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Pharmacobotanical application of *Ricinus communis* seed oil in formulation and evaluation of herbal emulgel for the treatment of psoriasis

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Abstract
Inflammatory and immune-mediated skin disease, Psoriasis. It's common for psoriasis to be seen in people all over the globe. Drugs are most effectively delivered through topical route for treating skin conditions. An attempt was made to increase the effectiveness of topical treatment for psoriasis by using emulgel compositions containing *Ricinus communis* seed oil. In order to create the gel, the extract was mixed with liquid paraffin, olive and coconut oils, and Carbopol 936 and 940 gelling agents. Viscosity and glossiness of the emulgel were achieved with the use of herbal extracts. When tested for physico-chemical criteria, the developed formulations were found to be acceptable in every way. These findings imply that topical gel therapy for psoriasis is becoming more effective. Due to the emulgel improved penetration, herbal gel has more effectiveness.

Keywords: psoriasis, *Ricinus communis*, emulgel

Introduction
Psoriasis is a chronic inflammatory autoimmune disease of the skin. It is possible to classify psoriasis into mild, moderate, and severe forms based on the severity of the disease's signs and symptoms. The most frequent signs and symptoms are areas of itchy, scaly skin that are white or red in colour. Itchiness, red scalps, white scales, and rashes are all signs of psoriasis. Psoriasis often affects the skin, joints, and nails. Although there are other clinical forms of psoriasis, the plaque kind is the most prevalent and affects the majority of individuals throughout the globe. Psoriasis is a painful and disfiguring skin condition that is not contagious and has an impact on the patient's mental well-being as well as their physical well-being. Traditional treatments for psoriasis are many. Topical and systemic treatments, as well as phototherapy and its combinations [1, 2] all fall under this category. There are a variety of drawbacks to long-term administration of these medications due to side effects, such as hepatotoxicity (hepatosis), nephrotoxicity (nephrotoxicity), carcinogenicity, and widespread immunosuppression [3, 4]. Short-term psoriasis therapy, on the other hand, causes the illness to go into remission or just alleviates the patient's symptoms. Psoriatic arthritis, a kind of seronegative arthritis, is often associated with psoriasis, as are mental illness, cardiovascular disease, and other disorders [5]. This necessitates the development of novel therapeutic options for psoriasis that have minimal or no adverse effects while yet being effective.
Most of the population relies on herbal treatment, with roughly 75 to 80 percent of all people using plant extracts and active ingredients in traditional therapy. A decline in the use of herbal remedies occurred with the introduction of modern medicine, but developments in phytochemistry and the discovery of plant chemicals that are helpful against certain ailments have reignited interest [6]. Patients prefer herbal remedies to conventional ones because they feel they are less harmful to them. Aside from the fact that herbal medications have a great deal more structural diversity and many modes of action than synthetic chemicals, they also tend to be less expensive. Psoriasis may be effectively treated using herbal medications, which have fewer side effects and cheaper prices than traditional treatments. Psoriasis sufferers have access to a wide range of natural medicines and formulations. Search for a newer replacement is ongoing.
A member of the Euphorbiaceae family, *Ricinus communis* is also known as "castor plant," "palm of Christ," "Endi," "Errandi," "Diveli," and Jada (Oriya), as well as other names such as Verenda (Bengali), "Endi," and "Errandi" in other dialects. Ornamental varieties of this plant may be found all across the tropics. Its oil-bearing seeds are the primary reason for its widespread cultivation. The oil found in seeds is called fixed oil (45-52 percent). This plant grows wild in Indian forests and is widely farmed throughout the country, mostly in the presidencies of Madras, Bengal, and Bombay. An annual shrub with little grey (white) seeds that have brown markings, as well as a perennial bushy shrub with huge fruits and enormous red seeds, both of which provide around 40% of the plant's oil [8].
Emulgel is a novel topical medication delivery method that combines an emulsion with a gel. Like an emulsion or gel, it offers a two-stage control release. An innovative new formulation class, gel distributes drugs more quickly than ointment, cream, or lotion. Skin problems may be treated using an emulgel formulation that

incorporates a medication. For a variety of reasons, topical application of medicinal substances is preferable to oral delivery. A typical emulsion gets turned into an emulgel as a result of the presence of gelling chemicals in the water during the emulsion process.Use of translucent gels in cosmetics and pharmaceuticals has increased in the principal category of semisolid preparations [9]. Emulgels are thixotropic, greaseless, freely smooth and creamy, easily reversed, emollient, non-staining, have a long shelf life, are bio-friendly, are transparent, and are visually appealing [10]. They too have a pleasing appearance.

In this study, a novel herbal emulgel containing Ricinuscommunis seed extract been created and assessed using a liquid paraffin or olive oil or ococonut oil oil phase and the gelling agents Carbopol 934/ or Carbopol 940 as that of the gelling agents.

Materials and methods

The common ragweed an ethanolic extract of the seeds was made in the laboratory. In Mumbai, Merck Labs produced Carbopol 934 and Carbopol 940. Fisher scientific in Mumbai provided the methyl and propyl parabens. Loba Chemie in Mumbai produces this liquid paraffin. They bought olive and coconut oils at the local store. Analytical-grade ingredients were used in all of the recipes.

Methodology [11-16]

1. Extraction

Ricinuscommunis seedlings were thoroughly pulverised and clear of debris before being separated in a Soxhlet apparatus utilizing ethanol as the menstruum, and the results were positive. The distillation procedure resulted in a more concentrated extract. The solvent was then evaporated further by drying the extract in the shade. Desiccators were used to preserve the dried extract, which was labelled and stored. Table 1 shows the results of testing the extract for a variety of phytochemical ingredients.

2. Characterization of *Ricinus communis*

Physiochemical Analysis: Analysis of the Physiochemical To identify *Ricinus communis*, different physiochemical characteristics were tested, including description, solubility, pH, loss on drying.

Description: Visual observation was used to assess the physical appearance of an extract of *Ricinus communis.*

Solubility: A *Ricinuscommunis* extractive then placed within amber-colored glass vials with 10 mL of distilled water.At room temperature, the vials were sonicated for up to two hours. Afterwards, the mixtures were centrifuged for five minutes after equilibrating for 24 hours. Whatman filter paper was used to filter off the supernatant from each vial, which was then diluted with filtered water and examined at 281 nm.

pH: The pH of a 1% w/v concentration of *Ricinus communis* strain with distilled water was determined using a pH metre. *Ricinuscommunis* extract was used to make the solution.

Loss on Drying (LOD): Loss on drying (LOD) was determined by weighing 1.5 grammes of powder onto a flat porcelain dish and allowing it to dry at room temperature. A 1000C oven was used to dry the powder. It was allowed to cool and the weight loss was measured as moisture.

Microbiological Analysis: The complete plate amount, yeast as well asmould totals, *Escherichia coli, Salmonella spp*. plus *Staphylococus aureus*remained between the many microbiological tests conducted to determine if the *Ricinus communis* extract was contaminated *(S. aureus).*

Pretreatment of Sample: Preparation of a specimen Buffering sodium chloride peptone, pH 7.0, was used to dissolve 10 gm of *Ricinus communis* extract in 100 ml of buffered solution.

Total plate count: We produced 1ml of the material, mixed it with 15ml of soybean-casein digest agar, and then placed it in sterile petri dishes. The petri dish was stirred to ensure an even dispersion of the organisms in the sample. Over the course of three days, plates were incubated between 30 and 35 degrees Celsius. At the conclusion of the third day, the colonies that had developed were counted [7].

Phytochemical Analysis

Following procedures for phytochemical analysis, the extract's active chemical components were determined to be absent.

Test for Tannins: For boiling, 1ml of the Sample was combined with 5ml of condensed water. A solution of 0.1 percent ferric chloride was then added to the cooled-down sample after the boiling process had been completed. The presence of tannins can be confirmed by the presence of a brownish green or black coloration.

Test for Phlobatannins: The extract (1ml) was treated with 1% HCl and heated to 90-100^{o}C in a water bath. Phlobatannins may be detected by the formation of red precipitate.

Test for Saponins: The extract was combined using 2ml of condensed water in a test tube containing 1ml of the strain. The test tube was then placed in a bain-marie filled with boiling water and aggressively shook to bring it to a rolling boil. The occurrence of froth production that lasted for an additional hour is proof that saponins are present.

Test for Terpenoids: 5mL of extract were mixed with 2 mL of chloroform and 3 mL of strong sulfuric acid in a test tube. Flavonoids are detected whenever a yellow colour emerges and then goes away when the plant is allowed to stand.

Formulation of Emulgel

Table 2 provides the recipe for the different *Ricinus communis* emulgel formulations. Initially, a gel was created by dispersing Carbopol940 and Carbopol934 in warm filtered water (80oC), which was then cooled and left overnight. Tween 80 was used to dissolve span80 in light liquid paraffin, while span80 was used to dissolve Tween 80 in water. Propylene glycol was used to dissolve methyl and propyl parabens, while water was used to dissolve the medication. Both solutions were then dissolved in aqueous phase. Continuous stirring was used to cool and mix the two phases at room temperature after they had been heated to 70-80oC in separate vessels. Emulgel was created by mixing the emulsion with gel in a 1:1 ratio with continuous stirring. Triethanolamine was used to modify the emulgel pH.

4. Evaluation of Prepared emulgel formulations

1. Physical Examination: The colour, look, consistency, smoothness, and grit of the emulgel compositions that were created were all evaluated visually for their characteristics.

2. Measurement of pH: The pH of the emulgel formulations was determined with the use of a digital pH meter. Distilled water was used to dissolve one gramme of gel, and the mixture was set aside for two hours. The pH of each composition was tested three times and averaged.

3. Viscosity: Spindle No. 4 of the Brookfield Viscometer at 10 rpm was used to test the viscosity of several emulgel compositions at 25°C by means of Brookfield Viscometer.

4. Spreadability: The emulgel spreadability was tested 24 hours after it was made. The diameter of the emulgel circle formed when emulgel is placed among glass plates of certain weight is used to calculate this value. Two plates were placed side-by-side and the weight of one (350 mg) was transferred to the other (500 mg). The diameter of the spread emulgel circle was determined by taking a measurement.

5. Extrudability: Formulations were placed in the collapsible pipes after the emulgel had been put in the container. This allowed for easy extrusion. An application of the amount in grammes required to extrude at least 0.5 cm of fluid from the aluminium collapsible tube in 10 seconds was made in order to calculate the value of gel that was ejected from the tube.The product's ability to be extruded is determined by the amount of product that was produced. Each formulation's extrudability was tested three times, with the average of the results calculated. In order to figure out the extrudability, we used the following formula:

$$\text{Extrudability} = \frac{\text{Applied weight to extrude gel from tube (g)}}{\text{area (cm2)}}$$

6. Drug content: It was determined that approximately 1g of emulgel was precisely weighed into a volumetric flask containing about 70ml of water, and that approximately 70ml deionized water was also added. The volume was increased to 100ml of distilled water after mixing. An appropriate filter paper was used to remove the impurities from the information. 1ml of filtrate was pipetted into a new container. A shimadzu UV/VIS spectrophotometer-1700 at a wavelength of 281 nm was used to quantify the extract spectrophotometrically.

7. *In vitro* diffusion study: *In vitro* diffusion tests were performed in Franz diffusion cells to investigate the dissolving release of gels via a cellophane membrane. 7. At 37o C, distilled water was used as a dissolving media for a gel sample (1gm) that was placed in cellophane membrane. Each test was replaced with an equal amount of dissolving media at intervals of 1, 2, 3, 4, 5, 6, 7 and 8 hours. Using filtered water as a blank, the drug concentration of the samples was determined.

Extract-excipient compatibility study

FTIR spectroscopy experiments were used to determine the extract's compatibility with the specified excipients in a 1:1 combination of extract and excipients. The KBr pellet technique was used to conduct spectroscopic analyses on the physical mixture samples. In order to identify any significant interactions, spectra of both medication and polymer were collected and examined.

FT-IR Spectroscopy: Attenuated total reflectance (ATR) modes of the Shimadzu FT-IR spectrometer Prestige 21 was used to acquire samples' FT-IR spectra. 45 scans with a solution of 5cm-1 were used to gather the spectra spanning the range of 4000-400cm-1.

Stability studies: To determine intermediate and accelerated shelf life, stability tests were performed for three months according to the International Conference on Harmonization (ICH) standards at temperatures of 300°C (65%) and 55% relative humidity (RH), respectively. Changes in pigment, texture, Spreadability, pH, and medication concentration were all examined in the formulations.

Table 1: Preliminary screening data of *Ricinus communis* extract

Bioactive constituents	Ethanolic extract
Alkaloids	+
Flavonoids	+
Carbohydrates	_
Glycosides	+
Saponins	+
Steroids	+
Tannins	+
Triterpinoids	-

Table 2: Formulation of Emulgel

Ingredients	Formula-1	Formula-2	Formula-3	Formula-4	Formula-5	Formula-6
Ricinus communis extract	1	1	1	1	1	1
Carbopol 940	1	1	1	-	-	-
Carbopol 934	-	-	-	1	1	1
Liquid paraffin	7.5	-	-	7.5	-	-
Olive oil	-	7.5	-	-	7.5	-
Coconut oil	-	-	7.5	-	-	7.5
Propylene glycol	5	5	5	5	5	5
Methyl Paraben	0.03	0.03	0.03	0.03	0.03	0.03
Propyl Paraben	0.03	0.03	0.03	0.03	0.03	0.03
Distilled Water	q. s	q. s	q. s	q. s	q. s	q. s

Table 3: Physicochemical observation data of emulgel formulations

S. No	Formulation code	Appearance	Homogeneity	Consistency	pH
1	Formula-1	Pale yellow	Fine	Excellent	6.3±0.01
2	Formula-2	Pale yellow	Fine	Excellent	6.3±0.01
3	Formula-3	Pale yellow	Fine	Excellent	5.96±0.01
4	Formula-4	Pale yellow	Fine	Excellent	6.53±0.05
5	Formula-5	Pale yellow	Fine	Excellent	6.08±0.13
6	Formula-6	Pale yellow	Fine	Excellent	6.24±0.40

Table 4: Physical evaluation data of emulgel formulations

S. No	Formulation code	Spreadability	Drug Content	Zone of Inhibition (mm)	Viscosity	Extrudability
1	Formula-1	66.39	78.1±0.03	20	99	++
2	Formula-2	55.5	84.4±0.55	21.5	97	+++
3	Formula-3	35.5	85.3±0.01	20.4	94	+++
4	Formula-4	81.36	93.6±0.007	20.7	92	++++
5	Formula-5	74	82.9±0.03	20.5	91	++
6	Formula-6	66	83.1±0.01	19.8	90	++

Table 5: *In vitro* Drug release from emulgel formulations

S. No	Time	Formula-1	Formula-2	Formula-3	Formula-4	Formula-5	Formula-6
1	0	0	0	0	0	0	0
2	1hr	10.34	12.44	11.3	10.14	10.34	12.4
3	2hrs	30.20	32.10	30.10	20.20	30.20	30.20
4	3hrs	34.30	38.12	31.30	31.30	34.30	44.30
5	4hrs	40.2	45.32	42.2	34.24	45.2	50.2
6	5hrs	50.41	52.11	52.40	40.41	60.41	70.41
7	6hrs	66.32	60.32	62.12	56.32	76.32	81.32
8	7hrs	74.12	84.12	72.12	74.12	84.12	88.2
9	8hrs	90.25	91.55	91.01	90.25	92.25	90.55

Table 5: Stability Study data of herbal emulgel formulation

Sr. No	Formulation	Days	Appearance	pH	% Drug Content
1	Formula-1	30 Days	Dark brown	6.3±0.01	78.1±0.03
2	Formula-2	30 Days	Dark brown	6.3±0.01	84.4±0.55

3	Formula-3	30 Days	Dark brown	5.96±0.01	85.3±0.01
4	Formula-4	30 Days	Dark brown	6.53±0.005	93.6±0.007
5	Formula-5	30 Days	Dark brown	6.08±0.13	82.9±0.03
6	Formula-6	30 Days	Dark brown	6.24±0.4	83.1±0.01

Results and Discussion

In a Soxhlet apparatus, ethanol was used as menstruum to extract the free of debris coarsely powdered *Ricinus communis* beans. The dried extract's phytochemical composition was examined. Early phytochemical screening findings showed the presence of flavonoids, alkaloids, polysaccharides, glycosides, saponins, tannins, as well as steroids, among other compounds. Table 1 shows the findings of the study. The technique of infrared spectroscopy was used to determine the compatibility of the ethanolic extract with the polymers. It was shown that formulations had peak heights comparable to the pure extract. Extract and excipients were shown to have no interaction.

For the purpose of creating an emulgel out from the strain, Carbopol 936 as well as Carbopol 940 gelling agents, as well as liquid glycerin, olive oil, as well as coconut oil, were used in conjunction with the extract. Although thick and yellowish white in colour, the emulgel exhibited a glossy shine. For this experiment, we tested for the emulgel acidity and found that were between 5.96 and 6.53. The viscosity of each formulation was measured using a Brookfield Viscometer. All of the formulae examined had a broad range of results between 90 and 91. (Cp). It was discovered that the emulgel could be easily disseminated with just a little amount of shear using the parallel glass slide method, which was used to all plant emulgel formulations. The densities varied from 35 to 81.6 grammes per cubic centimeter. Testing the emulgel extrudability in suitable tubes is shown in Table 3. A UV-Visible spectrophotometer was used to determine the herbal emulgel medication content, and the findings varied from 78.1 to 93.6 percent. Adequate drug release was shown *in vitro* by using emulgel formulations. Almost all formulations had the best drug release. During eight hours of dosing, Formulation F5 had a 92.25 percent drug release rate.

In the end, it was found that the emulgel formulas were reliable. For three months in storage, all of the compositions were found to be stable. There were no changes in terms of colour, physical appearances, pH, concentration of drug, rheological properties, or drug release parameters.

Conclusion

The castor plant, *Ricinus communis*, is one of the most widely used and most effective medicinal herbs. The pharmacological activities of *Ricinus communis*, as demonstrated in numerous studies, show that the therapeutic benefit is much greater. One of the primary sources of chemicals, both chemically and pharmacologically. The phytochemical components and pharmacological activity of the plant are likely to lead to the development of new, very effective medications.

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