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Development and evaluation of polyherbal emulgel formulation (A preventive hair care preparation)

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Abstract
The hair care polyherbal formulations were prepared in emulgel form by mixing the hydro alcoholic extract of four medicinal plants *Phyllanthus emblica* (*Phyllanthaceae*), *Centella asiatica* (*Apiaceae*), *Cucurbita pepo* (*Cucurbitaceae*), *Wedelia calendulacea* (*Asteraceae*), which are earlier reported to possess acclaimed hair growth promoting action. In this formulation carbopol 934 is used as gelling agent with herbal extracts. All formulations were evaluated for spreadability, viscosity, pH and Irritancy test. From the investigation, it can be concluded that the formulation of hair emulgel contain all good characters of an ideal emulgel and it was found to be harmless, more effective and economical.

Keywords: polyherbal formulation, hydroalcoholic extract, emulgel, carbopol

1. Introduction
The advantage of emugel topical delivery is to avoid first pass metabolism and avoids the risk of intravenous therapy. Topical delivery systems meant for cosmetic and skin diseases. Apart from advantages of gel, the major disadvantage is inability to deliver the hydrophobic drugs, to overcome this problem emulsion technology is recommended through gelling systems. Emugel is the water in oil or oil in water emulsion with active ingredient that incorporated in gelling agents, the system give the formulation more stability with desirable release of drugs [1, 2, 3].
The main object of present investigation to develop emugel system for hair care which consists polyherbal extract.

2. Materials and Methods
Carbopol, Span 80, Liquid paraffin, Triethanolamine, Methyl paraben, Propylene glycol, Rosemary oil, Castor oil, Lemongrass oil procured from Sisco research laboratories, Mumbai, India. Fresh fruits of *phyllanthus emblica*, leaves of *Centella asiatica*, *Wedelia calendulacea*, seeds of *cucurbita pepo* Collected from Local Area (cheeryal, Mechal Dist; Hyderabad).

2.1 Preparation of plant Extract
The fresh fruits of *phyllanthus emblica*, leaves of *Centella asiatica*, *Wedelia calendulacea*, seeds of *cucurbita pepo* were collected from nearby areas from cheeryal. The collected materials were shade dried and powdered, passed through mesh no 60, then subjected for maceration for 48 hrs with aqueous solvents. Collected powdered extracts were used for emugel preparation [4, 5].

2.2 Preparation of Emugel
Gels are transparent to opaque semi-solids containing a high ratio of solvent to gelling agent. The emulgel was formulated in three different steps [6, 7].
Step 1 Preparation of o/w emulsiuon.
Step 2 preparation of gel phase.
Step 3 Involves incorporation of emulsion into gel base with continuous stirring.

Gel was prepared by using various ratios carbopol 934 in queous solvent and stirring is applies on magenetic stirrer. Triethanolamine is added to maintain pH of all formulations. Oil phase is prepared by dossolvin span 80 in liquid paraffin and queous phase with extract in aqueous solvent. Methyl paraben was added as preservatiove. Oil and aqueous phases were preheated separately at 70^0C to 80^0C and both were mixed together and applied stirring until its get cool and gel formation.

Table 1: Formulation of emulgel

S. No	Ingredients	F1	F2	F3	F4	F5
1	Carbopol (gm)	0.5	1	1.5	2	2.5
2	Rosemary oil (ml)	1	1	1	1	1
3	Lemongrass oil (ml)	1	1	1	1	1
4	Castor oil (ml)	1	1	1	1	1
5	Span 80 (ml)	5	5	5	5	5
6	Liquid paraffin (ml)	25	25	25	25	25
7	Triethanolamine (ml)	0.4	0.5	0.6	0.7	1
8	Methyl paraben (ml)	0.5	0.5	0.5	0.5	0.5
9	Propylene glycol (ml)	15	15	15	15	15
10	Aq. extract of (Amla+Bharani+Bhringharaj+Pumpkin) (gm)	1	1	1	1	1

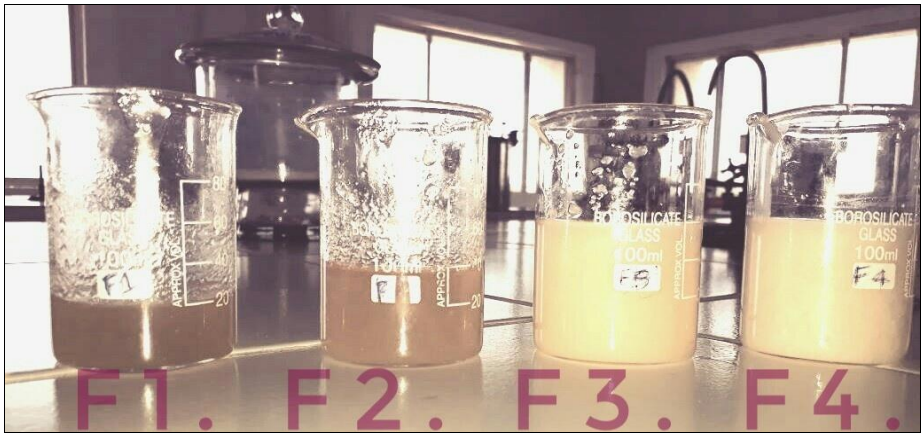

Fig 1(a): Formulations of F1, F2. F3, F4

Fig 1(b): Formulation of F5

2.3 Evaluation of Emugel Formulations

2.3.1 Organoleptic evaluation

The emugel was evaluated for its color, odor, and state. The appearance of the cream was judged by its color and roughness and graded [8].

2.3.2 Homogeneity

All developed gels were tested for homogeneity by visual inspection after the gels have been set in the container [9].

2.3.3 Extrudability

The extrudability of formulation was determined using aluminum collapsible tubes filled with 10g emugel. Tubes were held between two clamps. A tube was compressed and extrudability of the formulation was determined in terms of weight in grams required to extrude a 0.5cm ribbon of gel in 10 seconds [10, 11].

2.3.4 Spreadability

Spreadability is expressed to denote the extent of area to which gel readily spreads on application of skin or affected part. The spreadability was determined by parallel plate method which is widely used for determining and quantifying the spreadability of semisolid preparations. Various formulations (F1, F2, F3, F4, F5) 1g were pressed between two 20 x 20 cm horizontal plates, the upper of which weighed 125g [11, 12].

2.3.5 Viscosity study

The measurement of viscosity of the prepared gel was done using Brookfield digital viscometer. The viscosity was measured using spindle no. 64 at 10 rpm and 25°c [11, 12].

2.3.6 Determination of pH

The pH of formulation was determined using digital pH meter. One gram of gel was dissolved in 100 ml of de-mineralized water and stored for two hours. The measurement of pH of formulation was done in triplicate. Instrument was calibrated before use with standard buffer solutions at pH 4, 7, and 9 [11, 12].

2.3.7 Irritancy test: Mark an area (1sq.cm) on the left hand dorsal surface. The cream was applied to the specified area and time was noted. Irritancy, erythematic, edema, was checked if any for regular intervals up to 24 hrs.' and reported [11, 12].

3. Results and Discussion

3.1 Organoleptic Properties

The evaluation was conducted and noticed that there is no change in organoleptic properties of formulations as shown in Table 2.

Table 2: Organoleptic Properties

S. No	Specifications	Limits
1	State	Semi-solid
2	Colour	Pale brown-white
3	Odor	Characteristic

3.2 Homogeneity

All formulations were in uniform distribution of extracts.

3.3 Spreadability Studies

Spreadability studies showing that all formulations shown good spread as shown in Table 3.

Table 3: Evaluations of prepared Emugel formulations.

S. No	Parameters	F1	F2	F3	F4	F5
1	Spreadability	Average	Average	Average	Good	Good
2	Viscosity	Average	Average	Good	Good	Good
3	Washability	Average	Average	Good	Good	Good
4	Grittiness	-	-	+	+	+
5	pH	7.19	6.34	6.56	6.82	6.74
6	Colour	White to cream	White to cream	White to cream	White to cream	White to cream
7	Phase separation	Separation of oil phase	Slight separation of oil phase	-	-	-

3.4 Viscosity

The viscosities of all formulations were in between 500-1000 cps it indicating that easily spreadable by small amounts of shear.

3.5 pH of Emugel

The pH of the emugel was found to be in between 6.34 – 7.19 which indicates compatible with skin.

3.6 Irritancy test

All formulation were showed no edema, irritation and redness on applied skin, from this study it can be concluded that all formulations were safe.

4. Conclusion

In the present investigation experimental work conducted to formulate the herbal emulgel preparations based upon traditional knowledge. From this investigation, it can be concluded that the formulation of hair emulgel contain all good characters of an ideal emulgel and it was found to be harmless, more effective and economical. We opine that further experimental studies of this work will surely throw brighter light on developing effective Emulgels of medicated value.

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