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Exploring Wheat Derivatives in Cosmetic Formulations: An In-Depth Analysis of Efficacy and Applications

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Abstract

Natural and environmentally friendly, herbal cosmetics made from organic plant-based ingredients are becoming more and more popular in the skincare sector. These products meet the growing demand from consumers for safer, more environmentally friendly personal care products by substituting plant extracts for synthetic ingredients. Herbal cosmetics target a range of skin issues, including dryness, aging, and acne, by utilizing the medicinal qualities of plants including chamomile, green tea, and aloe vera. The bioactive ingredients in wheat, such as its antioxidants, anti-inflammatory properties, and moisturizing elements, have significant advantages for skin care. Growing consumer awareness of possible risks associated with synthetic products and a preference for ecologically friendly methods are driving the trend towards natural alternatives, which is shown in the growing popularity of herbal cosmetics. To fully utilize herbal constituents and overcome integration issues in contemporary cosmetic formulations, continued research and development will be essential as the industry develops.

Keywords: Skincare, natural remedies, herbal cosmetics, wheat, *Triticum vulgare*

INTRODUCTION

Herbal cosmetics have grown in popularity among health-conscious customers due to growing knowledge of the possible hazards linked with synthetic chemicals and the need for sustainable alternatives. These skincare solutions provide a kinder, frequently more efficient approach to skincare because they are made with plant-based components that are recognized for their medicinal qualities. They first serve customers who are looking for products devoid of harsh chemicals, artificial perfumes, and synthetic preservatives that can irritate their skin or have other negative effects [1]. Second, environmental responsibility and sustainability are becoming more and more important. Natural approaches, such as using organic materials, minimizing packaging, and conducting cruelty-free testing are often linked to herbal cosmetics [2]. This is in line with the general consumer trend toward socially and environmentally responsible products. In conclusion, the market for safer, more environmentally friendly, and potent personal care products is what is driving the need for herbal cosmetics. Herbal cosmetics are ideally positioned to address changing consumer demands and awareness while encouraging a more ecologically conscious and health-conscious approach [3].

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HERBS AND THEIR COSMETIC USE [4]

Using organic plant-based substances to improve skin health and appearance, herbal cosmetics have become a major market within the skincare and cosmetics sector [5]. Herbal cosmetics are praised for their ability to offer kinder and safer skincare solutions [6]. Many plant extracts, including chamomile for its calming qualities, green tea for its antioxidant qualities, and aloe vera for its hydration, are used in herbal cosmetics [7]. In addition to

enhancing the products' effectiveness, these substances support natural well-being and sustainability [8]. Studies on herbal cosmetics demonstrate the efficacy of herbs in treating a range of skin issues, such as dryness, aging, and acne, and show that many traditional therapies have scientific support [9]. To sum up, herbal cosmetics offer a promising route toward holistic and natural skincare by balancing history and innovation in a harmonic way. As the market develops, more research and development will be needed to fully realize the advantages of herbal remedies and deal with the challenges of incorporating them into contemporary cosmetic procedures (Figure 1 and Table 1).

Table 1. Herbs and their cosmetic use.

Herbs	**Cosmetic Use**
Turmeric	Face cream
Sandalwood	Oil
Bhringraj	Oil/shampoo
Neem	Face wash
Carrot	Emulsion
Oat	Powder/paste
Almond	Seed oil
Aloe vera	Cold cream/ lotion
Fullers earth	Face pack
China rose	China rose
Coconut oil	Hair oil
Sunflower	Lip balm
Cocoa butter	Body lotion
Amla	Hair oil
Saffron	Skin cream
Brahmi	Shampoos
Lemon	Soaps, shampoos
Tamarind	Face wash
Citronella oil	Body sprays

Figure 1. Wheat.

Triticum vulgare

- *Kingdom: Plantae.*
- *Group:* Angiosperms.
- *Common name:* Wheat.
- *Synonymous names: Triticum vulgare*, *Triticum aestivum.*
- *System of medicine:* Ayurveda, Siddha, Unani.

Geographic Distribution

Bread wheat, *Triticum aestivum*, is cultivated in Europe (both Eastern and Western) Americas (Latin America, US, Canada) Africa (Sub-Saharan and North Africa) Oceania (New Zealand, Australia).

With a few exceptions, such as tropical areas, it is extensively grown throughout the world.

Cultivation and Collection

Cultivation of *Triticum vulgare*, or common wheat, requires a temperate climate with moderate temperatures and rainfall. The ideal temperature for growth varies throughout the stages, from 10–15°C for germination to 25–30°C for grain filling [10]. Wheat can grow on various soil types, including slit loam, sandy loam, and clay loam, if the soil is well-draining and fertile with a pH between 6.0 and 7.0 [11]. Sowing typically occurs in autumn or spring, depending on the region, with seeds planted 2–3 cm deep and 200–250 seeds per square meter [12]. Adequate moisture is crucial during germination, seedling, and grain filling stages [13]. Balanced fertilizers are applied to promote healthy growth, with nitrogen, phosphorus, and potassium levels varying depending on the region and soil type [14]. Regular monitoring and control measures are taken to prevent damage from pests and diseases, including aphids, wheat bugs, rodents, powdery mildew, leaf rust, and fusarium head blight [15]. When the grains are dry and golden yellow, with a moisture content below 20%, they are ready for harvest [16]. Cutting, drying, threshing, winnowing, and storage follow, with grains cleaned, graded, and milled into various products like flour, bread, and pasta [17]. Some key points to consider include the use of conventional or organic farming practices, the impact of irrigation and crop rotation on yield and quality, and the importance of post-harvest handling and storage in maintaining grain quality (Figure 1) [18].

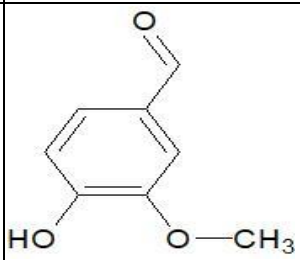
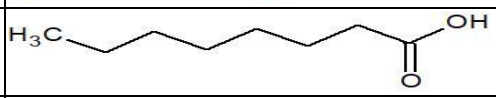
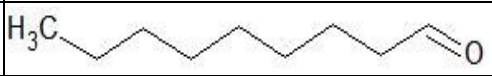
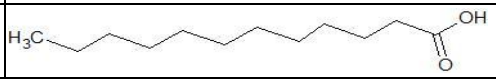
Significance

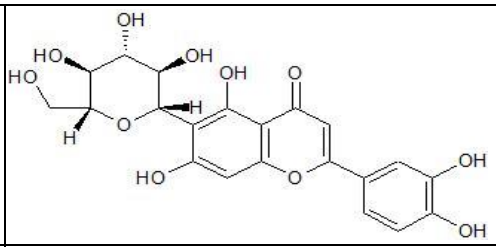
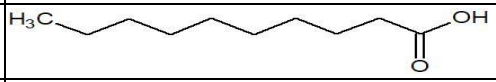
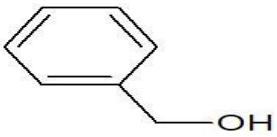
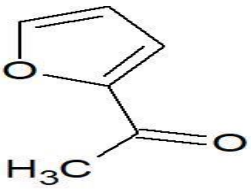
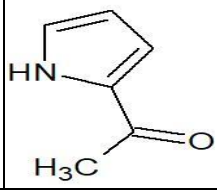
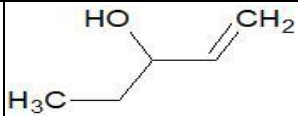
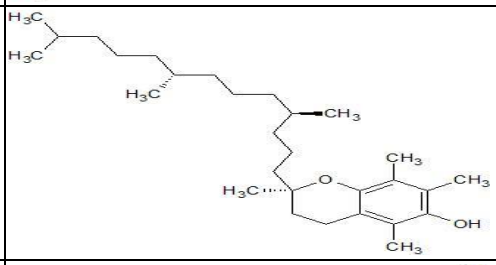
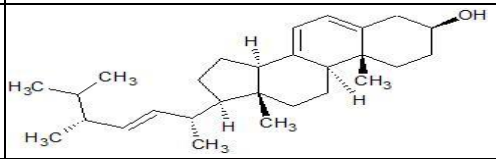
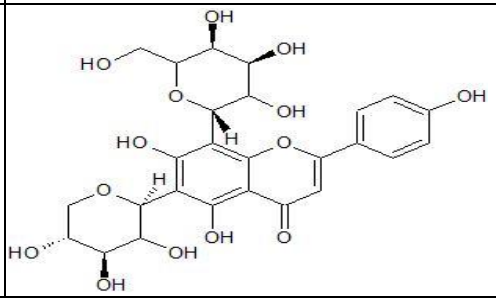
In Ayurveda and Unani systems wheat is considered a wholesome grain that provides nourishment and energy It's believed to have a balancing effect on the three doshas (Vata, Pitta, and Kapha) [19]. It possesses nutritional properties, balancing properties, strength and energy, digestive health, calming effects, and skin and hair benefits [20]. It is used to treat skin diseases, menstrual disorders, anxiety, constipation, diarrhea, and inflammation [21].

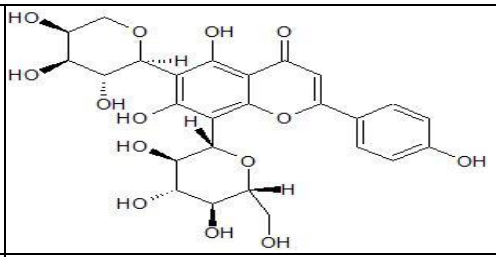
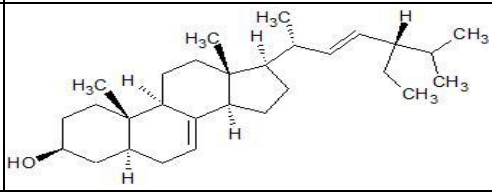
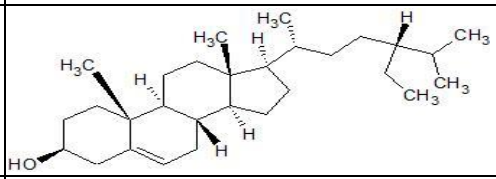
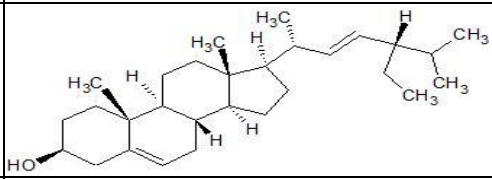
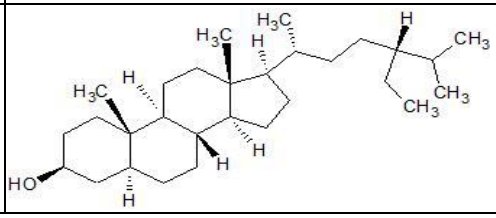
Phytoconstituents

Phytoconstituents like vanillin, isoorientin, and beta-sitosterol showcase diverse structures, contributing to their unique bioactivities. These compounds, ranging from fatty acids to sterols, play significant roles in medicinal and nutritional applications (Table 2).

Table 2. Phytoconstituents and their structure.

Plant Part	Phytoconstituents	Structure
Leaf	Vanillin	
	Octanoic acid	
	Nonanal	
	Lauric acid	

	Isoorientin	
	Octanoic acid	
	Benzyl alcohol	
	2-acetylfuran	
	2-acetapyrrol	
	2, 4 decadienal	
	1-penten-3-0l	
Seed	Vitamin E	
	Ergosterol	
	Vicenin 1	

	Isoschaftoside	
Stem	Alpha-Spinasterol	
	Beta-Sitosterol	
	Stigmasterol	
	Stigmastanol	

PHARMACOLOGICAL ACTIVITIES

Antioxidant Activity

These substances counteract free radicals, lowering oxidative stress and shielding the skin from UV rays, air pollution, and inflammatory damage [22]. By eliminating oxidative stress, blocking lipid peroxidation, and scavenging free radicals, *Triticum vulgare* helps to prevent skin aging, minimize wrinkles and fine lines, enhance the tone and texture of the skin, and guard against skin cancer [23]. Its antioxidant activity makes it an effective ingredient in skincare products, helping to protect and preserve the skin's health and appearance [24].

Anti-Inflammatory

The anti-inflammatory activity of *Triticum vulgare* is a complex and multifaceted phenomenon, credited to the abundance of bioactive substances it contains, including as carotenoids, phenolic acids, flavonoids, and avenanthramides [25]. This is achieved through the presence of antioxidants, such as phenolic acids and flavonoids, which neutralize free radicals and prevent them from causing damage to the skin [26]. Furthermore, *Triticum vulgare* has been shown to soothe and calm the skin, reducing redness and irritation, making it an effective ingredient in skin care products for sensitive skin [27].

The anti-inflammatory activity of *Triticum vulgare* makes it work well as a component in skin care products for reducing redness and irritation, soothing and calming sensitive skin, reducing inflammation, and improving skin conditions, such as acne, rosacea, and eczema, and protecting the skin from environmental stressors and pollution. In addition, the anti-inflammatory activity of *Triticum vulgare* has been shown to have a positive effect on the skin ailments, such as dermatitis, psoriasis, and

skin allergies, lowering inflammation, and enhancing skin health [28]. Its ability to soothe and calm the skin makes it an effective ingredient in skin care products for skin irritations, such as sunburn, windburn, and minor cuts and scrapes [29]. Overall, the anti-inflammatory activity of *Triticum vulgare* provides a range of benefits for the skin, making it an effective and natural ingredient for skincare products. Its ability to reduce inflammation, promote skin health, and soothe and calm the skin makes it an effective ingredient for a range of skincare products, from anti-aging creams to soothing lotions and creams [30].

Anti-Aging Activity

The chemical components of *Triticum vulgare* that contribute to its anti-aging activity include phenolic acids, such as ferulic acid, sinapic acid, and caffeic acid, which have antioxidant and anti-inflammatory properties [31]. Flavonoids like quercetin, kaempferol, and naringenin also play a role in reducing oxidative stress and inflammation [32]. Carotenoids, including lutein, zeaxanthin, and β-carotene, help protect the skin from environmental stressors and promote collagen production [33]. Avenanthramides, a unique compound found in wheat, have been shown to have anti-inflammatory and antioxidant effects, while phospholipids like phosphatidylcholine, phosphatidylethanolamine, and phosphatidylinositol help maintain skin hydration and elasticity [34]. Additionally, tocopherols (Vitamin E), tocotrienols, and squalene also contribute to the anti-aging activity of *Triticum vulgare* by protecting the skin from damage and promoting overall skin health [35, 36].

Moisturizing Activity

The moisturizing activity of *Triticum vulgare*, commonly known as wheat, has been widely recognized and utilized in the cosmetic industry [37]. Wheat's ability to retain moisture, hydrate, soothe, protect, and improve skin elasticity makes it an effective ingredient in various moisturizing products [38]. Wheat is composed of various bioactive compounds but ceramides and amino acids it used to retain the moisture of the skin [39].

Wheat's moisturizing effects come from its capacity to:

1. *Maintain moisture:* Wheat extracts assist in sealing in moisture, leaving skin smooth and supple [40].
2. *Hydrate:* Wheat's humectant qualities attract and retain water, resulting in long-term hydration [41].
3. *Soothe:* Wheat's anti-inflammatory qualities soothe and relieve dry, irritated skin [42].
4. *Protect:* Wheat's antioxidants protect the skin from external stresses, lowering moisture loss [43].
5. *Increase skin elasticity:* Wheat proteins support the skin's natural barrier function, decreasing moisture loss [44].

Skin Repair and Regeneration

The skin repair and regeneration properties of *Triticum vulgare*, commonly known as wheat, make it a valuable ingredient in skin care products [45]. Wheat's bioactive compounds, including phenolic acids, flavonoids, and carotenoids, stimulate collagen production, enhance cell proliferation, improve skin hydration, protect against environmental stressors, and soothe and calm the skin. By increasing collagen synthesis, wheat extracts improve skin elasticity and firmness, while stimulating cell growth promotes skin regeneration and repair [46]. Additionally, wheat's moisturizing properties maintain skin hydration, reducing the appearance of fine lines and wrinkles, and its antioxidant properties shield the skin from damage caused by UV radiation, pollution, and other environmental stressors. Overall, wheat's skin repair and regeneration properties promote healthy, youthful-looking skin, making it an effective ingredient in skin care products for reducing fine lines and wrinkles, improving skin texture and tone, enhancing skin elasticity and firmness, promoting skin regeneration and repair, and soothing and calming sensitive skin.

TOXIC EFFECT/ADVERSE EFFECT OF WHEAT AS A COSMETICS

Wheat has a very positive effect on skincare and hair care but some people can cause side effects of wheat-related products due to hydrolyzed wheat protein, and wheat germ oil it is comparatively less so it

is safe to use wheat in cosmetics in appropriate concentrations. Impaired barrier functioning in atopic dermatitis (AD) may enhance the chances of sensitization to oat and wheat proteins via the skin (Table 3).

Table 3. Some toxic effects of wheat.

Potential Issue	Description
Oxidation and spoilage	Wheat oil can undergo rancidity, producing toxic compounds due to improper storage.
Comedogenic effects	Can cause acne and comedones by clogging pores.
Celiac disease	Very rare; some individuals may suffer from skin reactions or celiac disease due to exposure.
Sensitization	Repeated exposure to wheat oil can cause sensitization of the skin.
Eye irritation	Exposure to the eyes can cause redness, itching, or irritation.
Lipid pneumonia	Inhalation of wheat oil droplets can cause lipid pneumonia, though this is a rare occurrence.

MARKETED FORMULATION

Face Wash

Wheat germ oil has a high vitamin and antioxidant content, it is a natural addition to face cleansers [47]. It nourishes and hydrates the skin while aiding in skin cleansing by eliminating debris and extra oil. Fatty acids that strengthen the skin barrier and vitamin E that protects and restores skin are both present in the oil [48]. A healthy glow, reduced dryness, and improved skin texture can all be achieved by washing your face with wheat germ oil [49]. Because of its delicate nature, it can be used on all skin types, including those with sensitive skin [50]. All in all, it provides a calming and efficient cleaning experience (Figure 2).

Figure 2. Face wash.

Hair Oil

Rich in vital fatty acids and vitamins, wheat germ oil is a nutritious hair oil. It lessens dryness and brittleness in hair by strengthening and moisturizing it [51]. Because vitamin E is abundant in the oil, it promotes circulation and guards against damage, improving the condition of the scalp [52]. Regular use can promote hair development and make hair shinier, softer, and easier to manage [53]. Because of its thin nature, hair is not burdened [54]. All hair types can benefit from using wheat germ oil, which can be used to repair frizz and split ends and provide a natural means of enhancing the general health and appearance of hair (Figure 3) [55].

Figure 3. Hair oil.

Face Massage Cream

With its abundance of nutrients, wheat germ oil makes a great option for a face massage cream [56]. It has vitamins A, D, and E in it, which support skin renewal and nourishment [57]. Antioxidant qualities of the oil are well known for shielding the skin from harm and enhancing its suppleness [58]. Additionally, it deeply hydrates the skin, leaving it feeling silky and smooth [59]. A healthy, radiant complexion can be enhanced, and fine lines and wrinkles can be less noticeable by applying wheat germ oil as a massage cream [60]. All skin types can use it, but dry or aged skin can benefit most from it (Figure 4) [61].

Figure 4. Face massage cream.

Skincare Gel

Wheat germ gel is a beneficial addition to skin care routines due to its high content of vitamins and nutrients [62]. Rich in vitamin E, it helps protect and repair the skin from damage while providing deep hydration [63]. The gel has antioxidant properties that combat free radicals, reducing signs of aging and

improving skin texture [64]. It's gentle and soothing, making it suitable for all skin types, including sensitive skin [65]. Regular use of wheat germ gel can enhance skin elasticity, reduce dryness, and promote a healthier, more radiant complexion [66]. Its lightweight formula ensures it absorbs quickly without feeling greasy (Figure 5) [67].

Figure 5. Skin care product.

Skin Care Oil

A very useful skin care product with nourishing qualities is wheat germ oil [68]. It has a lot of vitamins A, D, and E, which support skin protection and renewal [69]. Deep hydration from the oil makes it useful for dry, aged skin [70]. Free radicals are fought off by their antioxidant concentration, which also improves skin texture and lessens aging symptoms [71]. Additionally, wheat germ oil helps to treat and soothe inflamed skin while promoting skin elasticity. It is safe for all skin types and provides a natural means of achieving a smoother, more luminous complexion because it absorbs easily without leaving a greasy behind (Figure 6) [72].

Figure 6. Skin care oil.

HOME REMEDIES

For Skincare

Wheat Flour Face Mask

- *Ingredients:* 2 tablespoons of wheat flour, 1 tablespoon of honey, and a little water or milk.
- *Instructions:* Mix the wheat flour with honey and enough water or milk to form a smooth paste. Apply the mixture to your face and leave it on for 15–20 minutes before rinsing off with lukewarm water. This mask can help exfoliate and nourish the skin [73].

Wheat Germ Oil Moisturizer

- *Ingredients:* Wheat germ oil.
- *Instructions:* Apply a few drops of wheat germ oil to your face or body after cleansing. Wheat germ oil is rich in vitamin E and antioxidants, making it an excellent moisturizer and anti-aging treatment.

Wheat Flour Scrub

- *Ingredients:* 2 tablespoons of wheat flour, 1 tablespoon of yogurt, and a pinch of turmeric powder.
- *Instructions:* Mix the ingredients to form a paste. Gently massage it onto your face in circular motions for a few minutes before rinsing off. This scrub helps to exfoliate dead skin cells and brighten the complexion [74].

For Hair Care

Wheat Germ Oil Hair Treatment

- *Ingredients:* Wheat germ oil.
- *Instructions:* Massage a small amount of wheat germ oil into your scalp and hair. Leave it on for at least 30 minutes before washing your hair with shampoo. This treatment can help nourish and strengthen hair [75].

Wheat Flour Hair Mask

- *Ingredients:* 2 tablespoons of wheat flour, 1 tablespoon of yogurt, and 1 tablespoon of honey.
- *Instructions:* Mix the ingredients to form a paste. Apply the mixture to your scalp and hair, focusing on the roots. Leave it on for 20–30 minutes before rinsing thoroughly. This mask can help with hair conditioning and adding shine [76].

Wheat Flour Dry Shampoo

- *Ingredients:* Wheat flour.
- *Instructions:* Sprinkle a small amount of wheat flour onto your roots and work it through with your fingers or a brush. The flour helps absorb excess oil and can be brushed out for a quick freshen-up between washes [77].

CONCLUSIONS

Herbal cosmetics are gaining traction because they use organic, plant-based ingredients that are better for the environment and the skin. Soothing and moisturizing properties are well-known for ingredients including chamomile, green tea, and aloe vera. Wheat is a valuable ingredient in skincare products because of its anti-inflammatory, moisturizing, and antioxidant qualities. This makes wheat germ oil very beneficial for preventing aging, mending damage, and enhancing the texture of the skin. Herbal makeup is satisfying the growing need for safer, more environmentally friendly goods from consumers. To properly comprehend and employ these natural compounds in contemporary skincare products, more research is necessary. A healthier option for skincare and beauty, herbal cosmetics combine traditional knowledge with contemporary demands.

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