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A REVIEW ON INNOVATIVE USES OF SUNFLOWER (HELIANTHUS ANNUS) IN COSMETIC FORMULATIONS

Ch. Sravanthi*, M. Swapna[1], G. Karthik[2], G. Tulja Rani[3], M. Revathi[4]

*Assistant Professor, Mallareddy Pharmacy College, Hyderabad.

[1,2]B. Pharmacy, Mallareddy Pharmacy College. [3]Principal, Mallareddy Pharmacy College.

[4]Assistant Professor, Mallareddy Pharmacy College.

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***Corresponding Author**

Ch. Sravanthi

Assistant Professor, Mallareddy Pharmacy College, Hyderabad.

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ABSTRACT

Agricultural waste is underutilized, and sometimes burning them has a negative impact on the environment and human health. This research investigates the untapped potential of extracts from maize, wheat and sunflower waste as natural materials for cutaneous, specifically, cosmetic application. All extracts showed a desirable safety profile and good antimicrobial activity against various microorganisms. Lipid extracts have proven to be promising structural ingredients of the oil phase, contributing to the spreadability, occlusivity, and emollient effect. Ethanol extracts influenced washability and stickiness of the formulation and could be considered as prospective ingredients in self-preserving formulations. The extracts affected the sensory properties of the creams, mainly the smell and color. These results suggest that the extracts from wheat, maize, and sunflower waste could be used as multifunctional natural ingredients for cosmetic formulations which can replace less sustainable raw materials. This also represents a valorization of waste and is in line with broader sustainability goals. “Value-Added Products from Maize, Wheat and Sunflower Waste as Raw Materials for Pharmaceutical and Food Industry” (PhAgroWaste) has been designed, with the aim to investigate and propose a cost-effective and sustainable agricultural waste management practice, where micro- and nanocrystalline cellulose (MCC/NCC) and the other products of high commercial value and biological activity (waxes, polyphenol-containing extracts and/or isolated chemical compounds) will be produced from harvest residues of corn,

wheat and sunflower.

KEYWORDS: Wheat, Maize, Sunflower, Skin Care.

INTRODUTION

The use of skincare and cleansing products contributes to the health of the skin and the whole body, while daily skincare routines and decorative cosmetics improve body image, selfesteem, and quality of life. Cosmetics are topical products, i.e., substances or mixtures intended to be placed in contact with the external parts of the human body (epidermis, hair, nails, lips, and external genital organs) or with the teeth and mucous membranes of the oral cavity, mainly to cleanse them, perfume them, change their appearance, protect them, keep them in good condition or correct body odor. Wheat bran contains a significant amount of bioactive compounds, particularly phenolic acids and flavonoids. Antioxidant properties of wheat bran are primarily attributed to the presence of phenolic compounds, such as ferulic acid, p-coumaric acid, and vanillic acid. The presence of ferulic acid, syringic acid, phydroxybenzoic acid, vanillic acid, and coumaric acid in wheat bran further enhances its antioxidant properties, which are crucial in preventing oxidative-stress. Maize contains many biologically active compounds such as flavonoids, purine derivatives, alkaloids, saponins, volatile compounds, vitamins such as vitamin K, C and A, sugars, acids fats, starch, minerals. Essential fatty acid, isoquercitin, cyanogenetic material, dicarboxilatic acids includes oxalic acid; glycosides, polysaccharide, triterpene cyclosadol, flavonoids glycosides are also present in the maize. Corn is especially used to prepare traditionally value added products such as infant food, snacks, baked products etc. Chemicals such as ethanol and refined corn oil, starch, or industrial products like candies, cake mixtures, carbonated beverage, sorbitol and cosmetics. Corn is the excellent source of vitamins such as vitamin B-Complex which is used for the treatment of skin, hair, digestion, brain or heart disease. *Helianthus annuus* (sunflower) kernels and hulls contain phenolic compounds, which include chlorogenic and caffeic acids. *Helianthus annuus* (sunflower)-derived ingredients are used in cosmetics. Antimicrobial activities The antimicrobial activity of methanolic extract of seeds is evaluated from Helianthus annuus. The polar oil from the seeds of sunflower (Helianthus annuus) shows antimicrobial activity against Staphylococcus epidermis, E. coli. sunflower plant for the treatment of acne and pigmentation skin along with their pharmacological activities.

SUNFLOWER BIOLOGICAL SOURCE

The common sunflower (*Helianthus annuus*) is a species of large annual forb of the daisy family Asteraceae. The common sunflower is harvested for its edible oil seeds. which are often eaten as a snack food. They are also used in the production of cooking oil, as food for livestock, as bird food, and as plantings in domestic gardens for aesthetics. Wild plants are known for their multiple flower heads, whereas the domestic sunflower often possesses a single large flower head atop an unbranched stem.

Helianthus is a genus comprising about 70 species of Biological Source Helianthus is a genus comprising about 70 species of annual and perennial flowering plants in the daisy family Asteraceae commonly known as Sunflowers. The best-known species is the common sunflower (Helianthus annuus). Helianthus verticillate, was listed as an endangered species in 2014 when the U.S. Fish and Wildlife Service issued a final rule protecting it under the Endangered Species Act. The primary threats are industrial forestry and pine plantations in Alabama, Georgia, and Tennessee. They grow to 1.8 metres (6 feet) and are primarily found in woodlands, adjacent to creeks and moist, prairie-like areas.

Sunflower Seeds

Sunflower Plant.

DESCRIPTION

Sunflowers are usually tall annual or perennial plants that in some species can grow to a height of 300 centimetres (120 inches) or more. Each "flower" is actually a disc made up of tiny flowers, to form a larger false flower to better attract pollinators. The plants bear one or more wide, terminal capitula (flower heads made up of many tiny flowers), with bright yellow ray florets (mini flowers inside a flower head) at the outside and yellow or maroon (also known as a brown/red) disc florets inside. Several ornamental cultivars of H. annuus have red-coloured ray florets; all of them stem from a single original mutant. While the majority of sunflowers are yellow, there are branching varieties in other colours including, orange, red and purple. This genus is distinguished technically by the fact that the ray florets (when present) are sterile, and by the presence on the disk flowers of a pappus that is of two awn-like scales that are caducous (that is, easily detached and falling at maturity). Some species also have additional shorter scales in the pappus, and one species lacks a pappus entirely. Another technical feature that distinguishes the genus more reliably, but requires a microscope to see, is the presence of a prominent, multicellular appendage at the apex of the style. Variability is seen among the perennial species that make up the bulk of those in the genus. Some have most or all of the large leaves in a rosette at the base of the plant and produce a flowering stem that has leaves that are reduced in size. Most of the perennials have disk flowers that are entirely yellow, but a few have disk flowers with reddish lobes. One species, H. radula, lacks ray flowers altogether.

Growing sunflower

Microscopy of Sunflower

1. Sunflower Seed

a. Seed Coat

Structure: The outer layer is thick and can have various textures, including ridges and grooves.

Microscopic Features: The seed coat consists of multiple layers, including an outer epidermis and a thicker layer of sclerenchyma cells providing protection.

b. Endosperm

- Structure: The tissue inside the seed that stores nutrients.
- Microscopic Features: Composed of starchy, dense cells that provide nourishment to the developing embryo.

c. Embryo

- Structure: Contains the radicle (root precursor), hypocotyl (stem precursor), and cotyledons (seed leaves).
- Microscopic Features: The embryo includes a small, complex arrangement of cells that will develop into the seedling. Cotyledons appear as leaf like structures with distinct vascular tissues.

2. Sunflower Leaf

a. Epidermis

- Structure: The outermost layer of cells.
- Microscopic Features: Single layer of cells with cuticle covering. Often shows stomata (pores) surrounded by guard cells.

b. Mesophyll

- Structure: The middle layer of the leaf, consisting of palisade and spongy mesophyll.
- Microscopic Features:
- Palisade Mesophyll: Elongated cells rich in chloroplasts, arranged in columns.
- Spongy Mesophyll: Irregularly shaped cells with intercellular spaces, allowing gas exchange.

c. Vascular Bundles

- Structure: Xylem and phloem tissues arranged in veins.

- Microscopic Features: Xylem cells are typically larger with thickened walls, while phloem cells are smaller and involved in nutrient transport.[6]

3. Sunflower Stem

a. Epidermis

- Structure: The outer layer of the stem.
- Microscopic Features: Single layer of cells, often with a waxy cuticle and possibly some trichomes (hairs).

b. Cortex

- Structure: The region between the epidermis and vascular tissue.
- Microscopic Features: Contains collenchyma and parenchyma cells, providing support and storage.

c. Vascular Bundles

- Structure: Arranged in a ring in dicot stems.
- Microscopic Features: Xylem vessels are larger with thick walls; phloem is located outside the xylem. Bundles are surrounded by a bundle sheath.

4. Sunflower Flower Head

a. Ray Florets

- Structure: The large, petal-like structures on the outer edge of the flower head.
- Microscopic Features: Each ray floret is composed of a single layer of cells with a long, narrow shape, and the surface might have small hairs or glandular cells. b. Disk Florets
- Structure: The small, tubular flowers in the center of the head.
- Microscopic Features: Consist of numerous tiny cells with densely packed pollen grains and ovary structures.

c. Bracts

- Structure: Leaf-like structures beneath the flower head.
- Microscopic Features: Similar to leaf structure but often more specialized with fewer stomata.

5. Sunflower Petals

a. Epidermis

- Structure: The outer cell layer.
- Microscopic Features: The cells are usually more transparent, with pigments (like carotenoids) giving colour to the petals.

b. Mesophyll

- Structure: The tissue between the epidermal layers.
- Microscopic Features: Often contains cells with pigments and may include glandular cells that secrete substances.

Microscopy Techniques

Light Microscopy: Used for examining general structures and features of sunflower parts.

Scanning Electron Microscopy (SEM): Provides detailed surface images of seeds, petals, and other structures, showing textures and fine details.

Transmission Electron Microscopy (TEM): Offers a detailed view of internal cellular structures, including organelles.

Parts of Plant that has Cosmetic Values

Sunflower plants offer a variety of parts that can be Each part of the sunflower plant can contribute to various cosmetic products, from moisturizers and serums to exfoliants and masks, leveraging the plant's natural properties to benefit skin and hair.[9] Adulteration and Substitution of Sunflower Plant Sunflower oil is popular and widely used in both culinary and cosmetic products, but due to its popularity and value, it can sometimes be subject to substitution and adulteration. Here's how these issues typically manifest and what you can do to identify them.

- Substitution
- Blend with Other Oil: Sunflower oil might be blended with cheaper oils like soybean oil, canola oil, or palm oil to reduce costs. This can affect the oil's properties and quality.
- Lower-Quality.

Sunflower Oil: Sometimes, lower grades of sunflower oil may be used instead of high quality, refined sunflower oil. This can impact the utilized for cosmetic purposes. Here's a breakdown of the different parts and their cosmetic benefits.

Sunflower Oil: Extracted from the seeds, sunflower oil is widely used in skincare products due to its high content of essential fatty acids, such as linoleic acid, and vitamins E and K. It's known for its moisturizing properties, making it an excellent ingredient in lotions, creams, and hair care products.

Sunflower seeds: Beyond the oil, crushed sunflower seeds can be used as an exfoliant in scrubs. They help to gently remove dead skin cells and improve skin texture.

Sunflower Petals

The petals contain antioxidants and can be used in face masks and skincare treatments. They can also be infused into oils or used in herbal teas that are incorporated into cosmetic formulations.

- Sunflower Leaf: The leaves can be used to extract beneficial compounds that may offer anti inflammatory and soothing properties for skin care.

Sunflower Stems: Though less common, extracts from sunflower stems can sometimes be found in cosmetic products for their potential antioxidant benefits. oil's effectiveness and stability.

Phyto constituents of Helianthus Annuus Phyto constituents

Name of compounds	Plant part
Carbohydrates	seeds
Phenolic compound	florets
allelochemicals	Leaves, stems, roots
saponins	seeds
tannins	seeds
terpenoids	Aerial parts
steroids	seeds
flavonoids	seeds

The important Phytoconstituents derived from H. annuus are flavonoids, flavonoids, carbohydrates, tannins, saponins, alkaloids, phytosterols, active proteins and fixed oils. The composition of the seed of sunflower is as proteins, peptides, amino acids and other nonprotein nitrogen, carbohydrates, lipids, fatty acids, palmitic acid, oleic acid, linoleic acid, tocopherol, carotenoids, vitamin, chlorogenic acid, quinic acid, caffeic acid, total minerals potassium, Sulphur, phosphorus, calcium, magnesium and sodium.

Carbohydrate

Polysaccharides which are non-starch obtained from sunflower (H. annuus L.) extracts by delignification of the related cell wall materials which were sub fractionated by graded ethanol precipitation, adsorption chromatography and size exclusion and by chronological alkaline extraction. The methanolic seeds extract of H. annuus L. show that the plant contains significant amount of carbohydrates.

Phenols

Phenols are isolated from H. annuus Florets of sunflower are rich source of dietary fiber, Fe and phenols.

Allelo chemicals

Allelo chemicals are analyzed in leaves, roots and stems of sunflower by using thin layer chromatography for alkaloids and spectrophotometry for flavonoids and phenols.

Saponins

Triterpenoid Saponins: These compounds may have immune-boosting and anti-inflammatory properties.

Tannins

Tannins are reported in H. annuus and it is analyzed that contain an oleic acid, alkaloid, tannins, fixed oils and simple phenolic compound.

Terpene compounds From the aerial parts of H. annuus an entkaurane glycoside named helikauranoside A are analyze along three known compounds which are grandifloriacid, paniculoside and ent-kaurane-type diterpenoids: (-) kaur 16-en-19-oic acid. A new germacranolide with a methylene-y-lactone moiety, the heliangolideniveusin B and its ethoxyderivative are isolated by ethanolic extract and their structures elucidated by spectroscopic methods and two sesqui terpene are derived from the leaves and stem.

Flavonoids

Types of Flavonoids in Sunflowers

Quercetin: A common flavonoid with antioxidant and anti-inflammatory properties. It can help neutralize free radicals and reduce inflammation.

Kaempferol: Another flavonoid with antioxidant properties that may contribute to cardiovascular health and have anti-cancer effects.

Luteolin: Known for its antioxidant and anti inflammatory effects, luteolin is also being studied for its potential neuroprotective benefits. These phytoconstituents make sunflowers a valuable plant not only for their nutritional benefits but also for their potential therapeutic applications.

Cosmetic Use of Helianthus Annuus Sunflower (Helianthus annuus)

plants offer a range of Tyagi et al. European Journal of Biomedical and Pharmaceutical Sciences cosmetic benefits, primarily due to their various components like oil, seeds, and petals. Here's a comprehensive look at how different parts of the sunflower plant is utilized in cosmetics.

- Hydration: Sunflower oil and seeds help retain moisture and keep the skin hydrated.
- Antioxidant Protection: Vitamin E and other antioxidants help protect the skin from damage caused by free radicals.
- Nourishment: Essential fatty acids and vitamins in sunflower oil and seeds nourish the skin and hair.
- Soothing: Extracts from petals and leaves can soothe and calm irritated skin.[23]

1. Sunflower Oil

Moisturizer Uses: Sunflower oil is commonly used in lotions, creams, and body butters for its excellent moisturizing properties. It is rich in linoleic acid, which helps to maintain the skin's barrier and retain moisture.

Anti-Ageing

Uses: The high content of Vitamin E in sunflower oil acts as an antioxidant, protecting the skin from oxidative damage and reducing the appearance of fine lines and wrinkles.

Cleanser Uses: Sunflower oil can be used as a gentle makeup remover or facial cleanser. It helps to dissolve impurities and makeup without stripping the skin of its natural oils.

Hair Care Uses: Applied to the hair, sunflower oil can condition and add shine. It helps to nourish the scalp and can be used in hair masks to improve overall hair health.

Anti-Ageing Actions

Packed with a high concentration of vitamin E, sunflower oil promotes collagen production, reducing the appearance of fine lines and wrinkles. This supports to a make your skin look youthful and attain a radiant complexion.

Acne Prevention

Contrary to common belief, sunflower oil is non comedogenic and won't clog pores. The light

texture of this natural emollient makes it ideal for all skin types, even those prone to acne. Regular use may help prevent breakouts and make the skin flawless.

Uses of Sunflower Oil for Skin

Facial Moisturizer Smear a few drops of sunflower oil to your face as a part of your daily skincare routine to lock in moisture and promote a healthy glow.

Makeup Remover

Sunflower oil can effectively dissolve makeup without harsh chemicals. Gently massage it onto your face and wipe it away with a cotton pad for a natural and nourishing makeupremoval process.

2. Sunflower Seeds

Exfoliant Uses: Ground or crushed sunflower seeds are used in facial scrubs and body exfoliants. They provide a gentle abrasive action to help remove dead skin cells and improve skin texture.

Hair Treatment Uses: Sunflower seeds are rich in essential fatty acids and minerals, which can be beneficial when ground into a paste and used as a hair treatment to strengthen and nourish the hair.

3. Sunflower Petals

Infused Oils Uses: Sunflower petals can be infused into carrier oils to create a floral-scented oil that can be used in massage oils, bath oils, or as a base for other cosmetic products.

Face Masks Uses: Extracts or infusions of sunflower petals can be incorporated into face masks for their antioxidant and anti- inflammatory properties. They help soothe the skin and improve its appearance.

4. Sunflower Leaf Extract

Soothing Agent Uses: Sunflower leaf extracts can be used in skincare products for their potential anti-inflammatory and soothing properties, which help calm irritated or sensitive skin.

Anti-Ageing Actions

Packed with a high concentration of vitamin E, sunflower oil promotes collagen production, reducing the appearance of fine lines and wrinkles. This supports to a make your skin look youthful and attain a radiant complexion.

Acne Prevention

The light texture of this natural emollient makes it ideal for all skin types, even those prone to acne. Regular use may help prevent breakouts and make the skin flawless. Uses of Sunflower Oil for Skin.

METHODOLOGIES CREAM

Formulation Development

With the aim of investigating the potential of extracts from harvest residues to be used as cosmetic ingredients in cutaneous formulations, we set out to develop a simple cream (placebo 1 formulation—P1) that would also be in line with sustainable development in terms of ingredients. Initially, we prepared formulations with different concentrations of extracts—lipid extract 1.0, 2.0, and 10.0% and ethanol extract 1.0, 0.5, and 0.1%. As the formulations were only allowed to differ in the type of extract, due to the instability of the cream with 10% of the maize lipid extract, we selected formulations with 2% lipid extract for further investigation—WLE (wheat lipid extract in P1), MLE (maize lipid extract in P1), and SLE (sunflower lipid extract in P1). In all formulations with ethanol extracts, butylene glycol was added as a necessary co-solvent and placebo 3 (P3) was prepared. All formulations with 1% ethanol extracts were not stable few days after preparation as well as the formulation with 0.5% sunflower ethanol extract, so formulations with 0.1% ethanol extract were selected—WEE (wheat ethanol extract in P3), MEE (maize ethanol extract in P3), and SEE (sunflower ethanol extract in P3).

The initial development of formulations has shown that the extracts studied can be incorporated into formulation in larger quantities than in the creams tested. Lipid extracts can be incorporated in concentrations of up to 10%, whereas this concentration is much lower for ethanol extracts and could be as low as 0.5% according to our results. However, to achieve this, case-by-case development of each individual formulation is required.

ANTI MICROBIAL ACTIVITY

The antimicrobial activity of the extracts and creams was tested against ATCC laboratory control strains of seven pathogenic bacteria and one yeast purchased from the ATCC and NCIMB collection (KWIK-STIK™, Microbiologics, St. Cloud, MN, USA) as follows: *Staphylococcus aureus* subsp. *aureus* Rosenbach ATCC 6538, *Staphylococcus epidermidis* ATCC 12228, *Enterococcus faecalis* ATCC 29212, *Escherichia coli* ATCC 25922, *Klebsiella pneumoniae* subsp. *pneumoniae* NCIMB 8267, *Salmonella enterica* subsp. *enterica* serovar

Abony NCTC 601, *Pseudomonas aeruginosa* ATCC 27853, and *Candida albicans* ATCC 24433. The strains were maintained at −80 °C in 15% glycerol, defrosted before experiments, and inoculated from stock solutions onto Triptic Soy agar/broth (TSA/TSB, Oxoid Ltd., Basingstoke, UK) for bacteria and Sabouraud Dextrose agar/broth (SDA/SDB, Oxoid) for *Candida albicans*. Prior to experiments, all tested strains were incubated on corresponding agar plates for 24–48 h at 35 °C under aerobic conditions, and fresh (overnight) cultures were used for preparation of inoculum.

Antimicrobial Activity Analysis

Preservatives, as ingredients that prevent the growth and development of microorganisms, are necessary in water-based topical products. On the other hand, due to the possible toxic effect of preservatives, there is a requirement that products should be free of preservatives.

For this reason, research into multifunctional ingredients that could also have antimicrobial effects is attracting great attention. We investigated the antimicrobial activity of all the extracts tested, not only on those microorganisms whose presence is not allowed in cosmetic products and non-sterile topical medicines but also on several microbial laboratory strains that could be of importance for the human microbiome.

The results of the antimicrobial activity of all extracts are presented in Figure 6, with MIC values ranging from 0.125 to 64 mg/mL. As expected, the preserved cream samples showed low antimicrobial activity against all bacteria and yeasts tested with a MIC value of 64 mg/mL or more. Sunflower ethanol extract (EE-S) showed the best activity against *S. aureus* and *S. epidermidis* (MIC 0.125 mg/mL and less). Wheat ethanol extract (EE-W) showed moderate activity against these strains (MIC 32 mg/mL) and maize ethanol extract (EE-M) showed moderate and low activity against *S. aureus* and *S. epidermidis* (MIC 32 and 64 mg/mL, respectively). All ethanol extracts showed the best activity among investigated microorganisms (MIC < 1 mg/mL) against *C. albicans*. All lipid extracts showed good antimicrobial activity against *S. aureus*, *S. epidermidis*, *E. faecalis*, and *C. albicans*, while maize lipid extract (LE-M) showed low antimicrobial activity against *P. aeruginosa* (MIC 32 mg/mL). LE-S showed the best antimicrobial activity among lipid extracts.

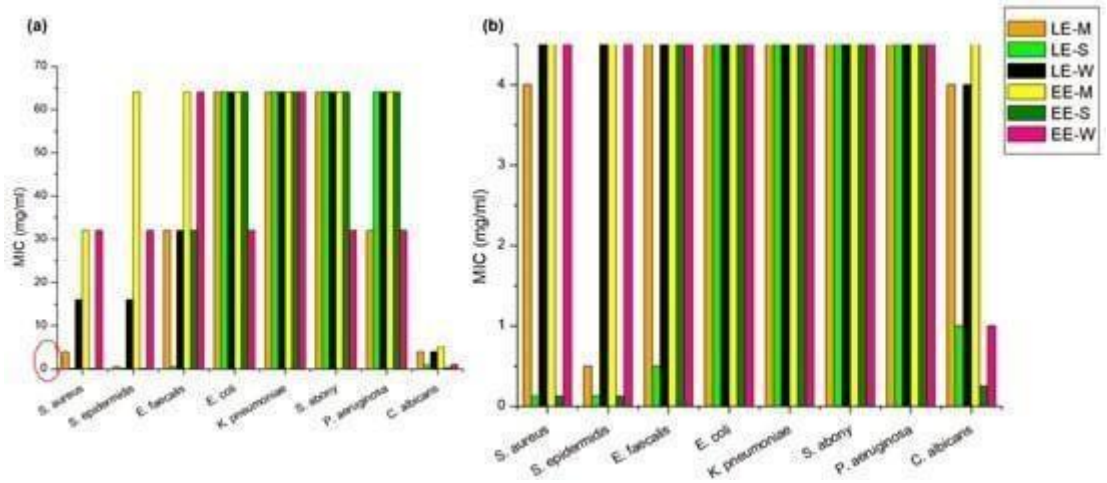

Figure: Antimicrobial activity of investigated extracts (a) MIC 0–64 mg/mL and (b) MIC 0–.

4.5 mg/mL

The results of the antimicrobial activity of the ethanol extracts were expected due to their composition and overall flavonoid and phenolic compounds that exhibit antimicrobial activity. The more pronounced effect of sunflower extract could be explained by the presence of chlorogenic acid, which has been shown to have a wide range of antimicrobial activity. A slightly better effect of wheat extract compared to maize extract may be due to the higher content of coumaric acid. The fact that the lipid fraction also showed very good antimicrobial activity is more interesting. The antimicrobial properties of fatty acids (FA) have long been recognized, and for saturated FA, better antimicrobial activity is determined for FA with a shorter alkyl, while unsaturated FA with a long chain has a better effect than saturated ones. It has been shown that a moderate alkyl chain length and the presence of an unsaturated site C8:0–18:1 FA are required for antimicrobial activity and this could explain the antimicrobial activity of the extracts studied. Based on available data for unsaturated FA antimicrobial activity, it could be assumed that LE-S (lipid sunflower extract) showed the best antimicrobial activity due to the highest content of unsaturated FA—C18:1, C18:2, and C18:3 (Table 2: LE-S ~ 61%, LE-M ~ 56%, and LE-W ~ 41%)—among lipid extracts. Considering the great interest in the research of FA antimicrobial effect and their application in the field of food, medicine, and cosmetics, it is important to emphasize the antimicrobial activity of investigated lipid extracts from harvest waste, which as structural components of an oil phase in an emulsion could be considered as multifunctional ingredients of topical products. Nevertheless, as in the case of tested creams with extracts that did not show antimicrobial activity, the fact that extracts have an antimicrobial effect is not enough to assume such

activity in the final formulation, and this potential effect needs to be evaluated for each formulation separately. In addition, this is important due to the fact that extracts can have a negative impact on skin commensal bacteria such as *S. epidermidis*. For potential final formulations in which extracts would be a part of the preservative system, proper safety assessment regarding the effect on the skin microbiome should be performed.

Facial Scrub

Cosmetics are available as various forms and each has its own role to play on the skin. Skin becomes dull, non glowing due to various causes and these can effectively be overcome with the application of scrubs. There are two types of scrub being used on the skin such as facial scrub and body scrub. These two differ only with the ratios of oil and sugar added in each. Usage of oil is high in facial scrub due to which it is less abrasive. It removes the dead skin cell and exfoliates the skin. Scrub can be used on any type of skin. Only the essential oil used in scrub as ingredient will vary with the type of skin. Skin is classified into three types such as dry skin, oily skin, and sensitive skin. On regular use of scrubs, skin becomes glowing and smoother because dead skin cells are removing thereby exposing new skin cells. Mild abrasive agent is one of the key ingredients in facial scrub formulation. Scrubs can be directly applied on to the skin or can be applied with small cosmetic pad. Gentle message is recommended on application of the scrub gel which helps to improve blood circulation and increases oxygen supply to all surface of the skin.

Preparation of Face Pack

The powdered ingredients were mixed and sieved using #40 mesh weighed accurately and mixed geometrically for uniform mixing. This was then stored in an air tight container for evaluation.

Evaluation of Scrub with different solvents.

Table: Evaluation of scrub with different solvents.

Honey	**Poor effect**
milk	better effect
Butter milk	excellent effect
Rose water	good effect

In Buttermilk due to astringent properties of lactic acid it helps in preventing premature aging and tightens the skin and keeps it wrinkle-free and youthful.

Rose water has its own fragrance. Evaluation Parameter of Facial Scrub.

Table: Evaluation parameter of facial scrub.

parameter		**Observation**
Organoleptic Evaluation	Nature	powder
	colour	Dark green
	taste	characteristic
	texture	fine
	odour	pleasant
Physicochemical Evaluation	ph	6
	Total ash	0.3 % w/w
	Moisture content	4 % w/w
General Powder Characteristics	tapped	18gm/cc
	bulk	25gm/cc
	Angle of repose	5 0.19
	grittiness	No gritty particle
	Nature of face wash	Soft and fresh, clean from dirt

Future Perspectives

Future research on wheat, maize, and sunflower in cosmetic

formulations should focus on advanced extraction and green processing technologies to obtain high-purity bioactives with minimal environmental impact. Greater emphasis is needed on valorization of agro-industrial by-products (bran, husks, oil cakes) to support sustainability and circular economy models. Nano- and micro-encapsulation approaches can be explored to enhance stability, skin penetration, and controlled release of plant-derived actives. More well-designed clinical studies are required to substantiate claims related to antiaging, barrier repair, and photoprotection. Comparative studies between plant-based and synthetic ingredients will further validate efficacy and consumer acceptance. Future formulations may integrate these ingredients into multifunctional cosmeceuticals targeting hydration, inflammation, and microbiome balance. Advances in biopolymer science can expand the use of wheat proteins and maize starch as biodegradable thickeners and film formers. Safety assessments should continue to address allergenicity and long-term use.

Finally, alignment with clean-label, vegan, and sustainable beauty trends will drive innovation and commercial relevance of wheat, maize, and sunflowerbased cosmetic ingredients.

CONCLUSION

This review highlights the significant potential of wheat, maize, and sunflower as innovative, multifunctional ingredients in modern cosmetic formulations. Rich in bioactive compounds

such as essential fatty acids, proteins, polysaccharides, antioxidants, and phytosterols, these crops offer diverse benefits including skin barrier repair, moisturization, antioxidant protection, anti-inflammatory effects, and formulation stability. Wheat-derived proteins and lipids contribute to conditioning, film-forming, and antiaging properties; maize-based starches and extracts provide sustainable texturizing, absorbent, and protective functions; while sunflower oil and its derivatives serve as effective emollients and delivery-enhancing agents. The reviewed evidence supports their safety, biocompatibility, and versatility in skincare and hair care products. Moreover, the utilization of agricultural by-products aligns with sustainability and circular economy principles, meeting the growing demand for natural and eco-friendly cosmetics.

Overall, wheat, maize, and sunflower represent valuable plant resources that can bridge traditional knowledge and advanced cosmetic science, offering promising avenues for innovation in clean, effective, and sustainable cosmetic formulations.

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