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Review Article

**NATURE'S TOUCH IN COSMETICS: A REVIEW OF SKIN
CARE INGREDIENTS FROM NATURAL SOURCES****Ayesha Siddiqua Gazi¹, Huma Fathima², Madiha Sadaf², Ramsha Fatima²**¹Faculty of Department of Pharmaceutics, Deccan School Of Pharmacy, Hyderabad, India.²Department of Pharmaceutics, Deccan School Of Pharmacy, Hyderabad, Telangana, India.**Abstract:**

There are various kinds of natural ingredients used in the cosmetics for skincare, which are obtained from different sources such as plants, animals, minerals, marine, micro-organisms etc. Among which this article elaborates about the information of a few natural ingredients including Liquorice, Centella asiatica, green tea extract, Collagen, Honey, Mucin, Kaolin. Now-a-days there is an increase in the usage of natural ingredients in skin care cosmetics due to minimized side effects or adverse effects, but the drawback is their interaction with other ingredients or excipients in the formulation, allergic reactions in sensitive individuals, other challenges in the preparation. There is an increase in research and advancement of making novel products using natural ingredients. Thus, the increased demand for natural substances is prevailing in the pharmaceutical and cosmetic industry.

Keywords: *Centella asiatica, Camellia sinensis, Mucin, Kaolin clay, benefits, challenges, recent advances.*

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INTRODUCTION:

Skincare products nowadays often feature natural ingredients like *Glycyrrhiza glabra*, known for its anti-inflammatory, skin-brightening, and antioxidant properties. However, difficulties such as inconsistent extraction of phytoconstituents and toxicity have led to recent advancements in improving its solubility profile.

Centella asiatica, known for its benefits in wound healing, tissue repair, photoprotection, and antioxidant properties, is incorporated into topical formulations ranging from 0.3% to 10% concentration with recent advancements in innovative dosage forms such as nano emulsions and liposomes.

Recent advancements in wound care have demonstrated the effectiveness of incorporating *Camellia sinensis* at a 5% concentration in topical treatments. Novel delivery techniques have shown encouraging outcomes despite encountering obstacles such as sensitivity, instability, low bioavailability.

Studies have explored collagen's use as a carrier for nanocarriers and microneedle delivery on the skin, with concentrations ranging from 0.5% to 5% for hydration and 0.5% to 3% for deep skin rejuvenation.

Skincare products such as gels and creams often contain honey in concentrations between 5-30% because of its advantageous qualities, including its antibacterial, antimicrobial, and antiseptic properties. Researchers have studied its safety, potential toxicity for sensitive individuals.

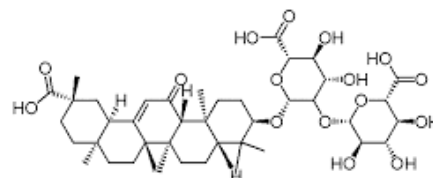
Mucin, which is known for its hydrating, fast wound-healing, antimicrobial, skin-repairing properties. Researchers have been exploring its incorporation into scaffolds, adhesives, and glycopolymers despite facing challenges related to standardization and limited effectiveness.

Kaolin is great at soaking up excess oil and purifying the skin. However, challenges in batch manufacturing include variations, impurities, microbial contamination, and the presence of heavy metals. Recent progress has revealed its capability as a nanocarrier for safety studies and wound care.

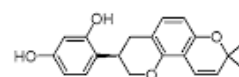
1. GLYCYRRHIZA GLABRA (Licorice):

Introduction

Glycyrrhiza glabra is a medicinal plant with robust phytochemistry; its root extracts have applications beyond classical therapy into dermal/cosmetic domains, due to its whitening, antioxidant, anti-inflammatory properties.



Glycyrrhizic acid



Glabridin

Figure 1: chemical constituents of *Glycyrrhiza glabra*

Benefits

Glycyrrhiza glabra (licorice) shows antioxidant, anti-inflammatory, UV-B protective, and skin-brightening activity due to the active ingredients of glabridin. It is said to offer protection against hyperpigmentation and UV-induced skin damage implicated in pigmentary disorders (e. g., age spots, melasma, and sites of actinic damage) by depigmenting and inhibition of tyrosinase, when used in 0.5-20% conc in topical products.

The licorice root contains multiple bioactives: glycyrrhizin (10-16% dry root in some cases) plus flavonoids (eg., glabridin, glabrene, isoliquiritigenin, and liquiritin). The *Glycyrrhiza glabra* extract can also be employed as a deodorant due to its reduction of the odors. The hydro-alcoholic extract of licorice also promotes hair growth.

Challenges

In The in-silico study explicitly showed skin permeability cut-off values and molecular dynamics to assess stability of ligand-target complexes, which remains a challenge.

Regulatory/ safety issues: Even though natural, licorice extracts still require safety validation for dermal use. The review in Plants (2021) pointed out that licorice, while promising, must be developed further with clinical evidence and toxicity profiling.

Trend Analysis

The cosmetic and dermal-care sector is increasingly turning toward herbal / plant-derived extracts. In particular, licorice (*Glycyrrhiza* spp.) extracts are being utilized for “dermocosmetic” uses because of their whitening, anti-sensitivity and anti-inflammatory potential.

For example, the work “In Silico Evaluation of the Antioxidant, Anti-Inflammatory and Dermatocosmetic Activities of Phytoconstituents in Licorice (*Glycyrrhiza glabra* L.)” (2023) emphasises how a growing demand for herbal cosmetics globally drives renewed interest in licorice extracts.

In the broader natural-cosmetic context, licorice has been documented for skin eruptions (dermatitis, eczema, pruritus) and possesses antioxidant flavonoids, which further supports its shift from traditional medicinal uses into cosmetic/dermal care.

Recent Advances / Latest Research

In silico molecular docking & dynamics (2023): The Fatoki et al. (2023) study used computational evaluation of nine licorice phytoconstituents with skin-permeation modeling. They found that glucoliquiritin apioside and glycyrrhizin showed the best docking scores / binding energies for targets like tyrosinase and COX-1, with stable complexes in molecular dynamics.

2. *CENTELLA ASIATICA* (Gotu kola):

Introduction

Centella asiatica, also known as Gotu kola or CICA, is a medicinal plant that contains triterpenoid saponins like asiaticoside and madecassoside, along with their aglycones, asiatic acid and madecassic acid.

These compounds are responsible for most of the plant’s skin-related and therapeutic benefits.

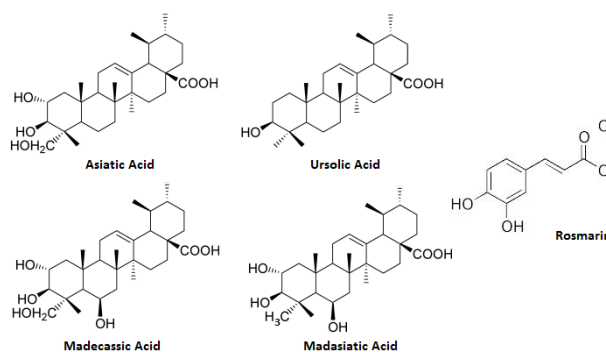


Figure 2: chemical constituents of *Centella asiatica*

Benefits: Major activities and mechanisms

Wound healing & tissue repair: CICA helps the body make more collagen, encourages fibroblast growth and blood vessel formation, and helps rearrange the skin’s outer layer in the effective conc of 0.3-10%. These actions increase TGF- β and collagen gene activity, leading to quicker skin healing, better scar quality, and reduced signs of aging.

Anti-inflammatory effects: CICA lowers pro-inflammatory substances in the skin, such as TNF- α and IL-1 β , and reduces NF- κ B signaling. This helps reduce redness and inflammation when applied topically.

Antioxidant & photoprotective activity due to the extracts of CICA neutralizing harmful free radicals and protect skin cells from damage caused by oxidation. Barrier & hydration improvements: Recent studies, including those involving extracellular vesicle-based formulations, report better skin hydration, elasticity, and texture after short-term use.

Challenges & limitations

Safety concerns & irritation: While generally safe for topical use, some people may experience skin irritation or contact dermatitis, especially if the product is not properly formulated.

Long-term oral use may pose risks, like liver damage, as noted in older studies. Safety testing and clear labeling are essential. Contamination and adulteration can occur without strict agricultural and manufacturing standards.

Recent advances / latest research

New green extraction methods, such as ultrasound, microwave, and supercritical CO₂, improve the yield and preservation of delicate compounds.

Recent reviews highlight the role of CICA in regulating TGF- β , collagen production, angiogenesis, and inflammation, supporting its use in wound care and scar management.

Preliminary studies using CICA-derived extracellular vesicles, like liposomes and nanoemulsions, show promising results in improving hydration, skin elasticity, and anti-aging effects. However, more large-scale, well-controlled clinical trials with standardized extracts are still needed.

Trend analysis

The cosmetic field of CICA is moving away from simple extracts like hydroalcoholic or aqueous solutions toward standardized extracts with defined levels of asiaticoside and madecassic acid, along with advanced delivery systems like nano-systems. Regulators now expect standardization, safety testing, and contaminant screening.

CICA is moving from being used mainly in beauty products like anti-aging creams into more scientifically supported cosmeceuticals and therapeutic applications like wound healing and scar treatment.

3. *CAMELLIA SINENSIS* (Green tea extract):

Introduction

Camellia sinensis, also known as green tea, is commonly used in cosmetics and cosmeceuticals.

It is mostly valued for its polyphenolic compounds, especially catechins like epigallocatechin-3-gallate (EGCG), which offer antioxidant, anti-inflammatory, and UV protection benefits. Skincare products often include whole leaf extracts (either water or alcohol-based), standardized fractions high in catechins, fermented extracts, and oils or seeds used for skin hydration.

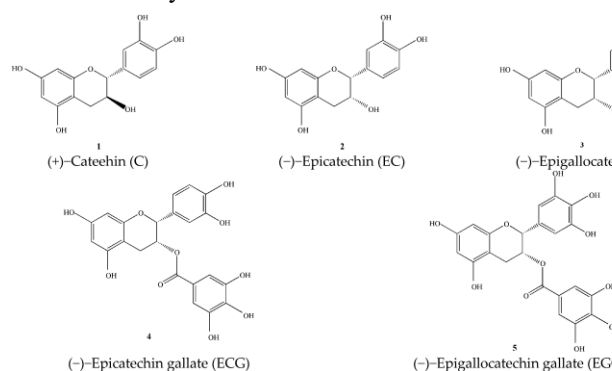


Figure 3: chemical constituents of *Camellia sinensis*

Benefits

Antioxidant and photoprotective effects: Green tea catechins help neutralize harmful free radicals, lower oxidative stress in skin cells like keratinocytes and fibroblasts, and protect against UV damage in the conc of 5% in the topical formulation. This supports anti-aging and UV protection claims when used topically.

Anti-inflammatory and anti-erythema activity: EGCG and other catechins reduce inflammation by affecting signaling pathways like NF- α B and lowering inflammatory cytokines. This explains why green tea helps reduce redness, irritation, and inflammatory acne. Preclinical and clinical evidence supports that EGCG can help in wound healing.

Studies show that skin hydration and fine lines can improve with green tea-based skincare, especially when combined with other ingredients like niacinamide.

Challenges & Limitations

Catechins, especially EGCG, are sensitive to air, light, heat, and high pH, which causes them to oxidize and lose effectiveness quickly.

These unstable compounds are not very effective in simple formulations, and their potency can drop if stability is not addressed.

They also have poor skin penetration and bioavailability. Though generally safe for topical use, concentrated green tea extracts or certain formulations can irritate or cause sensitivity in some individuals. Formulators need to test products on skin and follow recommended concentration limits based on safety assessments.

Recent Advances & Latest Research

New studies suggest green tea can help with wound healing and burn recovery, expanding its use beyond cosmetics into therapeutic applications.

More recent and controlled studies are evaluating measurable skin outcomes like elasticity, wrinkle depth, and pigmentation using standardized green tea-based products.

However, they recommend being cautious about long-term exposure and potential sensitization. Much of the focus now is on encapsulating EGCG in specialized delivery systems like liposomes, transfersomes, solid lipid nanoparticles, niosomes, nano-gels, and phytosomes. These help protect EGCG from degradation, improve how it deposits into the skin.

Trend Analysis

The use of green tea is evolving from a traditional ingredient to a science-backed cosmeceutical. Research is moving towards creating standardized

extracts with defined catechin levels and using advanced delivery systems to support claims related to anti-aging, UV protection, and wound healing.

Green tea is frequently combined with other active ingredients like vitamin C, niacinamide, and hyaluronic acid to enhance antioxidant, skin barrier, and brightening benefits.

4. COLLAGEN:

Sources, Composition & Biosynthesis

Collagen is a key structural protein that forms triple-helical fibers, mostly types I, II, and III.

Type I is found in skin, bone, and tendons, Type II in cartilage, and Type III in soft tissues. Fibroblasts produce it as procollagen, and it goes through processes such as hydroxylation and glycosylation to transform into mature collagen within the extracellular matrix. Collagen comes from various sources like cows, pigs, birds, marine animals, or through recombinant and microbial methods. Marine collagen is easier to digest but starts to break down at a lower temperature than collagen from mammals.

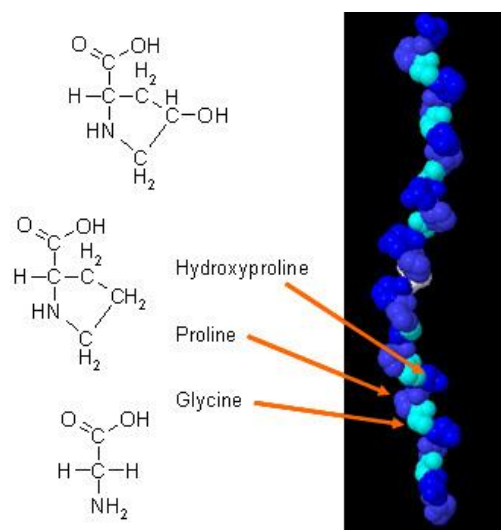


Figure 4: collagen structure

Biological Functions & Skin Mechanisms

Collagen gives structure and strength to skin and other connective tissues.

Collagen peptides can also help fibroblasts make new collagen, elastin, and hyaluronic acid, which supports skin structure and hydration. When used on the skin topically, collagen mainly helps with moisture, but using low-molecular weight peptides or special delivery systems can help it penetrate deeper into the skin.

Dose & Formulation

For topical use: 0.5-5% collagen for hydration; 0.5-3% bioactive peptides for deeper skin renewal.

Biomedical scaffolds are made based on the mechanical and degradation needs of the application.

Trends & Applications

Research on collagen is moving towards more sustainable sources like fish waste or microbial methods, and developing more effective peptides that can actively communicate with skin cells.

In biomedical uses, such as wound dressings and tissue scaffolds, collagen is growing in importance, with new materials designed for strength, durability, and controlled breakdown.

5. HONEY:

Source

Honey is a natural, sweet, thick substance made by bees from flower nectar, stored in their hives.

Its properties change depending on the flower it came from, the region it's from, and environmental conditions.

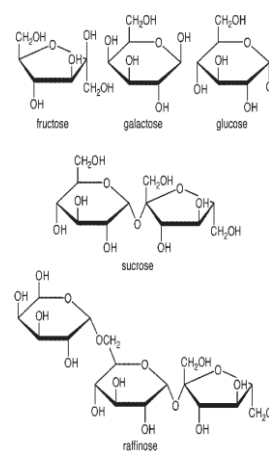


Figure 5: chemical constituents of Honey

Composition

Honey is mostly made up of carbohydrates—around 80-85% of it is sugars like fructose and glucose, with the remaining 15-20% being water.

It also contains organic acids, amino acids, enzymes such as invertase, catalase, and glucose oxidase, minerals, vitamins, and small amounts of proteins. Phenolic compounds and flavonoids, like quercetin, kaempferol, gallic acid, and caffeic acid, add to the antioxidant power and influence the color and taste. Manuka honey has methylglyoxal (MGO), which is a strong non-peroxide antimicrobial agent.

Benefits and Mechanisms

The high sugar content makes the environment too dry for bacteria to survive, while its low pH (3.2-4.5) helps stop bacterial growth. Hydrogen peroxide and other active compounds in honey fight bacteria and protect against oxidative stress. Its antioxidant properties help the body recover from damage more quickly. Manuka honey reduces inflammation by lowering pro-inflammatory cytokines. In wound healing, honey supports the growth of new tissue, blood vessels, and skin cells while keeping the area moist for better recovery.

Therapeutic Applications

Research shows that honey is effective in treating wounds on the skin. Medical-grade honey dressings have been used successfully in healing chronic ulcers, surgical wounds, and burns. The antimicrobial properties of honey work against resistant bacteria like *Staphylococcus aureus*. Clinical trials support that honey-based dressings reduce infections and promote faster healing compared to regular antibiotics.

Challenges

The main issue in honey research is its natural variation. Differences in plant sources and geographical areas cause changes in the active compounds, which makes it hard to create a standard.

Honey is now often adulterated, which affects both the safety and the realness of honey. Scientists are working on ways to check the authenticity of honey using machine learning and special fingerprinting techniques.

Allergic reactions are possible in people with sensitivity. Applying honey on sensitive skin or open wounds can cause mild irritation, especially with high-MGO Manuka honey.

Trends in Skincare

Honey has natural properties like holding moisture, fighting free radicals, and killing bacteria, so it's used in creams, masks, and serums. Recent studies show that honey can help with skin hydration, repairing the skin barrier, and reducing bacteria that cause acne.

New ways to use honey include impregnated hydrogels, nanofibers, and polymer films that slowly

release active ingredients for skin care and wound healing.

Manuka honey is especially used in medical dressings and high-end beauty products because of its strong antibacterial properties.

Dosing Considerations

In skin care products, honey concentrations range from 5% to 30% by weight in gels or creams.

Medical-grade honey dressings often contain almost pure honey. For taking internally, moderate use provides antioxidant and metabolic benefits without major risks.

6. MUCIN:

Overview & Sources

Mucins are a group of large, heavily sugar-coated proteins made in all animals.

Special cells in the body lining, such as goblet cells and submucosal glands, produce these in humans. They generate gel-forming mucins like MUC2, MUC5AC, and MUC5B or are intrinsic to the cells like MUC1. Animals, especially snails, also make mucin-rich secretions that are used in beauty and medical products.

Composition & Physical Properties

Mucins consist of three primary components: a protein structure containing serine and threonine, where sugar chains are attached; diverse sugar chains and cysteine-rich segments facilitate their gel formation through linking.

The arrangement of these elements results in the creation of a flexible gel that resembles a mesh, and its characteristics are greatly influenced by factors such as concentration, sugar variations, ionic conditions, and additional molecules.

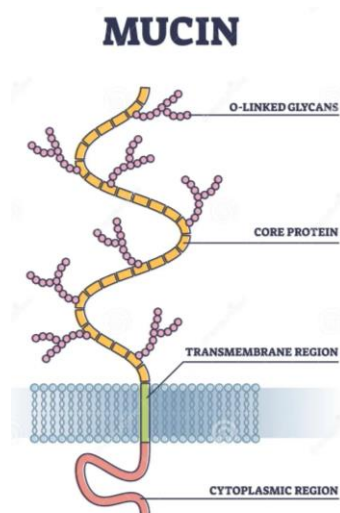


Figure 6: structure of Mucin

Challenges & Gaps

- 1) Heterogeneity & Standardization — native mucins are extremely varied in structure (isoforms, glycoforms), and commercial extracts can differ greatly based on species and how they are collected and processed, making it hard to compare studies.
- 2) The transition from laboratory or animal research to practical outcomes in fields like skincare and healthcare requires further meticulously planned clinical studies.
- 3) Safety, toxicity of mucin is not advantageous.

Benefits & Trends in Skin Care

The use of snail secretion filtrate (SSF), also known as “snail mucin,” has gained popularity in cosmetics, due to its benefits and trends in skincare.

Studies, both in the lab and in small human trials, suggest benefits such as faster healing of wounds, improved skin hydration and texture, anti-inflammatory effects, and better skin repair. These results are thought to be from a mix of mucin glycoproteins, peptides, hyaluronic-like sugars, allantoin, glycolic acid, and antioxidants found in the extract.

The recommended concentrations for snail mucin in topical products typically range from 1% to 10% based on information found in patents and product formulas. Some patents suggest 5% as a preferred amount for creams and lotions.

7. KAOLIN:

Introduction

Kaolin, mainly composed of the mineral kaolinite, is a layered silicate clay with the formula $\text{Al}_2\text{Si}_2\text{O}_5(\text{OH})_4$.

The unique structure of kaolinite contributes to its Physicochemical properties, which are important for absorption, texture control, such as

- Particle size and rheology: The size of the particles and any surface treatment affect how well they mix, their feel in topical products, and their opacity in pigments.
- Chemical stability in Kaolin explains its wide use as a supporting ingredient.

Benefits and applications

Kaolin is commonly utilized in cosmetic and dermo cosmetic products for its oil-absorbing and gentle cleansing properties, making it a popular ingredient in face masks, cleansers, and exfoliants to remove dirt from the skin.

It's especially popular for sensitive or combination skin since it is less harsh than other clays like bentonite. Clinical and consumer studies have shown that kaolin-based masks can improve skin texture and reduce oiliness. It helps control texture in creams, masks, and powders.

Challenges and safety considerations

Finely ground kaolin can pose a health risk if inhaled (as fine dust); safety assessments recommend caution with formulations that could be accidentally inhaled, like aerosolized powders.

Kaolin shows Batch-to-batch variation and impurities along with microbial contamination, heavy metals and processing residues

Compared to some clays (like bentonite), kaolin doesn't have much swelling or ion exchange ability, which limits its use in some adsorption or formulation methods.

Latest research trends

Recent reviews and studies have searched to create nanocarriers based on kaolin that improve drug loading, control release, and sometimes enhance the dissolution of poorly soluble drug ingredients.

Research is being done on combining kaolin with antimicrobials to create wound dressings and antibacterial surfaces.

Evaluations and regulatory reviews have confirmed kaolin's safety for topical use at standard concentrations but with caution against risk.

CONCLUSION:

The utilization of natural ingredients in skincare cosmetics has garnered significant attention owing to their diverse origins, encompassing plants, animals, minerals, marine sources, and micro-organisms. This article delineates several prominent natural constituents, including Liquorice, *Centella asiatica*, green tea extract, Collagen, Honey, Mucin, and Kaolin, underscoring their functional roles and benefits within skincare formulations. The increasing preference for natural ingredients is predominantly attributed to their lower incidence of adverse effects relative to synthetic alternatives. Nonetheless, challenges persist, such as potential interactions with other formulation components, allergic reactions in susceptible individuals, and complexities associated with product development. Continuous research and technological advancements are facilitating the creation of innovative skincare products that incorporate these natural substances, thereby promising enhanced efficacy and safety profiles in future applications.

CONFLICTS OF INTEREST:

The authors declare that they have no conflict of interest.

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