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Formulation and Evaluation of Tridax procumbens and Ginger Emulgel

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ABSTRACT :

The formulation and development of an emulgel combining Tridax procumbens and ginger extracts represent a novel approach towards creating a topical product with potential therapeutic benefits. This study aimed to optimize the emulgel formulation for enhanced stability, skin penetration, and efficacy. Various concentrations of Tridax procumbens and ginger extracts were incorporated into emulgel bases using different emulsifiers and stabilizers to achieve the desired rheological properties, spreadability, and drug release characteristics. The emulgel formulations were evaluated for physical appearance, pH, viscosity, drug content, spreadability, skin irritation potential, and in vitro drug release. Furthermore, stability studies were conducted to assess the shelf-life of the optimized emulgel formulation. The results revealed that the emulgel containing optimized concentrations of Tridax procumbens and ginger extracts exhibited good physical stability, acceptable pH range, suitable viscosity, high drug content, excellent spreadability, minimal skin irritation, and sustained drug release. The stability studies demonstrated that the optimized emulgel formulation maintained its physicochemical properties over the study period, indicating its potential for commercialization. Overall, the developed Tridax procumbens and ginger emulgel hold promise as a natural-based topical formulation for various skin conditions, and further studies are warranted to explore its therapeutic efficacy in clinical settings.

Keywords: Emulgel, Tridax procumbens, Ginger, Formulation and Preparations.

INTRODUCTION:

Traditional medicines have importance in India since hundreds of years and it has potential action on various diseases and disorders therefore it is an impactful way of treatment. As we are aware about importance of traditional medicines but it also has certain drawbacks, like lackof research, limited literature, and low patient compliance towards traditional medicine**.** Use ofthis plant for the treatment of certain bacterial infections which are caused due to Escherichia coli, Staphylococcus aureus and Pseudomonas aeruginosa has shown a desired effect [1]. The formulation and evaluation of a Tridax procumbens and ginger emulgel involves creating a topical preparation that combines the medicinal properties of both Tridax procumbens (also known as coat buttons or Mexican daisy) and ginger. Tridax procumbens is a plant belongs tofamily Asteraceae and genus Tridax; it is also called as Tridax daisy. Belongs to Asteraceae family. It is commonly known as 'Ghamra'. The plant has been extensively used in Ayurvedicsystem of medicine for various disorders. This plant is found easily in all parts of country eithertropical or subtropical, rural part of Maharashtra has variety of uses of this plant, mainly in farmers, workers and other people related with farming profession [2]. Gels are semisolid systems consisting of dispersions of small or large molecules in an aqueous liquid vehicle rendered jellylike by the addition of a gelling agent. Advantages of gel dosage form over otherdosage forms are less irritancy, softens the skin, easily removable [3]. Emulgels are formulations that combine the properties of both emulsions and gels, making them suitable for topical applications. To introduce your topic effectively, you can start by explaining the significance of Tridax procumbens and ginger in traditional medicine or their known pharmacological properties. For example: "Tridax procumbens and ginger are two medicinal plants that have been traditionally used for their therapeutic properties [4]. This plant widely distributed and it's each and every part having noble pharmacological activity. The work donetill to date on its pharmacological activities like hepatoprotective effect, immunomodulating property, promising wound healing activity, antidiabetic, hypotensive effect, antimicrobial, insect repellent activity, anti-inflammatory and antioxidant, bronchial catarrh, dysentery, diarrhea also prevent falling of hairs and leads to hair growth promotion [5].A gel is a solid or semisolid system of at least two constituents, consisting of a condensed mass enclosing and interpenetrated by a liquid. Gels and jellies are composed of small amounts of solids dispersed in relatively large quantities of liquid, yet they possess more solid-like than liquid-like characters. The characteristic of gel and jelly is the presence of some cutaneous structure, whichprovides solid-like properties. Most importantly, transdermal drug delivery systems (TDDSs) can be properly used for long-term or chronic use. Consequently, it is a valid choice to developTDDS for the treatment of a number of pathological illnesses, including inflammation. Nevertheless, transdermal treatment is only effective with certain kinds of bioactive compounds because of the stratum corneum, which acts as a barrier for the penetration of substances through the skin [6]. Emulgel possesses the advantages of being easily applied topically and could be intended for transdermal application [7]. Most importantly, emulgel hasthe capability to improve skin permeability, which in turn, increases therapeutic effectiveness[8]. Therefore, the application of emulgel is supposed to enhance the penetration of drugs through skin. The herbaceous plant Zingiber officinale, also known as ginger, a member of theZingeberaceae family, is frequently used as a spice, condiment, and herb [9]. It has been utilizedas traditional medicine to treat a variety of diseases, including inflammatory disorders. Gingerols, shagaols, and paradol, the active ingredients in ginger, have been repeatedly reported to exert anti-inflammatory, antioxidant, anti-cancer, and anti-atherosclerotic activitiesTridax procumbens is known for its anti-inflammatory and wound healing properties, while ginger is well-known

for its anti-inflammatory, analgesic, and antioxidant effects. Combiningthese two ingredients in an emulgel formulation can potentially enhance their therapeutic benefits for topical applications.[10]

PLANT PROFILE :

Scientific categorizing T. procumbens:

Fig No 1: T. procumbens

Kingdom - Plantae,
Subkingdom - Tracheobionta,
Division - Magnoliophyta,
Class - Magnoliopsida,
Subclass - Asteridae,
Order - Asterales,
Family - Asteraceae,
Genus - Tridax

Uses:

a) Wound healing properties
b) Antimicrobial Property
c) Anti-inflammatory Property
d) Antidiabetic Property
e) Antioxidant Property

Scientific categorising Zingiber officinale

Fig No 2: Zingiber officinale

Kingdom: Plantae
Phylum: Tracheophyta
Class: Liliopsid

Order: Zingiberales
Family: Zingiberaceae
Species: Zingiber officinale.

Uses:

a) For Digestive Purpose
b) Anti-inflammatory and pain relief
c) Antioxidant properties
d) Blood sugar control
e) Antimicrobial properties

PHYTOCHEMICAL CONSTITUENTS:

The leaf and other parts of *T. procumbens* L are reported to have flavonoids, alkaloids, carotenoids, hydroxycinnamates, lignans, benzoic acid derivatives, phytosterols, tannins, crudeproteins, crude fibre, soluble carbohydrates and calcium oxide. The presence of fumaric acid, B-sitosterol and the pentacyclic triterpenoid oleanolic acid have also been reported, Luteolin, glucoluteolin, quercetin, and isoquercetin have been reported in flower extracts.
Ginger contains various phytochemicals, including gingerol, shogaol, paradol, and zingerone,which contribute to its medicinal and culinary properties. These compounds have antioxidant,anti-inflammatory, and antimicrobial effects, among others.

EMULGEL

Definition
Emulgels are the emerging drug delivery system now days that has become popular for the delivery of hydrophobic drugs. This formulation is considered a novel drug delivery system and a mixture of emulsion and gel.

Properties of Emulgel

- Emulgels possesses many promising uses such as:
- Greaseless
- Easily removable
- Easily spreadable
- Longer shelf-life
- Transparent
- Having an elegant appearance
- Having a less potential to cause serious side-effects.

MECHANISM OF EMULGEL

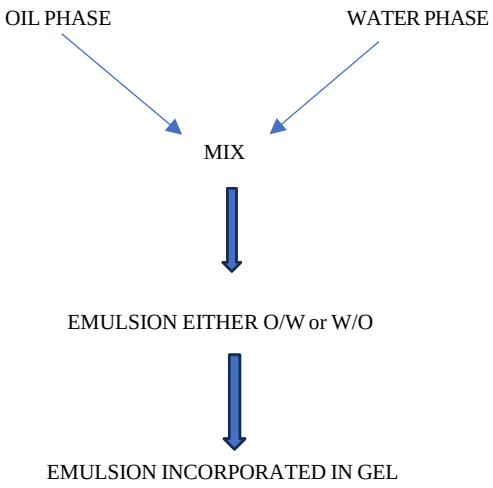
Emulgels are help in incorporation of hydrophobic drugs and then oily globules are dispersed in aqueous phase resulting in O/W emulsion. This emulsion can be mixed into a gel base. Theemulgel preparation comprises of simple and short steps. Which increase the feasibility of production.

MATERIAL AND METHODS

Plant Material
The whole plant of Tridax Procumbens and Ginger was collected form botanical garden of Ashokrao mane institute of Pharmacy, Ambap.

Preparation of Plant Extract
The aerial parts of plant (leaves, flowers) were shade dried for a week. The plant material wascut into fine pieces and dried powder (50gm) of each part were extracted sequentially using Soxhlet extractor with 250ml of hexane, chloroform, methanol and petroleum ether separatelyin order to extract non-polar and polar compounds. The crude extract then filtered through whatmann filter paper and concentrated extract was subsequently dried aseptically at room temperature.
100 grams of ginger powder was soaked in 500 ml of methanol in a conical flask covered withaluminium foil. This process was performed in duplicates. This mixture was allowed to macerate for 4-5 days with interval shaking. After maceration, the mixture was subjected to filtration. The filtrate was collected in China dishes up to 60%. This was allowed to evaporatefor a week until dry extract was obtained.[12]

Methods of Formulation of Emulgel



PROCEDURE

Formulation of gel

Accurately weighed Carbopol 940 was taken and dispersed in beaker containing 300ml of distilled water. The beaker was set aside for half an hour for allowing Carbopol 940 to swell. The Carbopol 940 was stirred continuously until no lumps are found. Then the pH is adjusted by using 5-6 drops of Triethanolamine to the Carbopol 940 and stir continuously until a clear,transparent gel is formed.

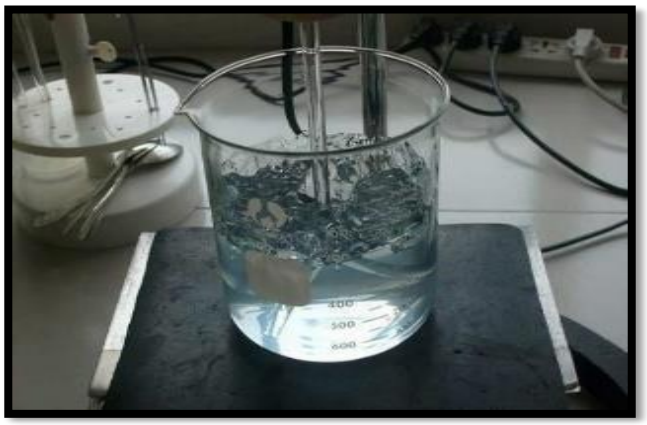


Fig No 1: Gel Phase

Formation of Oil phase

Dissolving span 20 in sesame oil. Mentha oil is mixed with these phase

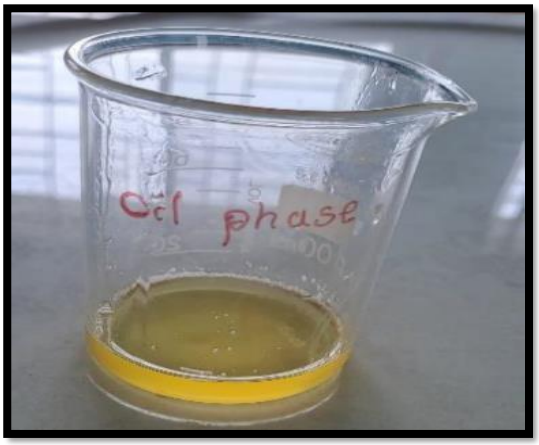


Fig 2: Oil phase

Formation of Aqueous phase

Tween 20 dissolved in purified water. Methyl and propyl paraben were dissolved in propyleneglycol were, T. procumbens Leaves extract and ginger extract was dissolved in ethanol.

Fig No3 :AqueouPhase

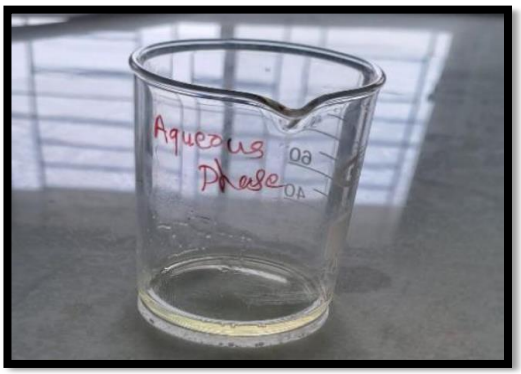


Fig No 4: T. procumbens Leaves Extract

Fig No 5: Ginger Extract

Both oil and aqueous phase were separately heated to 70 to 80 degrees, then oil phase was added to aqueous phase with continuous stirring until it got cooled to room temperature. Afterheating the oil phase added in aqueous phase with continuous stirring at constant temperature (80 degree). The obtained emulgel was mixed with the gel in 1:1 ratio with gentle stirring by using mechanical stirrer. [13]

CHARACTERIZATION

Table No 1: Observation Table

Components	Quantity	Uses
T. procumbens Extract	1ml	Anti-inflammatory
Ginger Extract	0.3ml	Anti- inflammatory, Cooling agent
Sesame oil	7.5ml	Anti-inflammatory
Carbopol 940	1gm	Gelling agent
Span 20	1ml	Biodegradable Surfactant
Propylene glycol	5ml	Moisturising Agent
Ethanol	2.5ml	Solvent
Methyl paraben	0.03 gm.	Preservative
Mentha oil	6ml	Soothing Agent
Water	q. s	-

EVALUATION OF EMULGEL

Physical Appearance

The physical appearance of the formulation was checked visually which comprised.

- Color - The color of the formulations was checked out against white background.
- Consistency-The consistency was checked by applying on skin.
- Homogeneity -The homogeneity was observed visually.
- Feel on the skin - No Irritation

PH

The pH of emulgel formulations was determined by using digital pH meter. One gram of emulgel was dissolved in 100 ml of distilled water and it was kept aside for 2 hr. The pH of each formulation was measured. (14)

Spreadability

The emulgel was sandwiched between 2 petri plates and the diameter of circle of spread emulgel was used to determine the spreadability. 1 gram of emulgel was weighed and placed on a petri plate. Other petri plate was placed on its top and weight of 50 grams was placed on the top of petri plate for about 60 seconds. After completion of 60 seconds the diameter of circles formed from the spread emulgel were measured in triplicate. The average of the reading was calculated. The reading was put into the following formula. (15)

$$S = M \times L T$$

Viscosity

Viscosity measures the flow characteristics of emulgel formulation. Change in viscosity of theproduct is indicative of change in stability and effectiveness of product. The viscosity of emulgel was determined by using Brookfield DV-II+Pro. (16)

RESULT AND DISCUSSION :

Table No 2: Evaluation Parameters

Sr. No	Parameters	Observations			
		F1	**F2**	**F3**	**F4**
1	**Appearance**	Transparent	Transparent	Transparent	Transparent
2	**Color**	Pale green-White	Pale green-White	green-White	Pale green-White
3	**pH**	5.5-5.7	5.6-5.8	5.3-5.5	5.5-5.9
4	**Viscosity**	18600cp	19210cp	18950cp	18900cp
5	**Spreadability**	14mm	15mm	17mm	18mm

Table No 3: Preparation & Optimization of Formulation

Ingredients	F1	F2	F3	F4
T. procumbensExtract	1	1	1	1
Ginger Extract	0.3	0.3	0.3	0.3
Carbopol 940	1	1	1	1
Sesame oil	7.5	7.5	7.5	7.5
Span 20	0.5	1	-	1
Tween 20	1	-	0.5	-

Mentha oil	4	4	4	4
Methyl paraben	0.03	0.03	0.03	0.03
Water	q. s	q. s	q. s	q. s

DISCUSSION :

After Completion of evaluation parameters like Anti-inflammatory action, Anti-bacterial action we can say that T. Procumbens and Ginger has a good Anti-bacterial and Anti-inflammatory properties. Amongst batches, batch F3 was observed as a good batch and it has also shown good spredability, viscosity and desired pH, therefore it has it is an optimized batch. (Table No: 2).

CONCLUSION :

Since topical formulation are widely utilized for better patient compliance and emulgel is helpful in improving loading of hydrophilic drugs in gel dosage form for control release with long term stability. Furthermore, they enhance spreadability, extrusion, adhesion and viscosity.Similarly in this study T. procumbens extract containing sesame oil emulgel formulation wereformulated with carbapol 940 as gelling agent using QbD approach. The performance of the formulation was evaluated on the parameters such as physical appearance, pH, viscosity, spreadability, swelling index, stability study. The design space is verified by preparing formulation within design space quantities of critical material attributes and show better releasewith reference product.

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