

Formulation and Evaluation of Herbal Lozenges

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Abstract :

The goal of the current study is to improve platelet counts in diseases like thrombocytopenia by developing and testing herbal lozenges that contain extracts of papaya (*Carica papaya*) leaves and kiwi (*Actinidia deliciosa*) fruit. Alkaloids, flavonoids, saponins, and phenolic compounds—all of which have medicinal benefits, particularly in increasing platelet production—are abundant in papaya leaves. Along with its nutritional advantages, kiwi fruit also has anti-inflammatory and antioxidant qualities. Weight variation, friability, hardness, disintegration time, and moisture content were among the physicochemical tests used to assess the lozenges, which were made with sugar, honey, and citric acid as excipients. The presence of important components in both extracts was verified by phytochemical screening. Formulation F3 was the most appropriate of the three formulations (F1, F2, and F3) since it had the best hardness, disintegration time, and lowest moisture content. Despite the need for more clinical trials to confirm safety and efficacy, the study found that these lozenges present a viable, all-natural, and pleasant option for managing thrombocytopenia.

Keywords : Herbal lozenges, Papaya leaves, Kiwi fruit, Thrombocytopenia, Minimal side effects

Introduction:

Lozenges are oral medications in a variety of shapes that often contain both a medical ingredient and a flavoring. These days, they are widely used to deliver various active ingredients in both culinary and pharmaceutical products. Since the medicinal substances are well absorbed through the buccal lining or when eaten, they are designed to lessen both local and systemic symptoms. Lozenges offer a number of benefits, including ease of administration to both young and old patients and ease of preparation requiring little time or equipment.¹

The medication tablet known as a lozenge is held in the mouth until it dissolves, releases the medication, and has a calming effect on the throat. Lozenges are dissolved slowly in the mouth to stop the cough and soothe irritation of the tissues in the throat.²

Lozenges are intended to ease oropharyngeal symptoms, often caused by local infections. When properly absorbed via the buccal linings or ingested, the medication can produce a systemic effect. Lozenges are used to treat patients who cannot swallow solid oral dose forms or medications that should be administered gradually to maintain a consistent level of the drug in the oral cavity or to coat the throat tissues with a drug solution. Lozenges often

contain analgesics, anesthetics, antimicrobials, antiseptics, and other types of medication; this is not a comprehensive list, as there are many other medications that may also be suitable for lozenge delivery.³

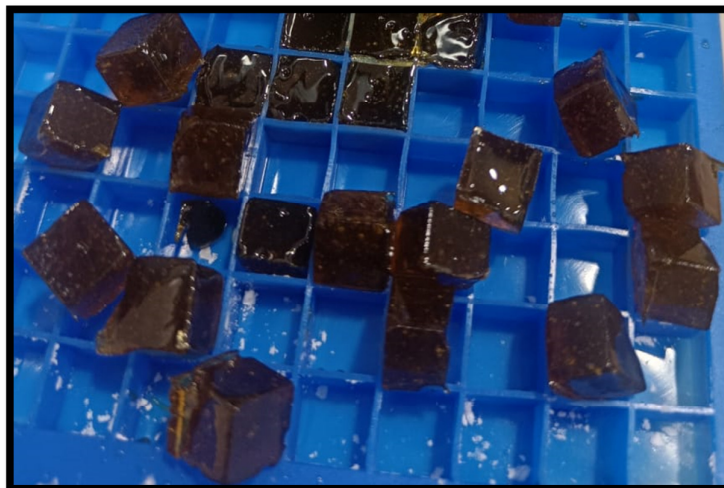


Fig no. 1 : Lozenges

Types of Lozenges:

1. Hard Lozenges
2. Soft Lozenges
3. Chewable Lozenges

Papaya :

The papaya, or *Carica papaya* L., is a crop of economic importance and is recognized for its nutritional and therapeutic qualities. It is a member of the Caricaceae family. For hundreds of years, papaya leaves have been utilized for a variety of therapeutic purposes. Papaya leaves were traditionally used to treat thrombocytopenia during dengue infections, and their decoction was used to treat malignancy. The pharmaceutical and wellness sectors have seen a steady rise in demand for papayas in recent years as a result of researchers discovering their potential.⁴

Papaya leaves include a number of vitamins and minerals in large quantities, are low in calories, and contain an enzyme that helps tenderize meat and ease indigestion. Active ingredients found in the leaves include papain, chymopapain, cystain, ascorbic acid, flavonoids, and cynogenic glucosides, which raise blood levels of antioxidants and lower levels of lipid preoxidation. Additionally, papaya leaves include minerals (calcium, magnesium, salt, potassium, iron), vitamins (vitamin A and B vitamins, particularly B12), alkaloids, saponins, and cardiac glycosides, all of which may be crucial in the treatment of thrombocytopenia.⁵



Fig no. 2 : Papaya leaves

Kiwi :

Kiwifruit is renowned for both its taste and high vitamin C content. It is highly susceptible to ethylene and is a climacteric fruit. The kiwifruit is a berry with several locules that contain a large number of tiny, soft black seeds, according to botany. Three sections make up its flesh: the columella (core), the inner pericarp with seeds, and the outside pericarp. The texture and composition of each component are unique. Compared to the inner and outer pericarps, the columella is lighter. The genus *Actinidia* and family Actinidiaceae include kiwi fruit. There are 76 species and roughly 125 taxa in the genus *Actinidia* worldwide but only two of these, *Actinidia deliciosa* (fuzzy kiwifruit) and *Actinidia chinensis* (golden kiwifruit), are commercially grown.⁶

Its brown, hairy peel, green flesh, and white pulp in the middle, along with numerous tiny, delicious black seeds, make it almost three inches long. In India, Arunachal Pradesh and Nagaland are the two states that produce the most kiwi fruit. The plant usually grows best in full sun or light shade and prefers slightly acidic soil (pH 6.0 to 6.5). The majority of kiwis are consumed fresh, but some are also processed into leather, spirits, syrups, dried, frozen, and lyophilized goods, juices, purees, sweets, and fortified beverages.⁷



Fig no. 3: Kiwi fruit

Thrombocytopenia:

Thrombocytopenia is a hematological disorder that is frequently multifactorial and is defined by a reduced platelet count. Commonly referred to as platelets, thrombocytes are either nucleated or anucleated blood cells that are formed in bone marrow and typically range between 150 and 450 x 10³ cells/ μ L of blood. In the body's physiological system, platelets are important, particularly in responses to vascular injury. Platelets create a structural block to prevent excessive blood loss following damage. The layers of the collagen, ADP, vasculature, and fibrinogen plugs contain a variety of receptors.

One-third of the platelets are located in the spleen, while two-thirds are found in the blood. Platelets typically live for 8–10 days on average. The primary causes of thrombocytopenia are augmented destruction, splenic sequestration, and reduced platelet production in the bone marrow. Thrombocytopenia can be caused by various factors, including drug-induced thrombocytopenia, idiopathic thrombocytopenic purpura, HIV, dengue, liver cirrhosis, leukemia, chikungunya, hepatitis C virus, malaria, and other diseases. The annual incidence of adult thrombocytopenia is 3.3 per 100,000 individuals, while its prevalence factor is 9.5 per 100,000.⁸

Drug Profile :

1. Papaya leaf :

Scientific Name: Carica papaya

Commonly Known As: Pawpaw leaf

Family Classification: Caricaceae

Utilized Parts of the Plant: Leaf

Classification¹⁵ :

Kingdom	Plantae
Division	magnoliophyta
Class	magnoliopsida
Order	Brassicales
Family	Caricaceae
Genus	Carica
Species	Papaya L.

Table no.1: Scientific classification

Medicinal uses of Papaya leaves:

- Anti oxidant
- Anti fungal
- Anti malarial
- Anti helmentic
- Anti ulcer
- Anti inflammatory
- Anti microbial
- Anti fertility
- Anti amoebic
- Hepatoprotective
- Diuretic activity
- Anti tumor
- Reduce blood pressure
- Hypoglycemic.⁹

Chemical Constituents :

Parts	Chemical Constituents
Leaves	Carpaine, Quercetin, Kaemferol, Myricetin, Rutin, Glycoside, Catechine, Gallic acid, Tannic acid, Oleonolic acid, Betulinic acid, Papain, Chymopapain, Lipase, Amylase, Protease Inhibitor, Caffeic acid, Chlorogenic acid, Coumaric acid, Vitamin A E C, Minerals, Iron, Potassium, Magnesium

Table no. 2: Chemical constituents of papaya leaves

2. Kiwi Fruits :

Scientific Name: Actinidia Deliciosa

Commonly Known: Chinese Gooseberry

Family Classification: Actinidiaceae

Utilized Parts of the Plant: Flesh, Seed, Skin

Classification¹⁶ :

Kingdom	Plantae
Division	magnoliophyta
Class	magnoliopsida
Order	Ericales
Family	Actinidiaceae
Genus	Actinidia

Species	Actinidia Deliciosa
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Table no. 3: Scientific classification**Medicinal uses of Kiwi fruit :**

- Antioxidant and anti-inflammatory
- Gi tract health
- Dermatological activity
- Diabetes
- Eye health
- Bone health
- Cardiovascular health.¹⁰

Chemical Constituents :

Parts	Chemical constituents
Flesh	Actinidin, Fructose, Glucose, Dietary fibres, Polyphenols, Flavonoid, Carotenoids, Potassium, Magnesium, Calcium, Vitamin C, E, K
Seed	Omega-3 fatty acid, Protein, Vitamin E
Skin	Polyphenols, Flavonoids, Fibers, Vitamin E

Table no. 4: Chemical constituents of Kiwi Fruit**Material and Method :****Material :****Plant Material :**

The leave of plant (*Carica papaya*) and Kiwi fruit was collected from the Local Market. The Plant material were identified and authenticated by Botanist.

Ingredient	Category
Papaya Leaves Extract	API

Kiwi Fruit Extract	API
Sugar	Diluent/ Base
Honey	Flavoring agent
Citric Acid(Lemon)	Buffering agent

Table no. 5 : Ingredients used in formulation

Method :

Formulation of Extract :

Papaya leaf :

Papaya leaf Extract was formulated using straining method.



Fig no. 4 : Papaya leaves extract

Kiwi fruit :

Kiwi fruit Extract was formulated using straining method.



Fig no. 5 : Kiwi fruit extract

Chemical tests :

Papaya leaves¹¹ :

Sr No.	Chemical Test	Observation	Inference
1.	Alkaloids: Wagner test	Reddish-brown precipitate.	Present
2.	Carbohydrates: Benedict test	Colored precipitate.	Present
3.	Glycosides : Kellar-Killiani test	Reddish-brown ring at the junction of liquids.	Present
4.	Phenolic compounds and tannins : Ferric chloride test	Dark green color.	Present
5.	Saponins :	Formation of foam.	Present

Table no. 6 : Chemical tests of papaya leaves

Kiwi Fruit¹² :

Sr No.	Chemical Test	Observation	Inference
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1.	Alkaloids : Wagner test	Reddish-brown precipitate.	Present
2.	Carbohydrates : Benedict test	Colored precipitate.	Present
3.	Phenolic compounds and tannins : Ferric chloride test	Dark green color	Present

Table no. 7 : Chemical test of kiwi fruit

Evaluation test :**1. Weight variation :-**

10 lozenges were randomly chosen, weighed, and their average was determined in order to perform the test.

$$\text{Avg wt} = \frac{\text{Wt. of 10 lozenges}}{10}$$

$$\% \text{ weight variation} = \frac{\text{Avg wt} - \text{wt of each tablet}}{\text{Avg wt}} \times 100$$

2. Friability testing :-

The friability of ten tablets from each batch was tested using a friabilator. for four minutes at a rate of 25 revolutions per minute. The percentage weight loss was calculated after dedusting and reweighing the lozenges, using the formula: % Friability = (initial Wt. - Wt. after friability) $\times$ 100 / initial Wt.



Fig no. 6: Friability test apparatus

3. Hardness :-

The hardness of the lozenges was measured using a Monsanto hardness tester. The test lozenges were positioned between the spindle and anvil, and after applying the necessary

pressure to hold them there, the screw knob was turned clockwise until the lozenges shattered. The pressure required to break the lozenges, expressed in kilograms per centimeter, was noted in the reading.



Fig no. 7 : Monsanto Hardness Tester

4. Diameter and thickness :-

The diameter and thickness of the tablets were measured with a Vernier calliper.

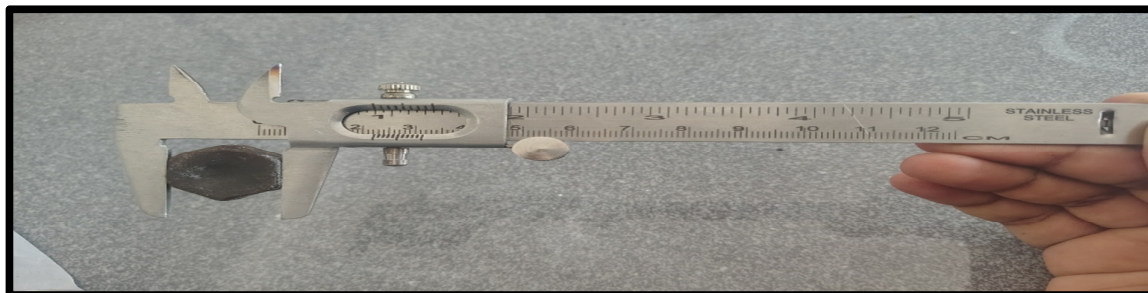


Fig no. 8 : Vernier Calliper

5. Disintegration Time :-

The disintegration time of six lozenges was measured using disintegration test equipment. Every lozenge was put into the basket rack assembly's tube of the discless disintegration equipment. The assembly was placed in a beaker with disintegration media that was kept at $37 \pm 2^\circ\text{C}$. The disintegration time was the amount of time needed for the assembly to completely disintegrate.



Fig no. 9 : Disintegration Test Apparatus

6. Moisture content analysis :-

In a mortar, the sample was crushed after being weighed. After weighing the material, one gram was put in a desiccator for a full day. A 24-hour period thereafter, the sample is weighed. The final weight of the lozenges is subtracted from the original weight to determine the moisture content.¹³



Fig no. 10 : Moisture content

Result :

For determination of Chemical constituent we performed chemical test :

For Papaya leaves :

Sr No.	Chemical test	Result
1	Alkaloid	Present(reddish-brown precipitate)
2	Carbohydrate	Present(colored precipitate)
3	Glycoside	Present(reddish-brown ring at the junction of liquids)
4	Phenolic compound and Tannin	Present(dark green color)
5	Saponin	Present(Foam)

Table no. 8 : Result of Phytochemical analysis tests of papaya leaves

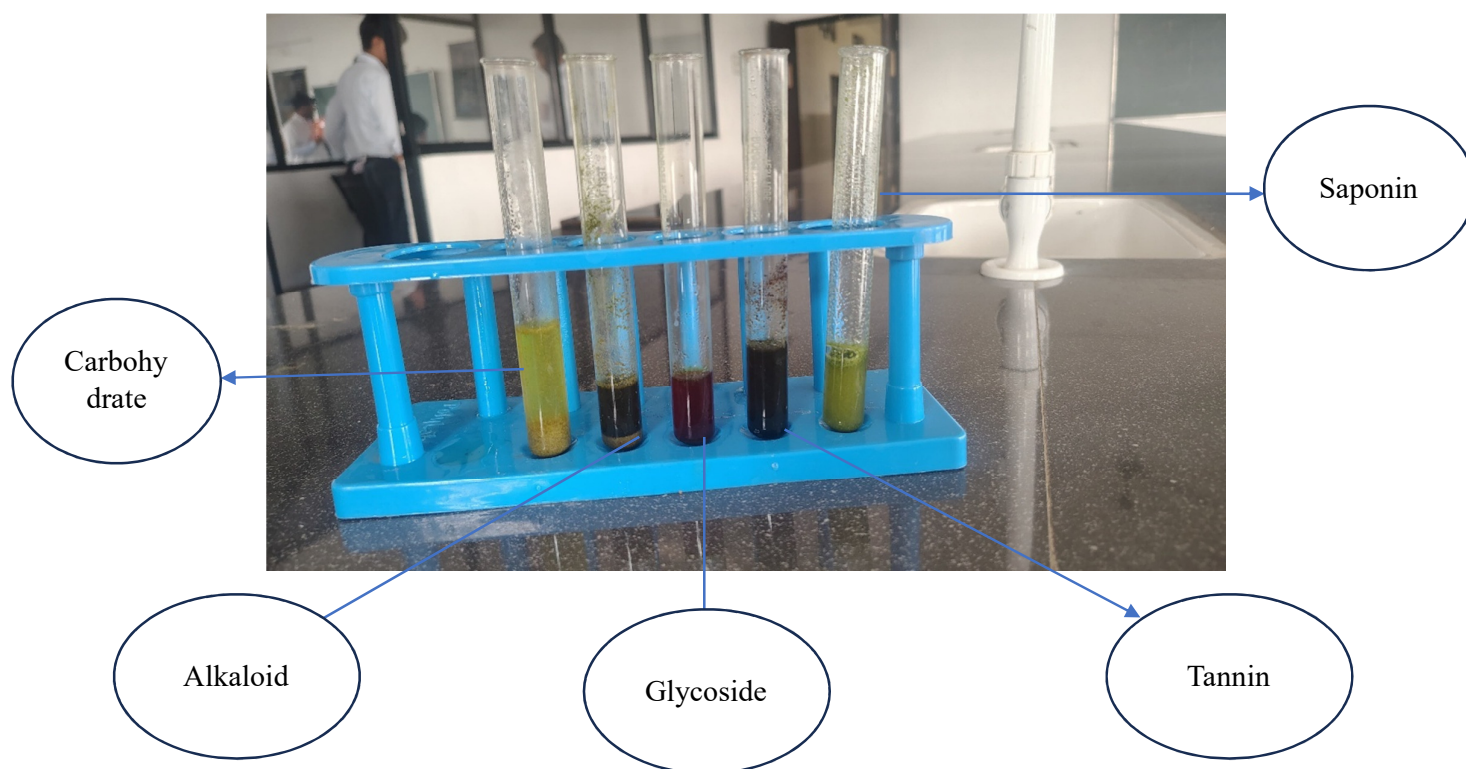


Fig no. 11 : Result of Phytochemical analysis tests of papaya leaves

For Kiwi Fruit :

Sr No.	Chemical Constituents	Result
1	Alkaloid	Present(reddish-brown precipitate)
2	Carbohydrate	Present (colored precipitate)
3	Phenolic compound and tannin	Present (dark green color)

Table no. 9 : Result of Phytochemical analysis tests of Kiwi fruit

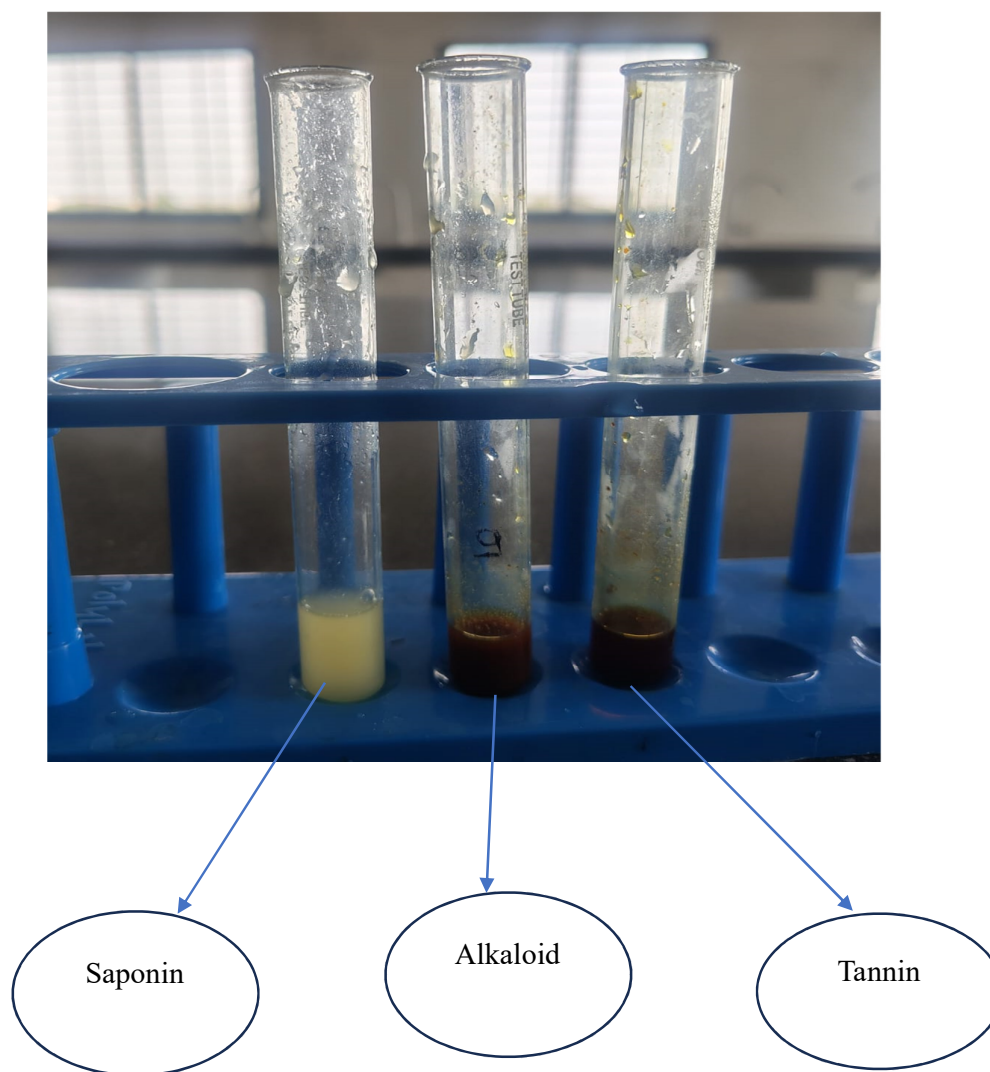


Fig no . 12 : Result of Phytochemical analysis tests of Kiwi fruit

Composition :

Ingredients	F1	F2	F3*
Papaya leaf extract	14ml	12ml	15ml
Kiwi fruit extract	6ml	7ml	4ml

Honey	5ml	5ml	4ml
Citric acid	1ml	1ml	1ml
Sugar	4gm	5gm	6gm

Table no. 10 : Composition of Lozenges

Organoleptic examination of prepared lozenges :

Parameter	Result
Shape	Spherical
Colour	Green
Texture	Smooth
Taste	Sweet

Table no. 11 : Organoleptic Properties of Lozenges

Result of Evaluation test :

Formulation	Weight variation	Friability	Hardness	Diameter and Thickness	Disintegration	Moisture Content
F1	2gm $\pm$ 5%	1.1% $>$ 1.0%	6kg/cm ²	10 cm/3mm	5 min	0.05%
F2	5gm $\pm$ 5%	1.3% $>$ 1.0%	7kg/cm ²	15 cm/5mm	4:30 min	0.04%
F3*	3gm $\pm$ 5%	0.8%$<$1.0%	12kg/cm²	22mm/7mm	4 min	0.01%

Table no. 12 : Results of Evaluation test

Conclusion :

The aim of present study was to developed an optimized formula for Lozenges containing extract of papaya leaves and kiwi fruit as active ingredient aimed at increasing platelet count, particularly beneficial in managing condition such as thrombocytopenia. Both Phytochemical and Evaluation test confirms presence of bioactive constituents like alkaloid, flavonoid, saponin, phenolic compounds which confirms the efficacy of the lozenges. F3 is considered as an optimized formulation based on evaluation tests. Overall this formulation offers natural, palatable, and effective approach to support platelet enhancement and immune health. Further clinical studies are recommended to establish standardized dosages, assess long-term safety, and explore synergistic effects with other herbal ingredients.

11.References :

1. Ali, A., Zam, W., & Ibrahim, W. (2022). Formulation and evaluation of chewable lozenges containing myrtle berries, cinnamon and cloves for oral disinfection. Journal of Stem Cell & Therapeutic Research, 1(1), 1–8.

2. Kumar, A., Mishra, M. K., Afeefa, Chandrashekar, K. S., Pai, G., & Pai, V. (2019). Development and evaluation of polyherbal lozenges for cold and flu. *Indian Journal of Pharmaceutical Education and Research*, 53(2 Suppl), S159–S163.
3. Durbale L, Meshram B , Jain V A 2024 Review: Formulation of herbal lozenges for increasing platlet count *IJPS Volume 2 issue 5* 1296_1301
4. Soni, S. K., Mishra, M. K., Mishra, M., Kumari, S., Saxena, S., Shukla, V., Tiwari, S., & Shirke, P. (2022). Papaya Leaf Curl Virus (PaLCuV) Infection on Papaya (*Carica papaya* L.) Plants Alters Anatomical and Physiological Properties and Reduces Bioactive Components. *Plants*, 11(5), 579.
5. Ugo, N. J., Ade, A. R., & Joy, A. T. (2019). Nutrient Composition of *Carica Papaya* Leaves Extracts. *Journal of Food Science and Nutrition Research*, 2(3), 274–282.
6. Satpal, D., Kaur, J., Bhadariya, V., & Sharma, K. (2021). *Actinidia deliciosa* (Kiwi fruit): A comprehensive review on the nutritional composition, health benefits, traditional utilization, and commercialization. *Journal of Food Processing and Preservation*, e15588
7. Guroo, I., Wani, S. A., Wani, S. M., Ahmad, M., Mir, S. A., & Masoodi, F. A. (2017). A review of production and processing of kiwifruit. *Journal of Food Processing & Technology*, 8(10), 699.
8. Munir, S., Liu, Z.-W., Tariq, T., Rabail, R., Kowalczewski, P. Ł., Lewandowicz, J., Blecharczyk, A., Abid, M., Inam-Ur-Raheem, M., & Aadil, R. M. (2022). Delving into the therapeutic potential of *Carica papaya* leaf against thrombocytopenia. *Molecules*, 27(9), 2760
9. Hussain, S. Z., Naseer, B., Qadri, T., Fatima, T., & Bhat, T. A. (2021). Kiwifruit (*Actinidia deliciosa*)—Morphology, Taxonomy, Composition and Health Benefits. In *Fruits Grown in Highland Regions of the Himalayas* (pp. 145–156). Springer.
10. Nandini, G., Gopena, T. S., Nagalambika Prasad, Murugesan, K., Gnanasekaran, A., Ranjith, M. S., Palanisamy, P., & Basalingappa, K. M. (2020). Phytochemical analysis and antioxidant properties of leaf extracts of *Carica papaya*. *Asian Journal of Pharmaceutical and Clinical Research*, 13(11), 58–62.
11. Lakshmi, B. M., Swathi, G., Sravani, S., Rao, P. I., & Shailaja, P. (2017). Formulation and evaluation of domperidone candy lozenges. *World Journal of Pharmaceutical and Pharmaceutical Sciences*, 6(12), 1167–1175.
12. Igbashio, M. D., Alonge, P. O., & Okoye, C. E. (2023). Phytochemicals and Minerals Composition of Matured (Yellow) *Carica Papaya* Leaves. *Journal of Energy Technology and Environment*, 5(4), 28–36.
13. Pattanayak D, Das S 2011 Formulation development and Optimization of Medicated lozenges for pediatric use *IJPSR volume 3 issue 1*.
14. Rafique, S., & Akhtar, N. (2018). Phytochemical analysis and antioxidant activity of *Persea americana* and *Actinidia deliciosa* fruit extracts by DPPH method. *Biomedical Research*, 29(12), 2459–2464.
15. Karunamoorthi, K., Kim, H.-M., Jegajeevanram, K., Xavier, J., & Vijayalakshmi, J. (2014). Papaya: A gifted nutraceutical plant - A critical review of recent human health research. *TANG [Humanitas Medicine]*, 4(1), e2.
16. Khutare, S. R., & Deshmukhs, A. S. (2023). A review on various medicinal applications of kiwi fruit. *International Journal of Science and Research Archive*, 8(2), 193–206.