



Review Article

Exploring the cosmetic potential of important medicinal plants

Rehana Javid*, Sheikh Bilal Ahmed, Rozy Rasool, Falak Jan

Regional cum Facilitation Centre, Northern Region-II, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir- 193201, Jammu & Kashmir, India.

Abstract

India is called the home of medicinal plants due to the vast biodiversity of these plant species found almost everywhere. Around 8000 species of medicinal plants accounting for 50% of the total plant species have been reported in the country. There is probably no state or Union territory in India where one could not explore this wealth and the UT of Jammu and Kashmir is no exception. Certain plant species of high medicinal value are found only in the UT of J&K. The antioxidants present in medicinal plants viz. *Echinacea purpurea*, *Tagetes minuta*, *Matricaria chamomilla* and *Hyssopus officinalis* are used as an anti-aging therapy. The essential oil extracted from them has a good nutritional and medicinal value. Phytochemicals present in various parts of these plants are used as a remedy for various ailments. These medicinal plants possess anti-inflammatory, antioxidant, antirheumatic, antinematic, antifungal, antibacterial and insect-repellent properties that are beneficial for human beings as well as animals. In the modern system of medicine, these plants are effective in contracting the blood vessels thereby inhibiting the sagging of skin and preventing aging. The cultivation of these plants could revolutionize the Indian cosmetic industry. Furthermore, the cultivation of medicinal plants could play a main role in uplifting the condition of Indian farmers by largely increasing the economic status of the farmers in particular and the nation as a whole.

Keywords: Anti-inflammatory compounds, Antioxidants, *Echinacea purpurea*, *Hyssopus officinalis*, *Matricaria chamomilla*, Medicinal plants, *Tagetes minuta*.

Introduction

In the pursuit of sustainable and wholesome beauty practices, there is a growing interest in harnessing the therapeutic properties of medicinal plants indigenous to diverse regions. The Himalayan ecosystem, renowned for its rich biodiversity and unique flora, stands as a source of inspiration for unlocking the potential of botanicals in the realm of skincare. As consumers increasingly gravitate towards eco-conscious and chemical-free cosmetic alternatives, the demand for plant-based skincare solutions has witnessed a notable surge (Yadav *et al.* 2017). The Himalayan region, characterized by its pristine environment and ancient herbal traditions, harbors a treasure trove of plant species known for their medicinal attributes (Dias *et al.*, 2019). This study meticulously delves into the unique biochemical compositions and traditional uses of *Echinacea purpurea*, *Tagetes minuta*, *Matricaria chamomilla*, and *Hyssopus officinalis*, aiming to elucidate their potential applications in formulating novel and effective skincare products. Beyond the allure of conventional cosmetics, this research endeavors to

shed light on the untapped cosmetic virtues that these Himalayan medicinal plants may offer (Mehta *et al.*, 2015). By amalgamating traditional wisdom with contemporary scientific methodologies, our exploration seeks to bridge the gap between the age-old practices of herbal medicine and the burgeoning field of modern skincare. The ensuing chapters will navigate the phytochemical intricacies of each plant species, unveiling their individual contributions to skincare efficacy and paving the way for a deeper understanding of their cosmetic potential (Bhargava *et al.*, 2022). In essence, natural elegance takes readers on a captivating journey through the botanical treasures of the Himalayas, offering a fresh perspective on skincare inspired by the wisdom of nature. As we unravel the cosmetic secrets of *E. purpurea*, *T. minuta*, *M. chamomilla* and *H. officinalis*, we aspire to contribute to the evolving narrative of sustainable beauty, where the bounty of the Himalayas meets the aspirations of conscientious consumers in search of truly natural elegance. This paper embarks on a fascinating exploration of the cosmetic capabilities inherent in four noteworthy

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*Corresponding author; Email: dr.rehanajavid@gmail.com

Himalayan medicinal plants—*E. purpurea*, *T. minuta*, *M. chamomilla*, and *H. officinalis*—seeking to unravel the untapped skincare innovations that lie within the natural elegance of these botanical wonders.

E. purpurea (L.)

An important medicinal plant found in Kashmir that has numerous applications in the system of medicine is *E. purpurea* (L.) Moench. This medicinal plant has originated in North America (Nadaf *et al.*, 2018). About 8 to 9 species of the Echinaceae family have been reported to date but only three of them possess medicinal properties, which include *E. purpurea*; *E. pallida* and *E. angustifolia*. *E. purpurea* (L.) produces a beautiful purple bloom attracting a no of insect pollinators (Figure 1). *E. purpurea* Moench (L.) flowers (Figure 2) serve as nature's immune booster. It stimulates the immune system resulting in quick recovery of the patient from illness. It is usually known for its effect against bacterial and viral infections. It decreases the breakdown of carbohydrates thereby lowering the blood sugar levels. The phytochemical profile of this plant reveals its significance. *E. purpurea* (L.) Moench comprises a number of important phytochemicals that are used in the treatment of various ailments in animals and human beings (Harbone & Williams, 2004). It serves as an immunostimulant herb used for curing common cold; flu and (SARS) severe acute respiratory syndrome diseases. *E. purpurea* is widely used in the cosmetic industry for its skin-rejuvenating, anti-aging, and moisturizing properties. Its antioxidants combat free radicals, delaying aging signs like wrinkles, while its anti-inflammatory and antimicrobial effects soothe irritation and reduce acne. *Echinacea* also promotes wound healing, improves skin hydration, and supports hair and scalp health by enhancing circulation and reducing dandruff. Additionally, it offers natural UV protection, making it a valuable ingredient in products like anti-aging creams,

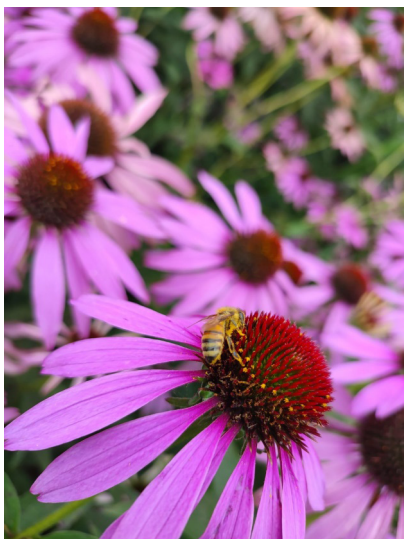


Figure 1: *E. purpurea* flower



Figure 2: *E. purpurea* at full bloom stage

moisturizers, sunscreens, acne treatments, and haircare products (Joshi, 2012). The cosmetic products derived from this medicinal plant include creams, ointments, body lotions, face packs, skin cleansers, fairness formulations, hair shampoo, eyeliner, lipstick, face powder and beauty soap. These products enhance skin function and texture, boost collagen growth, scavenge free radicals, and maintain keratin & skin healthier.

Uses and phytochemistry

E. purpurea (L.) Moench. is often described as a natural immunity booster due to the presence of alkamides which include echinacein, tetraenoic acid and isobutylamides. Alkamides present in the plant increase the activity of immune cells; viz natural killer cells and macrophages that boost the body's immune response; according to WHO (1999), the German Commission E, and the Canadian Natural Health Products Directorate, this plant is recommended for various upper respiratory diseases particularly the common cold, as it help reduce its occurrence as well as the duration, hence used against upper respiratory infections; including bronchitis and sinusitis, common cold, flu sore throat, cough, and congestion. Traditionally, this medicinal plant was used in the treatment of respiratory tract infections. Snake bites and other wounds were also cured by this plant. Over time, its popularity has grown and it is now widely used as a dietary supplement to support the immune system and promote overall well-being.

The phytochemicals present in *E. purpurea* include glycoproteins, volatile oils, antioxidants, caffeic acid derivatives (Chicoric acid) and flavonoids (Harbone & Williams, 2004). It is believed to treat HIV due to the presence of acid that has antiviral activity and inhibit the synthesis of enzyme HIV-1 integrase thereby preventing the replication of HIV virus. *Echinacea* contains different types of flavonoids, such as echinacoside and quercetin, which reduce the inflammation. Flavonoids present

in *Echinacea* inhibit the production and release of various pro-inflammatory mediators; which include cytokines viz tumor necrosis factor-alpha (TNF-alpha) and interleukins (IL-1; IL-6) (Karg et al., 2019). The antioxidants (derivatives of caffeic acid) present in *E. purpurea* have the potential to decrease the oxidative stress as well as scavenge the free radicles; however, by reducing oxidative stress the plant may alleviate the inflammation and probably the tissue damage. This makes it potentially beneficial for conditions such as arthritis, skin irritations and inflammatory skin conditions. *E. purpurea* also contains polyacetylenes; which have been shown to have antimicrobial properties. These compounds may help inhibit the growth of certain bacteria and fungi. This plant contains essential oil with various aromatic compounds including dodecatetraenoic acid isobutylamides. The essential oil may contribute to the herb's characteristic aroma and may have antimicrobial properties; potentially aiding in the body defence against infections. The most important component present in the roots and the petiole of this plant is the acid which finds application in the treatment for various conditions viz., trauma and eczema; which also improves the skin quality. The keratinocyte cell culture study showed that it has a potential to block water on the skin surface which prevent any skin irritation or other effects such as phytotoxicity; hence can be used as a good moisturizer. Furthermore, it was concluded that any cream containing the *E. purpurea* extract can improve the symptoms of eczema and thereby preventing outer layer of the skin from any external effect (Lee et al., 2012) besides curing various diseases it is beneficial for skin this plant also has the property of blocking the water coming out of the pores on skin hence acts as a good astringent. It can be used to cure skin irritations without causing any side effect (Luo et al., 2002). The synergistic action of these phytochemicals in *E. purpurea* contributes to its potential health benefits; particularly in supporting the immune system and overall well-being (Kilic et al., 2018). The phytochemicals in *Echinacea*, such as alkylamides, cichoric acid, and flavonoids, provide a wide range of benefits in the cosmetic industry, including anti-inflammatory, antioxidant, hydrating, and healing effects. These properties make *Echinacea* an essential ingredient in skincare and haircare products, especially those focused on soothing, anti-aging, and skin protection. *Echinacea* is a powerhouse ingredient in skincare, known for its anti-inflammatory, antioxidant, hydrating, and healing properties. Its ability to soothe, protect, and regenerate makes it an essential component in products for sensitive, aging, and acne-prone skin, as well as in formulations designed to support skin recovery and repair. Topical formulations of *E. purpurea* such as creams or ointments are used for their potential wound-healing properties are summarized in Table 1.

Table 1: Various products of *E. purpurea*

Product	Uses
Echinaforce forte	• Treats cold and flu • Reduces tonsillitis • Cures bronchitis • Supports respiratory health • Treats sore throat
Echinacea herbal tea	• Used to cure ear infections • Boosts immune system • Stress reliever • Reduces pain from arthritis • High source of antioxidants' • Reduces the appearance of wrinkles • Relieves urinary tract infections
Echinacea capsules	• Relieves upper respiratory issues • Functions as a laxative • Fights infection • Boosts immunity
Essential oil	• Improves skin problem • Anti inflammatory • Treats arthritis • Reduces anxiety • Treats insomnia • Insect repellent
<i>E. purpurea</i> TerraVita capsules	• Dietary supplement • Energy booster • Maintains healthy skin
<i>E. purpurea</i> cream formula	• Anti-aging • Insect repellent • Wound healer
Pro-life	• Dietary supplement • Prevents common cold • Treats eczema • Stimulates the formation of white blood cells

***T. minuta* L. (Wild marigold)**

T. minuta L. (Wild marigold) commonly called as 'Gul-e-Sad Barga' belongs to the family of Asteraceae bearing an annual life cycle with small white flowers; its centre of origin is believed to be the South America; later on it was introduced and domesticated in Central America; Eastern and Southern Africa; Europe and Australia. In India, *T. minuta* is grown wildly in the western Himalayan range comprising of the altitudinal range of 1000 to 2500 m. The states viz Himachal Pradesh; Jammu & Kashmir and hills of Uttar Pradesh are however the major growing regions of *T. minuta* growing naturally in these regions. This plant is growing widely in these states constitute the most important source of 'Tagetes oil' in India. Out of the 56 species of tagetes; all are grown for medicinal, cultural, therapeutic, ornamental as well as dye producing purposes. The species viz *T. minuta*, *T. erecta*, *T. patula*, and *T. tenuifolia* are most common but the species grown for essential oil (high grade) is *T. minuta*

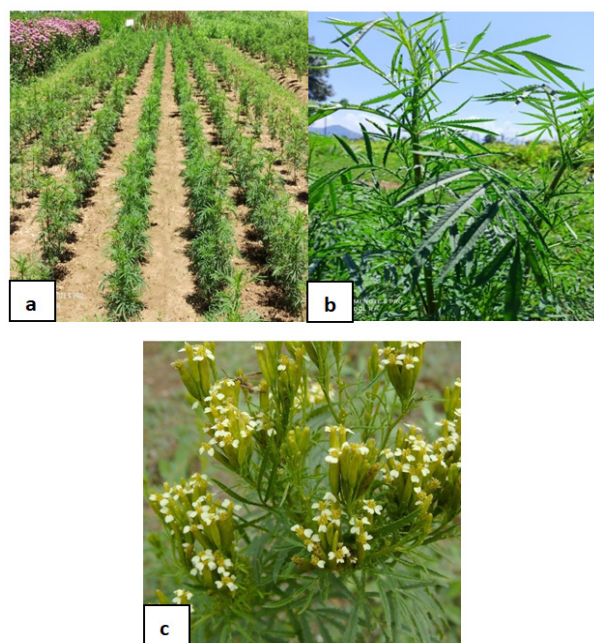


Figure 3: *T. minuta* (a. Nursery, b. Vegetative phase, c. Flowering stage)

(Pretorius *et al.*, 2018). *T. minuta* (Figure 3) an aromatic plant is least affected by diseases; insects and nematodes due to the presence of essential oil compounds; hence it is easy to manage this crop with low cost benefit ratio due to which its cultivation is gaining popularity among the farming community.

T. minuta (Mexican marigold) is valued in the cosmetic industry for its antimicrobial, antifungal, antioxidant, and aromatic properties. Its essential oil, rich in thiophenes and terpenoids, is widely used for skin and hair care (Kazami, 2015).

Its key roles in cosmetic industry are enlisted below:

Antimicrobial & antifungal

Helps treat acne, infections, and dandruff.

Antioxidant

Protects skin from oxidative stress and premature aging.

Wound healing

Accelerates repair of minor cuts and scars.

Aromatherapy

Offers a calming fragrance for relaxation in cosmetic formulations.

Insect-repellent

Incorporated in products for its natural insect-repellent properties.

Commonly found in cleansers, anti-aging creams, scalp treatments, and aromatic body care products, *T. minuta* enhances both the efficacy and sensory appeal of cosmetics.

Uses and phytochemistry

The phytochemical profile of *T. minuta* includes various compounds that contribute to its cosmetic properties and potential health benefits. It is particularly rich in thiophenes; such as tagetone; which is responsible for its characteristic odor. Flavonoids present in it include the main compounds with antioxidant and anti-inflammatory properties (Sadia *et al.*, 2013). *T. minuta* is reported to contain various flavonoids including quercetagenin, quercetagenin 3; 6-dimethyl ether, quercetagenin 3, 7-dimethyl ether, and their glycosides. One of the notable terpenes found in this plant is tagetone, which is a thiophene derivative with terpenoid characteristics (Lohani *et al.*, 2012). *T. minuta* is known for its rich content of carotenoids which are responsible for the vibrant yellow to orange color of its flowers. The major carotenoid present in this plant is lutein which is a xanthophyll pigment with potential health benefits for the eyes. Phenolic compounds are secondary metabolites found in plants known for their antioxidant properties. In the past, various parts of *T. minuta* were used for their medicinal properties. The plant is believed to have antimicrobial and anti-inflammatory properties. It treats skin conditions such as wounds, cuts; and burns (Tahir & Khan, 2012). Infusions or the extracts made from the leaves or flowers are important for their potential healing effects. Its essential oil alleviates itching and inflammation caused by insect bites and stings (Gilij *et al.*, 2008). The compounds found naturally in its oil may help provide relief from discomfort (Maity *et al.*, 2011). In Ayurvedic medicine *T. minuta* has been used to support digestive health too. It is believed to have carminative properties helping to alleviate digestive discomfort, bloating and gas (Table 2). *T. minuta* is used in Ayurveda to support respiratory health. It may be used in formulations or remedies targeting respiratory conditions such as coughs, colds, and bronchitis. Some traditional Ayurvedic practices involve the use of *T. minuta* for detoxification purposes. It is believed to help eliminate toxins from the body and support overall detoxification processes.

T. minuta (Mexican marigold) is rich in bioactive phytochemicals that contribute to its diverse applications in cosmetics (Patel, 2016). These compounds, including thiophenes, terpenoids, flavonoids, and essential oils, offer therapeutic and aesthetic benefits, making the plant a valuable resource for skincare and haircare formulations.

Key phytochemicals found in *T. minuta* and their roles are given as:

Thiophenes

Properties: Antimicrobial and antifungal.

Cosmetic use

- Helps treat acne, fungal infections, and microbial-related skin conditions.

Table 2: Important products from *T. minuta*

Tagetes oil	A powerful, yet sweet oil that has excellent fungicidal properties. It can also be used as an insect repellent. Pure essential oils can be used as essences in the bath or in vaporisers. They can also be used to make up your own massage blends having first diluted them in health aid massage oil base or lotion base.
Ancient healer Tagetes	Treating infection particularly weeping wounds and chest infections (it was used in both the American civil war and the first world war to treat war wounds and to prevent infection). It is often used as an ingredient in foot treatment preparations and in some perfumes.
Pest repellent	Tagetes oil is valuable in keeping insects at bay, and can help with parasitic and fungal infestation.
Marigold in cosmetics	It is used today in the form of ointments, wraps, butter, compresses and homeopathic remedies.
<i>T. minuta</i> powder	It help promote relaxation and reduce anxiety and stress, has anti-inflammatory properties that can help reduce pain and swelling, has antimicrobial properties that can help fight infections.

- Used in cleansers, acne treatments, and scalp care products.

Terpenoids

Properties: Antioxidant, anti-inflammatory, and soothing.

Cosmetic use

- Protects skin from oxidative damage and environmental stressors.
- Reduces inflammation in sensitive or irritated skin, making it ideal for soothing creams and anti-aging products.

Flavonoids

Properties: Antioxidant and UV-protective.

Cosmetic use

- Enhances the skin's defense against free radicals and UV radiation.
- Included in sunscreens and brightening formulations to improve skin tone.

Essential oils

Properties: Aromatic, antimicrobial, and calming.

Cosmetic use

- Provides a pleasant fragrance for aromatherapy-based skincare.
- Acts as a natural preservative and enhances the sensory appeal of products.

Carotenoids

Properties: Skin-brightening and antioxidant.

Cosmetic use

Improves skin radiance and helps in reducing dark spots and hyperpigmentation.

The phytochemicals in *T. minuta* contribute significantly to its role in the cosmetic industry, offering antimicrobial, antioxidant, soothing, and healing benefits. Its natural and multifunctional properties make it a versatile ingredient in formulations designed for skincare, haircare, and aromatherapy-based products.

M. chamomilla (German chamomile)

German chamomile (*M. chamomilla*) is recognized as a 'star herb' due to its tremendous medicinal as well as aromatic properties. Its flower are white with white colored flower heads (Figure 4); which occupy an important position in trade due to the blue oil extracted from them. It is an annual member of family Asteraceae; it is believed to be native to Europe and Western Asia (Vale-Silva *et al.*, 2012). In India; German chamomile is grown in the states of Uttar Pardesh, Rajasthan, Punjab, Haryana, Bihar, as winter crop across the hills of J&K Himachal Pradesh and Uttar Pardesh as summer crop. German chamomile has been widely used in traditional medicine systems around the world (Ali *et al.*, 2020). It is commonly employed as an herbal remedy for digestive issues such as indigestion flatulence and stomach cramps. It is also known for its calming and sedative effects and has been used to alleviate anxiety insomnia and restlessness (Franz *et al.*, 2007).

German chamomile (*M. chamomilla*) is a highly sought-after herb in the cosmetic industry due to its therapeutic, soothing, and healing properties. Its rich bioactive composition, including bisabolol, chamazulene, and flavonoids, makes it a versatile ingredient for skincare, haircare, and aromatherapy products. It is commonly mixed with various beauty products such as soaps, and shampoos due to its soothing and calming effects



Figure 4: Nursery of German chamomile

on the skin. As a versatile and accessible herb, German chamomile continues to be valued for its potential health benefits and is widely cultivated and used around the world. German chamomile has a great potential both in domestic as well as in international market. It ranks fifth in position as far as its sale across the world is concerned and it is the main pharmaceutical; food and cosmetic additive (Zohreg *et al.*, 2014). It is mainly sold in two forms, i.e., flower head or as oil called the blue oil (Macky & Blumbery, 2006). Its gentle nature, pleasant aroma and extensive historical use make it a beloved plant in herbal medicine and aromatherapy practices. It serves as a powerful natural ingredient in the cosmetic industry, valued for its ability to soothe, heal, hydrate, and protect the skin and hair. Its multifunctional benefits make it a cornerstone of formulations for sensitive skin, anti-aging, hydration, and relaxation products.

Uses and phytochemistry

German chamomile is often used topically as a soothing agent for skin conditions like eczema, rashes, and minor wounds. German chamomile (*M. chamomilla*) contains a rich array of phytochemicals that contribute to its widespread use in cosmetics. These bioactive compounds provide therapeutic and aesthetic benefits, making chamomile a key ingredient in formulations for skin, hair, and body care.

Key phytochemicals present in *M. chamomilla* and their roles are given as under:

Bisabolol

Properties: Anti-inflammatory, antimicrobial, and skin-soothing.

Cosmetic role

- Reduces redness and irritation, making it ideal for sensitive skin products.

- Aids in skin healing and regeneration, enhancing the effectiveness of wound care and anti-aging products.

Chamazulene

Properties: Anti-inflammatory, antioxidant, and soothing.

Cosmetic role

- Provides a calming effect for irritated or inflamed skin.
- Neutralizes free radicals, protecting skin from oxidative stress and premature aging.

Flavonoids (e.g., Apigenin, Luteolin, Quercetin)

Properties: Antioxidant and anti-inflammatory.

Cosmetic role

- Protects skin cells from environmental damage caused by UV radiation and pollution.
- Reduces redness and supports even skin tone, contributing to brightening and anti-aging formulations.

Phenolic acids

Properties: Antioxidant and antimicrobial.

Cosmetic role

- Helps combat acne-causing bacteria and other microbial infections.
- Protects skin and hair from oxidative damage, maintaining a youthful appearance.

Coumarins

Properties: Anti-inflammatory and healing.

Cosmetic role

- Enhances the repair of damaged skin tissues.
- Supports products for scar and stretch mark reduction.

Essential oils (e.g., α -Pinene, Limonene)

Properties: Aromatic, antimicrobial, and soothing.

Table 3: Products from German chamomile

Tea	Helps in inducing sleep, good for digestion, cure headaches and stress.
Face oil	The chamomile face oil is anhydrous (contains no water) mixture typically formulated with a blend of botanical-infused skin-loving oils, this essential comes in handy to soften, nourish, and balance skin for a healthy-looking glow.
Chamomile methi jel	Conditions & adds moisture to shaft, protects cuticles and prevents breakage & sun damage, prevents split ends, balances hair pH & controls scalp oil secretion, softens hair & detangles knots
Infusion	Relax and soothe nerves.
Hair oil	Mends split ends, moisturises and strengthens hair, adds luster and shine
Chamomile water	They can be added to skin care, baths, as a spritzer to refresh or relax and they make excellent linen and air fresheners.
German chamomile tincture	Works as an appetizer, a digestive, flower has a positive influence on the intestinal flora and it can also be used externally (1 soup spoon per glass of water): as a mouth rinse, to soften and purify the skin.
Toner	Helps rehydrate and soothe skin, improve its natural glow, nourish and repair irritated skin

Cosmetic role

- Provides a calming fragrance for aromatherapy-based skincare and relaxation products.
- Enhances scalp and hair health by reducing dandruff and irritation.

Polysaccharides

Properties: Hydrating and skin barrier-strengthening.

Cosmetic role

Improves moisture retention, making it a key ingredient in hydrating creams and serums.

Strengthens the skin's natural protective barrier.

Furthermore, bisabolol also known as α -bisabolol or levomenol has been identified as the main or primary component of its essential oil and chamazulene formed from the precursor compound matricin is responsible for the characteristic color of its essential oil which is blue (Abdalla & Abdelgadir, 2016). Both these compounds possess antimicrobial anti-inflammatory as well as antioxidant properties (Mahdavi et al., 2020). Bisabolol is also known for its skin-soothing and healing effects. Various flavonoids including apigenin, luteolin, quercetin and their glycosides present in German chamomile is known for their antioxidant and anti-inflammatory effects (Sharifi et al., 2018). Coumarin derivatives such as herniarin and umbelliferone have anticoagulant, anti-inflammatory, and antimicrobial properties. Terpenoids present in this plant including α -bisabolol oxide; chamomillene; farnesene; and various sesquiterpenes contribute to the plant's aroma and possess antimicrobial and anti-inflammatory properties. In addition; this plant contains various polyacetylenes and phenolic compounds also (El-agbar et al., 2008).

Its flowers are commonly used to prepare herbal tea. The tea is known for its relaxing and soothing properties and is often consumed to promote relaxation, relieve stress, and aid in digestion too. The oil obtained from its flowers finds application in aromatherapy and is known for its calming and stress-reducing effects when used in diffusers or applied topically. In some culinary traditions the flowers have been used to flavor dishes and beverages. They can be used as a garnish or brewed into infusions for added flavor (Roby et al., 2013). It is used to support respiratory health and is often employed to relieve symptoms of common respiratory conditions such as cough, bronchitis, and congestion. Inhalation of chamomile steam or consumption of chamomile tea can provide soothing effects on the respiratory system also. It is used as a natural remedy for soothing eye irritations and reducing inflammation (Zivkoriv et al., 2021). Chamomile-infused eye drops or compresses can be applied to tired or irritated eyes to provide relief. Chamomile infused mouth rinses or gargles are used to soothe oral ulcers; gum inflammation; and sore throat (Table 3). German chamomile is sometimes used



Figure 5: *H. officinalis* plant in flowering

in Ayurvedic detoxification practices to support the body's natural cleansing processes. It is believed to help eliminate toxins and promote healthy liver function (Pereira et al., 2018). In certain cultures, chamomile flowers were used in rituals to attract luck, ward off negative energies, and enhance dream experiences. The oil contains a rich phytochemical profile that contributes to its medicinal properties. Its oil contains tremendous chemical constituents have been found roughly 120 of them have been actually identified and isolated that mainly function as secondary metabolites; out of them 28 act as terpenoids; 36 act as flavonoids and 52 as additional compounds with high pharmacological properties (Newall et al., 1996).

H. officinalis

Kashmir being called the home of medicinal plants; almost every temperate medicinal plant could be found in the mountains surrounding the valley with its purple bloom. It produces fragrant flower spikes of bright blue to pink color (Figure 5). One of the important medicinal herbs of tremendous value found in the UT of J&K is *H. officinalis* L., Due to its therapeutic use in traditional system of medicine it is known as the Romania of the traditional medicine (Sotiropoulou et al., 2020). In India, it is distributed along the Himalayan Mountain range and is commonly cultivated in Kashmir (Lugasi et al., 2006). About six species of hyssop have been reported till date; all of them are used in food industry. The common species of hyssop found in India is *H. officinalis* L. In India, it is commonly known as *Jupha* in Hindi and *Zufah* in urdu. In the ancient times this herb was used for cleaning the sacred places; hence considered holy herb and a symbol of purification and cleansing. It is aromatic, evergreen and perennial medicinal herb reaching upto the height of 1.5 feet. Its leaves are elliptical in shape

usually in pairs; stem; leaves and flowers of this herb are used for various purposes. Leaves are used for healing the wounds, and flowers used in garnishing the food. hyssop antimicrobial, anti-inflammatory, antioxidant, and aromatic properties make it a valuable ingredient in cosmetics aimed at cleansing, soothing, and rejuvenating the skin and hair. Its multifunctional benefits cater to a wide range of products, enhancing their effectiveness and appeal.

Uses and phytochemistry

The phytochemicals extracted from this medicinal herb has tremendous market potential and can elevate the financial condition of farming community of J&K in particular and of India in general. Its dried leaves and stem are used as such as medicine however the flowers find application in food and cosmetic industry. In apiculture its pollens are used as food for insects to produce honey. The honey produced from hyssop is of excellent quality. Indigestion, gastric ulcers and peptic ulcers can be cured by it as it aids in the breakdown of digestive enzymes and juices (Fatimah & Hamedeyazdan, 2011). The main phytochemicals present include terpenoids, pinocamphone, isopinocamphone and β -pinene. The phenolic compounds present in this herb consists of chlorogenic, syringic, ferulic, protocatechuic, caffeic and p-hydroxybenzoic (Paun *et al.*, 2014) and flavonoids like apigenin, quercetin, diosmin and luteolin are also present in it. The phenolic compounds present in hyssop are similar to that of rosemary (Marin *et al.*, 1998). Diosmin is the primary bioactive flavonoids present in hyssop which is being presently used as an anti-inflammatory agent in the clinical treatment of various cardiovascular diseases viz, chronic venous insufficiency, venous stasis, varicose vein, vein wall remodeling and lymphedema (Zielinska & Matkowski, 2014). The most important bioactive compound (flavonoid) recently isolated from of hyssop of diosmin which is mainly used in treating various cardiovascular diseases like venous stasis, vein wall remodeling chronic venous insufficiency, lymphedema and varicose vein (Silambarasan & Raja, 2012). This bioactive flavonoid possesses antihypertensive effect that is clearly evidenced by lowering the blood pressure rate, improved nitric oxide availability, antioxidant status and lipid peroxides. Its therapeutic action has been attributed to its inhibitory effect on the metabolism and capture of the hormone, i.e., noradrenalin by the venous walls thereby increasing the vascular tonus, reducing the permeability as well as the elasticity. The oil extracted from hyssop is useful cough, sore throat, fungal infection, loss of appetite, potent antimicrobial activities and spasmodic condition, relaxation of plasma membrane as well as the cytotoxic activity (Fathiazad *et al.*, 2011). Since it cures the pain in joints and muscles, it is used for gout, arthritis as well as rheumatism and also treats cancer as it destroys the cancer cells

(Ahmadi *et al.*, 2020). The main constituents present in its essential oil are cis-pinocamphone, elemol, bicyclogermacrene, germacrene D-limonene, β -pinene, trans-caryophyllene and camphor (Colceru *et al.*, 2017). This medicinal herb is good for female reproductive health too as it treats pre-menstrual syndrome by normalizing the process of menstruation (Katiyar *et al.*, 2012). It diminishes the fine lines on skin and prevents wrinkles hence finding its application in cosmetic industry as well (Gupta *et al.*, 2018). This herb also cures the dental carries; it maintains the oral hygiene; tightens the gums thereby help in maintaining the oral health (Torwane *et al.*, 2014). The chemical molecules obtained from hyssop are used as stomachic, carminative, antispasmodic, and antiseptic agents (Colceru *et al.*, 2017). It corrects the problems of hypotension by raising the blood pressure, cure nausea, headaches and vomiting. This herb can be used as insecticide, insect repellent and pediculicide (Lice eradicator); fragrance in soaps and perfumes. It can also be used in making the liquors (Herbal wine). It is as disinfectant to clean the houses and other sacred places. The tea prepared from its leaves acts as stress reliever and promotes sleep. Its strongly scented leaves can repel the aphids hence can be also be grown in vegetable or home gardens.

It holds a valuable place in the cosmetic industry. Its essential oils and bioactive compounds provide various benefits for skin and hair care, making it a versatile ingredient in cosmetic formulation hyssop has potent antimicrobial effects, thanks to compounds like pinocamphone and isopinocamphone. It helps prevent and treat skin infections and can be used in cleansers, acne treatments, and deodorants. hyssop contains antioxidants that neutralize free radicals, reducing oxidative stress on the skin. This helps prevent premature aging, such as fine lines and wrinkles (Torwane *et al.*, 2014). It also promotes skin cell regeneration, improving skin texture and tone. The aromatic essential oil of hyssop has calming and stress-relieving effects. It is used in massage oils, bath products, and aromatherapy skincare to promote relaxation and well-being. In hair care, hyssop improves scalp health by soothing irritation and reducing dandruff. Its antimicrobial effects also help maintain a clean and healthy scalp.

In the gardens it can be grown as a border plant in the flower beds. In orchards it could act as a source of nectar for insects like honey bees and butterflies as it brightly colored purple flowers seem to be very attractive for these insects thereby helping in pollination and effective fruit set, hence it can be used as a source of pollinator in orchards of Kashmir which directly increase the income of the farming community by increasing the yield. Its flower can be used to garnish ice-creams; cakes and other food items. The use of this herb in cosmetics industry needs much more attention; it consists of various chemical compounds which can be used in treating different skin

problems, its use is still meagre. The extraction and application of phytochemicals present in this herb can revolutionize the pharma, food and cosmetic industry. The need of the hour is to motivate the farmers for its large scale cultivation that will directly uplift the farming community thereby improving the financial condition of J&K. The high content of polyphenol carboxylic acids present in hyssop which is mainly expressed as rosmarinic acid leads to a higher anti-inflammatory and antioxidant activity. *Hyssop*; an often overlooked herb with a rich history; is making a comeback in the culinary and medicinal world. This fragrant plant; known for its vibrant flowers and aromatic leaves; is captivating the attention of chefs; herbalists; and garden enthusiasts alike. A no of products can be prepared from this herb which can directly improve the financial condition of farming community in J&K.

Products prepared from hyssop

Hyssop, an often overlooked herb with a rich history, is making a comeback in the culinary and medicinal world. This fragrant plant, known for its vibrant flowers and aromatic leaves, is captivating the attention of chefs, herbalists, and garden enthusiasts alike. A no of products can be prepared from this herb which can directly improve the financial condition of farming community in J&K.

- Tea

Obtained from its dried leaves, used to cure cold, cough and other respiratory tract infections. The tea prepared from its leaves acts as stress reliever and promotes sleep. It is used as a remedy for asthma, cold, cough, sore throat, bronchitis, flatulence, upper respiratory tract infections, stomachaches, intestinal worms and gall bladder disease etc.

- Honey

Obtained from its flowers is considered as one of the fine quality honey based on its medicinal properties, can also be used as a sweetener and can be substitute for sugar.

- Essential oil

Its essential oil has a huge potential in treatment of various diseases and disorders. It has antifungal antibacterial and insecticidal properties.

Conclusion

Medicinal plants play a vital role in the cosmetic industry, offering natural, sustainable, and effective solutions for various skin, hair, and body care needs. Their bioactive compounds, derived from roots, leaves, flowers, and seeds, provide numerous benefits, making them integral to the development of a wide range of cosmetic products. States in northern and northwestern India; have suitable climate for the cultivation of medicinal plants. Cultivating

E. purpurea, *T. minuta*; and *H. officinalis* could provide an additional income source for farmers and encourage crop diversification. As *Echinacea*- the nature's immune booster finds wider application in food and cosmetic industry, by adding *Echinacea* to crop rotation, farmers can expand their agricultural options and potentially tap into a growing market. The pharmacological, nematocidal properties, phytotoxic effect, insecticidal properties, antibacterial and antifungal effect, antiviral and antimicrobial activity of *T. minuta* oil has a huge potential in pharmaceutical, cosmetic, as well as perfume industry. There is a great demand for chamomile in the world market because of its extensive medicinal values and impeccable pharmacological properties. German chamomile can be grown on any type of land; thereby requiring low input as it is not usually attacked by pests and diseases, farmers can grow it with a good benefit cost ratio. Undertaking the cultivation of this crop at commercial scale in the UT of J&K will definitely boost the economy as the oil extracted from it has a huge demand in national as well as international market. The high content of polyphenol carboxylic acids expressed as rosmarinic acid in hyssop lead to its higher antioxidant activity. A key challenge in cultivating this medicinal plant is the limited availability of quality planting material, coupled with a lack of awareness among the farming community issues that need to be addressed. Hyssop are making a remarkable comeback; captivating enthusiasts across various domains. As the demand for herbal and natural remedies grows in India and around the world; domestic cultivation will contribute to the country's herbal and medicinal industry. Medicinal plants enhance the effectiveness, safety, and appeal of cosmetics while promoting sustainability and meeting consumer preferences for natural, holistic skincare solutions. The extraction and application of phytochemicals present in these plants can revolutionize the pharma; food and cosmetic industry as well. The need of the hour is to motivate the farmers of the UT for their large scale cultivation that will directly uplift the farming community thereby improving the financial condition of J&K and India too.

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