FORMULATION AND EVALUATION OF HERBAL FACIAL CREAM

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INTRODUCTION

The term 'Cosmetic' originates from a Greek word 'kosmesticos', meaning to adorn. As per Drugs and Cosmetic Act 1940 and rule 1945, "Cosmetics is defined as any article intended to be rubbed, poured, sprinkled or sprayed on, or introduced into, or otherwise applied to, the human body or any part thereof cleansing, beautifying, promoting attractiveness, or altering the appearance and includes any article intended for use as a component of cosmetics".[1]

Herbal cosmetics referred as products formulated by various natural herbal ingredients these are used as a base in the preparation of effective herbal cosmetics. The best thing of the herbal cosmetics is that it is purely made by the herbs and shrubs and thus is side-effects free. The natural content in the herbs does not have any side effects on the human body; instead provide the body with nutrients and other useful minerals. [1]

Cream is defined as semisolid emulsion of the water in oil (w/o) or oil in water (o/w) type that are meant to be applied externally. Cream is divided into two categories: water in oil emulsion and oil in water. Its primary function is to stay longer at the application site when applied to the outer or superficial layers of the skin. A skin cream's purpose is to protect the skin from various environmental factors and weather conditions while also providing calming effects. There are various kinds of creams, including massage, night, vanishing, cleansing, cold, and hand and body creams. [2]

ANATOMY OF SKIN [3]

The skin is the largest organ in the human body and comprises approximately 8% of total body mass. The skin provides an essential barrier between the external environment and internal body contents. It protects against mechanical, chemical, osmotic, thermal, UV damage and microbial invasion.

The skin is composed of two main layers: the epidermis, made of closely packed epithelial cells, and the dermis, made of dense, irregular connective tissue that containsblood vessels, hair follicles, sweat glands and other structures. Beneath the dermis lies the hypodermis, which is composed mainly of loose connective and fatty tissues.

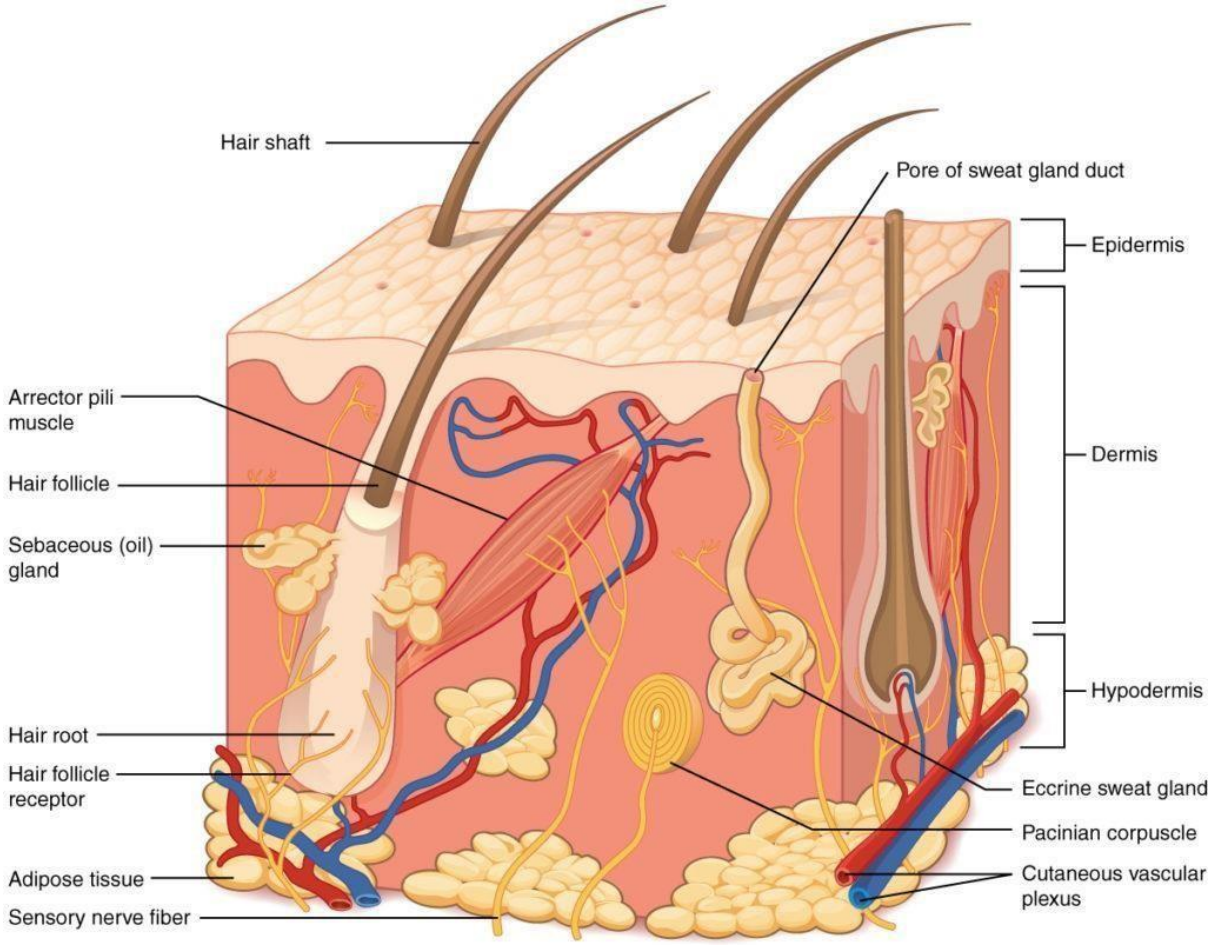

Figure no. 1: Structure of skin

(https://courses.lumenlearning.com/suny-ap1/chapter/layers-of-the-skin/)

Epidermis

The epidermis is the most superficial layer of the skin and is composed of stratified keratinised squamous epithelium, which varies in thickness in different parts of the body. It is thickest on the palms of the hands and soles of the feet. There are no blood vessels or nerve endings in the epidermis. The epidermis can be divided into five layers:

a. Stratum basale

b. Stratum spinosum

c. Stratum granulosum

d. Stratum lucidum

e. Stratum corneum

Dermis

The dermis is tough and elastic. It is formed from connective tissue and the matrix contains collagen fibres interlaced with elastic fibres. The dermis is immediately deep to the epidermis and is tightly connected to it through a highly corrugated dermo-epidermal junction. The dermis has only two layers, superficial papillary layer and the deeper reticular layer.

Hypodermis

The hypodermis also called subcutaneous tissue, contains the cell known as fibroblasts, adipose tissue, connective tissue, larger nerves, blood vessels and macrophages It is derived from mesoderm but unlike the dermis it is not derived from mesoderm's dermatome region. It is the major site of fat storage in the body.

FUNCTIONS OF SKIN

- **Protection:** The skin acts as the body's first line of defense, forming a physical and waterproof barrier against:
  - Pathogens (bacteria, viruses, and fungi) o Mechanical and chemical injury.
  - Harmful ultraviolet (UV) radiation from the sun (melanin pigment in the skin helps with this).

- **Temperature Regulation (Thermoregulation)**: The skin helps maintain a constant internal body temperature through:
  - Sweating: Evaporation of sweat from the skin surface cools the body when it gets too hot.
  - Blood vessel dilation and constriction: Blood vessels in the dermis can widen (dilate) to release heat or narrow (constrict) to conserve heat.

- **Sensation:** The skin is a major sensory organ, equipped with a network of nerve endings and specialized receptors that detect:
  - Touch and pressure.

- **Vitamin D Synthesis:** The skin plays a crucial role in bone health by

synthesizing vitamin D3 (cholecalciferol) when exposed to sunlight's UV rays, which is then converted into its active form by the liver and kidneys.

- **Storage and Excretion:** The skin's deeper layers (hypodermis) store fat and water, which provide insulation and an energy reserve. The sweat glands also excrete minor amounts of waste products like urea and salts.
- **Immunity:** Specialized immune cells (Langerhans cells) in the epidermis help detect foreign substances and fight off infections, supporting the overall immune system.
- **Wound Healing:** The skin orchestrates the complex process of wound healing following trauma to restore the protective barrier.

CREAMS

Creams are semisolid dosage forms that are administered topically to the skin or cosmetic purposes. Face cream is used topically to achieve a softening and cleansing effect. Skin creams possess two main purposes: they protect the skin from environmental pollutants and provide skin with a calming effect.

HERBAL CREAMS [4]

A Herbal cream is a semi-solid cosmetic or medicinal preparation made with plant-based extracts and oils combined with a cream base , that is applied topically to the skin. This cream having the therapeutic properties of natural ingredients for benefits like moisturizing, smoothing and treating skin conditions and aim to avoid harsh synthetic chemicals found in conventional preparations. Different tinctures, extracts, and essential oils can be found in herbal creams. Vitamins and minerals are natural nutrients found in herbal creams, which are free of synthetic additives that might be toxic.

TYPES OF HERBAL CREAMS [4]

They fall into two categories:

a) Oil-in-water (O/W) Creams: Creams that consist of small oil droplets distributed in a continuous phase are referred to as oil-in-water (O/W) creams. Whereas, an emulsion containing oil droplets dispersed across the aqueous phase is referred to as an oil-in-water (O/W) emulsion.

b) Water-in-oil (W/O) Creams: creams consisting of water combined with oil in a continuous phase, are referred to as waterin-oil (W/O) creams. The emulsion is considered to be water-in oil (W/O) type when the dispersed phase is water and the dispersion medium is oil.

Advantages [5]

- Easy to spread on the skin surface.
- Creams are less greasy, easily washable and easy to apply.
- Achievement of efficacy with lower total daily dosage of drug by continuous drug Input.
- Convenient and easy to apply.
- Avoidance of first pass metabolism.

Disadvantages [5]

- Possibility of allergic reactions.
- Poor permeability of certain drugs through the skin.
- Skin irritation of contact dermatitis may occur due to the drug and or excipients.
- Can be used only for drugs which require very small plasma concentration for action.
- Drugs of larger particle size not easy to absorb through the skin.

AIM

The aim of the study is to formulate herbal facial creams using leaf extract of ***Azadirachta indica*** (neem) and root extract of ***Withania somnifera*** (ashwagandha), plants known for their significant antimicrobial, antioxidant and skin-soothing properties. The formulations intended to act as moisturizer, reduce acne and reduce skin irritation. This study also aims to evaluate the formulated creams for their antimicrobial and antioxidant activities to validate their skincare potential.

PLAN OF WORK

To achieve the objectives a systematic plan of work has been conducted in the following manner:

1. Review of literature.
2. Collection and authentication of ***Azadirachta indica*** (leaves) and ***Withania somnifera*** (root)
3. Extraction of ***Azadirachta indica*** (leaves) and ***Withania somnifera*** (root) by maceration method.
4. Formulation of herbal facial creams.
5. Evaluation of herbal facial creams.
    - Physical examination
    - Homogeneity
    - Determination of pH
    - Viscosity
    - Washability
    - Spreadability test

- Antimicrobial activity
- Antioxidant activity

REVIEW OF LITERATURE

1. Kumar D Rajora G. et al. (International Journal of Research in Pharmacy and Allied Science 2022) formulated a polyherbal face cream using Aloe vera, Vitamin E oil, and Rose oil to enhance skin hydration and glow. The results demonstrated that Vitamin E oil provided antioxidant protection by preventing lipid peroxidation, while Rose oil improved skin brightness and softness. The prepared cream was found to have excellent stability and aesthetic appeal. [2]

2. Anne Waugh (Journal of Drug Delivery and Therapeutics 2021) conducted a study on the structural organization of the human skin, emphasizing the functional differences between the epidermis, dermis and hypodermis. The study reported that keratinocyte turnover, barrier lipid formation and melanocyte distribution play essential roles in maintaining epidermal integrity and photoprotection. The authors concluded that age-related decline in epidermal lipid synthesis significantly weakens the skin barrier.[3]

3. Bijauliya RK. et.al (International Journal of Pharmaceutical Sciences Review and Research 2023) conducted a study to prepare a herbal anti-acne cream containing Aloe vera and Curcuma aromatica (wild turmeric). The study concluded that the combination of Aloe vera gel and wild turmeric exhibited potent antimicrobial and antioxidant activity, reducing acne lesions and improving skin texture. The formulation was evaluated for pH, spreadability, stability, and homogeneity, and found to be suitable for topical application.[4]

4. Goyal A. et.al (International Journal of Pharmaceutical Sciences Review and Research 2023) found that the skin's extensive network of sensory receptors offers an important sensory advantage, allowing detection of temperature, pain, touch and pressure. This contributes to protection against harm and enhances interaction with the environment.Their findings also revealed that sensory receptor density declines with age, resulting in reduced tactile sensitivity and slower injury detection.[5]

5. Al-Busaid MM.et al. (Journal of Drug Delivery and Therapeutics 2021) investigated the potential of Curcuma aromatica (Kasturi Manjal) in cosmetic formulations. Their findings showed that curcuminoids and volatile oils present in the rhizome act as natural antioxidants and skin lightening agents. The study concluded that the herb can reduce pigmentation and fade scars, promoting an even skin tone and natural glow. [6]

6. Sailer R. et al. (International Sciences and Research 2021) developed a herbal cream incorporating Tea Tree Oil for its antimicrobial and anti-inflammatory properties. The study revealed that Melaleuca alternifolia oil is effective against Propionibacterium acnes and Staphylococcus aureus, thereby reducing acne formation. The addition of Tea Tree Oil enhanced the cream's antiseptic and skin-cleansing properties. [7]

7. Spritzler F. (Research Journal of Topical and cosmetic Sciences 2020) evaluated the effect of Coconut oil and Beeswax as base ingredients in herbal creams. Coconut oil was found to possess strong emollient and antimicrobial properties due to the presence of lauric acid, while beeswax provided ssa protective film over the skin, improving moisture retention and texture. The formulation was stable and enhanced overall skin smoothness. [8]

8. Saliha Rizvi. et al. (International journal of creative research thoughts 2020) studied the antioxidant role of Vitamin E oil in topical herbal preparations. Results indicated that Vitamin E effectively neutralizes free radicals, slows down signs of aging, and helps in the healing of acne scars and minor skin damage. The incorporation of Vitamin E improved the product's shelf life and oxidative stability. [9]

9. Sahu P. et al. (Journal of medicinal plant studies 2019) focused on the combined use of Aloe vera and Rose oil for developing a natural moisturizing and brightening cream. Their study revealed synergistic effects in improving skin elasticity, reducing dullness, and promoting natural radiance. The combination also showed mild

antibacterial and antiinflammatory properties beneficial for acne-prone skin. Priyanka D. et al. (2018) conducted phytochemical and stability studies on formulations containing Borax as an emulsifying and stabilizing agent in herbal creams. It was observed that borax not only improved cream consistency and shelf life but also maintained a favorable pH suitable for skin applications. [10]

10. **Kulkarni S. et al. (International journal of Innovative Science and Research Technology 2023)** investigated the dermatological benefits of Withania somnifera (Ashwagandha) extract in topical creams. The study revealed that the withanolides present in Ashwagandha significantly reduced oxidative stress markers and enhanced fibroblast proliferation, promoting collagen remodeling. Treated subjects showed noticeable improvement in fine lines, skin firmness, and texture. The formulation demonstrated excellent stability and non-irritating properties, making it suitable for anti-aging applications. [11]

11. **Albaqami JJ et al. (International Journal of Pharmaceutical Sciences Review and Research 2023)** evaluated the skin-brightening potential of Curcuma aromatica and Rosa damascena extracts in cosmetic formulations. Results demonstrated a marked decrease in melanin synthesis through tyrosinase inhibition and reduction of oxidative byproducts. Participants experienced improved skin radiance, reduced dark spots, and eventoned complexion. The formulation also provided significant antioxidant activity, supporting its use in brightening and glow-enhancing cream.[12]

12. **Induja Kalyana Sundaram. et al. (Asian Journal of Pharmaceutics 2020)** conducted a comparative study on the wound-healing and scar-reduction potential of Aloe vera gel and Vitamin E enriched creams. The combination formulation accelerated epithelialization, reduced inflammation, and improved collagen deposition. Clinical observations showed improved scar fading, reduced pigmentation, and better skin texture. The study supported the topical use of Aloe-Vitamin E blends for post-acne scar management. [13]

13. **Ng YJ. et al. (Asian Journal of Pharmaceutical Research and Development 2020)** evaluated the role of Cocos nucifera (Coconut Oil) and Beeswax in enhancing the emollient and barrier-protecting properties of herbal creams. The study confirmed that coconut oil's lauric acid content provides antimicrobial benefits, while beeswax forms a breathable protective layer that prevents trans epidermal water loss (TEWL). The herbal base improved skin hydration, glow, and suppleness, making it suitable for dry and aging skin. The formulation maintained physical and chemical stability throughout storage. [14]

MATERIALS AND METHODS

NEEM [15]

Figure.no.2: Neem

Biological source : Neem consists of the dried leaves, bark or seeds of ***Azadirachta indica.***

Family : Meliaceae

Synonyms : Indian lilac, Margosa

Geographical source : India, Pakistan, Sri Lanka, Bangladesh, Burma, tropical Africa.

Morphological characters

Odour : Characteristic, slightly aromatic.

Taste : Very bitter.

Appearance : Leaves are pinnate, lanceolate; bark is rough, fissured; seeds are oval.

Size : Leaves 20–40 cm long; seeds 1–2 cm.

Shape : Leaflets lanceolate; seeds ovoid.

External surface : Bark greyish-brown, rough; leaves bright green and glossy.

Internal surface : Bark reddish-brown with fibrous texture.

Fracture : Fibrous and tough.

Chemical constituents

Neem leaves contains azadirachtin, nimbin, nimbidin, nimbinene, quercetin, tannins, fatty acids.

Uses

- Potent antibacterial, antifungal, antiviral, and antiparasitic.
- Anti-inflammatory and antioxidant.
- Used in skin infections, acne, dandruff, and wound healing.
- In cosmetics: toner, anti-acne, anti-pigmentation agent.

ASHWAGANDHA [16]

Figure.no.3: Aswagandha

(https://healthmatters.nyp.org/what-is-ashwagandha/)

Biological source	: Ashwagandha is the dried roots of *Withania somnifera.*
Family	: Solanaceae
Synonyms	: Indian ginseng, Winter cherry
Geographical source	: India, Pakistan, Sri Lanka, Mediterranean regions

Morphological characters

Odour	: Earthy, horse-like.
Taste	: Bitter and slightly astringent.
Appearance	: Roots cylindrical, straight or slightly curved, yellowish-brown
Size	: Roots 7–10 cm in length, 0.5–2 cm in diameter.
Shape	: Tapering, unbranched.
External surface	: Rough, longitudinal wrinkles.
Internal surface	: Yellowish-white and starchy.
Fracture	: Short and mealy.

Chemical constituents

Ashwagandha contains Withanolides, withaferin A, alkaloids, sitoindosides, starch, saponins.

Uses

- Adaptogen, anti-stress & rejuvenator.
- Anti-inflammatory and antioxidant.
- Used in anti-aging creams, healing formulations, and tonics.
- Supports collagen and elasticity in skin.

WILD TURMERIC [17]

Figure.no.4 : Wild turmeric

(https://www.healthshots.com/beauty/natural-cures/meet-kasturi-manjal-or-wild- turmeric-canbrighten-your-skin-like-no-other/)

Biological source : Dried rhizomes of Curcuma aromatica.
Family : Zingiberaceae
Synonyms : Kasthuri turmeric, Aromatic turmeric
Geographical source : India (Kerala, Tamil Nadu), Sri Lanka, Myanmar.

Morphological characters

Odour : Strong, aromatic, more fragrant than regular turmeric
Taste : Mild bitter and pungent.
Appearance : Rhizomes small, oval, yellowish to deep orange inside
Size : 3–6 cm length, 1–2 cm thickness.

Shape : Ovoid or cylindrical.

External surface : Brownish with rings and wrinkles.

Internal surface : Deep yellow with radial striations.

Fracture : Short and tough.

Chemical constituents

Wild turmeric contains Curcuminoids, essential oils (turmerone, zingiberene), starch, resins.

Uses

- Skin brightening, anti-inflammatory, anti-acne.
- Reduces pigmentation and scars.
- Aromatic cosmetic ingredient.

ALOE VERA [18]

Figure.no.5: Aloe vera

(https://www.health.com/aloe-vera-juice-benefits-7550606)

Biological source : Dried latex or fresh gel from leaves of Aloe barbadensis Miller.

Family : Asphodelaceae / Liliaceae

Synonyms : Kumari, Ghritkumari

Geographical source : India, Africa, USA, Mexico, Mediterranean regions.

Morphological characters

Odour : Mild, characteristic.

Taste : Gel – bland; latex – bitter.

Appearance : Succulent leaves, thick, fleshy, green with spines.

Size : Leaves 30–60 cm long.
Shape : Lanceolate leaves with tapering ends.
External surface : Smooth, green with occasional white spots.
Internal surface : Transparent gel.
Fracture : Fibrous in rind, soft in inner gel.

Chemical constituents

Aloe vera contins Aloin, aloesin, polysaccharides (acemannan), vitamins, enzymes, saponins, minerals.

- Hydrating, soothing, cooling.
- Anti-inflammatory and wound healing.
- Common in moisturizers, face packs, gels, sunscreens.

VITAMIN E OIL [19]

Figure.no.6: Vitamin E Oil

(https://cureskin.com/articles/how-should-you-use-vitamin-e-oil-for-face/)

Biological source : Natural vitamin E (tocopherols) extracted from vegetable oils such as wheat germ oil and sunflower oil
Family : (Not applicable – it is a compound)

Synonyms : Tocopherol, α-tocopherol

Geographical source : Extracted globally from plant oils.

Morphological characters

Odour	:	Mild, oily.
Taste	:	Neutral to slightly nutty.
Appearance	:	Thick, viscous, yellowish oil.

Chemical constituents

Vitamin E Oil contains Alpha-tocopherol, gamma-tocopherol, tocotrienols.

- Powerful antioxidant.
- Prevents oxidative skin damage.
- Used in anti-aging creams, serums, scar reduction.
- Moisturizing and skin barrier–protective.

TEA TREE OIL [20]

Figure.no.7: Tea Tree Oil

(https://bebodywise.com/blog/tea-tree-oil-for-skin-whitening/)

Biological source	:	Steam-distilled essential oil from leaves of Melaleuca alternifolia.
Family	:	Myrtaceae
Synonyms	:	Melaleuca oil
Geographical source	:	Australia, some parts of Southeast Asia.

Morphological characters

Odour : Strong, medicinal, camphoraceous.

Taste : Pungent and bitter (not for ingestion).

Appearance : Clear to pale yellow volatile oil.

Chemical constituents

Tea Tree Oil contains Terpinen-4-ol (main), cineole, α-terpineol, pinene.\

- Strong antibacterial, antifungal, antiseptic.
- Used in acne control, dandruff treatment, anti-inflammatory creams.
- Reduces itching and irritation.

COLLECTION OF PLANT

The leaves of *Azadirachta indica* (neem) and roots of *Withania somnifera* (ashwagandha) were collected locally and authenticated by Dr. Aathira Chandran, Professor and HOD, Department of Dravyaguna Vijnana, MVR Ayurveda Medical College, Parassinikkadavu, Kannur. The leaves of *Azadirachta indica* and roots of *Withania somnifera* were washed thoroughly and shade dried for 72 hrs. The dried leaves and roots were powdered and enclosed in an airtight container.

Figure no.8: Dried neem leaves

Figure no.9: Dried powder of Neem leaves

Figure no.10: Dried Ashwagandha roots

Figure no.11: Dried powder of Ashwagandha roots

METHOD OF EXTRACTION OF PLANT

Maceration method was used for the extraction of the leaves of *Azadirachta indica*(neem) and the roots of *Withania somnifera* (ashwagandha).

Extraction of *Azadirachta indica* [21]

Dried leaves of *Azadirachta indica* (neem) were powdered using a mixer. 20 g of the powdered leaves were soaked in 200 ml of ethanol in a conical flask. The mixture was kept for 72 hours of maceration with occasional shaking. After the maceration period, the extract was filtered through a muslin cloth. The filtrate was then placed on a hot plate to evaporate the solvent. A soft, concentrated paste of neem extract was obtained.

Figure.no.12: *Azadirachta indica* extract

Extraction of *Withania somnifera* [22]

Dried roots of *Withania somnifera* (ashwagandha) were powdered using a mixer.20 g of the powdered roots were soaked in 200 ml of ethanol. The mixture was macerated for 72 hours with periodic shaking. After 72 hours, the extract was filtered through a muslin cloth. The filtrate was placed on a hot plate to evaporate the solvent. A soft, concentrated paste of ashwagandha extract was obtained.

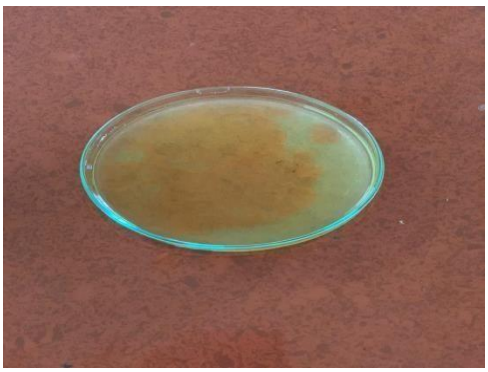

Figure.no.13: *Withania somnifera* extract

PHYTOCHEMICAL SCREENING OF EXTRACTS

The ethanolic extract of *Azadirachta indica* and *Withania somnifera* were subjected to the following qualitative tests:

Azadirachta indica:

Test for alkaloids [23]

- **Wagner's test**

  To 1ml of extract solution, 0.5 ml of Wagner's reagent (Iodine in potassium iodide) was added and mixed. A reddish-brown precipitate shows the presence of alkaloid.

- **Dragendorff's test**

  Equal volume of Dragendorff's reagent (Potassium bismuth iodide) and extract solution was mixed on a clean test tube. Formation of orange, brown precipitate indicates the presence of alkaloid.

Test for flavonoids [23]

- **Ferric chloride test**

  Extracts were treated with aqueous solution and add few drops of 10% ferric chloride solution. Appearance of green indicates the presence of flavonoids.

- **Shinoda test**

  To 2-3 ml of extract solution, add a small piece of magnesium ribbon and add 2-3 drops of concentrated HCL. Allow the mixture to stand for a few minutes.
  Appearance of pink or red indicates the presence of shinoda .

Test for terpenoids [23]

- **Ferric chloride test**

  Extracts were treated with aqueous solution and add few drops of 10% ferric chloride solution. Appearance of green indicates the presence of flavonoids.

- **Libermann burchard test**

  Take 2 ml of extract in a dry test tube, add 2ml of acetic anhydride to the solution, mix gently. Slowly add 1-2 drops of concentrated sulphuric acid. Appearance of green colour indicates the presence of triterpenoids.

Test for Saponin [23]

- **Froth test**

  To 2ml of extract add 2ml of distilled water. Shake the test tube vigorously for 30 seconds. Allow stand for 10 minutes. Stable persistent froth that lasts for 10 minutes, presence of saponins.

Withania somnifera :

Test for carbohydrates [23]

- **Fehling's test**

  Mix 1 ml Fehling's A and Fehling's B in a test tube and shake well. Add 2ml of the extract into the same test tube. Heat the mixture gently in a boiling water bath for 2-5 minutes. A brick- red precipitate indicates presence of carbohydrates.

- **Molisch test**

Add 2ml of extract into a clean test tube, add 2-3 drops of Molisch reagent and mix gently. Add concentrated sulphuric acid along the side of test tube so that it forms a separate layer beneath the extract . A purple ring at the junction of the two layers indicates presence of carbohydrates.

Test for flavonoids [23]

- **Shinoda test**

To 2-3 ml of extract solution, add a small piece of magnesium ribbon and add 2-3 drops of concentrated HCL. Allow the mixture to stand for a few minutes. Appearance of pink or red indicates the presence of shinoda .

Test for alkaloids [23]

- **Wagner's test**

To 1ml of extract solution, 0.5 ml of Wagner's reagent (Iodine in potassium iodide) was added and mixed. A reddish-brown precipitate shows the presence of alkaloid.

- **Mayer's test**

To 0.1 ml of Mayer's reagent (Potassium mercuric iodide), 0.5 ml of extract solution was added and mixed in a test tube. A pale-yellow precipitate indicates the presence of alkaloid.

Test for Starch [23]

- **Iodine solution test**

Take 2ml of the extract in a test tube, add 2-3 drops of iodine solution to the test tube,

Shake well. A blue-black colour indicates the presence of starch.

FORMULATION OF HERBAL FACIAL CREAMS

Herbal facial creams were formulated using extracts of ***Withania somnifera*** (ashwagandha) and ***Azadirachta indica*** (neem) as active herbal ingredients. Wild turmeric was included for its natural skin-brightening and antimicrobial properties. Beeswax and coconut oil from the oil phase, while borax and distilled water from the aqueous phase. Aloe vera gel was incorporated for its soothing, hydrating and healing effects on the skin. Tea tree oil was added for its strong antibacterial and anti-acne activity, while vitamin E oil provides antioxidant protection and enhances skin repair. Rose oil was added for fragrance.

Table no.1: Formulation of Herbal Facial Creams

SI No.	Ingredients	Formulation 1 (F1)	Formulation 2 (F2)	Formulation 3 (F3)
1	Extract of ashwagandha roots	0.5g	1g	1.5g
2	Extract of neem leaves	0.5g	1g	1.5g
3	Wild turmeric	0.5g	1g	1.5g
4	Aloe vera gel	4g	4g	4g
5	Tea tree oil	5 drops	5 drops	5 drops
6	Vitamin E oil	5 drops	5 drops	5 drops
7	Rose oil	9 drops	9 drops	9 drops
8	Borax	0.2g	0.2g	0.2g
9	Beeswax	4g	4g	4g
10	Coconut oil	12ml	12ml	12ml
11	Distilled water	3.8ml	3.8ml	3.8ml

METHOD OF PREPARATION

- Heat coconut oil and beeswax in a china dish at 75 °C and maintain that temperature.
- In another beaker, dissolve borax in distilled water and heat this beaker to 75°C to obtain a clear solution.
- Add aloe vera gel, wild turmeric powder and the measured amounts of herbal extracts (Ashwagandha, Neem) to the aqueous phase and stirring continuously.
- Slowly add the aqueous phase to the oily phase with continuous stirring until a uniform emulsion is formed.
- Once the cream begins to cool slightly, add Vitamin E oil, Tea tree oil and rose oil.Stir until a smooth cream forms.
- Transfer into a clean container and allow it to cool completely.

EVALUATION OF HERBAL FACE CREAMS

The prepared herbal face cream formulations (F1, F2 and F3) were subjected to various evaluation tests:

1. PHYSICAL EXAMINATION [25]

In this test, Formulation 1, 2 and 3 were observed for colour, odour, texture and state

2. HOMOGENEITY [25]

The formulation was tested for homogeneity by visual appearance and by touch.

3. DETERMINATION OF pH [25]

The pH meter was calibrated using standard buffer solution. About 0.5g of the formulations were taken and dispersed in 50 ml distilled water and then pH was measured by using digital meter.

4. VISCOSITY [25]

The viscosity of the formulation was determined at room temperature using Brookfield viscometer equipped with spindle No.63 at a rational speed of 25 rpm. The formulations were placed in 10 ml beaker and the spindle was lowered perpendicularly taking care that the spindle did not touch the bottom of the beaker. The readings were recorded after they became constant.

Figure no. 14: Brookfield viscometer

5. WASHABILITY [25]

A small amount of cream was applied on the hand, and it is then washed with tap water.

6. SPREADABILITY TEST [25]

The spreadability expressed in terms of time in seconds taken by two slides to slip off from the cream, placed in between the slides under certain load. Lesser the time taken for the separation of the two slides, better the spreadability. Two sets of glass slides of standard dimension were taken. Then one slide of suitable dimension was taken and the cream formulation was placed on that slide. Then either slide was placed on the top of the formulation. Then a weight or certain load was placed on the upper slide so that the cream between the two slides was pressed uniformly to form a thin layer. Then the weight was removed and excess of formulation adhering to the slides was scrapped off. The upper slide was allowed to slip off freely by the force of weight tied to it. The time taken by the upper slides slip off was noted.

Spreadability = m x l/t

Where, m = Standard weight which is tied to or placed over the upper slide

l = length of a glass slide t = time taken in seconds.

Figure no. 15: Determination of Spreadability

7. ANTIMICROBIAL ACTIVITY [26]

Medium used: Nutrient agar

Organism used: Bacillus substilis

Standard used: Chloramphenicol disc

Control used: Cold cream

The agar well diffusion assay was used for testing antimicrobial activity. Each sterilized petri plate was pre-seeded with 30ml of respective growth agar medium and 0.2ml of inoculum by spread plate method and dried for 30 minutes. Three wells were bored with the help of sterile borer in the plates containing bacterial culture under aseptic condition. 0.1ml of control sample (F_0), standard sample (Fs) and test sample (F1,F2,F3) were placed on the well of growth medium.

The inoculated plates were then kept under room temperature for 10-15 minutes so as to allow the diffusion of the substances and then incubated at 37+2 °c for 24 hours. The inhibition zones were measured.

8. ANTIOXIDANT ACTIVITY [27]

DPPH scavenging method:

2.5 ml of the samples containing varying concentrations (50, 100, 150, and 200 µg/ml) of extract and standard ascorbic acid (50, 100, 150, and 200 µg/ml) were combined with 3 ml of 24mg of DPPH in 100 ml of methanol. After 30 minutes, the absorbance at 517 nm was measured while the samples were left at room temperature in the dark. By utilizing the formula to compare the test and control results, the percentage inhibition of DPPH radical was computed.

$$\text{Percentage inhibition} = [(A_0-A_1) / A_0] \times 100$$

Where, A_0 = Absorbance of control

A_1= Absorbance of sample/standard

Based on the graph, the drug's concentration (µg/ml) needed to scavenge 50% of the DPPH free radical was determined. The inhibitory concentration of the sample and standard were determined, and the IC50 value was computed and tabulat.

RESULTS AND DISCUSSION

COLLECTION AND EXTRACTION OF PLANT

Leaves of *Azadirachta indica* (Neem) and roots of *Withania somnifera* (Ashwagandha) were collected locally and authenticated by a botanist. The plant materials were washed thoroughly, shade-dried for 72 hours, powdered, and stored in airtight containers for further use.
Preparation of extraction of powdered neem leaves and Ashwagandha roots (20 g each) were soaked separately in 200 ml of ethanol and kept for maceration for 72 hours with occasional shaking. The extracts were filtered using muslin cloth and concentrated by evaporating the solvent on a hot plate to obtain thick extracts.

PHYTOCHEMICAL SCREENING OF THE EXTRACTS

The phytochemical screening of the ethanolic extracts is summarized in the table no. 2, 3 and 4

Table no. 2 – Phytochemical analysis of *Azadirachta indica*

S. no.	Constituents	Test	Result
1	Alkaloids	Wagner's test	+
		Dragendorff's test	+
2	Flavonoids	Ferric chloride test	+
		Shinoda test	+
3	Saponins	Foam test	+
4	Steroids	Salkowski's test	+
		Libermann burchard test	+
5	Terpenoids	Salkowski's test	+

The phytochemical screening of the ethanolic extract of *Azadirachta indica* revealed the presence of various bioactive constituents including alkaloids, flavonoids, saponins, steroids and terpenoids which are responsible for the antioxidant activity.

Table no. 3 – Phytochemical analysis of *Withania somnifera*

S. no.	Constituents	Test	Result
1	Carbohydrates	Molisch's test	+
		Fehling's test	+
2	Alkaloids	Mayer's test	+
		Wagner's test	+
3	Flavonoids	Shinoda test	+
4	Tannins/Phenols	Ferric chloride test	-
5	Saponins	Foam test	-
6	Starch	Iodine solution test	+

The phytochemical screening of the ethanolic extract of *Withania somnifera* revealed the presence of various bioactive constituents including carbohydrates, alkaloids, flavonoids, tannins, saponins and starch which are responsible for the antioxidant activity.

FORMULATED CREAMS

Three formulations F1, F2 and F3 of herbal facial creams were prepared and evaluated. The formulations contains leaves extract of *Azadirachta indica* (neem) and root extract of *Withania somnifera* (ashwagandha)

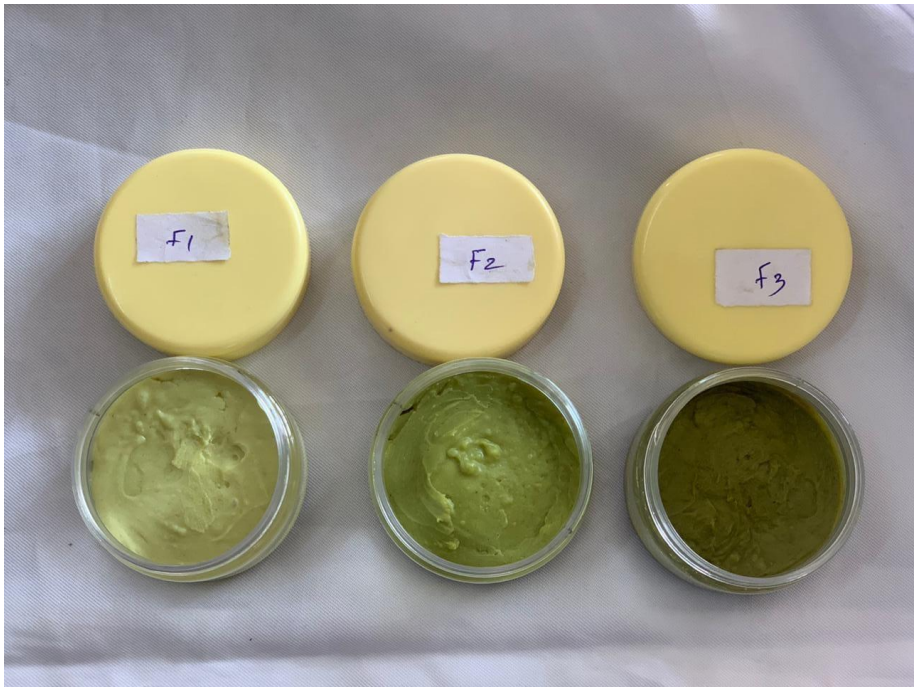

Figure no. 14: Photograph of formulated herbal facial creams

EVALUATION OF FORMULATED HERBAL FACIAL CREAMS

The following evaluation tests were performed on formulated creams.

1. PHYSICAL EXAMINATION

The formulated creams were evaluated for their colour, odour, state and texture by sensory and visual examination. Results are shown in table no 5.

Table no 4: Physical examination of formulated herbal creams

FORMULATION	IMAGE	COLOUR	ODOUR	STATE	TEXTURE
F1		Yellowish green	Pleasant	Semisolid	Smooth
F2		Pale green	Pleasant	Semisolid	Smooth
F3		Dark green	Pleasant	Semisolid	Smooth

2. HOMOGENEITY

The homogeneity of the formulated creams was judged by visual appearance and touch.

All the formulations F1, F2 and F3 were found to be homogenous.

3. DETERMINATION OF pH

pH of the prepared formulations were measured by using digital pH meter at constant temperature and the pH values were found and given in the table no 6.

Table no. 5: pH of the formulated herbal creams

FORMULATION	Ph
F1	5
F2	5
F3	5

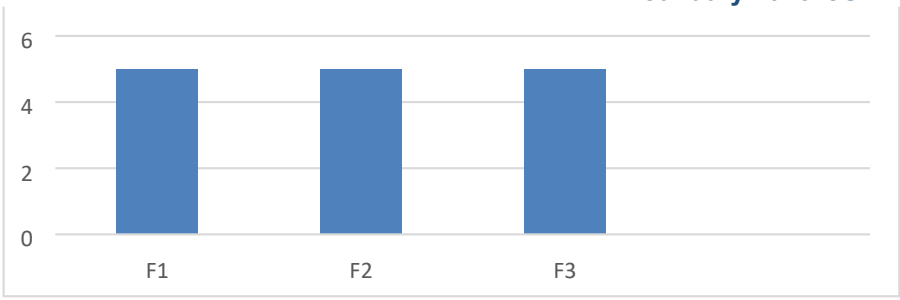

Fig no.15: Histogram of pH

The pH of all the formulations F1, F2 and F3 were found to be in the range 5 that is nearer to skin pH, so it can be safely applied on the skin.

4. VISCOSITY

Viscosity of the formulated creams was measured by using Brookfield viscometer (fig no.13) equipped with spindle No.63 at 25 rpm and the viscosity were found and given in the table no.7

Table no 6: Viscosity of the formulated herbal creams

FORMULATION	VISCOSITY (cP)
F1	4886
F2	4885
F3	4880

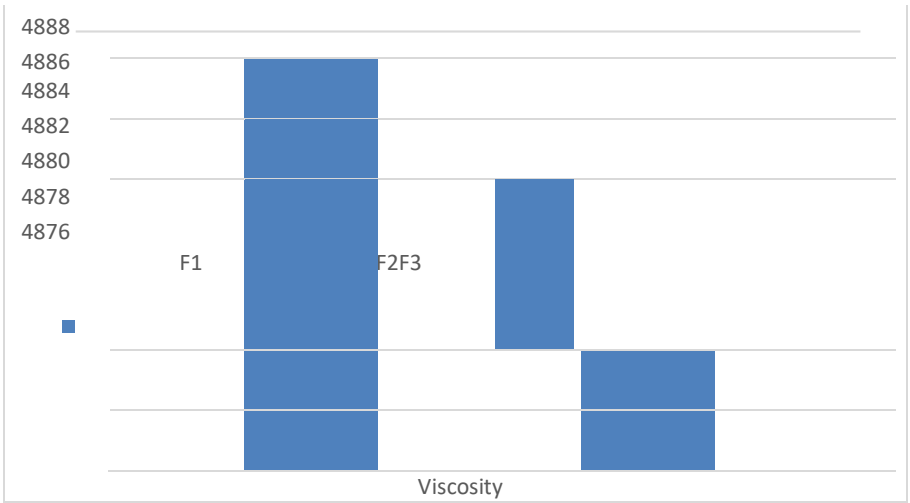

Fig.no. 17: Histogram of Viscosity

Based on the evaluation of the herbal face creams, the values of viscosity were found to be in range of 4880 to 4886 cps, this indicates the formulations are thick and stable.

3. WASHABILITY

Washability test was carried out by applying a small amount of cream on the hand and then washing it with tap water. All the three formulations were easily washable.

1. SPREADABILITY TEST

Table no. 7: Spreadability of the formulated herbal creams

FORMULATION	SPREADABILITY (gm.cm/sec)
F1	6.4
F2	6.5
F3	6.8

The spreadability study indicated that the formulated cream exhibited satisfactory spreadability which is crucial for ensuring uniform application and coverage on skin.

2. ANTIMICROBIAL ACTIVITY

All formulated herbal face cream was subjected to antimicrobial study and zone of inhibition was determined.

Table no. 8: Determination of antimicrobial activity

FORMULATION	ZONE OF INHIBITION (mm)
F1	12
F2	13
F3	15

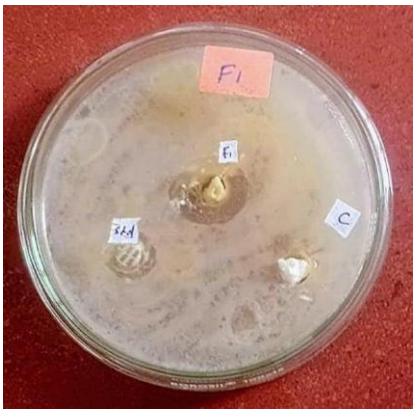

Figure no.19: Antimicrobial study of F1

Figure no.20: Antimicrobial study of F2

Figure no. 21: Antimicrobial study of F3

The zone of inhibition for formulation F1 was found to be 15 mm which is more than the zone of inhibition for other formulations. This shows that formulation F1 has better antimicrobial activity compared to the other formulation F2 and F3.

3. ANTIOXIDANT ACTIVITY

The DPPH method measures the ability of a compound scavenge free radicals. The ability of antioxidants is related to the ability of compound components to donate electrons or hydrogen. Any molecule that can donate electron or hydrogen will react to DPPH. The mechanism will change the colour of solution from purple to yellow. We got yellow coloured solution while adding DPPH solution and the percentage inhibition found to be shown in table no. 9

Table no. 9: Percentage inhibition of DPPH assay of standard

Concentration (µg/ml)	Ascorbic acid	
	Absorbance	% inhibition
50	0.310	62.2
100	0.180	78
150	0.110	86.6

Table no. 10: Percentage inhibition of DPPH assay of Herbal extracts

Concentration (µg/ml)	Neem extract		Ashwagandha extract	
	Absorbance	% inhibition	Absorbance	% Inhibition
50	0.645	21.3	0.670	15.12
100	0.512	37.6	0.530	27.87
150	0.420	48.8	0.460	43.9

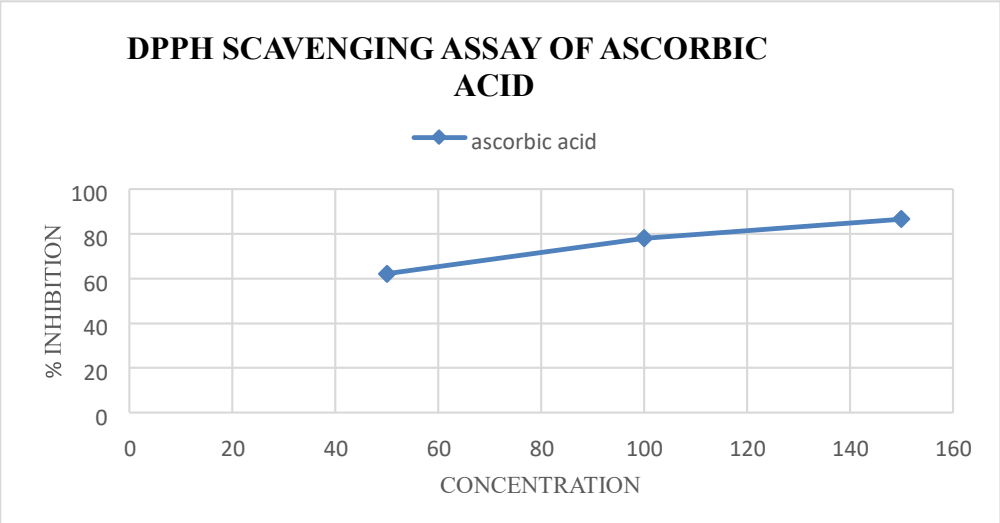

Figure no. 20: DPPH scavenging assay of ascorbic acid

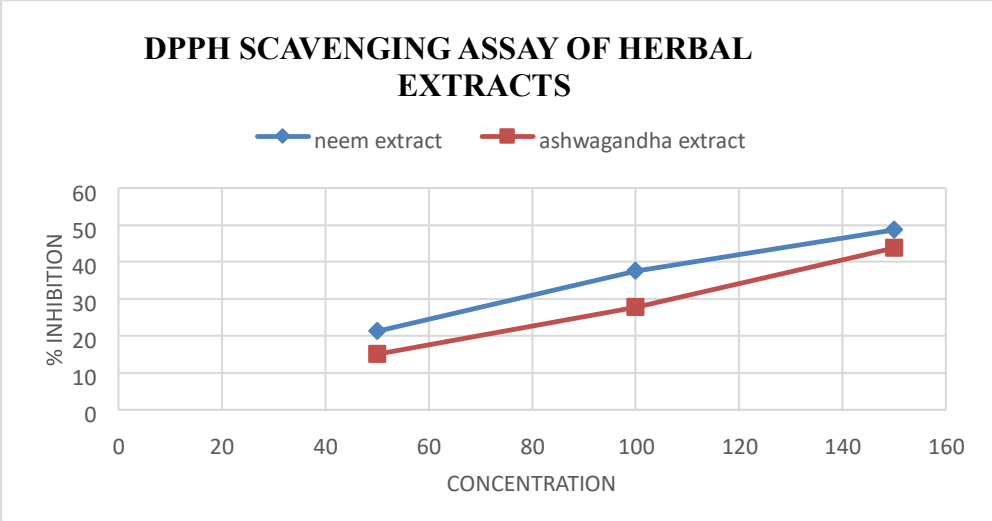

Figure no. 21: DPPH scavenging assay of Herbal extracts

CONCLUSION

The cosmetic industry is rapidly progressing towards the development of herbal cosmetic formulations that are safe, effective, and multifunctional. Increasing awareness about the adverse effects of synthetic cosmetic products has created a demand for natural alternatives that offer multiple skin benefits such as anti-acne, skin brightening, scar fading, and anti-aging activities with minimal side effects. Hence, the present study was undertaken to formulate and evaluate a herbal facial cream using Neem (*Azadirachta indica*), Ashwagandha (*Withania somnifera*), and Wild Turmeric (*Curcuma aromatica*) as active ingredients. In the present investigation, three herbal facial cream formulations (F1, F2, and F3) were prepared and evaluated for various parameters including physical examination, homogeneity, pH, viscosity, washability, and spreadability. All formulations were found to be smooth, homogeneous, semisolid in nature, pleasant in odour, and aesthetically acceptable. The pH of all formulations was found to be around 5, indicating good compatibility with the pH of the skin and as concentration of neem extract was increases the color of cream become darker. The viscosity values were within acceptable limits, providing appropriate consistency for topical application, and all formulations showed good washability.The antimicrobial activity evaluated by the agar diffusion method revealed that all formulations exhibited antimicrobial effects, with formulation F3 showing the highest zone of inhibition, indicating superior anti-acne activity by inhibiting acne-causing microorganisms. The antioxidant activity assessed by the DPPH method demonstrated significant free radical scavenging activity of the herbal extracts in a concentration-dependent manner, supporting their role in preventing oxidative stress, delaying skin aging, and enhancing skin brightness.

From the overall evaluation results, it can be concluded that formulation F3 was found to be the best formulation among F1, F2, and F3 due to its satisfactory physical properties, skin-friendly pH, acceptable viscosity, better spreadability, good washability, enhanced antimicrobial activity, and significant antioxidant potential.

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