

Formulation and *in Vitro* Evaluation of Herbal Emulgel

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1. Introduction

Drugs can be administered by many routes to human body namely oral, sublingual, rectal, parental etc. Topical drug delivery is an attractive route for local and systemic treatment.

The main advantage of the topical delivery system is to bypass first pass metabolism. The most popular products are semisolid preparation.

Among the semisolid preparations, the transparent gels are used both in cosmetics and in pharmaceutical preparations.

Gel formulations generally show better drug release than ointments and creams. When gels and emulsion are mixed together, emulgel is formed. It also shows good penetration through the skin.

Emulgels with properties such as being thixotropic, greaseless, easily spreadable, easily removable, emollient, water soluble, longer shelf life.

1.1. Advantages:

- Avoidance of first pass metabolism.
- More selective to a specific site.
- Suitability for self-medication.
- Drug with short biological half-life and narrow therapeutic window.
- Convenient and easy to apply.

1.2. Disadvantages:

- Skin irritation on contact dermatitis.
- Possibility of allergenic reactions

1.3. Application of Emulgel in Drug Delivery System

- Emulgel preparation is short and simple.
- There are no specialized instruments needed for the production of emulgels.
- Patient compliance
- They are less greasy and easy to apply.
- Better stability

1.4. Constituents of Emulgel

- **Aqueous Material:** This forms the aqueous phase of the emulsion. Commonly used agents are water, alcohols.
- **Oils:** Mineral oils, either alone or combined with soft or hard paraffin
- **Emulsifiers:** They are used to maintain stability of a preparation during its shelf life.. e.g. Span 80, Tween 80.
- **Gelling Agent:** It is used to improve the consistency of any dosage form and also used as a thickening agent. E.g. carbopol 940
- **Permeation Enhancers:** They are used to improve the absorption of drugs. Commonly used penetration enhancers are oleic acid, lecithin, clove oil, menthol etc.

Curcumin which is obtained from dried rhizome of *Curcuma longa* is well known plant extract used to treat inflammation. Curcumin showed anti-inflammatory action by inhibiting enzymes like cyclooxygenase 2 (COX-2) and lipoxygenase (LOX).

2. Review of Literature

2.1. Past work on Emulgel:

Jaise Thomas, et al. Topical drug delivery system can be

defined as a direct effect of drug containing medication to the skin to get the effect of drug or to cure disorders. Major disadvantage of gel is the delivery of hydrophobic drug¹.

Anil R. Phad, et al. In comparison with the other semisolid preparations, the use of gels has been emerged both in cosmetics and pharmaceutical preparations².

Abhijeet Ojha, et al. Gels are the preferable dosage forms for topical delivery of drugs in present days, but their use is not suitable for drugs with hydrophobic nature³.

2.2. Past work on Curcuma longa:

Jaggi Lal, et al. Turmeric is a very important spice in India, which is obtained from rhizomes of plant *Curcuma longa*, a member of the Zingiberaceae (ginger) family.

Abraham A, et al. to evaluate *Curcuma longa* rhizome by pharmacognostic and phytochemical analysis and standardize one of its formulations by HPLC.

Ghasem D. Najafpour, et al. in this study, extraction of curcumin, the bioactive compound of turmeric (*Curcuma longa* L.), through different extraction methods was investigated.

3. Drug Profile for Herbal Emulgel (Curcuma Longa)

Kingdom: Plantae

Family : Zingiberaceae

Genus : *Curcuma*

Species: *Longa*

Scientific name: *Curcuma longa*



Figure 1: *Curcuma longa*.

3.1. Chemical constituents

Curcuminoids are phenolic compounds which are the main active constituents

Other constituents of turmeric include terpenes, steroids and fatty acids, which contribute to its aromatic taste and smell⁴.

3.2. Applications:

- *Curcuma longa* rhizome is important as it is a commonly used spice and a widely used ingredient of herbal and ayurvedic formulations.
- The volatile oils and curcumin and exhibit potent anti-inflammatory effects.
- Constituents of turmeric exert several protective effects on the gastrointestinal tract.
- Turmeric lower serum cholesterol levels.
- Constituents of turmeric block the replication of HIV. Stimulate muscle regeneration.

4. Excipient Profile for Herbal Emulgel

4.1. Carbopol: Carbopol is a water-soluble polymer, used as an emulsifying, stabilizing, suspending, thickening and gelling agent.

4.2. Liquid Paraffin: Liquid paraffin is highly refined mineral oil used in cosmetics and for medicinal purposes.

4.3. Methyl Paraben: Methyl Paraben is an antimicrobial agent, Flavoring agent and Preservative.

4.4. Poly Sorbate 80: Polysorbate 80 is a hydrophilic nonionic surfactant. In pharmaceutical products, it can acts as an emulsifier, solubilizer, antimicrobial, preservative and disinfectant.

4.5. Menthol

- Menthol is widely used as a natural product in cosmetics.
- Menthol is used as traditional medicine for a number of ailments including infections, insomnia.

4.6. Propylene Glycol: Propylene glycol is used as an organic solvent and diluent in pharmaceuticals and many other industrial applications.

4.7. SPAN 20: Sorbitan laurate is an emulsifier in cosmetic creams and lotions as well as a stabilizer⁵.

4.8. Triethylamine

- Tri ethylamine is commonly employed in organic synthesis as a base.
- It is useful as an intermediate for manufacturing medicines, pesticides.
- Triethyl amine is the active ingredient of fly Nap.

5. Materials for Emulgel

Table 1: List of chemicals used in Emulgel.

S.No	Chemicals	Suppliers
1	<i>Curcuma longa</i>	Local market
2	Liq.Paraffin	Vijaya scientific center
3	Tween80:Span20 1:1	Vijaya scientific center
4	Carbopol	Vijaya scientific center
5	Propylene Glycol	Vijaya scientific center
6	Methyl Parabin	Vijaya scientific center
7	Propyl parabin	Vijaya scientific center
8	Triethanolamine	Vijaya scientific center
9	Menthol	Vijaya scientific center
10	Distilled Water	Vijaya scientific center

6. Methods For Emulgel

6.1. Selection of Herb

- *Curcuma longa* (Family-Zingerberaceae) chemically known as diferouloul methane has been reported to possess antioxidant, anti-inflammatory.
- It undergoes extensive first pass metabolism and hence is a suitable candidate for topical emulgel formulation.

6.2. Preparation of Extract: Maceration process of *Curcuma longa*

6.3. Preparation of 6.8 pH Buffer

6.4. Determination of Wave Length: Curcumin was examined in the range 200-600nm by using 3µg/ml solution.

6.5. Construction of calibration curve for Curcumin

- Preparation of stock solution
- Preparation of working standard
- Preparation of Dilutions

6.6. Evaluation Tests for Extract

- **Tests for carbohydrates:** Molisch test, Fehling test.
- **Tests for terpenoids:** Salkowski test
- **Tests for alkaloids:** Mayer's reagent test, Hager's reagent test, Wagner's reagent test
- **Tests for glycosides:** Legal's test
- **Tests for flavonoids:** Aqueous sodium hydroxide test, Concentrated sulphuric acid test
- **Tests for polyphenols:** Ferric chloride test.

6.7. Preparation of Emulgel

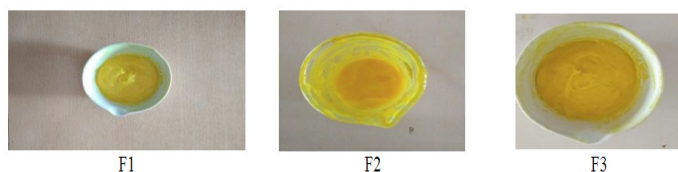


Figure 2: Curcuma Longa Herbal Emulgels.

6.8. Evaluation of Emulgel

- **Physical appearance:** The Emulgel is checked for their color, homogeneity, consistency.
- Spreadability.
- Skin Irritation Test (Patch Test).
- Drug Diffusion.

7. Results and Discussions

Table 2: Composition of all formulations of Herbal Emulgel.

S.No	Ingredients	Quantity For 50g Composition of all formulations of Herbal Emulgel		
		F1	F2	F3
1	Curcuma longa Extract	2.5g	2.5g	2.5g
2	Liq.Parrafin	2.5mL	2.5mL	2.5mL
3	Tween80:Span20 1:1	5mL	5mL	5mL
4	Carbopol	0.100g	0.250g	0.750g
5	Propylene Glycol	5mL	5mL	5mL
6	Methyl Parabin	0.1g	0.1g	0.1g
7	Propyl parabin	0.1g	0.1g	0.1g
8	Triethanolamine	0.25mL	0.25mL	0.25mL
9	Menthol	0.25g	0.25g	0.25mL
10	Water	Q.S	Q.S	Q.S

- Curcuma longa (Family-Zingerberaceae) is selected for this work. Curcumin is chemically known as diferouloul methane has been reported to possess antioxidant, anti-inflammatory.
- In the present work, studies were carried out on herbal emulgel by employing pharmaceutically acceptable

excipients like carbopol, methyl parabin, propylene glycol, liquid paraffin etc...with a main objective to control the drug release and to improve bioavailability.

- Curcumin is extracted from Curcuma longa by maceration process.

7.1. Preparation of Emulgel

- Herbal emulgel of Curcuma longa formulated with different concentrations (0.5, 1, and 1.5%) of carbopol and with different excipients like liquid paraffin, propylene glycol, Tween 20, span 80, menthol, Triethylamine.
- Then these prepared emulgels were evaluated for various physical parameters such as texture, appearance, Spreadability, irritability, and diffusion studies.

7.2. Physical parameters of herbal emulgel of Curcumin longum

The herbal emulgel has good texture without having any lumps. It has good appearance with acceptable color and fragrance, it also has good Spreadability character because it evenly spread in applied area. It has good consistency and overall acceptability. (Table 3) (Figure 3)

Table 3: Calibration data of Curcumin in 6.8 PH Buffer.

S.No	Concentration(µ g/ml)	Absorbance
1	1	0.276
2	2	0.592
3	3	0.956
4	4	1.256

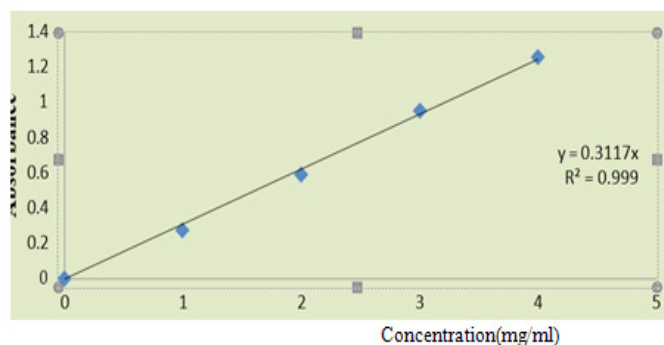


Figure 3: Calibration curve of Curcumin in 6.8 pH Buffer.

7.3. Determination of Wave Length: Curcumin was examined in the range 200-600nm by using 3µg/ml solution, it shows absorption maxima at 426 nm.

7.4. Preparation of calibration curve of curcumin: An analytical method used in the present work for the estimation of curcumin was UV spectrophotometric method. This method was adopted for the estimation of above drug in the herbal emulgel and in vitro diffusion studies. The method obeyed Beer's law in concentration range of 1-4(µg/ml) (Table 4).

Curcuma longa was analyzed for presence of carbohydrates, proteins, glycosides, tannins, saponins, polyphenols and flavonoids by using general identification tests. It composed of mono and sesquiterpenes⁶. (Table 5) (Figure 4)

7.5. Invitro drug release studies: Curcumin release from the emulgel was evaluated by invitro diffusion studies. % Drug release from emulgel depends on concentration of gelling agent. Gelling agent increases release of drug decreases. In F1, F2, F3 formulations concentration of carbopol is 0.5%, 1%, 1.5%

respectively. Based on the release rate, the order of drug release from the three formulations was F1>F2>F3. The invitro release data was presented in table.

Table 4: Phyto Chemical Analysis of Curcuma Longa Extract.

S.No	Name of the Test	Result
1	Carbohydrates Test	
	Molisch Test	Negative
	Fehling test	Negative
2	Tests for terpenoids	
	Salkowski test	Positive
	Antimony trichloride test	Positive
3	Tests for alkaloids	
	Mayer's reagent test	Positive
	Hager's reagent test	Positive
	Wagner's reagent test	Positive
4	Tests for glycosides	
	Legal's test	Negative
5	Tests for flavonoids	
	Aqueous sodium hydroxide test	Positive
	Concentrated sulphuric acid test:	Negative
6	Tests for polyphenols	
	Ferric chloride test	Positive
7	Test for saponins	Negative

Table 5: Cumulative % Drug release from Emulgel formulations at different time intervals.

S.NO	TIME (hrs)	F1	F2	F3
1	0	0	0	0
2	1	10.45	8.67	6.87
3	2	22.31	19.13	15.44
4	3	31.4	24.31	22.67
5	4	38.65	32.12	30.22
6	5	44.56	41.35	39.44
7	6	51.21	49.36	41.23

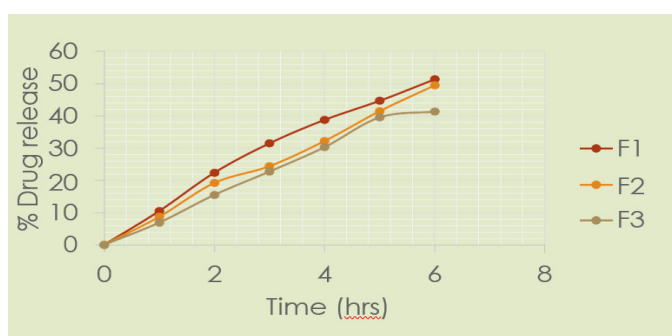


Figure 4: Comparative in vitro drug release plots of curcumin.

8. Conclusion

The following conclusion were made from these experimental results.

1. Emulgel was prepared with herbal drug.
2. Curcuma longa is selected for preparation of Emulgel.
3. Maceration is used for extraction of curcuma longa,
4. Extract was evaluated by phyto chemical analysis like presence of carbohydrates, proteins, glycosides, s polyphenols and flavonoids.
5. Emulgel was evaluated by Physical appearance, Spreadability, Skin irritation test, Drug diffusion.
6. And it has evaluated by invitro drug diffusion studies. % Drug release from emulgel depends on concent gelling agent. Gelling agent increases release of drug decreases.

9. References

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