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RECENT ADVANCES IN HERBAL FACE PACK FORMULATION AND EFFICACYASSESSMENT

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ABSTRACT

Herbal face packs have garnered significant attention in skincare routines due to their natural ingredients and multifunctional benefits. Incorporating elements like neem, aloe vera, and turmeric, these formulations offer solutions for various skin issues such as acne, wrinkles, and dark circles, while promoting fairness and smoothness. The efficacy of herbal face packs stems from their composition of herbs, flowers, roots, and essential oils, providing essential nutrients and properties beneficial for skin health. The popularity of herbal skincare products reflects a growing consumer preference for natural remedies, driven by their perceived safety and efficacy compared to synthetic counterparts. This transition towards natural ingredients aligns with historical practices from ancient civilizations and traditional medicine systems like Ayurveda and Traditional Chinese Medicine. However, standardizing and validating herbal formulations present challenges due to the complexity of herbal drugs, variations in traditional preparation methods, and the need for feasible quality evaluation methods. Overcoming these challenges requires stringent regulations, international standards, and the development of novel evaluation techniques suitable for natural medicines. In vitro and in vivo efficacy assessment methods play a crucial role in evaluating the safety and effectiveness of herbal face packs, ensuring their quality and efficacy. Overall, the evolution of herbal cosmetics signifies a return to nature in skincare, prioritizing holistic wellness and sustainability.

KEYWORDS: Herbal face packs, Skincare, Natural ingredients, Efficacy assessment,

standardization, Validation, Holistic wellness.

INTRODUCTION

Herbal face pack are essential to skincare regimens since they use natural ingredients and provide a host of advantages. These treatments, which include ingredients like turmeric, sandalwood, and hibiscus, work well for treating skin conditions including wrinkles, acne, pimples, and dark circles. They also help to improve the fairness and smoothness of the skin.[1] Various herbs, flowers, roots, and essential oils are commonly used in their composition, which offers vital nutrients and skin-healthy qualities. The market for personal face care is becoming more and more popular as a result.[2] Coffee and sandalwood powder are two beneficial ingredients in skincare products because of their reputation for reducing cellulite, treating acne, and improving complexion.[3] Herbal extracts are also used in skincare formulations because of their antibacterial, antioxidant, and pigmentation-inhibiting properties. The popularity and effectiveness of herbal skincare and cosmetic products, which are thought to be milder, more biodegradable, and to have less side effects than their synthetic counterparts, are largely attributed to these substances.[4] Herbal face packs are among the safest skincare treatments because of their dual use as cosmetics and pharmaceuticals, providing natural ingredients without any negative consequences.[5] Certain studies concentrate on specific herbal mixes, such as those using Chinese herbal ingredients like ginseng and angelica, which are well-known for their anti-aging qualities.[6] Notably, in an effort to lessen dependency on chemical-laden products, the skincare business is also seeing educational initiatives to educate communities about the benefits of natural skincare ingredients. These programs are crucial for encouraging skin health and customer trust in natural goods.[7] Herbal cosmetics have a long history dating back to ancient societies where using natural ingredients was essential to preserving good health and appearance. The development of herbal cosmetics has been greatly aided by the ancient civilizations of Egypt, Mesopotamia, Greece, Rome, Traditional Chinese Medicine, and Ayurvedic practices from India. These contributions have laid the groundwork for the current trend of using natural ingredients in beauty products.[8] For example, Indian botanicals have influenced the development of herbal cosmetics significantly over the years. Natural beauty enhancement techniques have long been employed, and ingredients like Sandalwood, Turmeric, and Henna, which have their origins in Ayurveda, Unani, Siddha, and Tibetan medicine, have been used for their physiological properties.[9]

The growing popularity of herbal cosmetics among consumers is ascribed to their inclination towards natural therapies and the historical triumph of plant-based cosmetics in various civilizations.[10] Due to their perceived safety, low cost, and simplicity of availability, herbal cosmetics and toiletries have become more popular in the modern era. This trend has been supported by organizations such as the World Health Organization (WHO) and AYUSH (Ayurveda, Yoga & Naturopathy, Unani, Siddha, and Homoeopathy) in India.[11] The benefits of herbal cosmetics over synthetic ones, which are widely recognized, further support this desire. Herbal products reduce oxidative stress-induced skin damage, slow down the aging process, promote collagen formation, preserve keratin structure, and promote healthy skin.[12] The ethnopharmacological significance of the herbal plants used to make toiletry and cosmetics is further highlighted by the historical perspective on herbal cosmetics.[13] Herbal cosmetics are valued for their inherent content derived from herbs and shrubs, which enrich the body with vitamins and minerals that are advantageous to health without causing negative reactions in humans.[14] Herbal cosmetics have evolved from natural beauty regimens of the past to sophisticated formulas enhanced by a range of bioactive plant elements. These components demonstrate the continuing importance of herbal compounds in cosmetics since they are recognized for both their medicinal and skin and hair health-promoting qualities.[15]

Herbal cosmetic products leverage the benefits of natural ingredients, offering a safer and more nourishing alternative to synthetic beauty products. According to 강응수 et al. (2003), herbal extractions such as those from Malva Sylvestris and Melissa officinalis are incorporated into formulations for skin whitening effects and melanin production inhibition.[16] Furthermore, natural components utilized in such compositions are known for their lack of side effects, making herbal cosmetics a preferable choice for consumers seeking organic and mild beauty solutions (A. Patra, 2017).[17] Examples of these products include powders, creams, lotions, and shampoos, which cater to a wide range of cosmetic requirements (Lovepreet Kaur et al., 2021).[18] The growing demand for these natural alternatives is driven by their effectiveness in minimizing skin damage and offering antioxidant, anti-inflammatory, and antiseptic properties, as highlighted by Anshika Garg (2023).[19]

The unique formulations of herbal cosmetics, such as those detailed in a study by 조영호 et al. (2003), leverage herbal medicines like Punica granatum Linne and Trichosantes Kirilowii Maxim for anti-aging and whitening effects, showcasing the multifunctional benefits of natural ingredients.[20] Additionally, herbal elements are playing an increasingly important role

in innovations within cosmetic products, as they combine the remedial effects of pharmaceuticals and the beautifying aspects of cosmetics (A. Goyal et al., 2022).[21] An emphasis on natural humectants like aloe vera gel and honey over synthetic alternatives for the formulation of products such as calamine lotion further demonstrates the industry's shift towards incorporating natural ingredients for enhanced skin health and beauty (Harsha Solanki et al., 2016).[22] The increasing use of herbal cosmetics, as observed in recent studies, is driven by the need for safer, more affordable, and readily available alternatives to conventionally available cosmetics. This shift responds to the broader advocacies by organizations like WHO and the AYUSH department of India for safer cosmetic options (Anuja S. Motule et al., 2021).[23] Consequently, the industry is witnessing a marked preference for natural over synthetic beauty products, propelled by their minimal or nonexistent side effects and compatibility with various skin types, thus championing skin health and holistic well-being.

Synthetic polymers are attractive as excipients for cosmetics formulations as they can be tailored for specific applications. They are often cheaper than natural polymers, can be produced on a large scale with uniformity, and have a long shelf life.[24]

The synthetic polymers most commonly found in cosmetics are acrylic acid-based polymers, polyacrylamides, silicones, and alkylene oxide-based homopolymers and copolymers. Some examples of synthetic polymers used in cosmetics include

- PEG/PPG (Polyethylene glycol/polypropylene glycol): Provide surface activity, humectancy, emollience, enhanced comfort, and protection.
- Poloxamer: Form thermoreversible hydrogels, increase viscosity at body temperature,and act as non-ionic surfactants.
- Poly (Lactic acid) and poly(ε-caprolactone): Used as biodegradable exfoliant microbeadsas alternatives to non-biodegradable polymers like polyethylene.
- Polyurethanes: Provide film formation, elastic properties, shape memory effects, improved surface feel, gloss, and water resistance.
- Polyquaternium: Used for conditioning, antistatic, and film-forming properties.

The advantages of herbal cosmetic products[25,26]

Natural ingredients

- Herbal cosmetics are formulated using natural plant extracts.
- These ingredients are free from harmful synthetic chemicals.
- They are gentle on the Skin and Less likely to cause adverse reactions.

Safety

- Herbal cosmetics are hypoallergenic.
- They are dermatologically tested, making them safe for individuals with sensitive skin.
- Unlike synthetic products, they have minimal side effects.

Antioxidant properties

- Many herbs used in cosmetics have antioxidant properties.
- These antioxidants help protect the skin from oxidative damage caused by free radicals.
- They promote healthier skin.

Anti-Inflammatory effects

- Herbal ingredients possess anti-inflammatory properties.
- They soothe irritated skin, reducing redness and swelling.

Multi-Functionality

- Herbs used in skincare products offer a range of benefits.
- These include antimicrobial, antiseptic, and anti-aging effects.
- They contribute to overall skin health and appearance.

Figure 1: Natural skincare ingredients.

Theoretical background

Herbal face pack compositions are grounded in the long-standing practice of utilizing natural components to offer comprehensive skincare advantages, both in terms of philosophy and

science. In order to create a solution that is acceptable for all skin types and decreases skin concerns like wrinkles and acne while assuring minimum side effects, these formulations prioritize the use of diverse dosages of natural components. This not only makes them a more secure substitute for makeup made of synthetic materials.[27,28] but also emphasizes a dedication to sustainability and well-being. Herbal face packs are made with components that promote blood flow, revitalize the skin, and preserve skin elasticity; they are tried-and-true, non-toxic benefits. Beneficial vitamins and enhanced blood circulation are two reasons why ingredients like hibiscus, sandalwood, turmeric, and neem are praised for their capacity to enhance skin health.[29,30] The formulations emphasize the non-toxic nature of the goods while attempting to create solutions that support smooth, bright skin, as validated by scientific evaluation and verification.[31,32] In order to obtain glowing skin, a blend of pure substances such as multani mitti, turmeric, aloe vera, and sandalwood is frequently used in the manufacture of these formulations. The examination of these formulations' ability to provide a radiant effect without causing skin irritation and preserving stability serves as evidence of their scientific foundation.[33] Herbal face packs, also known as "mukha lepa" (face packs) in Ayurvedic medicine, are used for facial therapy and help to promote skin suppleness, blood circulation, and general wellness. In order to find beneficial substances, this method combines Ayurvedic wisdom with contemporary scientific techniques like TLC Bioautography, demonstrating the connection between traditional knowledge and modern skincare science.[34] The science that is developing to support herbal remedies also looks at the active ingredients that are present in different plants, like banana leaf tannins, polyphenols, flavonoids, and allantoin, with an emphasis on the health and skin-protective qualities of these substances. These studies demonstrate a movement toward natural therapies by supporting the creation of products devoid of synthetic chemicals while also validating the efficacy of these herbal substances.[35] The components used in the formulation are selected with consideration for their therapeutic qualities and advantages for the skin, derived from both scientific studies and conventional knowledge systems such as Ayurveda. The emphasis on nutrient-dense plant-based substances efficiently treats skin issues and has the added benefit of having fewer side effects than synthetic drugs.[36] This scientific method and mindset support a larger movement toward effective, non-irritating, and environmentally friendly herbal cosmetics. Proposing a return to nature in skincare, the herbal face pack formulas exemplify a balance between nature and skin wellness, seeking to deliver cosmetic benefits without the negative consequences associated with synthetic chemicals.[37]

Table 1: Comparing skincare products made of Herbs and Synthetics.

Feature	Herbal skincare formulations	Synthetic skincare formulations	Reference
Ingredients	Natural Ingredientslike turmeric, neem, aloe vera.	Man-made chemicalslike parabens, sulfates.	[38,39]
Side effects	Minimal to no Side effects.	Can cause allergies, dermatitis.	[40,41]
Efficacy	Effective withcontinuous use over time.	Immediate results butmay not be sustainable.	[42,43]
Environmental Impact	Eco-friendly and biodegradable.	Often not eco-friendly; can be harmful to the environment.	[44,45]
Cost	Can be cost-effectiveor expensive depending on rarity ofingredients.	Usually more cost-effective due to mass production.	[46,47]
Skin Health	Promotes overall skinhealth and wellness.	Focused on targeting specific issues, mightnot improve overall skin health.	[48,49]

Natural components play a variety of roles in skin health, providing advantages including antioxidant and anti-inflammatory effects, among others. For example, anti-inflammatory, anti- aging, and antioxidant qualities have been found in colloidal oatmeal, aloe vera, green tea, niacinamide, licorice, arbutin, soy, acai berry, turmeric, and pomegranate, all of which are good for skin care.[50,51] By addressing problems including pigmentation inhibition, antibacterial action, and providing a milder formula than synthetic products, these substances improve skin tone, texture, and appearance while avoiding typical adverse effects.[52] There is a shift towards eco-friendly and health-conscious beauty alternatives as consumers look for natural and effective beauty products.[53] Licorice root, green tea extract, and vitamin C are among the ingredients that are known to have skin-whitening qualities. These ingredients have also been shown to be effective in lowering tyrosinase activity and melanin formation, emphasizing their anti-inflammatory and antioxidant qualities.[54] Additionally, it has been demonstrated that combining natural components in cosmetic formulations can increase the formation of collagen, improve skin hydration, lessen wrinkles, and improve elasticity. This provides a holistic approach to skin care that takes use of the synergistic benefits of natural compounds.[55,56] Micronutrients—like certain vitamins and minerals—are highlighted because of their critical role in preserving the skin's biological function and structural integrity. These are used as active ingredients in cosmetic goods and as therapeutic treatments for skin conditions.[57] Studies such as those conducted on skin health products including glycerinum, solanesol, general flavones from tea leaves, vitamins, beewax, and other

bioactive ingredients show that these ingredients significantly reduce the aging process of the skin and improve its general health.[58,59] This demonstrates the potential and contemporary use of natural compounds in improving skin health and therapy, in addition to their historical use.

Natural Ingredients and Their benefits

Many studies have been conducted on the use of herbal substances in face packs. Of these, neem, aloe vera, and turmeric stand out as popular and effective ingredients in a variety of formulations for the health and care of the skin. For example, a polyherbal face pack that includes, among other herbs, neem, turmeric, hibiscus, and sandalwood has been created, demonstrating the multipurpose use of these components in treating skin conditions.[60] Additional formulations that highlight the holistic approach to accommodating various skin types and enhancing general skin health are Mint, Fenugreek, and Green Tea.[61,62]

Because of its well-known antibacterial and antiseptic qualities, neem (Azadirachta indica) is a mainstay in anti-acne products. Its effectiveness against broad-spectrum antibacterial strains such as E. faecali highlights its potential for use into root canal treatments.[63] In contrast, aloe vera is prized for its healing, calming, and hydrating qualities. It functions as a naturally occurring surfactant in face wash gels and exhibits synergistic effects when mixed with other naturally occurring substances to improve the hydration and suppleness of the skin.[64,65]

Because of its anti-inflammatory, antioxidant, and antibacterial qualities, turmeric (Curcuma longa Linn) is used. Turmeric face packs can be therapeutically effective in treating psoriasis, acne, photoaging, and atopic dermatitis.[66] Aloe vera can also be used in cosmetic formulations for protection and healing because it is an effective way to supply nutrients and phytochemicals to the skin. Aloe vera's aloin component demonstrates antioxidant qualities that are useful in preventing skin infections and treating a range of skin disorders.[67]

Because of their rich phytochemical profiles and multifunctional benefits, these herbal substances, when combined in face packs, not only address specific skin disorders but also improve the appearance and health of skin.[68]

Key herbal elements in many skincare formulas include neem, aloe vera, and turmeric. Each of these compounds has a unique mechanism of action that is good for the health of the skin. Aloe vera gel and neem work synergistically to increase antibacterial and antifungal activities

more efficiently than when used alone, demonstrating a cooperative strategy to improve skin health.[69] Additionally, turmeric's ability to contain curcumin—a powerful ingredient with potent antioxidant, anti-aging, anti-inflammatory, and antimicrobial properties—has drawn attention. These qualities help turmeric effectively treat conditions like acne and lessen the effects of photodamage on the skin.[70] Aloe vera's anti-inflammatory, antioxidant, and antibacterial qualities are responsible for a wide range of skin benefits. In addition to providing necessary vitamins and amino acids for skin regeneration, it aids in wound healing, lowers inflammation, and improves the appearance of the skin overall by revitalizing the skin, easing irritation, delaying the onset of wrinkles, and mending damaged skin cells.[71] Aloe vera exhibits significant benefits in cosmeceuticals by shielding the skin from ultraviolet (UV) rays, promoting skin renewal, and aiding in the formation of new cells, all of which help to shield the skin from environmental stressors.[72] Neem is a promising ingredient in formulations intended to treat acne and other skin problems because it has antibacterial properties that contribute to skin health.[73] Neem, Aloe vera, and Turmeric are excellent in treating a variety of skin conditions, relieving discomfort, and forming a barrier that prevents microbiological deterioration.[74]

Research emphasizes how important it is to include these herbal elements in skincare products because of their proven therapeutic benefits as well as their cellular effects supported by science. These include decreasing the production of free radicals, preventing the deterioration of collagen and elastin, and providing protection from the harmful effects of UV radiation.[75]

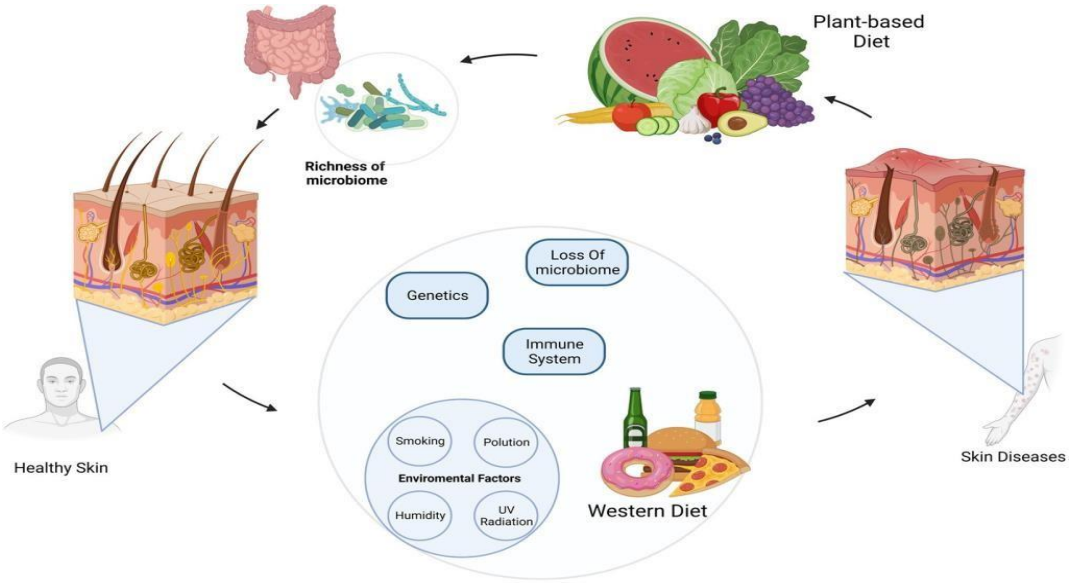

Figure 2: Infographic detailing plant-based Ingredients and Their effects on the skin.

Formulation techniques

The transition from conventional to contemporary formulation techniques signifies a substantial change in the manufacturing and assessment of pharmaceuticals, particularly conventional medications. A possible connection between contemporary processing concepts and conventional Ayurvedic processing methods was discovered through a comparison of traditional and current approaches to the preparation of Ayurvedic medications. The significance of incorporating systematic approaches to understand and enhance conventional formulations without sacrificing their effectiveness and quality was highlighted by this systematic analysis.[76] For example, considerable variations in physicochemical characteristics were found between products prepared utilizing modern and traditional methods for preparing ashwagandharista. Modern techniques sought to analyze and standardize Ashwagandharista in order to save manufacturing time without compromising quality. This strategy demonstrates a broader tendency toward using contemporary methods to increase the production efficiency of traditional medicines.[77] Furthermore, it has been suggested that modernizing traditional herbal medications can improve patient acceptance. In order to ensure the safety, effectiveness, and quality of old formulations, this transformation process entails not only modifying them to meet modern requirements but also reevaluating them using cutting-edge scientific perspectives.[78] The ability of contemporary formulation techniques to extract and preserve the bioactive components of medicinal plants is a powerful feature. Studies contrasting current extraction techniques such as ethanol extraction with traditional maceration procedures, for example, have demonstrated the better efficiency of the latter in extracting essential components from Ayurvedic medicines.[79,80] According to these results, modern technologies have significant advantages over traditional methods in terms of extraction efficiency, quality control, and pharmacological activity, even though older methods have enormous cultural and historical importance.[81]

Additionally, research on the antihyperlipidemic and diuretic properties in animal models has shown the significant therapeutic benefits of both traditional and contemporary preparation techniques. These studies demonstrate that despite variations in the preparation methods, the formulations' inherent medical potency remains potent.[82]

A careful process is involved in choosing skincare ingredients based on skin type in order to address the particular needs and problems related to various skin types. Making use of techniques like Simple Additive Weighting (SAW) can help with tailored

recommendations.[83] Choosing skin cleansing solutions that address particular skin types and related issues like wrinkling, sensitivity, acne, and sun damage requires careful consideration of factors including formulation, pH, ingredients, and skin compatibility.[84] The use of naturally produced ingredients has become more important as consumers seek out gentle, biodegradable, and efficient substitutes for manufactured products. These compounds address a wide range of demands, from treating dermatitis reactions in some patients to providing environmentally sustainable options.[85] The development of formula selection algorithms through deep learning approaches presents a sophisticated method to precisely forecast cosmetic product suitability for a range of skin types, offering a better way to help consumers choose the right goods.[86]

In response to consumer expectations for skincare products that are not only kind on the skin and environmentally responsible, but also effective, a shift towards natural ingredients has been noted in the industry.[87] In cosmetic formulations intended for sensitive skin, it is especially important to select components that either singly or in combination promote collagen formation, fibroblast proliferation, and anti-oxidation protection.[88] Products are formulated with components that have anti-inflammatory, antibacterial, and hydrating properties in mind.

These include natural components and extracts from a variety of medicinal plants, such as red ginseng, Asiatic pennywort, and bamboo leaf extract, mixed with moisturizing agents like shea butter or argan oil.[89] By examining sizable datasets, deep learning algorithms improve even more the capacity to suggest skincare items catered to certain skin types. This novel method seeks to address issues with choosing makeup for a range of skin types, such as oily, dry, or neutral skin.[90] In the end, knowledge of skin physiology and the biochemical processes by which these chemicals affect skin health should serve as a guide for selecting ingredients for skincare products. It involves finding a balance between treating particular skin issues, improving the texture and look of the skin, and maintaining the skin's general health.[91]

Efficacy assessment methods

Evaluating herbal face packs in vivo and in vitro is necessary to develop safe and effective products. Below is a summary of some typical techniques:

In vitro techniques

Antioxidant Assays: These tests assess how well herbal extracts scavenge free radicals, which

may have benefits for skin protection and anti-aging. As examples, consider the radical scavenging assays for DPPH (2,2-diphenyl-1-picrylhydrazyl) and ABTS (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid).[92]

Assays for Cell Viability: These tests determine if skin cells exposed to herbal extracts undergo cytotoxicity, or death of cells, or proliferation, or growth of cells. This aids in figuring out possible skin-regenerating benefits and safe concentrations. Examples of such tests include XTT (2,3-bis-(2-methoxy-4-nitro-5-sulfophenyl)-2H-tetrazolium-5-carboxanilide) and MTT (3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide).[93]

Assays for Enzyme Inhibition: These tests assess the capacity of plant extracts to impede the activity of enzymes linked to skin aging (hyaluronidase, collagenase, etc.) or pigmentation (tyrosinase, etc.). This aids in anticipating possible skin-lightening or anti-aging benefits.[94]

In vivo techniques

Clinical studies: In these, the face pack is applied to human volunteers, and its safety and effectiveness are assessed using both subjective and objective metrics (Such as wrinkle reduction and skin hydration) (e.g., user happiness). Regulatory permissions and ethical considerations are essential.[95]

Animal models: Skin irritation, sensitization, and possible absorption of herbal components can all be assessed in animal models, such as mice or rabbits. Nonetheless, cautious study design and result interpretation are required due to ethical issues.[96]

Herbal formulation standardization and validation present numerous and intricate obstacles. The process is hampered by a number of main issues, such as the lack of standards for product formulations, processing methods, raw materials, completed goods, and quality control standards—all of which are essential for guaranteeing the efficacy, safety, and quality of herbal medicine.[97] Furthermore, the factors influencing biological efficacy and therapeutic repeatability further complicate the standardization and validation of herbal formulations. As a result, quality standards must be established at every stage of the manufacturing of herbal medicines.[98] The regulatory settings pertaining to herbs are intricate and multifaceted, making it even more difficult to identify, standardize, and detect adulterants and contamination. Appropriate analytical methods are necessary for these purposes.[99] Numerous physical, chemical, and geographic factors affect the quality features of

pharmaceuticals and herbal products. Analytical methods hyphenated analytical methods, such as quantitative evaluations of bioactive substances, and chemical and phytochemical testing are used in the assessment of quality.[100] Furthermore, because incorrect handling might harm these components, maintaining the integrity of active constituents during the preparation and validation stages is crucial.[101] There is an increasing need for strict standardized procedures to address potential abuse, adulteration, and safety concerns in the global herbal industry.[102] In order to ensure the quality, safety, and efficacy of herbal medicines, researchers and practitioners are attempting to set criteria for raw materials, processing methods, dosage formulation, and quality control standards.[103] To assess herbal medications, verify their validity, and prevent adulteration, a variety of precise analytical methods, such as chemical fingerprinting, must be used.[104] In the standardization and quality assessment of herbal medicinal plants, these analytical techniques—physical, chemical, and biological techniques like TLC, HPLC, HPTLC, GC, LC-MS, UPLC, UHPLC, UPLC-MS, and UHPLC-MS—are essential.[105]

In summary, the complexity of herbal medications, the lack of universal methodological standards, variances in traditional system preparations, and the requirement for workable and reasonably priced standardization approaches present a number of problems for the standardization and validation of herbal formulations.[106] Strict norms, rules, global standards, and the creation of innovative assessment techniques appropriate for the intricate character of natural medicines are needed to address these issues.[107]

Table 2: List of studies assessing the efficacy of different herbal face pack formulations.

Study authors	Year	Key components of herbal face pack	Objective	Reference
S. Rubina	2017	Herbal Ingredients	Evaluating a herbal Face pack forcosmetic purposes	[108]
Surywanshi Mayuri Vilas, Indrakumar Sonawane	2022	Mint, Fenugreek,Green Tea, MultaniMitti, White Tea, Sandalwood, Orange Peel	Formulation and efficacy testing of herbal face pack	[109]
Swarali Yuvraj Sandanshiv etal.	2023	Orange Peel, Neem, Tulsi, Sandalwood,Rose Oil	Addressing skinissues such as acne,wrinkles, and excessive oil secretion	[110]

Sanket A.Avhad et al.	2022	Vitamins, Herbal Ingredients	Reducing skin problems and improving skin fairness and smoothness	[111]
Vidhate Prajwal G. et al.	2022	Multani Mitti, Turmeric, Aloe Vera,	Formulating a non-Toxic herbal	[112]
		Sandalwood, Orange Peel, Neem, Nutmeg Powder	Antibacterial facepack	
Ravi Kumar	2021	Multani Mitti,Turmeric, Aloe Vera, Sandalwood, Orange Peel, Neem	Evaluation of herbal face pack formulations F1 to F4	[113]
V. Anilkumar et al.	2020	Turmeric, Rice Flour, Gram Flour, Rose Powder, Tomato Powder, Orange Peel Powder, Sandalwood Powder, Milk Powder, Camphor Powder	In-house preparation and evaluation of herbal cosmetics face pack	[114]
Pooja Kashinath Khanzode et al.	2023	Naturak Ingredients	Demonstrating the glowing and smooth skin effects of an herbal face pack	[115]
Duhan P. et al.	2023	Feverfew (Tanacetum parthenium), Neem (Azadirachta indica)	Formulating a herbal face wash for treating acne and pimples	[116]
S. Mulla	2023	Herbal Ingredients, Soapnut Extracts	Formulating a herbal face pack for cosmetic purposes	[117]

Future prospects

Herbal face packs have a bright future ahead of them in terms of efficacy, sustainability, and creativity. There are several important regions waiting to be explored and developed.

1. **Advanced formulation techniques:** The creation of more effective and standardized herbal cosmetics will be fueled by ongoing research into both conventional and contemporary formulation techniques. Including state-of-the-art technologies like microencapsulation and nanotechnology can improve the effectiveness and distribution of herbal constituents, guaranteeing the best possible skincare results.

2. **Customized skincare solutions:** As artificial intelligence and big data analytics advance, it will be easier to obtain customized skincare advice that take into account each person's uniqueskin type, problems, and preferences. Large-scale datasets can be analyzed by deep

learning algorithms to generate customized herbal face pack formulations that maximize outcomes for individual customers.

3. **Green Chemistry and Sustainability:** The future of herbal cosmetics will be shaped by the focus on environmentally friendly procedures and sustainable sourcing. The development of ecologically friendly extraction techniques, packaging materials, and production processes will result from research into green chemistry principles, lowering the carbon footprint of herbal skincare products.

4. **Biotechnological innovations:** The synthesis and improvement of bioactive molecules from herbal ingredients are intriguing prospects provided by biotechnology. Novel herbal formulations can be made possible by the production of high-value phytochemicals with improved consistency and efficacy through the use of techniques like genetic engineering and plant cell culture.

5. **Clinical Validation and Regulatory standards:** Consumer acceptability and trust in herbal face packs will increase with a greater emphasis on clinical validation and adherence to regulatory standards. Strict clinical trials will yield scientific proof of safety and efficacy, and strong regulatory frameworks will guarantee uniformity and quality in products.

6. **International Collaboration and Knowledge sharing:** Knowledge sharing and innovation in herbal cosmetics will be facilitated by international collaboration between researchers, industry stakeholders, and regulatory organizations. Research collaborations and international alliances will propel advances in quality control standards, efficacy assessment techniques, and formulation science.

7. **Consumer Education and Awareness:** There will be a continuous push to inform customers about the advantages of using herbal skincare products and the significance of sustainable beauty practices. Consumers will be empowered to make informed decisions and develop a greater appreciation for natural ingredients through transparent labeling, consumer-friendly information, and educational programs.

CONCLUSION

The evolution of herbal face pack formulations represents a significant trend in skincare, driven by consumer preferences for natural ingredients and holistic wellness. These

formulations, enriched with elements like neem, aloe vera, and turmeric, offer multifunctional benefits while minimizing side effects compared to synthetic skincare products. The popularity of herbal cosmetics reflects a broader societal shift towards eco-friendly and health-conscious beauty choices, echoing historical practices from ancient civilizations and traditional medicine systems. However, standardizing and validating herbal formulations pose challenges due to the complexity of herbal drugs and variations in traditional preparation methods. Overcoming these challenges requires the establishment of stringent regulations, international standards, and the development of novel evaluation techniques suitable for natural medicines. In vitro and in vivo efficacy assessment methods play a crucial role in ensuring the safety and effectiveness of herbal face packs, ultimately contributing to their quality and consumer confidence. Overall, the adoption of herbal cosmetics signifies a return to nature in skincare, emphasizing a holistic approach to beauty and well-being that prioritizes sustainability and efficacy.

REFERENCE

1. Avhad SA, Dixit A, Bhakare SS, Akiwate JK, Aswale DU, Anbhule RV. Formulation and Evaluation of Polyherbal Face Pack. Journal of Drug Delivery and Therapeutics, 2022; 15, 12(5): 153-5.
2. Misar K, Gajbhiye R, Raut M, Sambare S. FORMULATION AND DEVELOPMENT OF HERBALFACE WASH TABLETS BY USING ROSA GALLICA & DEAD SEA MUD.
3. Somvanshi Akanksha A. et al., "Formulation and Evaluation of Herbal Face Pack (Coffee & Sandalwood) for Alluring Face", 2022.
4. Emerald M, Emerald A, Emerald L, Kumar V. Perspective of natural products in skincare. Pharmacy & Pharmacology International Journal, 2016; 4(3): 1-3.
5. Dave P, Patel G, Patel D, Patel B, Patel D, Chakraborthy GS, Jani R. Formulation and Evaluation of Herbal Face Scrub containing Coffea arabica Linn, Myristica fragrans, and Lens culinaris as an Antioxidant and Antiseptic Activity. International Journal of Drug Delivery Technology, 2022; 12(3): 1183-6.
6. Surini S, Auliyya A. Formulation of an anti-wrinkle hydrogel face mask containing ethanol extract of noni fruit (Morinda citrifolia L) for use as a nutracosmeceutical product. Int J App Pharm, 2017; 9: 74-6.
7. Yuliana A, Rahmiayani I, Pebiansyah A, Shaleha RR. Socialization and Education on the Use of Natural Skincare for Facial Skin Care at PC PERSISTRI Tawang Tasikmalaya City. E-DIMAS: Journal of Community Service, 2022; 7, 13(4): 670-4.

8. McMullen RL, Dell'Acqua G. History of natural ingredients in cosmetics. Cosmetics, 2023; 29, 10(3): 71.
9. Kaur L, Singh AP, Singh AP, Kaur T. A review on herbal cosmetics. International Journal ofPharmaceutics and Drug Analysis, 2021; 30: 196-201.
10. Kole PL, Jadhav HR, Thakurdesai P, Nagappa AN. Cosmetic potential of herbal extracts.
11. Garg A. Herbs in cosmetics: An overview. Research Journal of Topical and Cosmetic Sciences, 2023; 14(1): 45-9.
12. Fathima A, Varma S, Jagannath P, Akash M. General review on herbal cosmetics. Internationaljournal of drug formulation and research, 2011; 2(5): 140-65.
13. Bashir R, Maqbool M, Zehravi M, Ara I. Utilization of herbal cosmetics: A brief overview. Adv. J.Chem. Sect. B, 2021; 3: 277-88.
14. Nagre AK, Khan SS, Joshi JP, Nawale VA, Waghulde VR. FORMULATION AND EVALUATIONOF HERBAL FACE PACK. World Journal of Pharmaceutical Research, 2022; 3.
15. Sandanshiv SY, Patil SR, Wagh VD, Shinde PA, Mali RP. Formulation and Evaluation of HerbalFace Pack. Journal of Drug Delivery and Therapeutics, 2023; 15, 13(3): 120-4.
16. 강응수, 공우식, 김관철, 임동진. "Cosmetic composition comprising a herbal extraction." Patent KR20030034251A, 2003; 9.
17. Patra, A. K. HERBAL COSMETICS: A CONCEPTUAL FRAMEWORK. Abhinav-National Monthly Refereed Journal of Research in Commerce & Management, 2017; 6: 39-44.
18. Lovepreet Kaur, A. Singh, Taranjit Kaur. "A review on herbal cosmetics." International Journal for Pharmaceutical Research Scholars (IJPRS), 2021. Anshika Garg. "Herbs in Cosmetics: An Overview." Asian Journal of Pharmaceutical and Clinical Research, June, 2023; 5: 9-3.
19. 조영호 et al. "A cosmetic composition containing an extract of herbal medicines." Patent KR20030047667A, May, 2003; 12.
20. A. Goyal et al. "Bioactive-Based Cosmeceuticals: An Update on Emerging Trends." Molecules, 2022; 27(3): 828.
21. Harsha Solanki et al. "Natural Humectants in Formulation of Calamine Lotion: Its Evaluation and Comparison." International Journal of Pharmacy and Pharmaceutical Research, 2022; 72, 1: 15.
22. Anuja S. Motule et al. "Ethnopharmacological relevance's of herbal plants used in

cosmetics and toiletries preparations." Global Science and Technology Forum (GSTF) Journal of Biosciences (JBS), 2021; 16, 2: 30.

23. SK R, Neelofar Sulatna S, Mohana Priya R, Parameswari CS, Ramana BV, Badarinath AV. FORMULATION AND EVALUATION OF NATURAL HERBAL FACE PACK.
24. Alves TF, Morsink M, Batain F, Chaud MV, Almeida T, Fernandes DA, da Silva CF, Souto EB, Severino P. Applications of natural, semi-synthetic, and synthetic polymers in cosmetic formulations. Cosmetics, 2020; 25, 7(4): 75.
25. Hussain, F., Pathan, S., Sahu, K., & Gupta, B. K. Herbs as cosmetics for natural care: A review. GSC Biological and Pharmaceutical Sciences, 2022; 19(02): 316–322.
26. Wathoni NA, Haerani A, Yuniarsih N, Haryanti RE. A review on herbal cosmetics in Indonesia. International Journal of Applied Pharmaceutics, 2018; 10(5): 13-6.
27. Avhad SA, Dixit A, Bhakare SS, Akiwate JK, Aswale DU, Anbhule RV. Formulation and Evaluation of Polyherbal Face Pack. Journal of Drug Delivery and Therapeutics, 2022; 15, 12(5): 153-5.
28. Khanzode, P.K., Dhole, P.D., & Rathod, S.B. Antibacterial Herbal Facepack. International Journal of Advanced Research in Science, Communication and Technology, 2023.
29. Kumar R. Formulation and evaluation of herbal face pack. Asian Journal of Pharmaceutical Research, 2021; 11(1): 9-12.
30. Anilkumar V, Kalyani R, Padmasri B, Prasanth D. In-house preparation, development and evaluation of herbal cosmetics face pack using various natural powders. Journal of Drug Delivery and Therapeutics, 2020; 15, 10(5): 159-64.
31. SomvanshiAkanksha, A., KasarPoonam, S., RajdevPurva, S., VidhatePrajwal, G., & GunjalShubhangi, S. Formulation and Evaluation of Herbal Face Pack (Coffee & Sandalwood) for Alluring Face. International Journal of Advanced Research in Science, Communication and Technology, 2022.
32. Misar K, Gajbhiye R, Raut M, Sambare S. FORMULATION AND DEVELOPMENT OF HERBALFACE WASH TABLETS BY USING ROSA GALLICA & DEAD SEA MUD.
33. Ginting I, Rudang SN, Naldi J, Siboro E, Leny L. Utilization of Ambon Banana Stem (Musa paradisiaca var. sapientum (L)) Ethanol Extract as Moisturizing Sheet Mask. Journal of Drug Delivery and Therapeutics, 2022; 15, 12(2-S): 25-9.
34. Ganpat AM, Aswar AR, Hingane LD. Formulate and Evaluate Aloe-Vera Face Wash. International Journal for Research in Applied Science and Engineering Technology, 2022; 3782-91.

35. Pawar, M.P., Pacharne, M.G., Kumbhar, M.J., Tribhuvan, M.H., & Walunj, P.K. Formulation and Evaluation of Ubtan Facewash. International Journal of Advanced Research in Science, Communication and Technology, 2022.
36. Purkon DB, Kusmiyati M, Trinovani E, Aisyah ZA, Syahla N, Ansyirohanisa A, Amalia VN, Fadhlillah FM. Pelatihan Pembuatan Masker Wajah Tipe Peel-Off dari Herba Lumut Hati Marchantia paleacea dan Daun Teh Hijau kepada Mitra Posbindu. Poltekita: Jurnal PengabdianMasyarakat, 2023; 30, 4(2): 378-88.
37. Nagre AK, Khan SS, Joshi JP, Nawale VA, Waghulde VR. FORMULATION AND EVALUATIONOF HERBAL FACE PACK. World Journal of Pharmaceutical Research, 2022; 3.
38. Srinivas, M., Supriya, D., & Singh, D.A. Current Review on Herbal Face Care. International Journal of Pharmaceutical Sciences Review and Research, 2021.
39. Sandanshiv SY, Patil SR, Wagh VD, Shinde PA, Mali RP. Formulation and Evaluation of HerbalFace Pack. Journal of Drug Delivery and Therapeutics, 2023; 15, 13(3): 120-4.
40. Khanzode, P.K., Dhole, P.D., & Rathod, S.B. Antibacterial Herbal Facepack. International Journal of Advanced Research in Science, Communication and Technology, 2023.
41. Anilkumar V, Kalyani R, Padmasri B, Prasanth D. In-house preparation, development and evaluation of herbal cosmetics face pack using various natural powders. Journal of Drug Delivery and Therapeutics, 2020; 15, 10(5): 159-64.
42. Purkon DB, Kusmiyati M, Trinovani E, Aisyah ZA, Syahla N, Ansyirohanisa A, Amalia VN, Fadhlillah FM. Pelatihan Pembuatan Masker Wajah Tipe Peel-Off dari Herba Lumut Hati Marchantia paleacea dan Daun Teh Hijau kepada Mitra Posbindu. Poltekita: Jurnal PengabdianMasyarakat, 2023; 30, 4(2): 378-88.
43. Ansari, K.A., & Nazir, S. Role of herbals in skin caring. International journal of applied research, 2015; 1: 379-381.
44. Pawar, M.P., Pacharne, M.G., Kumbhar, M.J., Tribhuvan, M.H., & Walunj, P.K. Formulation and Evaluation of Ubtan Facewash. International Journal of Advanced Research in Science, Communication and Technology, 2022.
45. Priya R, Anand K, Rasika D. Preparation and evaluation of herbal anti–acne face pack. World J Pharm. Res, 2017; 31, 6(6): 1000.
46. Nagansurkar SB, Bais SK, Bagale J. A REVIEW: FACE PACK CONTAINING HERBAL PLANTSHOWING ANTI-AGING ACTIVITY.
47. Ganpat AM, Aswar AR, Hingane LD. Formulate and Evaluate Aloe-Vera Face Wash.

International Journal for Research in Applied Science and Engineering Technology, 2022; 3782-91.

48. Kaur L, Singh AP, Singh AP, Kaur T. A review on herbal cosmetics. International Journal of Pharmaceutics and Drug Analysis, 2021; 30: 196-201.
49. Fowler Jr JF, Woolery-Lloyd H, Waldorf H, Saini R. Innovations in natural ingredients and theiruse in skin care. Journal of drugs in dermatology: JDD, 2010; 1, 9(6): S72-81.
50. Akalın G, Selamoglu Z. Nutrition and foods for skin health. Journal of Pharmaceutical Care, 2019; 23.
51. Kim JE. Latest Methods of Developing Natural Product for Skin Health. Journal of Biotechnology and Bioindustry, 2020; 8: 11-5.
52. Boeriu CG. Plants4Cosmetics: perspectives for plant ingredients in cosmetics. Wageningen UR-Food & Biobased Research, 2015.
53. Do TA, Ho TT, Nguyen TH, Ly HH. Exploring the skin whitening properties of natural products: A comprehensive review. Tạp Chí Khoa Học Trường Đại Học Quốc Tế Hồng Bàng, 2023; 24: 87-94.
54. 드라포, 크., 쿠쿨칸, 샤., & 기테에스., 옌. Skin care compositions containing combinations of natural ingredients, 2012.
55. Herranz-López M, Barrajón-Catalán E. Antioxidants and skin protection. Antioxidants, 2020; 4, 9(8): 704.
56. Flores-Balderas X, Peña-Peña M, Rada KM, Alvarez-Alvarez YQ, Guzmán-Martín CA, Sánchez-Gloria JL, Huang F, Ruiz-Ojeda D, Morán-Ramos S, Springall R, Sánchez-Muñoz F. Beneficial effects of plant-based diets on skin health and inflammatory skin diseases. Nutrients, 2023; 15(13): 2842.
57. Emerald M, Emerald A, Emerald L, Kumar V. Perspective of natural products in skincare. Pharmacy & Pharmacology International Journal, 2016; 4(3): 1-3.
58. Do TA, Ho TT, Nguyen TH, Ly HH. Exploring the skin whitening properties of natural products: A comprehensive review. Tạp Chí Khoa Học Trường Đại Học Quốc Tế Hồng Bàng, 2023; 24: 87-94.
59. Avhad SA, Dixit A, Bhakare SS, Akiwate JK, Aswale DU, Anbhule RV. Formulation and Evaluation of Polyherbal Face Pack. Journal of Drug Delivery and Therapeutics, 2022; 15, 12(5): 153-5.
60. Nagre AK, Khan SS, Joshi JP, Nawale VA, Waghulde VR. FORMULATION AND EVALUATIONOF HERBAL FACE PACK. World Journal of Pharmaceutical Research,

2022; 3.

61. Somwanshi, S., Kudale, K.S., Dolas, R., & Kotade, K.B. FORMULATION AND EVALUATION OF COSMETIC HERBAL FACE PACK FOR GLOWING SKIN. International journal of research in ayurveda and pharmacy, 2017; 8: 199-203.
62. Shah SN, Awinashe MV, Mohammed A, Agarwal D, Anand A, Sonkar TP. Antimicrobial Efficacyof Sodium Hypochlorite, Neem, Tulsi, and Aloe Vera as a Root Canal Irrigants Against E. Faecali. International Journal of Health Sciences, (III): 809-15.
63. Wulandini R, Irwansyah FS, Windayani N. Formulation of facial cleansing gels using aloe veraas natural surfactant. InJournal of Physics: Conference Series, 2019; 1: (1402, 5, 055069). IOP Publishing.
64. Ariyanti A, Masruriati E, Santi H, Sulistyowati D. Formulation Stability Analysis Aloe Vera LeafExtract Gel and Shell Shell Collagen. International Journal of Health Sciences, (III): 2115-23.
65. Viana FD, de Souza Monteiro CL, da Costa Paes ER. Formulation of Turmeric face mask (Peel-Off) with potential antioxidant action. Brazilian Journal of Development, 2022; 29, 8(7): 54587-605.
66. Nidhal MK, Ekbal AK, Al-Waiz M. Topical preparations from the Iraqi plant aloe vera and their efficacy in skin infections. Al Mustansiriyah Journal of Pharmaceutical Sciences, 2005; 1, 2(1): 7-15.
67. Priya R, Anand K, Rasika D. Preparation and evaluation of herbal anti–acne face pack. World J Pharm. Res, 2017; 31, 6(6): 1000.
68. Khurshid MF, Ayyoob M, Asad M, Shah SN. Assessment of eco-friendly natural antimicrobial textile finish extracted from aloe vera and neem plants. Fibres & Textiles in Eastern Europe, 2015; (6 (114): 120-3.
69. Kryst J. Cosmetics containing turmeric in the light of the results of scientific research.
70. Sahu PK, Giri DD, Singh R, Pandey P, Gupta S, Shrivastava AK, Kumar A, Pandey KD. Therapeutic and medicinal uses of Aloe vera: a review. Pharmacology & Pharmacy, 2013; 8, 4(08): 599.
71. Korać RR, Khambholja KM. Potential of herbs in skin protection from ultraviolet radiation. Pharmacognosy reviews, 2011; 5(10): 164.
72. Rajeswari R, Umadevi M, Rahale CS, Pushpa R, Selvavenkadesh S, Kumar KS, Bhowmik D. Aloe vera: the miracle plant its medicinal and traditional uses in India. Journal of Pharmacognosy and Phytochemistry, 2012; 1(4): 118-24.
73. Nidhal MK, Ekbal AK, Al-Waiz M. Topical preparations from the Iraqi plant aloe vera

and their efficacy in skin infections. Al Mustansiriyah Journal of Pharmaceutical Sciences, 2005; 1, 2(1): 7-15.

74. Shah SN, Awinashe MV, Mohammed A, Agarwal D, Anand A, Sonkar TP. Antimicrobial Efficacyof Sodium Hypochlorite, Neem, Tulsi, and Aloe Vera as a Root Canal Irrigants Against E. Faecali. International Journal of Health Sciences, (III): 809-15.
75. Singh S, Datta R, Johri P, Trivedi M, editors. Phytopharmaceuticals and Biotechnology of HerbalPlants. CRC Press, 2022; 28.
76. Sekar S, Vinothkanna A. Polyherbal and submerge fermented medicines of Ayurveda: Convergence of tradition with scientific trends and needs. South African journal of botany, 2019: 1, 121: 410-7.
77. A. Nagre, S., Kazi, M.A., Pise, S.A., G. Pise, A., & N. Mahajan, U. Physicochemical Evaluation of Formulation of Ashwagandharista Prepared by Traditional and Modern Method. International Journal of Medical & Pharmaceutical Sciences, 2017.
78. Ghosh S, Murthy PN, Joshi H. Different methods of preparation, evaluation and comparison of one traditional oral liquid formulation for potential antihyperlipidemic activity in hyperlipidemic Wistar rats. Research Journal of Pharmacy and Technology, 2021; 1, 14(5): 2426-33.
79. Ruhela G, Dhama P, Shanker K, Ding X, Sharma A. Exploration of metabolomics of Phyllanthus emblica: From Ayurveda food to modern prospectives in quality control. Food Chemistry Advances, 2023; 1, 3: 100330.
80. Nguyen NV, Nguyen XD, Nguyen KN, Nguyen TK, Nguyen MP, Kim KH. Quantitative Determination And Preparative Isolation Of Two Major Alkaloids From The Vietnamese Medicinal Herb Evodiae Fructus. Int J Pharm Pharm Sci, 2019.
81. Tiwari P. Diuretic Potential of Balarishta Prepared by Traditional and Modern Methods in Experimental Albino Rats. Asian Journal of Pharmacy and Technology, 2014; 4(1): 13-6.
82. Rahayu MI, Siregar MK, Desnia M. Basic Skincare Product Selection Recommendation SystemBased on Skin Type Using Simple Additive Weighting (SAW) Algorithm. Journal of Informationand Communication Technology, 2022; 1, 11(2): 1-6.
83. Nix DH. Factors to consider when selecting skin cleansing products. Journal of WOCN, 2000; 1, 27(5): 260-8.
84. Rodan K, Fields K, Majewski G, Falla T. Skincare bootcamp: the evolving role of skincare. Plastic and Reconstructive Surgery–Global Open, 2016; 1, 4(12S): e1152.
85. Bruusgaard-Mouritsen MA, Johansen JD, Zachariae C, Kirkeby CS, Garvey LH. Natural ingredients in cosmetic products—A suggestion for a screening series for skin allergy.

Contact Dermatitis, 2020; 83(4): 251-70.

86. Abishek R, Ajeyan TS, Aravinth N, Gokul M, Dhiyanesh B. Advanced Skin Category Prediction System for Cosmetic Suggestion using Deep Convolution Neural Network. In2023 7th International Conference on Intelligent Computing and Control Systems (ICICCS), 2023; 17: 627-631. IEEE.
87. Redding, M. Natural Ingredients for Skin Care, 2011.
88. Ray S, Abinaya M, Rao AK, Shukla SK, Gupta S, Rawat P. Cosmetics Suggestion System using Deep Learning. In2022 2nd International Conference on Technological Advancements in Computational Sciences (ICTACS), 2022; 10: 680-684. IEEE.
89. Hameury S, Borderie L, Monneuse JM, Skorski G, Pradines D. Prediction of skin anti-aging clinical benefits of an association of ingredients from marine and maritime origins: ex vivo evaluation using a label-free quantitative proteomic and customized data processing approach.Journal of Cosmetic Dermatology, 2019; 18(1): 355-70.
90. Namkoong J, Kern D, Knaggs HE. Assessment of human skin gene expression by different blends of plant extracts with implications to periorbital skin aging. International journal of molecular sciences, 2018; 26, 19(11): 3349.
91. Aeschbach, H. P., ROBERT Urbain, and Walter SCHÖNBACH. "Prooxidant activity of {ital tocopherols}." https://pubs.acs.org/doi/10.1021/jf0012852
92. Berridge, M. V., & Tan, A. S. Determination of cell death: viability using tetrazolium dye MTT, 1993. https://pubmed.ncbi.nlm.nih.gov/16216776/
93. Park, T. Y., & Kim, Y. M. Hypocholesterolemic and antioxidant effects of hot water extract from roasted barley hull (Hordeum vulgare L.) in rats. Food science and technology research, 2008; 14(2): 166-173. [Google Scholar]
94. Draelos, Z. D. In vivo methods in cosmetic research. Clinics in dermatology, 2007; 25(5): 482-490. [DOI: 10.1016/j.clindermatol.2007.05.002]
95. Marzulli, F. H., & Maibach, H. I. Animal models in industrial toxicology. Food and chemical toxicology, 1996; 34(8): 643-657. [DOI: 10.1016/0278-6915(96)00032-3]
96. Pore AV, Bais SK, Kale TH. Quality Aspects of Herbal Drugs and its Formulation. International Journal of Advanced Research in Science, Communication and Technology (IJARSCT), 2023; 3(2).
97. Santosh J, Jyotiram S. Standardization of poly-herbal formulations: A comprehensive review. Research Journal of Pharmacognosy and Phytochemistry, 2016; 8(2): 85-9.
98. Shukla, P., Chaurasia, P., Younis, K., Qadri, O.S., Faridi, S.A., & Srivastava, G. Nanotechnology in sustainable agriculture: studies from seed priming to post-harvest

management. Nanotechnology for Environmental Engineering, 2019; 4: 1-15.

99. Lamichhane S, Sahariah BJ, Das B, Khatiwara D, Sola P, Adhikari RP, Gogoi B, Alam T. Herbal drug standardization: a systemic review. Journal of Drug Delivery and Therapeutics, 2023; 15, 13(4): 149-53.
100. Yadav P, Mahour K, Kumar A. Standardization and evaluation of herbal drug formulations. Journal of Advanced Laboratory Research in Biology, 2011; 2(4): 161-6.
101. Kunle OF, Egharevba HO, Ahmadu PO. Standardization of herbal medicines-A review. International journal of biodiversity and conservation, 2012; 20, 4(3): 101-12.
102. Shinde VM, Dhalwal K, Potdar M, Mahadik KR. Application of quality control principlesto herbal drugs. International Journal of Phytomedicine, 2009; 1, 1(1): 4-8.
103. Corthout J. Problems in Evaluating Herbal Medicinal Products. Natural Product Communications, 2008; 3(12): 1934578X0800301231.
104. Manani L, Raval M, Chandarana C, Gawas K, Prajapati P. Standardization, evaluation and quantification of Herbal drugs by various analytical methods. International Journal of Ayurvedic Medicine, 2022; 13(3): 613-24.
105. Karthi J, Purushothaman M. Importance of standardization of herbal drugs-an updated overview. Journal of Global Trends in Pharmaceutical Sciences, 2016; 7(2): 3138-42.
106. Wei XC, Cao B, Luo CH, Huang HZ, Tan P, Xu XR, Xu RC, Yang M, Zhang Y, Han L, Zhang DK. Recent advances of novel technologies for quality consistency assessment of natural herbal medicines and preparations. Chinese Medicine, 2020; 15: 1-24.
107. SK R, Neelofar Sulatna S, Mohana Priya R, Parameswari CS, Ramana BV, Badarinath AV. FORMULATION AND EVALUATION OF NATURAL HERBAL FACE PACK.
108. S.M., & -, I.S. Formulation and Evaluation of Herbal Face Pack. International Journal For Multidisciplinary Research, 2022.
109. Sandanshiv SY, Patil SR, Wagh VD, Shinde PA, Mali RP. Formulation and Evaluation of Herbal Face Pack. Journal of Drug Delivery and Therapeutics, 2023; 15, 13(3): 120-4.
110. Avhad SA, Dixit A, Bhakare SS, Akiwate JK, Aswale DU, Anbhule RV. Formulation and Evaluation of Polyherbal Face Pack. Journal of Drug Delivery and Therapeutics, 2022; 15, 12(5): 153-5.
111. Somwanshi, S., Kudale, K.S., Dolas, R., & Kotade, K.B. FORMULATION AND EVALUATION OF COSMETIC HERBAL FACE PACK FOR GLOWING SKIN. International journal of research in ayurveda and pharmacy, 2017; 8: 199-203.

112. Kumar R. Formulation and evaluation of herbal face pack. Asian Journal of Pharmaceutical Research, 2021; 11(1): 9-12.
113. Anilkumar V, Kalyani R, Padmasri B, Prasanth D. In-house preparation, development and evaluation of herbal cosmetics face pack using various natural powders. Journal of Drug Delivery and Therapeutics, 2020; 15, 10(5): 159-64.
114. Khanzode, P.K., Dhole, P.D., & Rathod, S.B. Antibacterial Herbal Facepack. International Journal of Advanced Research in Science, Communication andTechnology, 2023.
115. Duhan P, Dahiya G, Payal KR. Formulation and Evaluation of Herbal Facewash: A Step Towards Nature and a Boon to Skin. International Journal of Newgen Research in Pharmacy &Healthcare, 2023; 30: 22-7.
116. Pal RS, Pal Y, Wal P. In-house preparation and standardization of herbal face pack. The Open Dermatology Journal, 2017; 31, 11(1).
117. Ashawat M, Banchhor M, Saraf S, Saraf S. Herbal Cosmetics:" Trends in Skin Care Formulation". Pharmacognosy Reviews, 2009; 3(5): 82.