

<https://doi.org/10.33472/AFJBS.6.9.2024.1055-1070>



**African Journal of Biological Sciences**

Journal homepage: <http://www.afjbs.com>



Research Paper

Open Access

## **FORMULATION DEVELOPMENT AND IN VITRO EVALUATION OF MULTIPURPOSE POLY HERBAL COSMETIC FACE CREAM**

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Article History

Volume 6, Issue 9, 2024

Received: 21 Mar 2024

Accepted : 22 Apr 2024

doi: 10.33472/AFJBS.6.9.2024.1055-1070

**ABSTRACT**

Cream is described as semisolid emulsions of the water in oil (w/o) or oil in water (o/w) type or topical medications that can be applied to the skin are meant to be applied externally are called creams. The face skin is the area of the body that is most exposed to diseases, sunlight, and environmental pollutants. Herbal extracts have long been utilized for their therapeutic qualities, and because of its natural source and lack of adverse effects, their application in contemporary medicine is becoming more and more common. The main objective of this research study is to formulation development and in vitro evaluation of multipurpose poly herbal cosmetic face cream by using neem, tulsi, carrot and aloe vera. In conclusion experiments (F1-F5) of different batches of polyherbal face cream were developed. Based on appearance, pH, homogeneity, roughness, spreadability, dye test, dilution test, irritancy test, washability, phase separation, consistency, and viscosity, as well as the fact that it meets all the criteria needed for a high-quality cream, F3 was chosen as the best formulation out of all of the others.

**Keywords:** Multipurpose face cream, Herbal cosmetics, polyherbal components

**INTRODUCTION** <sup>[1, 2]</sup>

The face skin is the area of the body that is most exposed to diseases, sunlight, and environmental pollutants. The most prevalent skin conditions include psoriasis, allergies, warts, acne, rashes, and eczema (atopic dermatitis) to shield the skin from dangerous microbes and stop the spread of numerous skin infections. Cream is described as semisolid emulsions of the water in oil (w/o) or oil in water (o/w) type or topical medications that can be applied to the skin are meant to be applied externally are called creams.

Herbal extracts have long been utilized for their therapeutic qualities, and because of its natural source and lack of adverse effects, their application in contemporary medicine is becoming more and more common. Herbs have contributed significantly to human evolution. Hippocrates published a great deal on the curative properties of herbal therapy more than 2000 years ago. Prior to the 20th century, the majority of therapies in medicine were derived from plants, plant extracts, and other plant products. The first fully synthetic medications were developed in the 1900s. Even still, three-fourths of the world's population still mostly uses plants to heal illnesses decades later. In a similar vein, a large number of modern medications are made from compounds found in plants.

Plant parts are employed in Ayurvedic medicine, which has a three millennium-long history. These forms include powders, decoctions, and pressed juices.

Herbs with antibacterial qualities that have been employed include neem, tulsi, carrot seed and aloe vera gel. Tulsi possesses antiviral and antibacterial qualities, while neem is well-known for its antifungal, antibacterial, and antiviral qualities. Aloe vera is well-known for having antibacterial and antifungal qualities and the carrot seed oil is generally used as a antiaging. When these herbs are taken together, they can have a synergistic effect that increases their antibacterial effectiveness compared to when they are used alone. Thus, the purpose of this study is to create and assess a multipurpose, polyherbal face cream containing aloe vera gel, tulsi, and neem.

Cosmetics are meant to improve the appearance and beauty of the skin while shielding it from external and internal hazardous substances. The artificial or natural components used in a skin care product to preserve the skin's elasticity, health, texture, and integrity; these include moisturizing, photo protection, and type I collagen reduction. This cosmetic feature results from the components included in skin care products, which serve to control the skin's qualities over an extended period of time and lessen the generation of free radicals in the skin. The market for herbal cosmetics is growing quickly. The availability of new substances, the financial incentives for creating profitable products, consumer demand, and an improved comprehension of skin physiology are the reasons for this expansion. Plant components that are utilized to prepare cosmetics should possess a range of qualities, such as antibacterial, antiseborrheic, emollient, anti-inflammatory, and antioxidant. Products made using herbs are said to have fewer adverse effects than those made with synthetic ingredients.

The poly herbal face cream described in this study article contains tulsi, neem, carrot seed and aloe vera four natural plants with antibacterial, antifungal, antiaging and anti-inflammatory qualities. Neem, the main component of this soap, has medicinal properties. The immune-modulatory properties of neem leaf and extract include anti-inflammatory, anti-ulcer, antimalarial, effects that include antifungal, antibacterial, and anticarcinogenic. Tulsi is the most effective medicinal substance. The main component of this multi-herbal face cream is tulsi, which also increases stamina, lowers inflammation, lowers stress levels, and has antifungal qualities. Using tulsi's main antifungal properties to make face cream is beneficial. Because it soothes, hydrates, and softens skin, aloe vera is a common element in cosmetics. Aloe vera is a rich source of amino acids, including leucine and isoleucine, as well as vitamins A, C, E, B, choline, B12, and folic acid, which have cleaning properties and antioxidant activity. Carrots, or *Daucus carota*, are a useful herb that have long been prized for their abundance in natural vitamin A content as well as other vital vitamins. Carrot seed oil has been

shown to have anti-aging, renewing, and rejuvenating properties. because it encourages the growth of new cells and lessens wrinkles. It functions as the skin's natural rejuvenator and toner. Creams are classified as semisolid emulsions and come in a variety of forms, including cleansing, moisturizing, vanishing, and all-purpose creams.

### **Cosmetics** <sup>[3]</sup>

The Greek word "kosmesticos," which meaning to embellish, is the source of the English word "cosmetic." In actuality, the word "cosmetics" originated in Ancient Rome. Usually, they were made by female slaves called "cosmetae," which is where the word "cosmetics" originated. The purpose of cosmetics is to improve attractiveness.

The history of makeup spans several centuries. The Egyptians are credited as being the first people to employ cosmetics to improve their appearance. Back then, makeup was limited to body paint or rudimentary eye colouring. These days, cosmetics is significant for both men and women. The desire of many people to remain youthful and appealing has led to a growth in the significance of cosmetics. These days, cosmetics are widely accessible in the form of creams, lotions, lipsticks, scents, eye shadows, nail polishes, hair sprays, and more. They are created with the appropriate quantity of wax and cocoa butter. In many situations, creams serve as a facial cleanser. Anti-aging treatments that help keep skin looking younger for years have been produced more recently.

For dry, chapped, and hard skin, cosmetic creams act as a skin nourishment. It primarily lubricates, softens, and cleanses the skin of undesirable filth. Dry creams are utilized in the production of soap and gelatin, which serves as the skin's foundation. Certain occupations, such as those in show business, emphasize the significance of looks.

They use a range of cosmetics to preserve their appearance because they understand how important it is to look well. According to recent studies, cosmetics can help shield the skin from the sun's harmful rays. Many producers of cosmetics have taken advantage of people's need to shield their skin and themselves from the sun's rays. Many producers of cosmetics have taken advantage of people's need to shield their skin and themselves from the sun's rays. The Significance of Makeup These days, cosmetics help us feel more confident and improve our appearance. We can see that cosmetics are highly important in our daily lives because there are more of them on the market now than ever before.

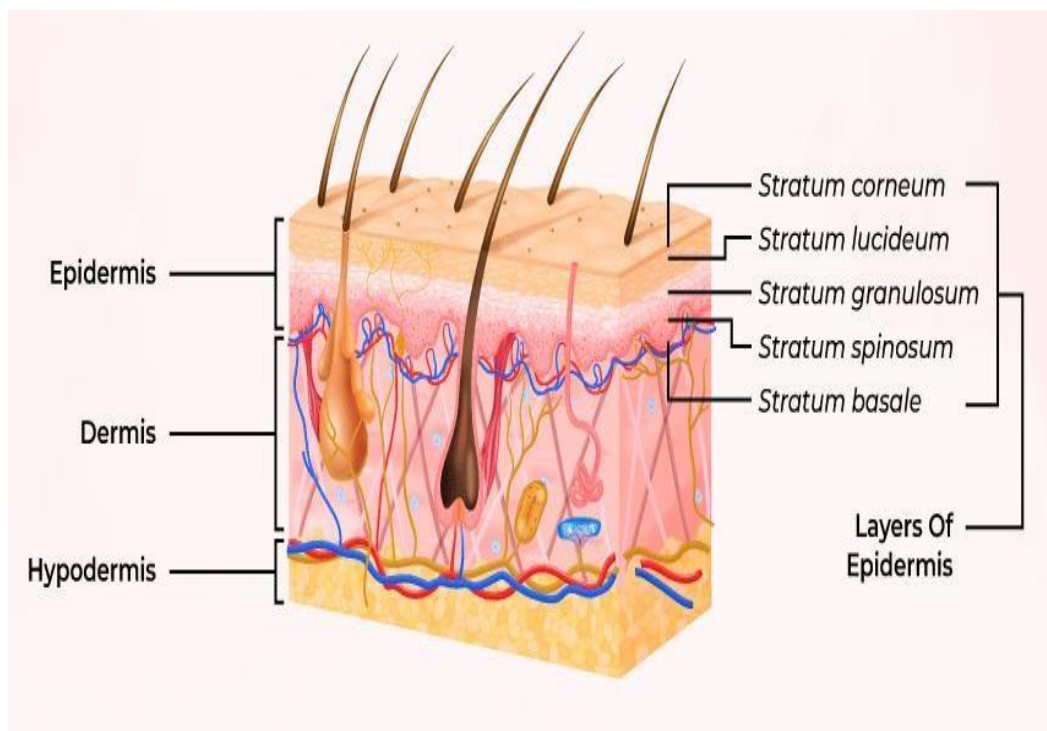
### **Topical drug delivery** <sup>[4]</sup>

Even though intact skin is far less permeable than other tissues, a variety of substances can still penetrate the skin to some extent, albeit at relatively slow rates. The factors that

affect how quickly drugs and other substances can penetrate the skin include the penetrant's physiochemical properties, the skin's condition, and the type of vehicle. Antiseptic, antifungal, anti-inflammatory, and skin emollient medications are used topically, mostly for local action, and have protective properties. Although systemic medication delivery can also be accomplished by this approach. Drugs administered topically may diffuse through the skin via sweat glands, sebaceous glands, or hair follicles, but the main route of penetration is through the stratum corneum's numerous lipid bilayers, albeit at a very sluggish pace. The goal of topical delivery is to contain the drug's pharmacological effects to the skin's surface or within the skin.

### Physiology of human skin <sup>[5]</sup>

The skin is the largest sensory organ in the body. It serves as a barrier to protect the body's organs and gathers sensory data from the surroundings. It also helps the body to remain at a healthy temperature. the skin's numerous unique cell types and structures. The three main layers are the dermis, epidermis, and hypodermis (figure 1).



**Figure 1:** Skin's Layer <sup>[6]</sup>

Each layer affects the skin's overall functions in a distinct way. We need to safeguard the skin from skin conditions and misalignment because it serves a specific purpose for

maintaining body health. Skin conditions are a prevalent category of illness. It harms people of all ages, including the young and old, in a variety of ways. Sun exposure, trauma, allergies, infections, and other factors can all lead to skin issues.

### **Cream** <sup>[7,8]</sup>

Cream is described as semisolid emulsions of the water in oil (w/o) or oil in water (o/w) type or topical medications that can be applied to the skin are meant to be applied externally are called creams. Creams are characterized as "viscous liquid or semi-solid emulsions of either the water-in-oil or oil-in-water type," with varying consistency depending on the type of oil and water used.

Creams serve a variety of cosmetic functions, including cleansing, beautifying, enhancing appearance, protecting, and medicinal. The localized impact of these topical preparations is intended to deliver the medication to the mucous membrane or the skin's underlying layer. These treatments are intended to be applied topically to improve the drug's site-specific delivery to the skin for skin conditions.

Pharmaceutical creams are used for a wide range of cosmetic applications, including skin protection against bacterial and fungal infections, skin cleansing, beautifying, modifying look, moisturizing, and mending cuts, burns, and wounds. Because of how simple they are to apply to the skin and remove, creams have long been regarded as an essential component of cosmetic products. Although human skin is often damaged, it is also capable of healing itself. However, infection is a possibility, particularly in the early stages of an injury, and the natural healing process may take some time. In these situations, the wounded site can be treated with medicated creams to promote faster healing and prevent infection.

Since creams are made using methods developed in the pharmaceutical business, they are regarded as pharmaceutical products. Both medicated and unmedicated creams are widely used to treat dermatoses and other skin problems. People can utilize creams that are allopathic, herbal, or ayurveda based on the demands of their individual skin issues. They include one or more drug ingredients that have been spread or dissolved in an appropriate base. Based on phases, creams can be categorized as o/w or w/o types of emulsions. Traditionally, semisolid formulations that are either oil-in-water (such as vanishing cream) or water-in-oil (such as cold cream) have been referred to as "cream."

### **Types of skin creams**

They are divided into two types:

- i. Oil-in-Water (O/W) creams which are made up of tiny oil droplets distributed in a continuous phase, and an emulsion known as an oil-in-water (O/W) emulsion is one in which the oil is distributed as droplets throughout the aqueous phase.
- ii. Water-in-Oil (W/O) creams which are made up of tiny water droplets scattered throughout an oily phase. The emulsion is of the water-in-oil (W/O) type when the dispersed phase is water and the dispersion medium is oil.

### **Herbal Creams** <sup>[9-11]</sup>

Herbal extracts are now utilized in cosmetics to improve appearance and beauty. Cosmetic herbs are categorized by the body or body part they are used to (skin, hair, nails, mouth, etc.) as well as by their dosage forms (sugar, powder, soap, medicine, etc.). Creams are semi-solid emulsions used in cosmetics that are applied to the skin or mucous membranes. Disappearing creams are low-fat moisturizers that vanish off the skin.

It leaves no imprints on the skin, only softening it. An aqueous phase and an oil phase make up the formulation of Vanishing Cream, an oil-in-water emulsion. Creams can be liquid or combined with water and readily cleaned, depending on the water to oil ratio. Probably the most prescribed medication is this one.

The majority of patients find it less sticky, greasy, and untidy, making it easier to use. Up until the introduction of allopathic medicine, the development of traditional medicine was responsible for maintaining global health for centuries. The latter method, which employs current understanding of biology and chemistry for diagnosis and therapy, is quickly gaining traction and is ruling the medical industry. Nonetheless, due to the widespread belief that traditional preparations mostly herbal remedies are safe, their use is growing.

Allopathic medicine uses conventional single-molecule medications, which might have detrimental side effects. The body's first exposed boundary is the skin. While aging skin does not directly harm individuals, it can have detrimental consequences on the brain. Many cases of premature aging are caused by the skin's interaction with the environment, either directly or indirectly. It is thought that sun exposure causes a noticeable, unfavourable alteration to the skin. Because of the excessive synthesis of oxygen, the photochemical reaction shields the skin from the damaging effects of UV light.

**Advantages of herbal creams:**

Herbs are valuable because of their ability to prevent disease and promote health. Some of these benefits are listed below;

- 1) Natural cosmetics are made of natural materials and typically don't include artificial components that are bad for the skin.
- 2) Using safe and efficient natural cosmetics is safe. They have been dermatological tested, shown to be hypoallergenic, and are safe to use anywhere, at any time. People don't have to worry about acne or skin irritation because they are made of natural substances.
- 3) Fits all types of skin Whether you have fair or brunette complexion, you can find natural makeup products like lipstick, eye shadow, and foundation that work well for your face. You can use it without worrying about your skin growing worse if you're a woman with oily or sensitive skin.
- 4) Lots of choices. These goods are worth more than imitation goods. They are inexpensive when on sale and are offered at reasonable costs. The adverse effects and growing costs of contemporary medicine have led to the World Health Organization estimating that 80% of the world's population relies on natural goods for medical care.
- 5) No adverse reactions. Acne and skin irritation can be caused by synthetic beauty products. They may cause skin to become oily or dry and clog pores. You don't have to worry about these when you use natural cosmetics. To prevent negative consequences, utilize natural products that are accessible to everyone, anywhere, at any time.

**Disadvantages of herbal creams:**

- 1) Contact dermatitis can be brought on by chemicals and/or additives irritating the skin.
- 2) Some substances are not easily absorbed by the skin.
- 3) There could be allergic responses
- 4) The cost of using medications that require less plasma exceeds the benefit.
- 5) Massive epidermal denaturation is caused by the epidermis enzyme.
- 6) Making use of medications that Very tiny plasma sizes make it difficult for the skin to absorb drugs.

**MATERIALS AND METHODS****Collection of plant material**

The proposed study of aloe vera, carrot seed, neem and tulsi leaves were collected from the local herbal garden of the B. R. Nahata College of Pharmacy from the Mandsaur (Madhya Pradesh). They were powdered after being shade dried to eliminate any



remaining moisture. They were employed to create the formulation after being extracted using a soxhlet extractor and maceration methods with the necessary solvents. Additionally, the remaining necessary elements were acquired.

### Herbal ingredients and excipients with their properties

**Table 1:** Properties of herbal ingredients and other excipients <sup>[12-14]</sup>

| S. No. | Materials       | Property  |
|--------|-----------------|---|
| 1      | Neem            | Aid in the healing of wounds and reduce redness, irritation, and dryness of the skin. Antibacterial |
| 2      | Tulsi           | Antibacterial, antifungal and skin-luminous.  |
| 3      | Carrot seed oil | Anti-ageing, anti-inflammatory  |
| 4      | Aloe vera       | Moisturizer, reduce acne and pimples  |
| 5      | Bees wax        | An Emulsifying agent, stabilizer and gives thickness to the cream                                   |
| 6      | Methylparaben   | Preservative  |
| 7      | Liquid paraffin | Lubricating agent   |
| 8      | S.M twenty      | Fragrance   |
| 9      | Distilled Water | Vehicle   |

### Extraction Process

#### Extraction of neem leaves

After being gathered, neem leaves were cleaned with distilled water and dried in a hot air oven. Leaves were pulverized once they had properly dried. Next, 5g powdered neem leaves at 80–100 degrees Celsius. A volumetric flask containing dimethyl sulfoxide was placed on a REMI RSB-12 mechanical shaker and agitated for three days. After heating the mixture to between 80 and 100 °C on a water bath, it was concentrated to a volume of 20 millilitres and filtered through muslin fabric to eliminate any remaining contaminants. Next, the preparation was done using the filtrate, or filter product, which is a clear solution or clear extract of neem leaves <sup>[15]</sup>.

**Extraction of *Daucus carota* (carrot)**

The carrot fruits were pulverized after being air dried. Petroleum ether and ethanol were used in succession to extract 500g of *Daucus carota* from the soxhlet extractor. After the extract was concentrated to eliminate the solvent, it was allowed to dry at a regulated temperature and under low pressure before being gathered and kept for further use in the formulation <sup>[16]</sup>.

**Extraction of tulsi leaves**

After gathering, tulsi leaves were cleaned in distilled water and dried in a hot air oven. After the leaves had dried properly, they were pulverized. Subsequently, a volumetric flask containing 1g of Tulsi leaf powder and 10 ml of dimethyl sulfoxide was placed on a REMI RSB-12 mechanical shaker and shaken for three days. After a few minutes of heating the solution over a water bath between 80 and 100 degrees Celsius, the mixture was concentrated to 5 millilitres and filtered through a muslin cloth to get rid of any remaining contaminants. Next came the filtrate, or filter product, which was made using a clear Tulsi leaf extract or solution <sup>[17]</sup>.

**Extraction of aloe vera gel**

Aloe Vera leaves that were fresh, healthy, and mature were gathered and cleaned with distilled water. The outer portion of the leaf was then longitudinally cut using a sterile knife following the proper drying of the leaves in a hot air oven. The colourless parenchymatous tissue, or aloe vera gel, was then cut out using a sterile knife. The fibres and contaminants are then filtered out using muslin cloth. The preparation then made use of the filtrate, also known as the filter product, which is a transparent aloe vera gel <sup>[18]</sup>.

**Formulation of cream**

In the boro-silicate glass beaker, heat the liquid paraffin and beeswax at 70 °C and keep it there (Oil phase). Melt methylparaben in distilled water in a different beaker, then bring the temperature of this beaker to 70°C to dissolve the methylparaben and obtain a transparent solution. (Phase of water). Add this prepared aqueous phase into the heated oily phase. After that, add a measured amount of carrot, Tulsi, Neem, and aloe vera gel and stir well till a creamy cream forms. Then, as a scent, add a few drops of S. M. Twenty. Place the cream onto the slab & stir it in a geometric pattern to combine all the components and give it a smooth texture, and add a few drops of distilled water as needed. This kind of the process of making the face cream is called the extemporaneous method. Table 2 illustrated the formulation of cream

**Table 2:** Formulation of cream

| S. No. | Materials       | F1     | F2     | F3     | F4     | F5     |
|--------|-----------------|--------|--------|--------|--------|--------|
| 1      | Neem            | 0.2 ml | 0.3 ml | 0.4 ml | 0.5 ml | 0.6 ml |
| 2      | Tulsi           | 0.3 ml | 0.6 ml | 0.9 ml | 1.2 ml | 1.5 ml |
| 3      | Carrot seed oil | 0.2 ml | 0.3 ml | 0.4 ml | 0.5 ml | 0.6 ml |
| 4      | Aloe vera       | 0.3 ml | 0.6 ml | 0.9 ml | 1.2 ml | 1.5 ml |
| 5      | Bees wax        | 1.5 gm | 2 gm   | 2.5 gm | 3 gm   | 3.5 gm |
| 6      | Methylparaben   | 0.01 g | 0.02 g | 0.03 g | 0.04 g | 0.05 g |
| 7      | Liquid paraffin | 6 ml   | 8 ml   | 10 ml  | 12 ml  | 15 ml  |
| 8      | S.M twenty      | Q. S.  | Q. S.  | Q. S.  | Q. S.  | Q. S.  |
| 9      | Distilled Water | Q. S.  | Q. S.  | Q. S.  | Q. S.  | Q. S.  |

**In Vitro Evaluation of poly herbal face cream** <sup>[19-20]</sup>**1) Appearance**

The colour, pearlescence, and roughness of the cream were used to evaluate its appearance.

**2) pH of the Cream**

Standard buffer solution should be used for pH meter calibration. After dissolving about 0.5 g of the cream in 50 millilitres of distilled water, the pH was determined with a pH meter.

### 3) Homogeneity

Both physical contact and visual inspection were used to test the compositions for homogeneity.

### 4) Viscosity

The formulations' viscosity was assessed using spindle number 7 and a Brookfield viscometer operating at 100 RPM.

### 5) Consistency

One way to assess the consistency of the formulation was to just touch the cream.

### 6) Phase separation

The made cream was kept in a covered container, out of direct sunlight, and ranged from 25 and 100 °C in temperature. After that, phase separation was noticed for 24 hours out of 30 days. Any adjustments made to the stage of separation were documented and confirmed. The results indicate that there was certainly no phase separation in any of the three formulations.

### 7) Spreadability

The cream was compressed to a uniform thickness by applying 100 g of weight for five minutes after it had been split between two glass slides. There was weight in the pan.

The time it took to separate the two slides or the distance the top glass slide travelled over the bottom slide was used to gauge spreadability. Additionally, spreadability was investigated by applying a predetermined quantity of cream to the skin's dorsal surface and monitoring for spreadability.

### 8) Washability

To perform the washability test, just a little of cream was placed to the hand, which was subsequently cleaned with tap water. It was easy to wash each of the three formulations.

### 9) Irritancy test

A one square centimetre area on the right hand dorsal surface was used for this purpose. The time was noted once the cream was applied to the specified area. Irritability, erythema, and edema were recorded on a 24-hour basis at regular intervals.

### 10) Test for type of emulsion

Dye test:

Cream is combined with crimson red colour. Apply a dab of cream to a tiny slide, cover it with a cover slip, and look at it under a microscope. If scatter

The O/W emulsion is visible when the ground is colourless and the globules appear red. It is W/O type if it is inverted, that is, globules seem colourless and the ground is red in colour. However, the outcome showed that it is an O/W emulsion.

Dilution test:

A small amount of cream was diluted with oil in a test tube. The type of emulsion is W/O if the oil is evenly dispersed throughout the mixture without causing any emulsion breakage. In a test tube, a small amount of cream was taken and diluted with water. An emulsion is classified as O/W type if water is added to it evenly without causing it to break. However, the outcome showed that the emulsion is O/W.

### RESULT AND DISCUSSION

The polyherbal cream was observed for its appearance, pH, homogeneity, roughness, spreadability, dye test, dilution test, irritancy test, washability, phase separation, consistency, viscosity and the results of all formulation were tabulated in table 3.

**Table 3:** Evaluation Parameter of all formulation

| S. No. | Evaluation Parameter      | F1               | F2           | F3           | F4           | F5               |
|--------|---------------------------|------------------|--------------|--------------|--------------|------------------|
| 1      | Appearance                | Good             | Good         | Excellent    | Good         | Good             |
| 2      | pH of the Cream           | 5.0              | 5.3          | 5.8          | 6.1          | 6.3              |
| 3      | Homogeneity and roughness | Little roughness | No roughness | No roughness | No roughness | Little roughness |
| 4      | Viscosity                 | 580 cps          | 595 cps      | 610 cps      | 625 cps      | 640 cps          |

|    |                          |                                  |                                  |                     |                         |                     |
|----|--------------------------|----------------------------------|----------------------------------|---------------------|-------------------------|---------------------|
| 5  | Consistency              | Semisolid and dry to little soft | Semisolid and dry to little soft | Semisolid and soft  | Semisolid and more oily | Semisolid and dry   |
| 6  | Phase separation         | No Phase Separation              | No Phase Separation              | No Phase Separation | No Phase Separation     | No Phase Separation |
| 7  | Spreadability            | Poor                             | Good                             | Excellent           | Good                    | Very Poor           |
| 8  | Washability              | Washable                         | Washable                         | Washable            | Washable                | No Washable         |
| 9  | Irritancy test           | Nil                              | Nil                              | Nil                 | Nil                     | Little irritancy    |
| 10 | Dye test & Dilution test | O/W                              | O/W                              | O/W                 | O/W                     | O/W                 |

## CONCLUSION

In experiments (F1-F5), different batches of polyherbal face cream were created including neem, tulsi, carrot, and aloe vera among other plants and components. Based on appearance, pH, homogeneity, roughness, spreadability, dye test, dilution test, irritancy test, washability, phase separation, consistency, and viscosity, as well as the fact that it meets all the criteria needed for a high-quality cream, F3 was chosen as the best formulation out of all of the others.

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