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Formulation and Evaluation of Herbal Anti-Emetic Emulsion Containing Ginger (Zingiber officinale) for the Management of Nausea and Vomiting

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Abstract: *Nausea and vomiting are common clinical symptoms associated with pregnancy, motion sickness, chemotherapy, postoperative conditions, and gastrointestinal disorders. Conventional anti-emetic agents such as ondansetron and metoclopramide are effective but may produce adverse effects including sedation, extrapyramidal reactions, and gastrointestinal disturbances. Herbal medicines provide safer alternatives with improved patient compliance. The present study aimed to formulate and evaluate an oral anti-emetic emulsion using ginger (Zingiber officinale) extract as the active herbal ingredient. Ginger contains bioactive constituents such as gingerols and shogaols possessing potent anti-emetic, antioxidant, anti-inflammatory, and gastroprotective activities. Seven formulations (F1–F7) of oil-in-water emulsion were prepared by the dry gum method using acacia and Tween 80 as emulsifying agents. The prepared formulations were evaluated for organoleptic properties, pH, viscosity, globule size, phase separation, creaming index, homogeneity, and stability. Among all formulations, F7 showed optimum viscosity, excellent stability, uniform globule distribution, pleasant taste masking, and absence of phase separation. The developed ginger anti-emetic emulsion demonstrated satisfactory pharmaceutical properties and may serve as a safe, effective, and economical herbal alternative to conventional anti-emetic preparations.*

Keywords: Ginger, Anti-emetic, Emulsion, Zingiber officinale, Herbal formulation, Nausea, Vomiting.

I. INTRODUCTION

Nausea and vomiting are protective physiological reflexes that occur due to stimulation of the vomiting center located in the medulla oblongata. These symptoms are associated with several conditions including pregnancy, chemotherapy, motion sickness, gastrointestinal infections, postoperative complications, and vestibular disorders. Persistent vomiting may result in dehydration, electrolyte imbalance, nutritional deficiency, and poor patient compliance.

Modern anti-emetic drugs including dopamine antagonists, serotonin antagonists, and antihistamines are widely used in therapy. However, long-term use of these agents may produce adverse effects such as sedation, hypotension, extrapyramidal symptoms, and cardiac disturbances. Therefore, the development of safer herbal anti-emetic preparations has gained significant importance.

Ginger (Zingiber officinale) is one of the most extensively studied medicinal plants for the treatment of nausea and vomiting. The rhizome contains active constituents such as gingerols, shogaols, paradols, and volatile oils which exert anti-emetic activity mainly through antagonism of 5-HT3 receptors and enhancement of gastric motility.

An emulsion dosage form offers several advantages including improved solubility of lipophilic phytoconstituents, ease of administration, enhanced patient acceptability, and improved bioavailability. Hence, the present research work focused on the formulation and evaluation of an oral ginger anti-emetic emulsion.

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II. AIM

To formulate and evaluate a stable and effective herbal anti-emetic emulsion containing ginger extract.

III. OBJECTIVES

- To prepare ginger extract suitable for oral emulsion formulation.
- To formulate oil-in-water anti-emetic emulsions using suitable excipients.
- To evaluate physical and pharmaceutical properties of the prepared emulsions.
- To optimize formulation parameters for maximum stability and patient acceptability.
- To compare various formulations and identify the optimized batch.

IV. MATERIAL USED

Ingredient	Category
Ginger Extract	Active ingredient
Light liquid paraffin	Oil phase
Acacia [Gum Arabic]	Emulsifying agent
Tween 80	Surfactant
Surcrose	Sweetening agent
Glycerin	Humectant
Methyl Paraben	Preservative
Propyl Paraben	Preservative
Purified water	Vehicle

V. METHOD OF PREPARATION

- The anti-emetic emulsion was prepared by the dry gum method.
- Acacia was triturated with light liquid paraffin in a mortar.
- Ginger extract was added to the oil phase.
- Water was added rapidly with continuous trituration to form the primary emulsion.
- Sucrose syrup was prepared separately and incorporated.
- Preservatives dissolved in glycerin were added.
- Remaining water was added to make final volume.
- Flavoring agent was incorporated and homogenization was carried out.

VI. FORMULATION TABLE

Ingredient	F1	F2	F3	F4	F5	F6	F7
Ginger Extract	1mL	1mL	1.2mL	1.2mL	1.5mL	1.5mL	1.5mL
Liquid Paraffin	6mL	5mL	6mL	6mL	6mL	7mL	6mL
Acacia	2.5g	3g	3g	3.5g	3.5g	4g	3.5g
Tween 80	_	_	0.5mL	0.75mL	0.75mL	1mL	0.75mL
Sucrose	5g	6g	6g	6.5g	7g	7g	6.5g
Glycerin	3mL	3mL	4mL	4mL	4mL	5mL	4mL
Methyl Paraben	0.06g	0.06g	0.06g	0.06g	0.06g	0.08g	0.06g
Propyl Paraben	_	_	0.02g	0.02g	0.02g	0.03g	0.02g
Water	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.	q.s.

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VII. EVALUATION PARAMETERS

1. Organoleptic Evaluation

Principle: Organoleptic properties help determine patient acceptability and physical appearance of the formulation.

Procedure: The prepared emulsion was visually examined for:

-Colour

-Odour

-Taste

-Appearance

-Consistency

Observation: The formulation showed a light creamy yellow colour with characteristic ginger odour and sweet pleasant taste.

Result: The emulsion was smooth, homogeneous, and pharmaceutically acceptable.

2. pH Determination

Principle: pH determination ensures compatibility of the formulation with the gastrointestinal tract and improves stability.

Procedure: 10 mL of emulsion was taken in a beaker. The pH was measured using a calibrated digital pH meter at room temperature.

Observation: The pH of optimized formulation F7 was found to be between 5.8–6.5.

Result: The formulation possessed suitable pH for oral administration.

3. Viscosity Test

Principle: Viscosity measurement determines flow behavior and stability of the emulsion.

Procedure: Viscosity was measured using Brookfield Viscometer. Appropriate spindle was selected and readings were recorded at room temperature.

Observation: F7 showed optimum viscosity with smooth pourability.

Result: The formulation exhibited good consistency and stability.

4. Globule Size Determination

Principle: Smaller and uniformly distributed globules improve stability of emulsions.

Procedure: A drop of diluted emulsion was placed on a glass slide. Microscopic examination was carried out under optical microscope. Average globule size was calculated.

Observation: Uniformly distributed fine globules were observed in F7 formulation.

Result: The optimized batch showed good emulsification efficiency.

5. Phase Separation Test

Principle: This test evaluates physical stability of emulsion during storage.

Procedure: Prepared emulsions were stored in closed containers. Formulations were observed periodically for creaming, cracking, or phase separation.

Observation: No visible phase separation was observed in F7.

Result: The formulation remained physically stable.

6. Creaming Index

Principle: Creaming index indicates the extent of phase separation in emulsions.

Procedure: Emulsion was stored undisturbed for 7 days. Height of cream layer and total height of emulsion were measured.

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Observation: F7 showed very low creaming index.
Result: The formulation exhibited excellent emulsion stability.

7. Homogeneity Test

Principle: Homogeneity indicates uniform distribution of ingredients throughout the formulation.
Procedure: A small quantity of emulsion was rubbed between fingers and visually examined.
Observation: No coarse particles or lumps were observed.
Result: The formulation was homogeneous and smooth.

8. Stability Study

Principle: Stability studies determine the effect of temperature and storage conditions on formulation quality.
Procedure: The formulation was stored at Room temperature. Accelerated condition (40°C ± 2°C). For 30 days and evaluated periodically for:
-pH
-Colour
-Odour
-Phase separation
-Viscosity
-Observation:
-No significant changes were observed during storage.
Result: The optimized formulation F7 was found to be stable.

VIII. RESULTS AND DISCUSSION

Among all prepared formulations, F7 demonstrated the best pharmaceutical characteristics including optimum viscosity, excellent taste masking, improved stability, and absence of phase separation.
The presence of Tween 80 and optimum concentration of acacia significantly improved emulsification efficiency and reduced globule size. Higher sucrose concentration enhanced palatability and viscosity. The prepared emulsion remained stable throughout the evaluation period.
The results confirmed that ginger extract can be successfully incorporated into an oil-in-water emulsion for anti-emetic therapy.

IX. CONCLUSION

The present study successfully formulated and evaluated a ginger-based herbal anti-emetic emulsion. The optimized formulation F7 exhibited satisfactory stability, viscosity, palatability, and pharmaceutical characteristics. Ginger demonstrated promising anti-emetic potential due to the presence of gingerols and shogaols. The developed herbal emulsion may serve as a safer and economical alternative to conventional anti-emetic drugs with improved patient compliance and reduced adverse effects.

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