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Formulation, Evaluation, and Development of Multipurpose Cream Containing Kokum Butter

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Abstract

The creation of the multipurpose polyherbal crack-healing cream, which shields the skin from cracks and can also serve as a multifunctional cream to shield the skin from other skin issues. The polyherbal cosmetic formulation can be used to give skin a protective barrier and is safe to use. Over the course of the study, this multipurpose polyherbal cream demonstrated good homogeneity, pH, consistency, spreadability, and lack of phase separation. This multipurpose polyherbal cream is used to remove waste from pores and moisturize dry skin. Further skin conservation is offered by the water phase. It is simple to clean, store, and moisten. Herbal extracts would be significantly more widely accepted than synthetic ones if they were used in a polyherbal cream that is safe, non-toxic, and increases patient compliance. According to the present research, it is possible to create a polyherbal cream. Because it was created using a straightforward ingredient and process, the cream also became more affordable. Kokum butter, coconut oil, and olive oil work together to preserve the skin when applied. In addition to coconut oil, which fills the spaces between skin cells and leaves the skin feeling soft and smooth, extra virgin olive oil encourages angiogenesis by increasing intravascular endothelial growth factor (VEGF) levels and can permanently reduce inflammation. Kokum butter also absorbs quickly into the skin without leaving a greasy residue.

Keywords: Multipurpose cream, Kokum butter, topical drug delivery system, *Garcinia indica*, Olea europaea, cocos nucifera

INTRODUCTION

Multipurpose Cream

Creams are formulations that are homogeneous, semisolid, or viscous, have somewhat fluid viscosity, and are applied externally to the skin or specific mucous membranes for protection, preventive or therapeutic action. Typically, they are semisolids. Including one or more medication solutions or dispersions on appropriate bases. These are the categories into which creams fall. A) Tiny oil droplets dispersed in a continuous water phase comprise oil-in-water (O/W) creams [1–5].

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Since natural treatments are more popular these days due to the perception that they are safer and have fewer side effects than synthetic ones, there is a growing commercial need for herbal formulations. Consequently, it makes sense to create a multifunctional herbal cream that is safe, effective, and free of harmful side effects, with more patient compliance than allopathic medicines (Figure 1).

Figure 1. Multipurpose cream.

Products known as cosmetics are typically used to both beautify and purify the skin. The Greek word for cosmetics is where the word "cosmetics," which comes from it, originates. Cold cream is the term for water in oil emulsion. Cold cream offers a longer contact time at the application site than other semisolid dosage forms. They reduce oiliness and give the skin a more refined appearance. Because of the oily phase, it gives the skin emollience. The cold cream replenishes dry skin and makes it possible for waste items to be removed from the pores. Wetting, washing, and rinsing it off is easy. They are non-irritating when applied to the skin. The skin is further protected by the water phase. It melts at body temperature. It enters the body through the epidermis's natural pores [6–7].

Anti-aging lotions that help prolong the young appearance of skin. The best cleaning supplies include soap, water, and cleaning lotions. Creams can be either water in oil (w/o) or oil in water (o/w) in kind, and they are categorized as semisolid emulsions intended for external application. Cream can be classified as either an oil in water or a water in oil emulsion. Its main purpose is to remain at the application site for a long period of time. It is applied to the skin's outermost or superficial layer. The goal of a skin cream is to both relax the skin and protect it from different environmental variables and weather conditions [8–10].

There are various kinds of creams, including cleansing, massage, cold, foundation, night, vanishing, and body and hand creams. Since ancient times, several medicinal plants have been utilized as cosmetics and have had encouraging results in treating a range of skin conditions, including rashes, acne, blackheads and age spots. Wrinkles, rashes, allergies, skin lightening, and other skin conditions. Because vegetable oils, such as almond oil, can degrade when mixed with water, the early models were not very long-lasting. Traditionally, cold creams are of short shelf life, they can be made at home or purchased in tiny amounts freshly made by a local pharmacy, pharmacist, or druggist. Petroleum jelly or cold creams with a high mineral oil (liquid paraffin) content were typically employed as cleaners. They were applied generously and then scraped off with tissues or cloth. Although they might be used for a variety of purposes depending on the formulation, they were commonly promoted as night creams or beauty creams [11].

Uses of Multipurpose Cream

1. As a makeup removal and cleansing preparation.
2. To provide an emollient effect.
3. To give the skin an oil barrier of protection.
4. As with sunscreen components, additionally offer a chemical barrier.
5. As a vehicle for pharmaceutical ingredients.
6. To eliminate skin contaminants that are soluble in oil.

TOPICAL DRUG DELIVERY SYSTEM

To treat illnesses, medications have been given to the body in a variety of methods throughout the last few decades, including orally, sublingually, rectally, parentally, topically, breathed, etc. [12–16].

The process of applying a drug-containing formulation directly to the skin to treat a skin disorder or the external symptoms of a general disease (like Dermatitis) with the aim of limiting the drug's pharmacological effects to the skin's surface or inside the skin is known as topical delivery. Although foams, sprays, medicated lotions, and other topical administration methods are also utilized, semisolid formulations in all their varieties predominate in the system for topical delivery (Figure 2) [17, 18].

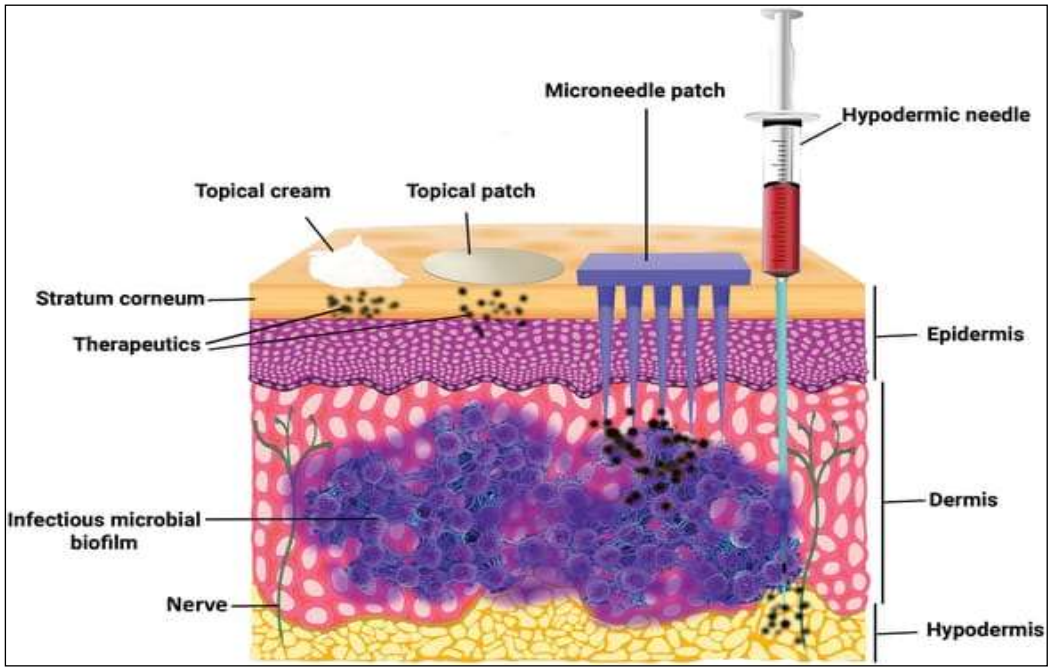

Figure 2. Topical drug delivery.

Advantages of Topical Drug Delivery System

- Preventing first-pass metabolism.
- Convenient and simple to use.
- Prevention of risk.
- Continuous drug input can achieve efficacy with a lower total daily dose of medication. Prevent intra- and inter-patent fluctuations in medication levels.
- The disadvantages of intravenous treatment and the different absorption conditions, including pH variations, enzyme presence, and the stomach's rate of absorption, etc. are overcome.

KOKUM

Figure 3. Kokum.

Geography of Kokum

Garcinia indica, or kokum, is a native tree in India. It is a member of the family Cluisiaceae. The tree can be found along the coasts of Konkan, Sindhudurg, Ratnagiri. Additionally, it can be found throughout eastern and northeastern India, including Assam and Andhra Pradesh. There are numerous popular names for kokum in each of the following states. There are 200 varieties in the genus. Garcinia, India is home to 20 of these species. Kokum is a 15-meter-tall tropical evergreen tree with slanting branches. The kokum tree blooms between November and February. The spherical fruit have four to eight intact seeds and is scarlet or dark purple in colour. Then, in April and May, the fruits are picked. The ideal temperature range is between 20°C and 35°C (Figure 3) [19, 20].

PHYTOCHEMISTRY

Garcinol and isogarcinol, which are polyisoprenylated benzophenone derivatives, hydroxycitric acid, xanthochymol, garsubillin, guttiferon isoforms, combogenol, and mangostin are among the chemical compounds found in *Garcinia indica*. Procynidines, anthocynines, gambogic acid, kolaviron, and caged xanthone derivatives. Ascorbic acid, citric acid, acetic acid, and malic acid are also present. The largest concentration of anthocynin (2.4g/100g of fruit) from any natural source is found in kokum rinds, where the main pigments are cyanadin-3-glycoside and cyaniding-3-sambubioside.

Related to kokum butter, essential fatty acids and fat are abundant in seeds. Kokum butter, which is solid at room temperature, is essentially the fat (24%) found in kokum seeds. Kokum butter is white when refined and yellow when unrefined. Kokum butter contains 7.2% total free fatty acids.

Traditional Extraction Process of Kokum

1. Using a plank or a rod, the kokum beats the seeds in this way.
2. Winnowing is used to extract the seeds from the husk, which are then sun-dried and ground into flour.
3. Then the water and seeds are combined and then cooked.
4. To extract the oil, the seed powder is boiled in water, and the released oil is skimmed off.
5. The procedures for producing kokum butter domestically happens in India’s coastal regions. This procedure involves cracking the seed and removing the shell.
6. Next, a big, specifically crafted stone mortar and pestle are used to pound the white kernel. The container is filled with water and filled with ground seed powder, which is then brought to a boil.
7. The classic manufacturing method flow chart is followed. As it cools, the oil that rises to the surface gradually, solidifies.
8. It is hand-molded into egg-shaped balls with strength. As a result, Kokum butter is a valuable oil or fat that is extracted from kokum seeds.

OLIVE

Figure 4. Olive.

Geographical Source

The real origin of the olive is unknown, but it is thought to be Syria or even sub-Saharan Africa. Over 6000 years, cultivated olives have evolved with Mediterranean civilizations and are today grown to over 23 million acres (9.4 million ha) in the Mediterranean basin. New plants are also present in California, Chile, Argentina, South Africa, and Australia (Figure 4).

Chemical Constituents

1. *Fatty Acids:* Oleic acid (55–83%), linoleic acid (3.5–21%), palmitic acid (7.5–20%).
2. *Vitamins:* Vitamin E, Vitamin K.
3. *Phenolic Compounds:* Hydroxytyrosol, tyrosol, oleuropein.
4. *Squalene:* A triterpene compound with antioxidant properties.

COCONUT

Figure 5. Coconut.

Geographical Source

According to current studies, it is native to Malesia, a bio-geographical region that encompasses various Pacific Island groups, Australia, New Guinea, Southeast Asia, and Indonesia. Among the eight centers, the Indian subcontinent and South Asia are known as the Hindustani place, which is a significant area for agricultural plant variety and the secondary place of origin for Cocos nucifera (Figure 5).

Chemical Constituents

Phenols, tannins, alkaloids, flavonoids, triterpenes, and steroids, whereas triterpenes, saponins, and condensed tannins were found in a butanol extract. Notably, edible fruits, vegetables, and numerous herbs contain chemicals with antioxidant properties, such as flavonoids.

LITERATURE SURVEY

1. SB Kalse et al. in 2023 published a review article on exploring the versatile uses and extraction techniques of kokum butter in Volume 6, Issue 1. The various extraction techniques for kokum butter, a naturally occurring plant-based fat derived from kokum seeds, were investigated in this review article. The significance of selecting the right extraction technique for Kokum butter and its possible uses in a range of sectors are emphasized in this review [7].
2. Rahul C Ranveer et al. in 2017 published a review article on bioactive constituents of kokum and its potential health benefits in Volume 1, Issue 6. This paper reviewed potential health benefits bioactive components present in kokum [6].
3. Mythili Suresh et al. in 2024 published an article on "Development and Examining a Multifunctional Herbal Cream Using *Moringa oleifera*". The researcher demonstrated how effective the cream's multifunctional activity would be [8].

4. Vikrant Dandekar et al. in 2024 published novel multipurpose herbal topical formulation in Journal of Medical Pharmaceutical & Allied Sciences V 13-13 page 6539–45. The herbal ingredients used to develop herbal cream comprises aloe-vera, Neem oil, turmeric and rose water. Several physicochemical criteria, including appearance emulsion, pH, texture, homogeneity, irritancy SPF, antimicrobial investigations, and ingredient identification, were assessed for the innovative formulations [9].
5. Shina Singh et al. on 29 March 2022 published an article in World Journal of Pharmaceutical Research Volume 11, Issue 6, 798–805 describes. Creation and assessment of a multifunctional herbal cream with tulsi (*Ocimum tenuifiorom*), neem (*Azadirachta indica*), and aloe vera gel method of preparation & evaluation test were described [10].
6. Nayana PV, Navyashree published in 2024 Journal of Pharma Insights and Research. They described the research work on preparation of herbal cold cream from using different herbs, and preparation of a face cream to evaluate the efficacy, the goal of their work is to develop herbal cold cream for moisturizing. Nourishing, enhancing whitening and treating various skin disease [18].
7. Preetha Panicker et al. Published on Dec 12, 2021 Vol. 10 Issue 01, page no. 1708–1710 in Journal of Pharmacognosy and Phytochemistry. In this, the desire for natural ingredients and natural extracts in cosmetics preparations was sparked by the rising public awareness of the negative effects of chemical-based cosmetics on the skin [3].
8. Sundaram S, Malviya R, Verma S. (2023) worked towards patient care and treatment strategies for skin diseases in sub-Saharan Africa. This herbal cream, may be used as a moisturizer, reduce acne and skin irritation, and lessen skin conditions, like psoriasis, eczema, dry skin, wrinkles, rashes, and more, has been developed. It also adds radiance to the face [13].
9. Roshan Yadav et al. published in May 2023, Vol. 08 Issue 05 in International Journal of Innovative Science and Research Technology. In this, the purpose of the current study was to create and evaluate herbal cold creams with plant extracts manufactured using the water-in-oil method to hydrate and nourish the skin. The cold cream is made with turmeric extract and neem oil [4].
10. Prajakta Jagtap et al. published in 2017, Vol 04 Issue 11 in International Journal of Herbal medicine. Kokum has been described as a traditional home cure for infections, heat strokes, and flatulence. Ayurvedic-based traditional medicine has reported the fruit's several medicinal benefits [19].
11. Shweta Parwez published on June 2022 in Indian system of Medicine narrates that virgin coconut oil made by cold pressing, this extraction method prevents loss of vitamin E, pro-vitamin A, polyphenols from skin [15].
12. Anabel Gonzalez et al. published on 25 April 2023 in open access article named nutrients 2023, studies effects of hydroxytyrosol, tyrosol and oleocanthol present in extra virgin olive oil on antigenic profile of cultured human fibrioblasts [11].
13. Sandeep R. Verma et al. published on 17 January 2018 in Journal of Traditional and Complementary Medicine (2019) page 5–14, states that coconut oil is used as moisturizer since many centuries in topical region. Clinical research showed that by calming and moisturizing the skin, virgin coconut oil improves the symptoms of skin conditions [12].
14. Paul Vossen published in Aug 2007 in Journal of Hort Science Vol. 42 Issue 5 Page No 1093–1099. In this article History, Production and Characteristics of Olive oil are stated. It is noted that the origin of Olive oil is speculated to be seria or possible sub-Saharan Africa [14].

OBJECTIVES

The main objective of our multipurpose cracked heel cream is to provide effective treatment for dry and damaged heels.

The effects are as follows,

1. Multipurpose crack heel creams are designed to deeply hydrate and moisturize the skin which helps restore the skin's natural moisture balance.

2. This cream contains ingredients that promote the heeling of cracked skin by stimulating cell regeneration.
3. To provide soothing property that helps to reduce irritation, discomfort caused by cracked heels.
4. Regular use of crack heel cream can help to improve the elasticity of skin making it less prone to cracking in future.
5. This crack heel cream collectively works to improve the health and appearance of the feet while alleviating discomfort associated with cracked heels.

NEED OF WORK

1. It is cost effective.
2. They have negligible side effects.
3. Ingredients are easily available (Commonly used in day-to-day life).
4. Such herbal ingredients show more than single effect (Figure 6).

PLAN OF WORK

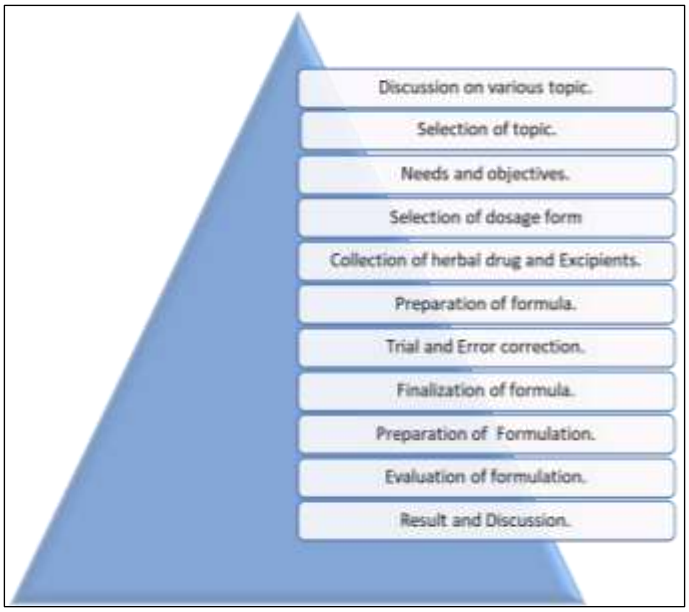

Figure 6. Plan of work.

EQUIPMENT AND MATERIAL LIST

Table 1. Materials list.

S. N.	Material
1	Kokum butter.
2	Olive oil.
3	Sandalwood oil.
4	Coconut oil.
5	Methyl paraben.
6	Bees wax.
7	Xanthan gum.

Table 2. Equipment list.

S. N.	List of Equipment
1	Weighing balance.
2	Mortar pesters.

3	Beaker.
4	Test tube.
5	Conical flask.
6	Magnetic stirrer.

Plant and Excipients Profile API (Active Pharmaceutical Ingredient)
Kokum Butter

Figure 7. Kokum butter.

Extra Virgin Coconut Oil

- *Synonym:* Mediterranean oil, Greek oil.
- *Biological Source:* Olive oil is obtained from fruit of olea europaea L. which is native to the Mediterranean region.
- *Family:* Oleaceae.
- *Chemical Constituents:* Fatty acid [Oleic acid (55–83%), linoleic acid (3.5–21%), palmitic acid (7.5–20%)], vitamin K, Oleuropein (Figure 8).

Extra Virgin Coconut oil

- *Synonym: Garcinia indica*, wild mangosteen or red mangosteen.
- *Family:* Clusiaceae family, also known as the mangosteen family (Figure 7).
- *Chemical Constituents:* The polyisoprenylated benzophenol derivatives, Garcinol and isogarcinol, Hydroxycitric acid, Xanthochymol, and Garsubilin guttiferon, isoform, combinogenol and mangostin.

Figure 8. Extra virgin olive oil.

Extra Virgin Coconut Oil

- *Synonym:* Copra oil, Cocos oil.
- *Biological Source:* Coconut oil is extracted from endosperm of coconut fruit when its fully mature and dry (Figure 9).
- *Family:* Arecaceae.
- *Chemical Constituents:* Triglycerides, Lauric acid, Myristic acid, Palmitic acid, Capric acid, Vitamin E.

Figure 9. Extra virgin coconut oil.

Formulation of Cream

The formulation of the cream begins with the preparation of the oil phase, where Kokum butter, Extra Virgin Olive oil, Extra Virgin Coconut oil, and Beeswax are weighed and gently heated to 60–70°C until fully melted with continuous stirring. Simultaneously, the aqueous phase is prepared by dissolving Borax and Xanthan gum in water, heating to 60°C, and adding Methyl Paraben while stirring to ensure uniform dissolution. The emulsification process involves gradually adding the heated aqueous phase to the heated oil phase with continuous stirring to form a stable emulsion, which is then cooled to room temperature. Sandalwood oil is added as a fragrance agent, and the mixture is stirred to ensure uniform distribution. The final cream is transferred to sterile containers, labeled, and stored in a cool, dry place (Tables 1–4).

EVALUATION TESTS

1. *Organoleptic Evaluation:* For organoleptic evaluation parameters, such as color, appearance, and odor was carried out which helped in the visual identification of the cream.
2. *Determination of pH:* A solution was prepared from the cream by weighing 0.5 g of cream and dissolved in 50 ml of water. When a proper solution was prepared, and pH was determined by using a pH meter. The apparatus was calibrated first using buffers of 4, 9 and 7 PH.
3. *Thermal Stability Test:* The obtained formulation's thermal stability was assessed at three distinct temperatures: 20°C, 30°C, and 40°C.
4. *Spreadability Test:* Spreadability was determined by taking 1 g of cream and placing it on a circle glass plate of 1cm diameter another glass plate was placed on it and a certain weight was applied on the upper plate for 5 min. The consistent spread of cream, free of lumps or unmixed particles, is a measure of spread ability. Three readings were averaged and calculated.
5. *Sensitivity and Irritation Test:* To check for anomalies, the produced formulation was applied to the 1 cm of skin on the feet that were exposed to the sun for four to five minutes.

6. *Washability Test:* To determine whether the prepared cream was washable, a tiny amount was applied to the skin and then submerged under running water.
7. *Determination of Viscosity:* A Brookfield viscometer operating at 20 rpm and 25 degrees was used to determine the viscosity. The average of the three readings was obtained after the determinations were made in triplicate.
8. *Determination of Type of Smear:* By applying the lotion to the skin's surface, it was ascertained. The kind of film or smear that developed on the skin following cream application was examined.

MECHANISM OF ACTION

Role of Extra Virgin Olive Oil

When extra virgin olive oil is applied topically it promotes angiogenesis by raising intravascular endothelial growth factor (VEGF) levels and can permanently reduce inflammation when combined with Lauric acids in coconut oil. Additionally, extra virgin olive oil enhances cell viability by boosting antioxidant capacity and mitochondrial membrane potential (MMP), which is necessary to preserve keratinocyte mitochondrial function. Because they promote epithelial regeneration, olives can aid in the healing of wounds.

Role of Extra Virgin Coconut Oil

Fatty acid is present in extra virgin coconut oil which fills the gap between skin cells and makes the skin feel smooth and soft. Application of Extra virgin Coconut oil increases the expression of Aquaporin-3 (AQP3) which helps in skin hydration and wound healing. It reconstructs human epidermis (RHE) and NIH3T3 cells. Extra virgin coconut oil is a non-skin irritant and non-phototoxic. Extra virgin coconut oil has anti-inflammatory properties by reducing inflammatory indicators and strengthening the skin's protective layer.

Role of Kokum Butter

Kokum butter is known for its emollient properties, which help to soften & smooth the Skin, Kokum butter is relatively lightweight and absorbs quickly into the skin without leaving a greasy residue. Kokum butter comprising triglycerides and fatty acids which allows it to penetrate the skin's lipid bi-layer, and its emollient property fills the gap between skin cells which makes the butter to absorb into the skin.

RESULT

When applying a combination of kokum butter, coconut oil and olive oil, they work to protect the skin. Extra virgin olive oil promotes angiogenesis by raising intravascular endothelial growth factor (VEGF) levels and can permanently reduce inflammation than coconut oil which fills the gap between skin cells and makes the skin feel smooth and soft then kokum butter absorbs quickly into the skin without living a greasy residue. When these three ingredients are added together they also give other effects, such as wound healing (it can heal small cuts and scratches), cooling effect, moisturizing (these three combined penetrates the outermost layer of epidermis, i.e., stratum corneum and provides hydration to skin), Anti-inflammatory, Anti-oxidant effect, thus it can also be called as multipurpose cream.

Table 3. Pharmaceutical ingredients with their synonyms, uses, and chemical formulas.

Names	Synonyms	Uses	Chemical Formula
Methyl paraben	P-hydroxybenzoic acid	Preservative	$C_8H_8O_3$
Extra Virgin Olive oil	Greek oil	Skin toner	$CH_3(CH_2)nCOOH$
Extra Virgin Coconut oil	Cocos oil	Antioxidant	$C_{12}H_7Cl_3O_2$
Bees wax	Paraffin wax	Emollient	$C_{15}H_{31}COOC_3OH_{61}$
Sandalwood oil	Oleum Santalum	Perfuming agent	$C_{13}H_{22}O$
Borax	Sodium borate	stabilizer	$Na_2H_{20}B_4O_{17}$
Xanthan gum	Corn sugar gum	Thickening agent	$C_{35}H_{49}O_{29}$

Table 4. Formulation table for 20 gm cream.

Ingredients	Quantity Taken	Role
Kokum butter	3.2 gm	Moisturizer
Extra Virgin Olive oil	3.5 ml	Antioxidant
Extra Virgin Coconut oil	3.5 ml	Anti-inflammatory
Xanthan gum	3 gm	Thickening agent
Borax	0.16 gm	Stabilizer
Bees wax	1 gm	Emollient
Water	5 ml	Diluent
Perfume	0.62 ml	Fragrance
Methyl paraben	0.02 gm	Preservative

CONCLUSIONS

In conclusion the formulation of the crack healing polyherbal cream which protects the skin from cracks and can also act as multipurpose cream to protect the skin from various skin problems. The polyherbal cosmetic formulation is safe to use and can be utilized to provide a protective barrier for skin. This multipurpose polyherbal cream show good consistency and spread ability, homogeneity, pH, non-greasiness and no phase separation over research period. This multipurpose polyherbal cream is used to moisturize dry skin while also clearing pores of waste. The water phase provides additional conservation of the skin. It is easy to moisten clean and store. The use of herbal extracts in a polyherbal cream that is safe, non-toxic, and improves patient compliance would be far more acceptable than synthetic ones. The current investigation suggests that creating a polyherbal cream is feasible. The cream also becomes cost effective because it was made with a simple component and procedure.

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