

Development And Evaluation of Polyherbal Thin Film of Motion Sickness

Saurabh Narayan Shinde, Vijaykumar Sidramappa Wakale*, Pramod Dattu Pokharkar

Samarth Institute of Pharmacy, Belhe, Tal- Junnar, Dist- Pune, Maharashtra PIN- 412 410.

Corresponding Author: Dr. Vijaykumar Sidramappa Wakale, Professor, Dept of Pharmaceutical Chemistry, Samarth Institute of Pharmacy, Belhe, Tal- Junnar, Dist- Pune.

Date of Submission: 10-05-2026

Date of Acceptance: 20-05-2026

Abstract

Motion sickness is a condition that arises due to a mismatch between signals received from the vestibular system and visual inputs, resulting in symptoms such as nausea, vomiting, dizziness, and general uneasiness. Traditional dosage forms like tablets and capsules often show a slower onset of action and may reduce patient compliance, particularly during travel situations. In this context, the present study aims to develop a polyherbal oral thin film (OTF) incorporating natural antiemetic ingredients such as ginger extract, Tulsi oil, lemon oil, and cardamom oil.

The formulation was developed using the solvent casting technique, where Hydroxypropyl Methylcellulose (HPMC E15) served as the film-forming agent and polyethylene glycol (PEG-400) acted as a plasticizer to provide flexibility. Additionally, β -cyclodextrin was included to improve the solubility and stability of the essential oils used in the formulation. The prepared oral films were subjected to various physicochemical evaluations, including thickness, weight variation, folding endurance, disintegration time, surface pH, and uniformity of drug content.

The findings indicated that the formulated films were consistent in appearance, mechanically stable, and flexible, with a rapid disintegration time occurring within a few seconds. Based on these results, it can be concluded that polyherbal oral thin films offer an effective and patient-friendly alternative for managing motion sickness, providing faster onset of action and improved convenience for users¹.

Keywords: Oral thin film, Polyherbal formulation, Motion sickness, Ginger, β -cyclodextrin, Fast dissolving film Oral thin film, Polyherbal drug delivery system, Motion sickness management, Ginger extract, β -cyclodextrin complexation, Fast dissolving film formulation.

I. Introduction

The oral route remains one of the most widely accepted methods of drug administration because of its convenience, non-invasive nature, and high level of patient compliance and acceptability. However, certain patient groups, particularly pediatric and geriatric populations, often face difficulty in swallowing conventional dosage forms such as tablets and capsules, a condition known as dysphagia. To address these challenges, fast dissolving drug delivery systems (FDDS) were introduced in the late 1970s as an effective alternative to traditional formulations like capsules and syrups.

FDDS are designed as solid dosage forms that rapidly disintegrate and dissolve in the oral cavity without the need for water, making them highly suitable for on-the-go administration. This category includes orally disintegrating tablets (ODTs) and oral thin films (OTFs). According to the Center for Drug Evaluation and Research (CDER), ODTs are solid dosage forms containing medicinal substances that disintegrate quickly upon contact with saliva. The first ODT approved by the U.S. Food and Drug Administration was Zydis ODT containing loratadine, which marked a significant advancement in drug delivery technology. This innovation eventually led to the development of fast dissolving films (FDFs), with early products such as Chloraseptic relief strips incorporating active pharmaceutical ingredients into thin film formulations.

Oral thin films are ultra-thin, flexible strips composed mainly of hydrophilic polymers that hydrate quickly when placed on the tongue or in the buccal cavity, leading to rapid drug release. These systems provide several advantages, including ease of administration, portability, and improved patient adherence.

Motion sickness is a frequently encountered physiological condition that arises due to a mismatch between sensory signals from the visual system,

vestibular apparatus, and proprioceptive inputs. This sensory conflict disrupts normal central nervous system processing and results in symptoms such as nausea, vomiting, dizziness, sweating, and a general feeling of discomfort. It commonly occurs during travel in vehicles such as cars, buses, ships, and airplanes, affecting individuals across all age groups. Although not a serious medical condition, it can significantly reduce comfort and negatively influence travel experiences².

Conventional treatment options for motion sickness mainly involve antihistamines and anticholinergic drugs. While these medications are effective in controlling symptoms, they are often associated with side effects such as drowsiness, dry mouth, blurred vision, and decreased alertness. Furthermore, these formulations typically require water for administration and may show a delayed onset of action, limiting their usefulness in situations requiring immediate relief. These limitations highlight the need for a more efficient and patient-friendly drug delivery approach³.

In recent times, herbal medicines have gained increasing attention due to their natural origin, better safety profile, and reduced risk of adverse effects. Among these, ginger (*Zingiber officinale*) is well known for its strong antiemetic and anti-nausea properties and has been widely studied. In addition, essential oils derived from Tulsi, lemon, and cardamom possess therapeutic benefits such as digestive support, calming effects, and potential synergistic action when combined. The use of these herbal components in a single formulation offers a comprehensive and effective strategy for managing motion sickness.

Oral thin films (OTFs) represent a modern and promising drug delivery system that overcomes many limitations of conventional dosage forms. These films are thin, flexible, and rapidly dissolving strips made from hydrophilic polymers, which disintegrate quickly upon contact with saliva in the oral cavity. This allows for faster drug release and absorption, leading to a quicker onset of action and improved patient convenience⁴.

II. Literature Survey:

1. Motion sickness is a widely occurring condition that arises due to a mismatch between visual, vestibular, and proprioceptive signals, leading to symptoms such as nausea, vomiting, and dizziness. Conventional pharmacological treatments, including antihistamines and anticholinergic agents, are effective but often

associated with adverse effects such as sedation, dry mouth, and reduced alertness. In addition, these medications may not provide immediate relief due to slower onset of action. Owing to these limitations, there has been a growing interest in developing alternative drug delivery systems, particularly those based on herbal ingredients and novel formulations like oral thin films.

2. Several researchers have explored the potential of oral thin films as an advanced drug delivery system. Dixit and Puthli (2009) reported that oral strip technology offers rapid disintegration, improved bioavailability, and enhanced patient compliance, especially for patients who have difficulty swallowing conventional dosage forms. Similarly, Arya et al. (2010) highlighted that oral thin films prepared using hydrophilic polymers such as hydroxypropyl methylcellulose (HPMC) exhibit excellent film-forming properties and rapid drug release characteristics.
3. Studies focusing on formulation variables have demonstrated that the concentration of polymer and plasticizer plays a crucial role in determining film properties. Bala et al. (2013) observed that the use of plasticizers like polyethylene glycol (PEG-400) improves film flexibility and prevents brittleness, thereby enhancing mechanical strength. Further, Nagaraju et al. (2013) emphasized that the solvent casting method is the most widely used technique for preparing oral thin films due to its simplicity, cost-effectiveness, and reproducibility.
4. The incorporation of solubility enhancers such as β -cyclodextrin has also been extensively investigated. Loftsson and Duchêne (2007) reported that cyclodextrins form inclusion complexes with hydrophobic compounds, thereby improving their aqueous solubility and stability. This approach is particularly beneficial for incorporating essential oils into film formulations, ensuring uniform distribution and enhanced therapeutic efficacy.
5. Herbal ingredients have gained considerable attention in the management of motion sickness due to their safety and effectiveness. Ginger (*Zingiber officinale*) is one of the most widely studied herbs for its antiemetic properties. Ali et al. (2008) reported that ginger effectively reduces nausea by acting on gastrointestinal motility and central nervous pathways. Similarly, Ernst and Pittler (2000) demonstrated

that ginger is a safe and effective alternative to conventional antiemetic drugs

6. Essential oils such as tulsi (*Ocimum sanctum*), lemon (*Citrus limon*), and cardamom (*Elettaria cardamomum*) have also shown promising therapeutic effects. According to Prakash and Gupta (2005), tulsi possesses significant anti-inflammatory and adaptogenic properties. Lemon oil has been reported to provide anti-nausea and refreshing effects, while cardamom acts as a carminative and digestive aid, contributing to overall symptom relief.
7. Recent studies have also explored the development of oral thin films containing antiemetic drugs for motion sickness. Patel et al. (2012) formulated buccal films of antiemetic agents and reported improved drug release and patient compliance compared to conventional tablets. In addition, research by Bhyan et al. (2011) indicated that oral films dissolve rapidly within seconds, making them highly suitable for conditions requiring quick onset of action.
8. Polyherbal formulations combine multiple plant-based ingredients to achieve a synergistic therapeutic effect. According to Mukherjee (2019), such formulations enhance efficacy while reducing the risk of side effects. The combination of ginger with essential oils in a single dosage form can provide complementary mechanisms of action, improving the overall effectiveness in managing motion sickness.
9. Overall, the available literature supports the use of oral thin films as an efficient drug delivery system and highlights the therapeutic potential of herbal ingredients in the treatment of motion sickness. The integration of herbal extracts with modern formulation techniques, such as the use of cyclodextrin complexes and solvent casting methods, offers a promising approach for developing safe, effective, and patient-friendly formulations. However, further research and clinical evaluation are necessary to establish their long-term efficacy and safety⁵.

III. Material and Methods :

1. Herbal ingredients :

1. **Name of Drug :** Ginger
 - **Biological Name:** *Zingiber officinale*
 - **Common Name:** Ginger
 - **Family:** Zingiberaceae
 - **Source :** Ginger consists of the dried or fresh rhizomes of *Zingiber officinale*, a perennial herb widely cultivated in tropical

and subtropical regions such as India, China, and Southeast Asia.

- **Use:**
 - Management of motion sickness
 - Treatment of nausea and vomiting (including pregnancy-induced nausea)
 - Relief from indigestion and bloating⁶



Fig 1: Ginger

2. **Name of Drug :** Peppermint
 - **Biological Name:** *Mentha piperita*
 - **Common Name:** Peppermint
 - **Family:** Lamiaceae
 - **Source :** Peppermint consists of the dried leaves and flowering tops of *Mentha piperita*, a hybrid mint widely cultivated in Europe, North America, and Asia.
 - **Use :**
 - Management of indigestion and irritable bowel syndrome (IBS)
 - Relief from nausea and headache
 - Carminative (reduces gas and bloating)
 - Mild antispasmodic for gastrointestinal discomfort



Fig 2 : Peppermint

3. **Name of Drug :** Fennel
 - **Biological Name:** *Foeniculum vulgare*
 - **Common Name:** Fennel
 - **Family:** Apiaceae

- **Source :** Fennel consists of the dried ripe fruits (seeds) of *Foeniculum vulgare*, flowering plant cultivated in Mediterranean regions, India, and China.

- **Use:**
 - Relief from indigestion and flatulence
 - Carminative and digestive stimulant
 - Mild expectorant



Fig 3 : Fennel

- **Source :** Cardamom consists of the dried ripe fruits (capsules) of *Elettaria cardamomum*, cultivated mainly in India and Sri Lanka.

- **Use:**
 - Relief from nausea and vomiting
 - Improves digestion and appetite
 - Carminative (reduces gas and bloating)
 - Flavoring agent in pharmaceutical preparations⁷



Fig 4 : Cardamom

4. Name of Drug :

- **Biological Name:** *Elettaria cardamomum*
- **Common Name:** Cardamom
- **Family:** Zingiberaceae

2. Other ingredients

- B-cyclodextrin
- HpmcE15
- PEG 400
- Sucrose
- Distilled water

Ingredient Table :

Sr. No.	Ingredients	Quantity for F1	Quantity for F2	Quantity for F3
1	Ginger Extract	250 mg	250 mg	250 mg
2	Peppermint Oil	25 mg	25 mg	25 mg
3	Fennel Extract	25 mg	25 mg	25 mg
4	Cardamom Oil	25 mg	25 mg	25 mg
5	HPMC E15	1.5 g	2.0 g	2.5 g
6	PEG-400	0.4 mL	0.6 mL	0.8 ml
7	β-Cyclodextrin	0.5 g	0.5 g	0.5 g
8	Sucralose	50 mg	50 mg	50 mg
9	Distilled Water	q.s. to 50 mL	q.s. to 50 mL	q.s. to 50 mL

Formulation Design Table :

A 2² factorial design was used for the optimization of the polyherbal oral thin film formulation. The concentration of polymer (HPMC E15) and plasticizer (PEG-400) were selected as independent variables, while folding endurance, disintegration time, and drug content uniformity were selected as dependent variables.

Formulation Code	HPMC E15 (g)	PEG-400 (mL)	Observation
F1	1.5 g	0.4 mL	Optimized film with good flexibility and rapid disintegration
F2	2.0 g	0.6 mL	Increased thickness and folding endurance with slightly delayed disintegration
F3	2.5 g	0.8 ml	Film showed higher thickness and excellent folding endurance with slower disintegration time and improved mechanical strength

Method of Formulation :

Formulation Method of Polyherbal Oral Thin Film .

1. Step 1: Preparation of Polymer Solution

Take a clean and dry beaker and add approximately 30 mL of distilled water. Slowly sprinkle 1.5 g of HPMC E15 into the water with continuous stirring to avoid lump formation. Stir the solution using a magnetic stirrer for about 30–40 minutes until a clear and viscous polymer solution is obtained. Allow the solution to stand undisturbed for 30 minutes to ensure complete hydration of the polymer.

2. Step 2: Preparation of Ginger Extract Solution

In a separate beaker, dissolve 250 mg of ginger extract in 5 mL of distilled water. Stir the mixture until a clear and uniform solution is formed.

3. Step 3: Preparation of Essential Oil–Cyclodextrin Complex

Take another beaker and add 0.5 g of β -cyclodextrin along with 3–5 mL of distilled water to form a slurry. Stir the mixture for 10–15 minutes. Then add the essential oils:

25 mg tulsi oil

25 mg lemon oil

25 mg cardamom oil

Continue stirring for 20 minutes to allow the formation of an inclusion complex, which improves the solubility and stability of the oils.

4. Step 4: Addition of Plasticizer

Add 0.4 mL of PEG-400 slowly into the prepared polymer solution. Stir continuously for 10 minutes to ensure uniform distribution. The plasticizer helps in improving flexibility and prevents brittleness of the film.

5. Step 5: Mixing of Drug and Polymer Solutions

Slowly add the prepared ginger extract solution into the polymer solution with continuous stirring. After proper mixing, incorporate the essential oil–cyclodextrin complex into the mixture. Stir the entire solution for 20–30 minutes to obtain a homogeneous film-forming solution.

6. Step 6: Addition of Sweetener

Add 50 mg of sucralose to the above mixture. Stir for 5–10 minutes until it is completely dissolved, ensuring improved taste of the final formulation.

7. Step 7: Adjustment of Final Volume

Add distilled water gradually to make up the final volume to 50 mL. Stir gently to maintain uniformity of the solution.

8. Step 8: Removal of Air Bubbles (Degassing)

Allow the prepared solution to stand undisturbed for 30 minutes to remove entrapped air bubbles. Alternatively, the solution may be sonicated for 5 minutes for effective degassing.

9. Step 9: Casting of Film

Pour a measured quantity of the solution onto a clean glass plate or petri dish. Spread it uniformly using a glass rod or film applicator to obtain a film of uniform thickness.

10. Step 10: Drying of Film

Place the cast film in a hot air oven at 40–45°C and allow it to dry for 6–8 hours. Ensure slow and uniform drying to prevent cracking or brittleness.

11. Step 11:

Removal and Cutting of Film

After complete drying, carefully peel off the film from the casting surface. Cut the film

into uniform strips (e.g., 2 × 2 cm) using a sterile cutter.

12. Step 12:

Packaging and Storage

Wrap the prepared film strips in aluminium foil or butter paper. Store them in an airtight container or desiccator to protect from moisture and environmental conditions⁸

Evaluation :

a) Physical Appearance:

The prepared are visually examined for color, transparency, smoothness, and absence of defects to ensure good quality and acceptability. The thickness of the film is measured using a micrometer to confirm uniform distribution of the formulation across the film.



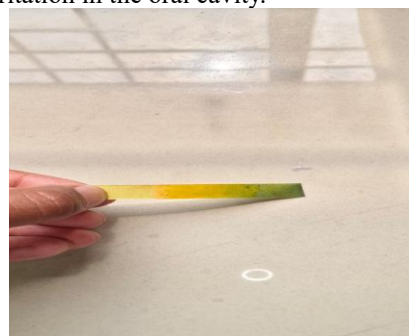
b) Weight Variation: Individual film strips are weighed to ensure consistency in weight, which indicates uniform drug distribution.



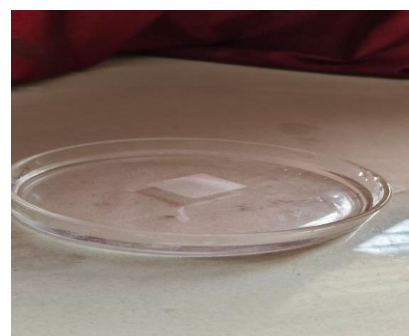
c) Folding Endurance: The film is repeatedly folded at the same point until it breaks to assess its flexibility and mechanical strength.



d) Surface pH: The pH of the film is measured to ensure it is close to neutral and does not cause irritation in the oral cavity.



e) Disintegration Time: The time required for the film to dissolve in a suitable medium is recorded to evaluate how quickly the drug will be released.



Sr No.	Parameter	F1	F2	F3
1	Thickness	0.21 ± 0.02 mm	0.28 ± 0.03 mm	0.34 ± 0.02 mm
2	Folding Endurance	120 ± 5	145 ± 4	168 ± 6
3	Surface pH	6.7 ± 0.1	6.8 ± 0.1	6.9 ± 0.1
4	Disintegration Time	45 ± 5 sec	58 ± 4 sec	72 ± 5 sec
5	Drug Content	98.5 ± 1.5 %	97.8 ± 1.2 %	97.2 ± 1.4 %

Figure : Evaluation Table

IV. Result :

The polyherbal oral thin films prepared by the solvent casting method were evaluated for various physicochemical parameters, and the results obtained indicated satisfactory performance of the formulation. The films were found to be smooth, transparent, and flexible, with no visible cracks or air bubbles, indicating good film-forming ability of the polymer used.

The thickness of the films was found to be uniform, which suggests proper distribution of the polymer and other ingredients throughout the formulation. The weight variation study showed minimal differences among individual film strips, confirming uniformity in drug content and consistency in the casting process. The folding endurance values were observed to be above the acceptable limit, indicating that the films possessed good mechanical strength and flexibility.

The surface pH of the films was found to be close to neutral, suggesting that the formulation is suitable for oral administration and is unlikely to cause irritation to the mucosal lining. The disintegration time of the films was within the desired range, demonstrating rapid dissolution and indicating the potential for quick onset of therapeutic action.

Drug content uniformity results revealed that the active ingredients were evenly distributed throughout the films, ensuring accurate dosing. The tensile strength and percentage elongation values indicated that the films had sufficient strength and elasticity to withstand handling and packaging without breaking. Furthermore, the in-vitro drug release study showed that a significant amount of the drug was released within a short period, confirming the fast-dissolving nature of the formulation.

Overall, the evaluation results demonstrated that the prepared polyherbal oral thin films met the required quality parameters and exhibited suitable characteristics for effective management of motion sickness.

V. Conclusion :

The present study successfully focused on the development and evaluation of a polyherbal oral thin film for the management of motion sickness using the solvent casting method. The formulation incorporated natural ingredients such as ginger extract and selected essential oils, along with suitable excipients like HPMC E15, PEG-400, and β -cyclodextrin to achieve an effective and stable dosage form. The prepared films exhibited satisfactory physicochemical properties, including uniform thickness, adequate mechanical strength, and good

flexibility, indicating the suitability of the selected polymer and plasticizer.

The films demonstrated rapid disintegration and efficient drug release, which are essential characteristics for achieving a quick onset of action in the treatment of motion sickness. The surface pH was found to be close to neutral, suggesting that the formulation is safe for oral administration without causing irritation. Uniform drug content further confirmed the consistency and reliability of the formulation process.

Overall, the developed polyherbal oral thin film offers a promising alternative to conventional dosage forms by providing improved patient compliance, ease of administration, and faster therapeutic effect. The use of herbal ingredients enhances the safety profile of the formulation while maintaining its effectiveness. However, further studies such as stability testing and clinical evaluation are recommended to establish long-term safety and efficacy on a larger scale.

Reference :

- [1]. Dixit RP, Puthli SP. Oral strip technology: Overview and future potential. *J Control Release*. 2009;139(2):94–107.
- [2]. Arya A, Chandra A, Sharma V, Pathak K. Fast dissolving oral films: An innovative drug delivery system. *Int J ChemTech Res*. 2010;2(1):576–583.
- [3]. Bala R, Pawar P, Khanna S, Arora S. Orally dissolving strips: A new approach to oral drug delivery system. *Int J Pharm Investig*. 2013;3(2):67–76.
- [4]. Nagaraju T, Gowthami R, Rajashekar M, Sandeep S, Malleshm M, Sathish D. Comprehensive review on oral disintegrating films. *Curr Drug Deliv*. 2013;10(1):96–108.
- [5]. Loftsson T, Duchêne D. Cyclodextrins and their pharmaceutical applications. *Int J Pharm*. 2007;329(1–2):1–11.
- [6]. Ali BH, Blunden G, Tanira MO, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (*Zingiber officinale*): A review. *Food Chem Toxicol*. 2008;46(2):409–420.
- [7]. Ernst E, Pittler MH. Efficacy of ginger for nausea and vomiting: A systematic review. *Br J Anaesth*. 2000;84(3):367–371.
- [8]. Prakash P, Gupta N. Therapeutic uses of *Ocimum sanctum* (Tulsi) with a note on eugenol. *Indian J Physiol Pharmacol*. 2005;49(2):125–131.



- [9]. Patel AR, Prajapati DS, Raval JA. Fast dissolving films (FDFs) as a newer venture in fast dissolving dosage forms. *Int J Drug Dev Res.* 2010;2(2):232–246
- [10]. Bhyan B, Jangra S, Kaur M, Singh H. Orally fast dissolving films: Innovations in formulation and technology. *Int J Pharm Sci Rev Res.* 2011;9(2):50–57.
- [11]. Mukherjee PK. *Quality Control and Evaluation of Herbal Drugs.* 2nd ed. New Delhi: Elsevier; 2019.
- [12]. Deshmukh VN. Mouth dissolving drug delivery system: A review. *Int J PharmTech Res.* 2012;4(1):412–421.