



FORMULATION AND PHYSICOCHEMICAL CHARACTERIZATION OF A MEDICATED CREAM CONTAINING PLANT-BASED ACTIVE INGREDIENTS

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ABSTRACT: Medicated creams are topical preparations designed to be applied to the skin to prevent, relieve, or treat specific skin conditions. They contain one or more active medicinal ingredients in a cream based that helps deliver the active substance to the affected area. The formulation and physicochemical analysis of medicated creams play a pivotal role in determining their efficacy, stability, and safety for dermatological use. This study aims to develop a medicated cream with specific Active Plant-based Ingredients (APIs) to treat common skin conditions such as eczema, psoriasis, and fungal infections. The formulation process involves selecting appropriate excipients, evaluating different base formulations, and incorporating the active ingredients at optimized concentrations. The physicochemical properties, including viscosity, pH, spread ability, drug release, stability, and texture, are thoroughly assessed to ensure the cream's effectiveness and user acceptability. The stability studies under various environmental conditions are performed to determine the shelf life of the formulation. The results demonstrate that the formulated medicated cream exhibits desirable properties in terms of drug release, stability, and patient compliance, making it a promising option for topical therapeutic applications.

Keyword: Excipients, formulation, Medicated cream, plant-based ingredients, physicochemical properties, viscosity

1.0 INTRODUCTION

Herbal creams, which harness the therapeutic properties of plant extracts, have long been integral to traditional medicine and are increasingly recognized in modern healthcare for their medicinal benefits. Medicated creams are topical preparations designed to be applied to the skin to prevent, relieve, or treat specific skin conditions. They contain one or more active medicinal ingredients in a cream based that helps deliver the active substance to the affected area. These topical formulations utilize the natural healing power of herbs and are employed to address a variety of skin conditions, from minor irritations to chronic dermatological issues. The rising consumer interest in natural and organic products has propelled herbal creams to the forefront of cosmetic and medicinal products, reflecting a broader shift towards integrative and holistic health approaches (Patwardhan et al., 2005).

The use of herbal remedies dates back thousands of years, with ancient civilizations such as the Egyptians, Greeks, and Chinese documenting the medicinal properties of plants (Wang et al., 2007). In traditional Chinese medicine (TCM) and Ayurveda, herbal formulations have been pivotal in treating a range of ailments, including skin disorders. These historical practices laid the groundwork for the contemporary use of herbal creams. For instance, aloe vera, known for its soothing and healing properties, has been used for centuries to treat wounds and burns (Surjushe et al., 2008). Such historical usage underscores the deep-rooted reliance on plant-based remedies in human health practices.

In recent years, the integration of herbal medicine into modern dermatology and cosmetic formulations has been driven by growing consumer demand for natural alternatives to synthetic products. Herbal creams are now widely used not only for their therapeutic properties but also for their perceived safety and minimal side effects compared to conventional pharmaceuticals (Akinmoladun et al., 2007). The global shift towards natural and organic products has been influenced by increasing awareness of the potential side effects of synthetic chemicals and a growing preference for products derived from natural sources (Patwardhan et al., 2005).

Herbal creams are formulated with various plant extracts known for their beneficial effects on the skin. These include ingredients like chamomile, known for its anti-inflammatory and calming properties, and turmeric, which is valued for its anti-aging and antioxidant effects (Aggarwal & Harikumar, 2009). The incorporation of such

ingredients into topical formulations reflects an effort to blend traditional knowledge with modern scientific understanding.

The medicinal importance of herbal creams is grounded in the pharmacological properties of their ingredients. Many herbal extracts contain bioactive compounds that have demonstrated efficacy in treating various skin conditions. For example, aloe vera has been shown to enhance wound healing through its anti-inflammatory and antimicrobial activities (Surjushe et al., 2008). Similarly, turmeric contains curcumin, a compound with well-documented anti-inflammatory and antioxidant properties that can be beneficial in managing conditions like psoriasis and eczema (Aggarwal & Harikumar, 2009).

Herbal creams offer multiple benefits, including their ability to reduce inflammation, combat oxidative stress, and provide antimicrobial protection. These properties are crucial in the management of dermatological conditions such as acne, eczema, and aging skin. The use of herbal creams in treating these conditions aligns with a growing body of research supporting the therapeutic potential of natural products in dermatology (Katiyar, 2001).

Despite their benefits, the formulation of herbal creams presents several challenges. Ensuring the stability and efficacy of herbal ingredients is critical, as many plant extracts are sensitive to environmental factors like light and temperature (Mukherjee et al., 2011). Additionally, the standardization of herbal extracts is essential to guarantee consistent quality and therapeutic effectiveness across different batches of cream (Ekor, 2013).

Moreover, medicated creams are often preferred by patients due to their cosmetic appeal. Unlike ointments, which can be greasy and leave residues on the skin, medicated creams are lighter, non-greasy, and are quickly absorbed into the skin, making them more comfortable for daily use. The spreadability and ease of application of creams contribute to their high patient compliance, especially when treatments are required for long durations. While medicated creams are highly effective, the process of developing a stable, effective, and patient-acceptable product presents several challenges. One of the primary difficulties is ensuring the proper delivery of the active ingredient to the target site. The skin acts as a formidable barrier, preventing the penetration of many substances, including drugs. The stratum corneum, the outermost layer of the skin, is particularly effective at blocking the absorption of foreign compounds. Therefore, the formulation must overcome this barrier to ensure that the active ingredient reaches the deeper layers of the skin, where therapeutic effects are achieved. (Teixeira et al., 2019)

Several factors influence the penetration of drugs through the skin, including the physicochemical properties of the active ingredient, the formulation type, and the presence of penetration enhancers. Drugs that are highly lipophilic (fat-soluble) tend to penetrate the skin more easily than hydrophilic (water-soluble) drugs. Consequently, the formulation base, whether it is oil-in-water or water-in-oil, must be chosen based on the properties of the active ingredient. Emulsions and gels, for example, are commonly used as vehicles because they facilitate the controlled release and absorption of drugs. (Kesharwani et al., 2023)

In addition to skin penetration, stability is another key consideration in the formulation of medicated creams. Topical formulations are exposed to environmental factors such as temperature, light, and humidity, all of which can affect the stability of both the cream and the active ingredient. A cream that is unstable can degrade or lose its therapeutic efficacy, leading to poor patient outcomes. Therefore, stability testing is an integral part of the formulation process to ensure that the product maintains its potency over time. The selection of excipients is equally important, as these ingredients affect not only the cream's texture and spreadability but also its stability and skin compatibility. Some excipients, such as emulsifiers and preservatives, may cause irritation or allergic reactions in sensitive individuals. Therefore, excipients must be carefully chosen and tested for safety and efficacy. (Caballerro et al., 2021)

The use of topical preparations for medical purposes dates back to ancient civilizations, where herbal formulations and ointments were used to treat wounds, burns, and skin diseases. With the advancement of pharmaceutical science, the formulation of topical creams has evolved into more sophisticated systems that are designed to provide controlled release of active ingredients over time. In the early 20th century, the formulation of creams became a standardized process, with the introduction of emulsifiers and stabilizers that improved the texture and consistency of the creams. This period marked the transition from simple ointments to emulsified creams, which have become a cornerstone of modern pharmaceutical practice. (Maver et al., 2015)

Medicated creams are one of the most commonly used topical formulations for the treatment of various dermatological conditions, offering localized therapeutic effects with minimal systemic side effects. These products are primarily used for conditions such as eczema, psoriasis, acne, fungal infections, and other skin-related disorders. Despite their widespread use, several challenges persist in the development, formulation, and clinical efficacy of medicated creams. These challenges need to be addressed in order to improve the performance of these formulations and ensure their safety, effectiveness, and patient satisfaction. (Leppert et al., 2018)

The problem can be viewed from multiple perspectives, the scientific challenges related to drug formulation, the physiological barriers to drug absorption, the difficulties in maintaining product stability, and the challenge of ensuring patient compliance and satisfaction. Below are the main issues identified in the development and use of medicated creams. One of the primary challenges faced in the development of medicated creams is the ability of the Active Plant-based Ingredients (APIs) to penetrate the skin and reach the target site at therapeutic concentrations. The skin is an effective natural barrier that prevents the absorption of harmful substances, but this

also limits the ability of drugs to pass through the outer layers and exert their effects. The stratum corneum, the outermost layer of the epidermis, is particularly resistant to penetration due to its dense, keratinized structure, which makes it challenging for many drugs to permeate (Barry, 2001).

While many medicated creams are formulated to enhance skin absorption, achieving adequate bioavailability for a range of drugs remains difficult. Factors such as the molecular size of the drug, the use of penetration enhancers, and the formulation base (oil-in-water or water-in-oil emulsions) all influence the ability of the drug to be effectively delivered into the deeper layers of the skin. Some drugs, such as corticosteroids, are relatively well absorbed through the skin, while others, including many antibiotics or antifungals, may struggle to penetrate effectively. Without effective skin penetration, the therapeutic efficacy of the medicated cream is compromised, and the patient may not experience the desired clinical outcomes. (Jorge et al., 2010)

Another significant problem is the stability of both the cream formulation and the API. Medicated creams are susceptible to degradation over time due to various factors such as exposure to air, light, heat, and moisture. The emulsions used in cream formulations can also destabilize, leading to phase separation and the eventual breakdown of the product. This is particularly problematic for products that contain sensitive APIs, such as vitamins or certain biologics, which degrade when exposed to environmental conditions (Singh & Chien, 2003). Stability testing of medicated creams is a critical part of formulation development. These tests aim to assess how the cream performs under different conditions (e.g., varying temperatures, humidity levels, and light exposure). However, even well-tested formulations can experience physical changes that impact their performance. For example, phase separation or the breakdown of emulsions can lead to inconsistent dosages of the active ingredient and, in some cases, cause irritation or other adverse reactions when applied to the skin. Additionally, preservatives used to prevent microbial contamination can lose their effectiveness over time, resulting in the product becoming contaminated, which further compromises its safety and effectiveness. (Erickson et al., 2017)

The texture and spread ability of medicated creams are essential factors influencing patient compliance and overall product acceptance. Creams that are too greasy, too thick, or too difficult to spread may deter patients from using them as directed, which can negatively affect treatment outcomes. Dermatological conditions often require frequent application of topical products, and if the cream is not aesthetically pleasing or comfortable to apply, patients may stop using it, leading to suboptimal results. (Somkuwar 2024)

Medicated creams should have a smooth, non-greasy texture and be easy to spread and absorb into the skin. They should not leave a sticky or oily residue, as this can cause discomfort and make the patient reluctant to apply the cream regularly. The sensory properties of the cream—such as its fragrance, color, and appearance—also play a significant role in patient acceptance. For instance, patients with sensitive skin may be more likely to experience irritation or allergic reactions to certain fragrances or preservatives commonly found in topical formulations. Therefore, achieving a balanced, non-irritating formula that is both effective and cosmetically acceptable remains a critical challenge in the development of medicated creams. (Swetha et al., 2024)

The clinical efficacy of medicated creams is directly tied to the release profile of the API from the cream matrix and its subsequent absorption into the skin. Drug release is a complex process influenced by the physicochemical properties of both the active ingredient and the excipients in the formulation. Some drugs may be released too quickly, potentially causing irritation or systemic side effects, while others may be released too slowly, rendering the cream ineffective over time. (Polonini 2022)

Achieving the optimal release profile is crucial for ensuring that the drug is delivered at therapeutic concentrations over the appropriate duration. This is particularly important for chronic skin conditions such as eczema or psoriasis, which require continuous treatment over extended periods. Sustained release formulations that provide controlled release of the active ingredient can help avoid the peaks and troughs associated with conventional formulations, leading to more consistent and predictable therapeutic outcomes (Zhang et al., 2014).

Medicated creams are subject to stringent regulatory requirements to ensure their safety, efficacy, and quality. Regulatory agencies such as the U.S. Food and Drug Administration (FDA) and the European Medicines Agency (EMA) require that medicated creams undergo rigorous testing and meet specific standards before they can be marketed. This includes clinical trials, stability testing, and quality control assessments to ensure that the formulation is safe for consumer use and performs as expected. Quality control measures must be in place to ensure that each batch of cream meets the required standards for potency, purity, and uniformity. Variations in the manufacturing process, ingredient quality, or environmental conditions can lead to batch-to-batch differences, which could affect the cream's performance and safety. In addition, quality control must also address issues such as microbial contamination, which could result in infections or other adverse effects. Ensuring consistent quality and regulatory compliance is an ongoing challenge for manufacturers, especially as the demand for novel active ingredients and formulations increases. (Devangan et al., 2024)

The cost of developing, manufacturing, and marketing medicated creams is another issue that affects their accessibility and affordability for patients. Some of the excipients, preservatives, and active ingredients used in cream formulations are expensive, particularly if they require specialized processing or sourcing. As a result, the cost of medicated creams can be prohibitively high, limiting access for certain populations or countries with lower healthcare budgets. Moreover, the availability of affordable generics is often restricted for newer drugs, especially

when they contain proprietary or patented active ingredients. This can lead to higher prices for patients who need chronic treatment for conditions such as psoriasis or eczema. Therefore, addressing cost and accessibility concerns is a critical issue in improving patient outcomes and ensuring that effective treatments are available to all who need them. (Kanavos et al., 2008)

The formulation and physicochemical analysis of medicated creams using raw materials is an area of significant importance in pharmaceutical sciences, particularly for the effective management of various dermatological conditions. Topical preparations, such as medicated creams, are widely used due to their ability to deliver targeted therapy to specific areas of the body, minimizing systemic side effects while promoting localized therapeutic effects. This study is justified on several grounds, including the need to improve existing formulations, enhance the stability and efficacy of these products, address challenges related to skin penetration, and ensure that medicated creams continue to meet the evolving needs of patients and healthcare providers.

The justification for this study lies in addressing the critical challenges faced by the current generation of medicated creams, particularly in terms of skin penetration, stability, patient compliance, and cost-effectiveness. The insights gained from this research have the potential to significantly improve the formulation, efficacy, and accessibility of medicated creams, offering enhanced treatment options for patients suffering from a wide range of dermatological conditions. By advancing formulation technologies and addressing these key issues, this study aims to contribute to the development of more effective, stable, and patient-friendly medicated creams, ultimately improving the quality of life for individuals affected by skin diseases. The aim of the study is to evaluate the physicochemical properties of formulated medicated cream from natural raw materials.

2.0 METHODOLOGY

2.1 MATERIALS

2.1.1 Sampling

Among the sample used are: Turmeric (Glow the skin, antiseptic, anti-inflammatory); Ripe papaya (Anti-wrinkle, cleansing enzymes action); Aloe – Vera (Anti-aging, reduce acne); and Neem (Relieves skin dryness, promote wound healing).

2.1.2 Apparatus

Bowls, Beakers, measuring cylinders, Spatula, glass rod or smooth sticks for stirring, Hot plate, Weighing balance, Thermometer, pH meter, Droppers, Volumetric flask, water bath, Filter paper.

2.1.2 Reagents

Among the reagents used are: Glycerine (Retains moisture in skin); Vit. E (Promotes collagen production); Bees Wax (Emulsifying agent); Sodium Borate (Preservative); Sodium Benzoate (Preservative); Distilled Water (solvent); and Rose Oil (Fragrance).

2.1.3 Collection of Plant Materials

Plant materials were sourced from different locations like; Spice markets (for Turmeric), Local farmers' markets (for Ripe papaya and Neem seeds) and botanical gardens (for Aloe vera). Turmeric, papaya, aloe-vera, tulsi, and neem were collected from local botanical garden. Irrespective of the type of crude drug and area of collection, there cannot be two opinions that drug is collected suitably when they contain maximum concentration of active ingredients. The advantage of existing environment condition is also taken into consideration while collecting the crude drugs while collecting the natural drugs on commercial scale, attention should be paid for the use of skilled labour. The fruits are collected depending upon the part of fruit used. They collected either ripe or half ripe, but full grown. Rhizomes are collected, when they stored ample of reserve food material and contain maximum content of chemical constituent. Plant collecting is the acquisition of plant specimens for the purpose of research, cultivation, or as a hobby. Plant specimens may be kept a live but are more commonly dried and pressed to preserve the quality of the specimens. Plant collecting is an ancient practice with records of a Chinese botanist collecting roses over 5000 years ago. These plants usually ended up in botanical gardens or the private gardens of wealthy collectors. They can also provide biological materials for researchers, a reference point to documents scientific names and vouchers, is being used in herbaria across the world. Plant samples in herbaria typically include a reference sheet with information about the plant and details collection. This detailed and organized system of failing provides horticulturist and other researchers a like with a way to find information about a certain plant, and way to add new information to existing plant sample files. The collection of live plants specimens from the wild, sometimes referred to as plant hunting, is an activity that has occurred for centuries. Herbaria are collection of preserved plants samples and their associated data for scientific purpose.

2.1.4 Extraction Processes

- **Preparation of turmeric extract:** 1g of turmeric powder was dissolved 10 ml of distilled water and shaken in a volumetric flask and heated in water bath at 80°C for 10 minutes. It was then filtered and the turmeric extract is obtained

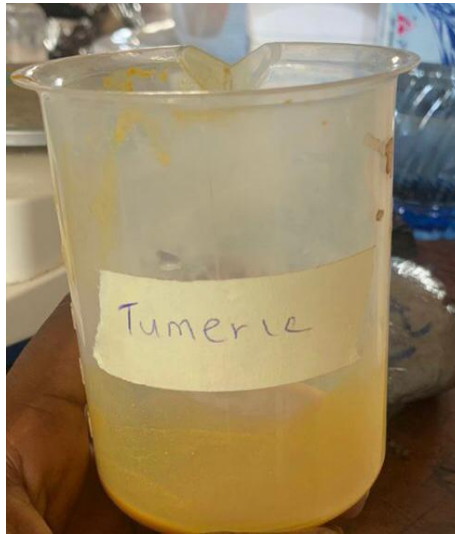


Fig 1: Turmeric extract

- **Preparation of Papaya oil:** A ripe but firm organic papaya was cut into fine pieces and transferred into a sauce pan. Two cups of essential oil were poured in and heated for 30 minutes with continuous stirring and allowed to cool after which it was sieved using muslin cloth and the oil was collected.



Fig 2: Papaya oil



Fig 3: Aloe extract

- **Preparation of Aloe vera extract:** Fresh and matured aloe vera leaves were washed properly with distilled water. The plant was then dissected longitudinally using a sterile knife and the gel was collected. The gel was vigorously mixed for homogeneity

2.1.5 Formulation Development

The bees wax was melted in heated liquid paraffin at 75°C while the heating temperature was maintained (oil phase). In another beaker immersed in water bath at 75 °C, Sodium borate and Sodium benzoate was dissolved in distilled water (Aqueous phase). The dissolved aqueous phase was gently poured in the dissolved oil phase with continuous stirring after which the aloe vera extract, turmeric extract, papaya oil, Neem oil and vitamin E oil were added immediately with continuous mixing. When cream is formed, rose oil was added as fragrance. The cream was allowed to cool before packaging.



Fig 4: Medicated Cream

Table 1: formulation of the Samples

S/N	Ingredients	Formulation 1	Formulation 2	Formulation 3
1	Turmeric	2.7 ml	10ml	10ml
2	Ripe papaya	2.7 ml	10ml	8ml
3	Aloe	2.8 ml	14.2ml	16ml
4	Neem	0.9ml	8.0ml	6.0ml

5	Glycerine	1ml	6ml	4ml
6	Vit. E	1ml	6ml	4ml
7	Bees Wax	5.45g	50g	30g
8	Sodium Borate	0.36g	3.30g	2.80g
9	Sodium Benzoate	0.03g	0.28g	0.19g
10	Distilled Water	Q. S	Q. S	Q. S
11	Rose Oil	Q. S	Q. S	Q. S



2.2 METHODOLOGY

The following parameters were observed: Physical evaluation; pH test; Wash Ability; Phase separation; Irritancy; Homogeneity; Viscosity; Type of emulsion; accelerated stability testing.

3.0 RESULT AND DISCUSSION

3.1 RESULT

3.1.1 Physiochemical Analysis

Below are the results of physiochemical analysis

Table 2: Evaluation OF Physiochemical Parameters of Herbal Cream

Formulation	pH	Colour	Homogeneity	Viscosity	Type of Emulsion	Type of Smear	Irritancy
F1	6.9	Pale Yellow	**	1256±0.67	O/W	Non-greasiness	Non-Irritant
F2	7.8	Pale Yellow	**	1459±0.58	O/W	Non-greasiness	Non-Irritant
F3	7.8	Pale Yellow	***	2089±0.89	O/W	Non-greasiness	Non-Irritant

= Good, *=Excellent

Table 3: Results of Accelerated Stability Studies of the samples

Days	Temp	Formulation	pH	Colour	Homogeneity	Viscosity	Type of Emulsion	Type of Smear	Irritancy
0	40 °C ±1 °C	F2	7.8	Pale Yellow	***	2089±0.89	O/W	Non-greasiness	Non-Irritant
	40 °C ±1 °C	F3	7.8	Pale Yellow	***	3256±1.56	O/W	Non-greasiness	Non-Irritant
5	40 °C ±1 °C	F2	7.8	Pale Yellow	***	2089±0.89	O/W	Non-greasiness	Non-Irritant
	40 °C ±1 °C	F3	7.8	Pale Yellow	***	3256±1.56	O/W	Non-greasiness	Non-Irritant
10	40 °C ±1 °C	F2	7.8	Pale Yellow	***	2089±0.89	O/W	Non-greasiness	Non-Irritant
	40 °C ±1 °C	F3	7.8	Pale Yellow	***	3256±1.56	O/W	Non-greasiness	Non-Irritant
15	40 °C ±1 °C	F2	7.8	Pale Yellow	***	2089±0.89	O/W	Non-greasiness	Non-Irritant
	40 °C ±1 °C	F3	7.8	Pale Yellow	***	3256±1.56	O/W	Non-greasiness	Non-Irritant
20	40 °C ±1 °C	F2	7.8	Pale Yellow	***	2089±0.89	O/W	Non-greasiness	Non-Irritant
	40 °C ±1 °C	F3	7.8	Pale Yellow	***	3256±1.56	O/W	Non-greasiness	Non-Irritant

***=Excellent

3.2. Discussion

- **pH test:** The pH of the cream was found to be in range of 6-7 which is excellent for skin pH. All the formulations were revealed pH nearer to skin required.
- **Color and Odor:** The color of the cream was found to be slight yellow in color due to the existence of turmeric in it. The odor was not found to be obnoxious.
- **Homogeneity:** The cream was found to be homogenous. Any sign of heterogeneity was not found.
- **Type of emulsion:** The prepared cream was O/W type emulsion, hence can be with no trouble washed with plane water which gives better customer compliance.
- **Viscosity:** The viscosity determinations were carried out using a Brookfield Viscometer (DV II+ Pro model) using spindle number S- 64 at a 20 rpm at a temperature of 25o C. The determinations were carried out in triplicate and the average of three readings was recorded. The viscosity was found in the range of 1256 to 3256.
- **Type of Smear:** After application of cream, the type of smear formed on the skin were non- greasy.
- **Irritancy:** The formulations show no redness, edema, inflammation and irritation during irritancy studies.
- **Accelerated Stability Testing:** There is no change in the properties of the prepared formulations 2 and Formulation3.

4.0 CONCLUSION AND RECOMMENDATION

4.1 Conclusion

The prepared herbal cream has best properties and having nutritional values using less chemicals which protects the skin from the various skin problems. Since the cream was prepared by using simple ingredients and simple methods so the cream is also economical. The herbal cosmetic formulation is safe to use and it can be used as the provision of a barrier to protect skin.

By using turmeric, papaya, aloe-vera, neem and tulsi the cream showed multipurpose effect and all herbal ingredients were used showed different significant activities. Based on the results we can say that all formulation, F2C and F3C were stable at room temperature and can be safely used on the skin. Therefore, according to statement is better formulation than F2C and F3C are the best formulation of the herbal cream produced. The present work focuses on the potential of herbal extract from cosmetic purpose. The uses of cosmetic have been increased in many folds in personal care system. The uses bioactive ingredient in cosmetic influence biological functions of skin and provide nutrients necessary for the healthy skin. The prepared formulation showed good spread ability, no evidence of phase separation and good consistency during the study period. The prepared herbal cream has best properties and having nutritional values using less chemical which protects the skin from the various skin problem. Since the cream was prepared by using simple ingredients and simple method so the cream is also economical. The herbal cosmetic formulation is safe to use and it can be used as the provision of a barrier to protect skin. The result of different tests of cream showed that the formation could be used topically in order to protect skin against damage. Natural remedies are more acceptable in the belief that they are safer with fewer side effects than the synthetic ones. Further research will carry out to check scientifically the synergistic action of formulation

4.2 Recommendation

To improve the development and evaluation of medicated creams, the following recommendations are proposed:

- **Comprehensive Excipient Selection:** Prioritize excipients that enhance the stability, efficacy, and safety of the formulation. Select skin-compatible emulsifiers, stabilizers, and penetration enhancers to improve the delivery and absorption of the active ingredient.
- **Optimized pH and Viscosity:** Ensure that the cream's pH is within the physiological range of the skin (typically 4.5–6.5) to prevent irritation. The viscosity should strike a balance between ease of application and retention on the skin.
- **Advanced Formulation Techniques:** Employ advanced formulation strategies, such as nano emulsions or liposomal carriers, to improve the delivery of the active ingredient to deeper layers of the skin, particularly for conditions requiring systemic penetration.
- **Enhanced Stability Studies:** Conduct extensive stability testing under varying environmental conditions (temperature, humidity, and light) to ensure the product remains effective throughout its shelf life. Include accelerated stability studies to predict long-term performance.
- **Patient-Centric Design:** Incorporate cosmetic elegance into the formulation by ensuring the cream is non-greasy, spreads easily, and has a pleasant texture and appearance. This increases patient compliance, especially for long-term therapies.
- **Standardized Testing Protocols:** Adopt standardized protocols for physicochemical testing, including spreadability, viscosity, pH, and drug release profiles. This ensures consistent quality and facilitates regulatory approval

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