoliopsida
- Subclass: Dilleniidae
- Super division: Spermatophyta
- Phyllum: Steptophyta
- Order: Brassicales
- Family: Caricaceae
- Genus: *Carica*
- Botanical Name: *Carica papaya* Linn

2.2 Nutritional value of papaya

The papaya is a large, tree-like plant with a single stem, growing to a height of 5 to 10 meters (16 to 33 feet), and features spirally arranged leaves confined to the trunk. The leaves are large, measuring 50-70 cm in diameter, and are deeply palmately lobed, typically with seven lobes. The tree is usually unbranched, unless pruned. The flowers appear in the axils of the leaves and mature into large fruit. The fruit is considered ripe when it feels soft and its skin has turned from amber to orange in color. Ripe and green papayas differ in their nutritional value.

2.3 Phyto-Constituents of papaya

Papaya fruit is highly valued worldwide for its flavor, nutritional benefits, and digestive properties. When unripe, it contains the enzyme papain, a cysteine protease that acts similarly to pepsin in gastric juice. The latex, which contains papain, is harvested from unripe fruit by making incisions on the fruit's surface over a 4-5 day period and collecting the latex until it stops flowing. The greener the fruit, the more active the papain is. Three other cysteine proteases have been isolated from papaya latex: chymopapain, caricain, and papaya protease IV. These enzymes have been purified and biochemically characterized.

2.4 Uses

Digestive health: The enzyme papain, found in both ripe and unripe papaya, aids digestion by breaking down proteins and is commonly used as a digestive aid and in treating digestive disorders.

Anti-inflammatory: Papaya has anti-inflammatory properties, which make it useful in alleviating symptoms of conditions like arthritis.

Wound healing: Papaya latex (from unripe fruit) has been traditionally used for its wound-healing properties, especially in treating cuts, burns, and insect bites.

Antioxidant and Anticancer: Papaya is rich in vitamins A, C, and E, along with carotenoids, which contribute to its antioxidant properties. It may also offer anticancer benefits through its ability to neutralize free radicals and reduce oxidative stress.

Fig. 4: *Carica papaya.*

3. MATERIALS AND METHODS

3.1 Preparation of ethanolic extracts

Collect fresh whole plant of *Carica Papaya* were cleaned with water & shade dried until a constant weight was obtained & subsequently powdered & sieved mash no 40. Powdered material 5kg was deflated with petroleum ether & marc was extracted with of 90% of ethanol v/v at 50 degree in soxhlet apparatus 1L for 72hr. dark brown semi – solid residues. 525g was obtained by evaporating the ethanol extract under reduced pressure.

3.2 Formulation of herbal lozenges

Table 1: Composition of herbal lozenges.

S. No	Ingredients	HL 1	HL 2	HL 3
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 paraban	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

Procedure: Take a 10 mL beaker and add sugar syrup, glycerin, agar, acacia, and tragacanth into separate beakers. Then, add methyl paraben to each beaker and pour the plant extract into the mixture. Stir well and then add the sweetening agent, flavoring agent, colorants, and the required quantity of water. After thoroughly mixing, pour the heated mixture into the lubricated mold.

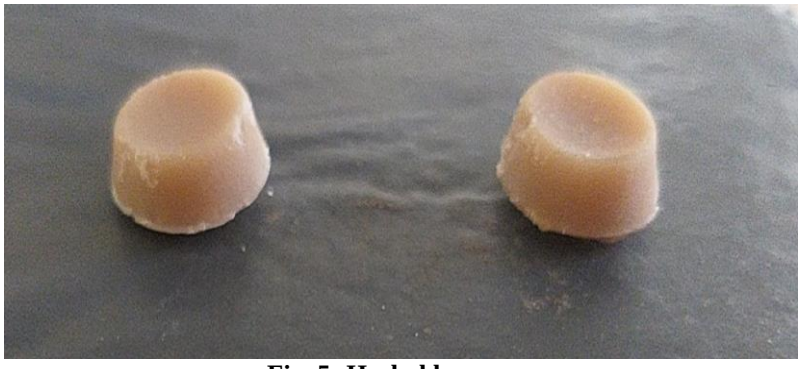

Fig. 5: Herbal lozenges.

3.2.1 Evaluation of herbal lozenges

A. Physical parameter: The general appearance of a lozenges including size, shape, colour, odour, taste having should be observed. It is must to have a good appearance for consumer acceptance. Physical changes may occur during storage, which can be determined PH and melting point using PH meter and melting point apparatus.

B. Thickness: The thickness and diameter of the formulated lozenges were measured by using Vernier callipers.

C. Weight variation: The formulated lozenges were tested for weight uniformity. 20 lozenges were collectively and individually. From the collective weight, average weight was calculated. Each lozenges weight was then compared with average weight to ascertain whether it is with in permissible limits or not.

D. Hardness: The lozenges crushing strength, which is the force required to break the lozenges by compression in the diametric direction was measured in triplicate using Pfizer tablet hardness tester.

E. Friability: The Roche friability test apparatus was used to determine the friability of the lozenges. 5 pre-weighed lozenges were placed in the apparatus, which was subjected to 100 revolutions. Then the lozenges were reweighed.

F. Moisture content: The sample was weighed and crushed in a mortar. From this, one gram of the sample was weighed and placed in desiccators for 24 hours. After 24 hours the sample is weighed. The moisture content is determined by the abstracting the final weight from initial weight of lozenges.

G. Drug content: Weighed 10 gm of each lozenges formulation were transferred in 250 ml of the volumetric flask containing 20 ml of alcohol and stirred for 30 min. The volume was made up to 100 ml and filtered. 1 ml of the above solution was further diluted to 10 ml with alcohol and again 1 ml of the above solution was further diluted to 10 ml with alcohol. The absorbance of the solution was measured spectrophotometrically at 260 nm.

H. Disintegration test: Disintegration study performed by disintegration apparatus. Put one lozenges into each tube suspend the assembly in the beaker containing pH 6.8 phosphate buffer and operate without the discs 30 min. Remove the assembly from the liquid. The Herbal lozenges pass.

I. Sensory evaluation: Sensory evaluation of herbal lozenges was done, following parameters were considered like color, taste, flavor, consistency and overall acceptability. On the basis of this evaluation following results came out.

J. Preliminary phytochemical analysis: Preliminary phytochemical analysis includes the tests for the presence of carbohydrates, proteins, glycosides, amino acid, saponin and flavonoids in the prepared herbal lozenges by following standard procedures. A Lozenges was divided into few pieces, one piece was taken, crushed and placed in a test tube following the test.

K. *In-Vitro* drug release: In vitro release studies were performed using USP Apparatus II (Paddle type). The dissolution test was performed using 900 ml of water 37 ± 0.5°C, 100 rpm. Samples (5 ml) were collected at predetermined time intervals and replaced with equal volume of fresh medium, and analyzed using UV-Visible spectrophotometer at λ= 224 nm.

Apparatus	**:**	USP Type II (Paddle type)
Medium	**:**	Water
Rpm	**:**	100
Volume	**:**	900 ml
Temp	**:**	37 ± 0.5ºC

3.3 Formulation of herbal syrup

Table 2: Composition of herbal syrup.

S. No	Ingredients	HS 1	HS 2	HS 3
1	Plant extract	10ml	10ml	10ml
2	Hydroxy ethyl cellulose	1gm	1.2gm	1.4gm
3	Glycerin	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	Sorbitol	Up to 100ml	-	-
8	Simple syrup	-	Up to 100ml	-
9	Honey	-	-	Up to 100ml

Procedure: Disperse hydroxyethyl cellulose in 5 mL of purified water and allow it to swell at room temperature for 15 minutes. Add sodium benzoate to the mixture. Heat the solution to 80°C while stirring for 1 hour. After heating, allow the solution to cool to room temperature and then add 10 mL of the plant extract while stirring.

Prepare peppermint oil and propylene glycol separately. Add 15 mL of glycerol to the mixing vessel under stirring, rinse the container with 50 mL of purified water, and add it to the mixing vessel while stirring. Add the herbal extract to the mixing vessel under stirring. Rinse the containers with 5 mL of distilled water and add the rinsing to the mixing vessel under stirring. Cool the solution to 35-40°C. Add the peppermint oil solution to the mixing vessel under stirring, rinse each container separately with 5 mL of distilled water, and add the rinsing to the mixing vessel. Finally, make up the volume to 100 mL with sorbitol for HS 1, make up to 100 mL with simple syrup for HS 2, and make up to 100 mL with honey for HS 3.

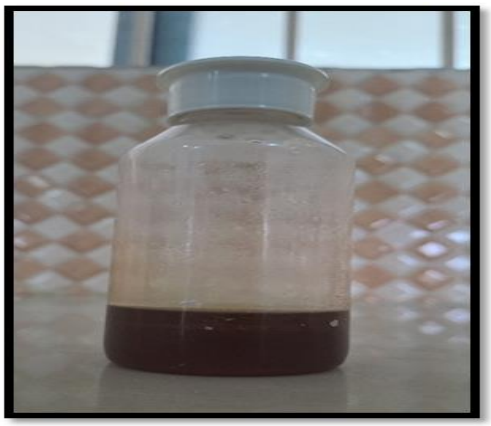

Fig. 6: Herbal syrup.

3.3.1 Evaluation of herbal syrup

A. Physicochemical parameters: The herbal syrup was evaluated for various physicochemical parameters, including physical appearance (color, odor, taste), pH, weight per milliliter (Wt/mL), and viscosity, which was determined using an Ostwald viscometer.

B. Glucose diffusion: It was performed according to the method. A total of 25 ml of glucose solution (20m mol / L) and the samples of plant extract (1%) were dialyzed in dialysis bags against 200ml of distilled water at 37 degree centigrade in a shaker water bath. The glucose content in the dialysate was determined at 30, 60, 120 & 180 minutes using UV Spectrophotometer. A control test was carried out without sample.

C. Sensory evaluation of syrup: Herbal syrup were diluted at 1:4 (Syrup: water) for evaluation. Sensory evaluation was carried out by semi trained panel members. Hedonic rating test was employed using 9-point hedonic scale. Sensory parameter such as color, taste, texture and overall acceptability was evaluated. The following were numerical score assigned. Like extremely (9), Like very much (8), Like moderately (7), Like slightly (6), Neither like for dislike (5), Dislike slightly (4), Dislike moderately (3), Dislike very much (2), Dislike extremely (1).

D. Animal experiment: The animal experimental study haematological and biochemical parameters in the groups after giving papaya extract and herbal syrup. The experimental starting collect 1 to 5 day albino white mice 2 collected. one mice was used in control another one used for test, control used pure papaya extract and test used for prepared herbal syrup this experiment was during five days. Per day 0.5ml in 2times used end of day collect blood. Every day collect from blood in mice to analyzed RBC, WBC, Platelets count to report it for comparison study from one to five days.

E. Thin-Layer chromatographic analysis: Sugars obtained from herbal syrup were spotted on the cellulose layer of TLC plates and the eluted compounds were labeled as HS 1, HS 2 and HS 3 on the chromatogram. The Rf values of analyzed sugars from fractions were found to match with the Rf values of authentic samples of sugars leading to the identification of the former as maltose, glucose and fructose. Rf for the standard sugars and the matching analyzed sugars extracted from papaya.

F. Stability testing: Stability testing of the prepared herbal syrup was performed on keeping the samples at accelerated temperature conditions. Nine portions of the final syrup (HS 1 A, HS 1 B, HS 1 C, HS 2 A, HS 2 B, HS 2 C, HS 3 A, HS 3 B and HS 3 C), were taken in amber colored glass bottles and were kept at accelerated temperature at 40°C, Room temperature and 47°C respectively. The samples were tested for all the physicochemical parameters, turbidity and homogeneity at the interval of 24 hr, 48 hr and 72 hr to observe any change.

3.4 Formulation of herbal sanitizer gel

Table 3: Composition of herbal sanitizer gel.

S. No	Ingredients	HSG 1	HSG 2	HSG 3
1	Plant extract	1.25gm	1.25gm	1.25gm
2	HPMC	1.5gm	2.25gm	3.0gm
3	Glycerin	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	Up to 100ml	Up to 100ml

Procedure: Various hand wash gel formulations were prepared (Table No: 3) using HPMC and as gelling agents. The desired concentration of gelling agent, sodium lauryl sulphate, glycerin were measured accurately and dispersed in purified water with moderate stirring. The required quantity of methyl paraben and propyl paraben was dissolved in remaining quantity of purified water by gentle heating. Desire quantity of Plant extract and isopropyl alcohol added. Triethanolamine was used to adjust the pH. The formulated hand wash gel was filled in collapsible tubes and stored at cool and dry place until further evaluation.

Fig. 7: Herbal sanitizer gel.

3.4.1 Formulation of herbal sanitizer gel

A. Physical evaluation: Physical evaluation (color, dour) was done by sensory and visual inspection.

B. Grittiness & Consistency: 1ml of gel was taken on finger tips and rubbed between two fingertips then the formulation was evaluated. The consistency was checked by applying on skin.

C. PH: One gram of sample of herbal gel was taken and dissolved it into 100ml distilled water. The pH of solution was measured by previously standardized digital pH meter.

D. Spreadability: A sample of 0.5 g of each formula was pressed between two slides and left for about 5 minutes where no more spreading was expected Diameters of spreaded circles were measured in cm and were taken as comparative values for spreadability. The results obtained are average of three determinations.

E. Foam height: One gram of sample of hand wash gel was taken and dispersed in 50ml distilled water. Dispersion was transferred to 500ml measuring cylinder. Volume was made up to 100ml with water. The foam height above the aqueous volume was noted.

F. Foam retention: 25ml of the 1% herbal gel was taken into 100ml graduated cylinder. The cylinder was covered with hand and shaken 10 times. The volume of foam at 1 minute interval was recorded for 4 minutes.

G. Percentage yield: The empty container was Weighed in which the gel formulation was stored then again the container was weighed with gel formulation. Then subtracted the empty container weighed with the container with gel formulation then it gives the practical yield.

H. Irritancy test: Mark an area (1sq.cm) on the left hand dorsal surface. The gel was applied to the

specified area and time was noted. Irritancy, erythema, edema, was checked if any for regular intervals up to 24 hrs and reported.

I. Viscosity measurement: viscometer can be used to measure the viscosity of prepared gel formulations. The gels are rotated at 0.3, 0.6 and 1.5 rotations per minute. At each speed, the corresponding dial reading is noted. The viscosity of gel is obtained by multiplication of dial reading with factor given in the viscometer catalogues.

J. Homogeneity: All developed gels were tested for homogeneity by visual inspection after the gels have been set in the container. They were tested for their appearance and presence of any aggregates.

4. RESULTS AND DISCUSSION

4.1 Herbal lozenges

4.1.1 Physical evaluation of herbal lozenges

Table 4: Physical evaluation of herbal lozenges.

S. No	Parameter	HL 1	HL 2	HL 3
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/Cm^2)	11.83±0.008	11.16±0.005	10.16±0.002
9	Friability %	1.66±0.12	1.85±0.006	1.92±0.153
10	Weight Variation (gm)	2.97±0.004	2.89±0.005	2.83±0.005
11	Moisture Content %	0.6±0.005	0.6±0.100	0.7±0.002
12	Disintegration Test (Min)	17min	15min	16min

4.1.2 Sensory evaluation

Table 5: Sensory evaluation.

S. No	Parameter	HL 1	HL 2	HL 3
1	Color	8	8	8
2	Taste	8	8	8
3	Flavour	8	7	8
4	Shape	8	8	7
5	Consistency	8	8	8

1: extremely dislike, 2: strongly dislike, 3: moderate dislike, 4: slight dislike, 5: neutral, 6: slight like, 7: moderate like, 8: strongly like, 9: extremely like, 10: excellent

4.1.3 Preliminary phytochemical analysis

Table 6: Preliminary phytochemical analysis.

S. No	Compound	Test	Apperances	Result
1	Carbohydrate	Molish Test	Violet Color Ring	Present
2	Amino acid	Ninhydrin Test	Purple Color	Present
3	Protein	Biuret Test	Bluish – Violet Color	Present
4	Glycoside	Legal's Test	Reddish Color	Present
5	Flavonoids	Con.c Sulphuric Acid Test	Orange Color	Present
6	Saponins	Emulsion Test	Emulsion Development	Present

4.2 Herbal syrup

4.2.1 Physical evaluation of herbal syrup

Table 7: Physical evaluation of herbal syrup.

S. No	Parameters	HS 1	HS 2	HS 3
1	Colour	Yellow	Brown	Brown
2	Odour	Aromatic	Aromatic	Aromatic
3	Taste	Slightly Tasteless	Slightly Sweet	Sweet
4	PH	5.25	7.11	8.23
5	Viscosity	24.58 Centipoise	27.68 Centipoise	31.54 Centipoise

4.2.2 Glucose diffusion

Table 8: Glucose diffusion.

S. No	Concentration of glucose (µg/mL)	HS 1	HS 2	HS 3
1.	5	0.110	0.114	0.118
2.	10	0.121	0.126	0.139
3.	20	0.145	0.131	0.144
4.	50	0.177	0.144	0.178
5.	100	0.189	0.174	0.951

4.2.3 Sensory evaluation of syrup

Table 9: Sensory evaluation of syrup.

S. No	Sensory	HS 1	HS 2	HS 3
1	Color	8	8	8
2	Taste	7	7	8
3	Consistency	8	7	8
4	Appearance	8	8	8
5	Flavour	8	7	8
6	Over All Acceptability	7.8	7.5	8

4.2.4 Animal experiment

Table 10: Animal experiment.

HS / Day	Experiment	RBC ($\times 10^6$ / µL)	WBC ($\times 10^6$ / µL)	Platelets ($\times 10^6$ / µL)
HS 1 DAY 1	Test	6.20±0.17	7.43±0.22	3.68±0.18
	Control	5.80±0.19	7.40±0.23	3.31±0.15
HS 2 DAY 1	Test	6.45±0.18	7.45±0.23	4.52±0.15
	Control	5.95±0.22	7.61±0.13	4.02±0.23
HS 3 DAY 1	Test	5.95±0.18	7.62±0.32	5.21±0.13
	Control	6.63±0.32	7.16±0.21	5.11±0.15
HS 1 DAY 5	Test	6.61±0.28	7.68±0.15	7.86±0.38
	Control	7.95±0.59	7.71±0.61	7.80±0.13
HS 2 DAY 5	Test	6.31±0.11	7.52±0.11	9.00±0.35
	Control	7.97±0.62	8.01±0.42	9.21±0.31
HS 3 DAY 5	Test	6.41±0.10	7.59±0.10	9.01±0.31
	Control	8.01±0.31	8.02±0.39	9.23±0.35

4.2.5 Thin-Layer chromatographic analysis

Table 11: RF Values Matching of The Analytical Standard Samples and The Separated Samples.

Sugars	RF (Scale of RF =1)	Fraction matching
Lactose	0.20	-
Maltose	0.27	HS 3
Sucrose	0.41	HS 2
Galactose	0.35	-
Glucose	0.44	-
Mannose	0.47	-
Sorbose	0.51	HS 1
Fructose	0.55	-
Arabinose	0.56	-
Xylose	0.65	-
Ribose	0.70	-
Rhamnose	0.73	-

4.2.6 Stability test

Table 12: Stability study.

Sample code	Time in hour	Temperature (°C)	Physicochemical parameters					
			Color	Odor	Taste	PH	WT/ML AT 25°C	Turbidity/ Homogeneity
HS 3 A	24 Hr	5°C	+	+	+	8.25	1.1835 G	No Turbidity

HS 3 B		Room Temp	+	+	+	8.25	1.1835 G	X
HS 3 C		47°C	+	+	+	8.25	1.1835 G	Homogeneity
HS 3 A		5°C	+	+	+	8.25	1.1835 G	No Turbidity
HS 3 B	48 Hr	Room Temp	+	+	+	8.25	1.1835 G	X
HS 3 C		47°C	+	+	+	8.25	1.1835 G	Homogeneity
HS 3 A		5°C	+	+	+	8.25	1.1835 G	No Turbidity
HS 3 B	72 Hr	Room Temp	+	+	+	8.25	1.1835 G	X
HS 3 C		47°C	+	+	+	8.25	1.1931 G	Homogeneity

+ = No Change. X = Original Condition

4.3 Herbal hand sanitizer gel

4.3.1 Physical evaluation of herbal sanitizer gel.

Table 13: Physical evaluation of herbal sanitizer gel.

S. No	Parameter	HSG 1	HSG 2	HSG 3
1	Colour	Light Blue	Light Blue	Light Blue
2	Odour	Characteristic	Characteristic	Characteristic
3	PH	7.81	7.88	7.82
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 (in ml)	70	69	78
8	Foam Retention (in ml)	13	15	20
9	Homogeneity	Homogeneous	Homogeneous	Homogeneous
10	Percentage Yield %	91.25 %	95.31 %	89.02 %
11	Viscosity	4790	6970	7131
12	Moisture Content %	0.3	0.3	0.4

4.3.2 Skin irritancy test

Table 14: Skin irritancy test.

S. No	Formulation code	Signs of skin irritation		
		Erythema	Edema	Irritation
1	HSG 1	Nil	Nil	Nil
2	HSG 2	Nil	Nil	Nil
3	HSG 3	Nil	Nil	Nil

5. CONCLUSION

The present work involves the formulation of different dosage forms of Carica papaya, including solid, liquid, and semi-solid preparations. The papaya leaf was successfully extracted using 90% ethanol. Herbal lozenges were prepared using a heating and congealing technique. Literature regarding lozenge dosage form preparation, excipient selection, and manufacturing methods has been collected and reviewed. Excipients were selected based on this literature review and included agar, acacia, tragacanth, peppermint oil, sugar syrup, sucrose, glycerol, and citric acid.

The prepared lozenges were evaluated for weight variation, hardness, thickness, friability, drug content, disintegration time, and in-vitro dissolution studies. All these parameters were found to be within the standard limits. The HL 1 formulation released 98.49% of the drug within 35 minutes.

The syrup was prepared using different bases, such as water, simple syrup, and honey, with an excipient selection based on a literature review. Excipients used included hydroxyl ethyl cellulose, peppermint oil, sodium benzoate, propylene glycol, and glycerol. The prepared herbal syrup was evaluated for sensory characteristics, TLC analysis, viscosity, pH, and stability studies. All parameters were found to be within the standard limits. The HS 3 formulation compare to other good stability & good result in animal experiments.

The sanitizer gel was prepared using the polymer HPMC, and excipient selection was also based on a literature review. Excipients included SLS, methyl paraben, propyl paraben, isopropyl alcohol, and glycerin. The prepared herbal sanitizer was evaluated for irritation, pH, viscosity, foam height, and foam time. All these parameters were found to be within the standard limits.

In conclusion, all the Carica papaya-containing dosage forms were successfully prepared and evaluated, demonstrating satisfactory results for their intended applications.

6. REFERENCES

1. Mr.L.Gopi, M.R.Charulatha, “Development and Characterization of Kalmegh Containing different Types of Lozenges“ – A Research, International

Journal of Pharmaceutical Research and Applications, 2023; 8, 2: 1379-1389.
2. V. Anitha1*, L. Gopi2 Optimizing Herbal Lozenges: Formulation Techniques and Efficacy Evaluation - A Research, INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES, *2024; 2, 11: 59-70 |Research*
3. Nagoba SN, Rao KP, Sameer S, Gujarathi DS, Nagoba BS. Studies in candy bases Ketaconazole pediatric lozenges. Int J Res Ayurveda and Pharm, 2011; 2(1): 239-243.
4. Pattanayak D, Das S. Formulation Development and Optimization of Medicated Lozenges for pediatric use. Int J Pharm Sci Res, 2012; 3(1): 138-140.
5. Kini R, Rathnanand M, Kamath D. Investigating the suitability of Isomalt and liquid glucose as sugar substitute in the formulation of Salbutamol sufate hard candy lozenge. J Chem Pharm Res, 2011; 3(4): 69-75.
6. Phaechamud T, Tuntarawongsa S. Clotrimazole soft lozenges fabricated with melting and mold technique. Res J Pharm Bio Chem Sci, 2010; 1(4): 579-86.
7. Anjum V, Ansari SH, Naquvi KJ, Arora P, Ahmad A. Development of quality standards of *Carica papaya* Linn. Leaves, Sch Res Lib, 2013; 5(2): 370-376.
8. Jean Bruneton. *Carica papaya*, In: Pharmacognosy, phytochemistry of medicinal plants, Tech Docu Fra, 1999; 2: 221-223.
9. Swain Pramod Kumar1, Nayak Durga Prasan Design. Development & Evaluation of a Poly herbal Syrup from some herbs used as Energy booster. International Journal of Ayurvedic Medicine, 2013; 4(4): 374-378. ISSN: 0976-5921
10. Rassol Bazigha Kadhim et al, Ali Heyam Saad, "Formulation and Evaluation of Herbal Hand Wash from Matricaria Chamomilla Flowers". International Journal of Research in Ayurveda and Pharmacy, 2011; 6: 11- 1813.
11. Sayant Londhe snehal D et al "Formulations of Herbal Hand wash with potential Anti bacterial Activity" International Journal of Research in Adent Technology special issue National Conference ACGT, 2015; 11-15.
12. Majumdar S.H et al, Kadam S.S. "Formulation and Antimicrobial Activity of Liquid Herbal Hand Wash". Journal of Advanced Drug Delivery (JADD), 2(3).
13. Abhishek Shound, Reenu Yadav et al. "Formulation and evaluation of Herbal Hand Wash" would Journal of Pharmacy and Pharmaceutical Sciences, 2016; 5(3): 675-683.
14. Palash Mandal, et al, Prince Kumar Pal. "Formulation and Evaluation of Hand wash of Vitex Negundo". World Journal of Pharmacy and Pharmaceutical Sciences, 2017; 4(11): 1488-1492.
15. Rathi P. B.et al, Patil S.C. Development and Evaluation of Herbal Gel for Treatment of Psoriasis". Journal of Innovations in Pharmaceuticals and Biological Sciences, 2015; 2(1): 772-87. Print.