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Exploring Nature's Remedies: The Soothing Effects of Chamomile and Calendula Extracts in Herbal Cold Creams for Alleviating Skin Irritation

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ABSTRACT :

Skin irritation, characterized by symptoms such as redness, itching, swelling, and discomfort, is a prevalent dermatological concern affecting individuals across all demographics. This review paper investigates the therapeutic potential of herbal cold creams containing chamomile (Matricaria chamomilla or Chamaemelum nobile) and calendula (Calendula officinalis) extracts for alleviating skin irritation. These botanical ingredients are renowned in traditional medicine for their anti-inflammatory, antimicrobial, and antioxidant properties, making them promising candidates for soothing and healing irritated skin. Chamomile extract, with its rich content of bisabolol, flavonoids, and azulenes, exhibits potent anti-inflammatory and antimicrobial effects, enhancing skin healing and reducing inflammation. Calendula extract, rich in triterpenoids, flavonoids, and carotenoids, is celebrated for its wound-healing capabilities and its ability to alleviate skin irritation. The incorporation of these extracts into cold cream formulations leverages their natural properties to offer a moisturizing, cooling, and protective medium for the skin.This comprehensive review examines the botanical characteristics, chemical compositions, and mechanisms of action of chamomile and calendula extracts. It delves into their anti-inflammatory, antioxidant, antimicrobial, and wound-healing properties, providing evidence from various clinical studies. Additionally, the review explores the formulation of herbal cold creams and the synergistic effects of combining these extracts to enhance their therapeutic efficacy. By providing an in-depth analysis of the soothing properties of chamomile and calendula in herbal cold creams, this paper aims to contribute to the growing body of knowledge on natural remedies for dermatological care. The findings suggest that these botanical extracts offer a safe and effective alternative to conventional treatments for skin irritation, promoting skin health and improving the quality of life for affected individuals.

Keywords: Skin Irritation, Chamomile, ,Calendula, Cyclooxygenase (COX) Inhibition, Moisturizing Effects, Triterpenoids.

1. Introduction :

Skin irritation is a common dermatological complaint, affecting individuals of all ages and backgrounds. Characterized by symptoms such as redness, itching, swelling, and discomfort, skin irritation can significantly impact quality of life. The causes of skin irritation are diverse, encompassing environmental factors, allergens, irritants, infections, medical conditions, and even psychological stress[1]. Given the prevalence and multifactorial nature of this issue, there is a growing interest in effective, safe, and natural remedies to alleviate skin irritation.Herbal medicine has long been valued for its potential in treating various skin conditions. Among the numerous herbal remedies, chamomile (Matricaria chamomilla or Chamaemelum nobile) and calendula (Calendula officinalis) extracts have garnered particular attention for their soothing properties[2]. Both plants have a rich history of use in traditional medicine, celebrated for their anti-inflammatory, antimicrobial, and antioxidant activities.Chamomile, renowned for its calming effects, contains active compounds such as bisabolol, flavonoids, and azulenes that contribute to its efficacy in reducing inflammation and promoting skin healing. Similarly, calendula is prized for its wound-healing capabilities and its ability to alleviate skin irritation, attributed to its triterpenoids, flavonoids, and carotenoids.Cold creams, traditionally used for their moisturizing and cooling effects, provide an ideal medium for delivering these herbal extracts to irritated skin[3]. The combination of chamomile and calendula in a cold cream formulation aims to enhance the soothing and protective properties of the product, offering a natural alternative to conventional treatments[4].This review paper aims to assess the efficacy of chamomile and calendula extracts in herbal cold cream formulations for the relief of skin irritation. By examining the botanical characteristics, chemical compositions, mechanisms of action, and clinical evidence associated with these extracts, this paper seeks to provide a comprehensive evaluation of their therapeutic potential. Additionally, the review will explore the formulation of herbal cold creams and the synergistic effects of combining chamomile and calendula, ultimately contributing to a better understanding of their role in dermatological care[5].

Chamomile and calendula extracts have been extensively studied for their soothing properties in skincare products. Chamomile extract, known for its anti-inflammatory and antimicrobial properties, is suitable for intimate feminine hygiene during menopause, reducing genital symptoms and improving quality of life[6]. On the other hand, calendula flower extract has been shown to inhibit nitric oxide production, demonstrating anti-inflammatory effects that can benefit sensitive skin conditions[7]. Additionally, herbal cold creams containing plant extracts like neem oil and almond oil have been formulated to provide moisturizing effects by reducing water loss from the skin's outermost layer[8]. These findings collectively suggest that incorporating chamomile and calendula extracts in herbal cold creams can potentially offer effective relief for skin irritation by soothing and nourishing the skin while addressing inflammatory responses and enhancing skin barrier function[9].Natural remedies, particularly chamomile and calendula extracts, play a significant role in dermatology due to their potential therapeutic benefits. Chamomile and calendula are commonly used in dermatological products for their anti-inflammatory, wound-healing, and soothing properties[10]. These botanical ingredients have been scientifically validated for their biological mechanisms of action, making them valuable in clinical practice for various skin conditions[11]. The rise in demand for herbal and plant-based dermatological products, including chamomile extracts, highlights the growing interest in natural remedies for skin health and treatment[12]. Despite the popularity of herbal remedies, it is essential to be cautious as they can also lead to adverse skin reactions, emphasizing the importance of proper testing, labeling, and quality control when using botanical products in dermatology[13].There are many plants which showing the the soothing properties.

2.Chamomile

The Asteraceae family comprises the annual chamomile plant, which is widely used in medicine and has several applications in the culinary sector, including beverages, ice cream, and pastry products. It is also used in cosmetics and perfumes[14].

Fig. 1 – Chamomile Plant

Pharmacology, and medicine. The Greek terms melon, which means apple, and Khamai, which means on the ground, are the roots of the English name chamomile. According to Moumita , chamomile was utilized as a therapeutic plant in ancient times and was revered by the Egyptians, who saw it as a gift from the God of the Sun[15]. Originating in southern and eastern Europe, chamomile is a highly significant medicinal plant species that is now through all of Europe, North Africa, Asia, America, Australia, and New Zealand[16]. Three species are known by the name chamomile, including the German or Hungarian chamomile (Matricaria chamomilla L.); these species are also referred to as Rauschert and Matricaria recutita L. Roman chamomile, and identify as Anthemis nobilis L. (synonyms Chamaemelum nobile L. All.) and Juhua (Chrysanthemum morifolium Ramat.)[17]. The Matricaria chamomilla L., often known as German or Hungarian chamomile, is a plant that grows to a height of about 50 cm and has an upright, branching stem that reaches a height of 15–15 cm. The flowers are held in paniculate capitula, and the leaves are bipinnate or tripinnate. The container has a width of 6 to 8 mm and two distinct shapes: it starts off flat and then takes on the shape of a cone. One of Matricaria chamomilla L.'s most significant distinguishing features is its receptacle form. Figure 1 shows the variations in floral morphology between German and Roman chamomile[18].

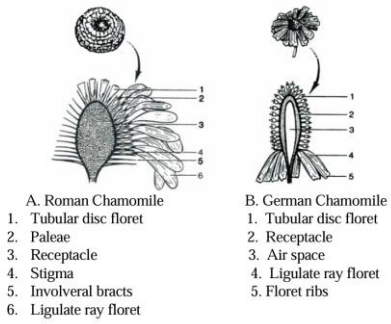

Fig.2 The Roman and German Chamomile flowers

2.1. German and Roman chamomile for medicinal purposes

European Pharmacopoeia (EP) states that chamomile flowers should have at least 0.4% essential oil and 0.25% of apigenin 7-glucoside[19] . How much essential oil is extracted from the average content of chamomile flowers ranges from 0.4 to 2% and includes around 120 constituents, including terpenoids, farnesene, spathulenol, spiroethers, and azulenes. This is consistent with recent research by Singh et al. (2011), who found that the chamomile flower contains over 120 components, including 52 chemicals with potential pharmacological activity, 28 terpenoids, and 36 flavonoids[20]. German chamomile (Matricaria chamomilla L.), which is well-known for its chemical composition rich in bioactive compounds like essential oils, polyphenols, flavonoids, and coumarins, is the most commonly used variety of chamomile, whether it is Roman or German. Chamomile is used in many commercial products with medicinal purposes. German chamomile essential oil is used in the food and beverage industries to enhance the organoleptic qualities (taste, color, and flavor) of the products. Additionally, it can be used as a compress, in aromatherapy, massage, and bath[21]. The plant chamomile is used extensively around the world and has calming, antispasmodic, and anxiolytic properties in addition to having favorable effects on inflammation and skin irritation. In addition, it is a home remedy and has been classified as GRAS (generally recognized as safe) by the FDA[22].With about a million cups drank daily, German chamomile tea is one of the most popular teas in the world [23]. Additionally, fresh German chamomile flowers could be used to make drinks and salads. You might use the dried flowers as an ingredient in salads, soups, and non-alcoholic drinks like lemonade. However, because of its beneficial effects on stomach ailments and nausea, Roman chamomile flower tea is also acknowledged in traditional medicine[24]. German chamomile is a raw material for drug elaboration and is also used as a laxative, anti-inflammatory, and antibacterial treatment for irritable bowel syndrome and sore stomach[25]. The chamomile medication is included in the pharmacopoeia of 26 nations due to its antibacterial, carminative, sedative, spasmolytic, and anti-inflammatory properties.Conversely, Roman chamomile is known to possess sedative, carminative, antispasmodic, and antiemetic qualities. It may also possess antibacterial activities against Porphyromonas gingivalis, the endogenous bacteria that causes periodontitis[26].Additionally, Roman chamomile, which is high in 5-O-caffeoylquinic acid and a derivative of apigenin, has been utilized for millennia in therapeutic applications through oral dosing methods such decoctions and infusion illustrates Alireza's (2012) demonstration of the antifungal properties of German chamomile (Matricaria chamomilla L.) against Staphylococcus aureus, Bacillus cereus, and Bacillus subtilis[27].

2.2. Chemical composition

The essential oil content and chemical makeup of Roman and German chamomile varies significantly[28]. In addition to genetics, postharvest handling, soil composition, and environmental factors .Handling may have an impact on the plant's chemical makeup and, in turn, the volatile oils' chemical makeup. The terpenoid chamazulene, which makes up around 5% of the essential oil, is what gives chamomile oil its blue color[29] . Bisabolol, a terpene, is the primary constituent of German chamomile (Matricaria chamomilla L.). Furthermore, among the bioactive ingredients of German chamomile include farnesene, chamazulene, flavonoids including quercetin, luteolin, and patuletin, and coumarin[30]. A total of 11 phenolic compounds, including quercetin and rutin (flavonols), naringenin (flavanone), herniarin and umbelliferone (coumarin), apigenin, apigenin-7-O-glucoside, luteolin and luteolin-7-O-glucoside (flavones), and caffeic acid (phenylpropanoids), were detected in the German chamomile extract[31].

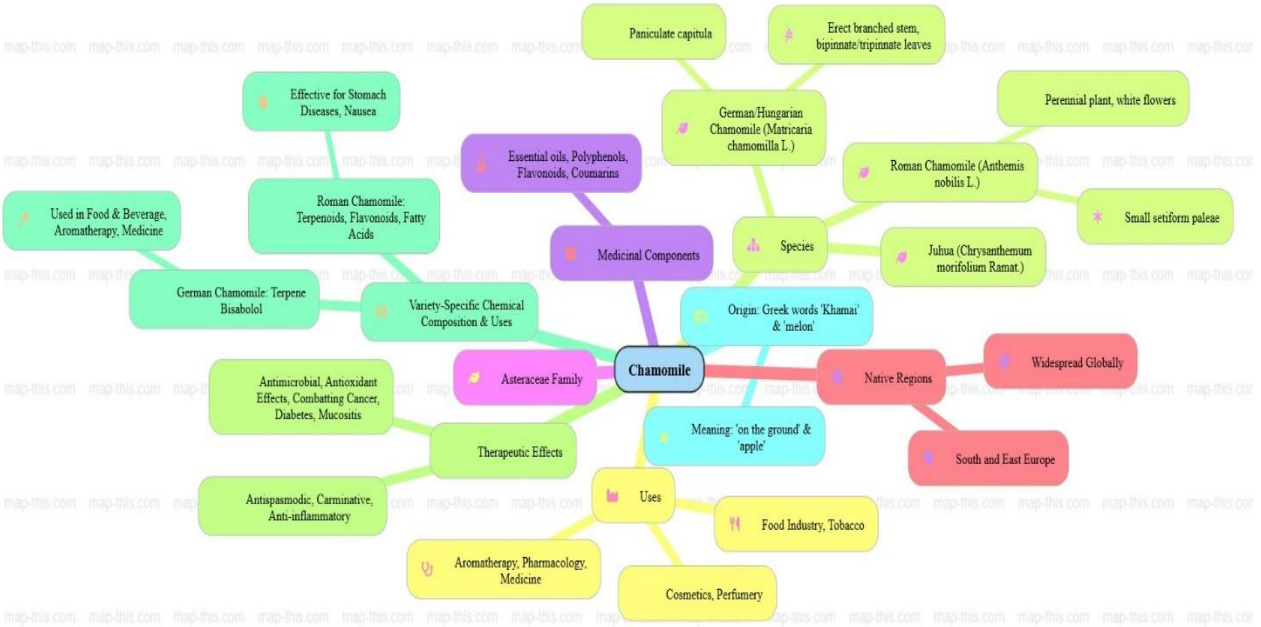

Fig. 3 - Overview of the Chamomile Plant

The main constituent of the essential oil of German chamomile derived from the flowers is (E)-β-farnesene (4.9–8.1%), which is followed by terpene alcohol (farnesol), chamazulene (2.3–10.9%), α-bisabolol (4.8–11.3%), and α-bisabolol oxides A (25.5–28.7%) and B (12.2–30.9%)[32]. The active ingredients in Roman chamomile (Chamaemelum nobile L. All) include coumarins like scopoletin-7glucoside, flavonoids like luteolin, apigenin, and

quercetin, terpenoids like bisabolol and chamazulene, and additional ingredients like fatty acids and choline [33]. The Roman chamomile has less chamazulene than the German variety, and its main constituents include esters of tiglic and angelic acids, along with chemicals like farnesene and pinene . Wistar-Kyoto (WKY) rats' depressive-like behaviors may be lessened by inhaling Roman essential oil due to its pinene content[34].In a different investigation, the hydrodistillation-extracted Roman chamomile oil shown a high content of chamazulene, 3-phenyl propyl isobutyrate, 2-phenylethyl isobutyrate, isobutyric acid ester, and angelic acid. France's Roman chamomile oil is rich in volatile chemicals, including isobutyl angelate, isobutyl isobutyrate, and 2-methylbutyl 2-methylbutyrate.Owing to its complex chemical makeup, chamomile oil shown antibacterial efficacy against yeasts like Candida albicans and gram negative bacteria like Escherichia Coli, Pseudomonas aeruginosa, Klebsilla pneumoniae, and Salmonella sp[35].
This is consistent with another study that was published by Chao et al. (2011) and looked at the antimicrobial properties of 45 different essential oils against bacteria, yeast, molds, and bacteriophages. Roman chamomile and lemongrass oils demonstrated the strongest antibacterial effects against phage among all the oils[36].A different investigation that German chamomile was unable to exhibit exhibition zones against Staphylococcus aureus (0 mm), whereas Roman chamomile demonstrated inhibition activity against methicillin-resistant strains of the bacteria, with an inhibition zone of 19 mm.The octulosonic acid that was extracted from Roman chamomile using contemporary chemical analysis was shown to have beneficial effects against inflammation and metabolic disorders in a study published[37]. Owing to the presence of bioactive components like flavonoids (luteolin and apigenin) in both Chamaemelum nobile L. and Matricaria chamomilla L., chamomile has antispasmodic, carminative, and anti-inflammatory properties. When it comes to antifungal, anti-inflammatory, and spasmolytic qualities, the German chamomile is thought to possess spiroethers cis- and trans-en-yn-dicycloether in its composition, in contrast to the Roman variety. Phenolic chemicals, including flavonols, flavones, phenolic acids, and organic acids, are associated with antioxidant and anticancer actions without posing any secondary unfavorable qualities.The organic acids in Roman chamomile[38]. Conversely, Roman chamomile is a significant species that has a high concentration of phenolic compounds, proteins, carbohydrates, tocopherols, carotenoids, and fatty acids. Apigenin, a bioactive substance found in both chamomile kinds, is thought to be the cause of chamomile's anticancer properties. Research conducted on preclinical models of various cancer types, including skin, ovarian, prostate, and breast cancer, revealed that chamomile extract was able to dramatically lower the viability of these human cancer cell line. German chamomile has the potential to be used in anti-cancer treatments because of its high flavonoid content (157.9 ± 2.22 mg QE/g), high level of polyphenols (21.4 ± 0.327 mg GAE/g), and high antioxidant activity as demonstrated by radical scavenging activity (94.8% RSA)[39]. A recent study by Kreuter, Naby, Kemmler, and Ghazaly demonstrated that an innovative therapeutic approach for the prevention of intestinal mucositis could be the oral administration of chamomile extract prior to radiation therapy.
Furthermore, as demonstrated by a study conducted on rats by El Safer et al, chamomile extract may have a significant antidiabetic effect in addition to its antioxidant, anti-inflammatory, anti-cancer, and antibacterial properties[40].

2.3. MOA of Soothing Properties of Chamomile Extract

Chamomile extract is renowned for its soothing properties, which make it an effective ingredient in herbal cold creams for skin irritation relief. These properties stem from the various bioactive compounds present in chamomile, which interact with the skin through multiple mechanisms. This section will delve into the key mechanisms by which chamomile extract provides relief from skin irritation[41].

2.3.1.Anti-Inflammatory Properties

Chamomile extract contains several compounds that exhibit strong anti-inflammatory effects:
Bisabolol: This primary active component of chamomile has potent anti-inflammatory properties. Bisabolol inhibits the production of pro-inflammatory cytokines, thereby reducing inflammation and alleviating symptoms such as redness and swelling
Chamazulene: Formed during the extraction process, chamazulene contributes to chamomile's anti-inflammatory effects by inhibiting the production of inflammatory mediators such as prostaglandins and leukotrienes.
Flavonoids (Apigenin, Luteolin, Quercetin): These polyphenolic compounds inhibit the activity of inflammatory enzymes like cyclooxygenase (COX) and lipoxygenase (LOX), which play a crucial role in the inflammatory response[42-44].

2.3.2.Antioxidant Activity

Chamomile extract is rich in antioxidants, which help protect the skin from oxidative stress and damage caused by free radicals:
Flavonoids (Apigenin, Quercetin): These antioxidants neutralize free radicals, reducing oxidative stress and preventing cellular damage that can worsen skin irritation.
Phenolic Compounds: Other phenolic compounds in chamomile also contribute to its overall antioxidant capacity, helping to protect the skin from environmental stressors[45].

2.3.3.Antimicrobial Effects

Chamomile has natural antimicrobial properties that help prevent and manage infections, which can aggravate skin irritation:
Essential Oils (α-Bisabolol, Chamazulene): These components possess antimicrobial activity against a range of bacteria and fungi, reducing the risk of secondary infections that can exacerbate skin irritation.
Other Compounds: Additional antimicrobial agents in chamomile further enhance its ability to protect the skin from infectious agents[46].

2.3.4.Wound Healing and Regenerative Effects

Chamomile promotes skin healing and regeneration, which are vital for relieving skin irritation:
Bisabolol and Flavonoids: These compounds accelerate the healing process by promoting the formation of new tissue and enhancing collagen production, which is crucial for repairing damaged skin.
Increased Epithelialization: Chamomile extract can enhance the rate of epithelialization, aiding in the quick recovery of the skin barrier and reducing irritation[47].

2..3.5. Skin Barrier Protection

Chamomile extract helps to strengthen and protect the skin barrier, which is essential for preventing irritation:
Enhanced Barrier Function: By promoting collagen production and supporting the skin's natural repair processes, chamomile helps to maintain a healthy and resilient skin barrier.
Moisturization: The moisturizing effects of chamomile extract help to prevent dryness and maintain skin hydration, which is crucial for reducing irritation and preventing further damage[48].

3. Calendula

Calendula, scientifically known as Calendula officinalis, belongs to the Asteraceae family and is renowned for its medicinal properties [49-51]. This herbaceous plant is traditionally used in various cultures for treating a wide array of ailments such as skin conditions, wounds, gastrointestinal issues, and eye problems. The chemical composition of calendula includes flavonoids, triterpenoids, glycosides, saponins, carotenoids, volatile oil, amino acids, steroids, and quinines, which contribute to its diverse therapeutic effects like anti-inflammatory, antioxidant, and wound healing activities . Additionally, Calendula officinalis is rich in bioactive compounds like fatty acids, sterols, phenolics, flavonoids, saponins, tannins, alkaloids, and terpenoids, further enhancing its pharmacological properties . This plant's multifaceted nature and extensive chemical composition make it a valuable resource in traditional medicine for addressing various health issues [52-53].
Calendula flowers, scientifically known as Calendula officinalis, possess a wide array of medicinal properties. These flowers are rich in various bioactive compounds such as carotenoids, flavonoids, glycosides, steroids, sterols, quinines, volatile oil, and amino acids, making them valuable in traditional medicine for treating wounds, ulcers, scars, hair damage, eczema, and other skin conditions [54-56]. Calendula flowers exhibit anti-inflammatory, anti-cancer, antidiabetic, wound healing, hepatoprotective, and antioxidant activities[57]. Additionally, they are utilized in addressing gastrointestinal, gynecological, ocular, and skin issues, and have been found to have antiviral and anti-mutagenic properties . The extracts from these flowers have shown pharmacological effects such as anti-inflammatory, anti-oxidant, anti-bacterial, anti-fungal, and wound healing activities, making them a promising candidate for various therapeutic applications .
Calendula flowers, scientifically known as Calendula officinalis, possess a plethora of bioactive compounds such as carotenoids, flavonoids, saponins, sterols, and phenolic acids, making them beneficial for skin healing [58] [50]. These flowers have been traditionally used in various forms like extracts, tinctures, balms, and salves for their wound healing and anti-inflammatory properties . Calendula oil, extracted from the petals, is particularly potent and is utilized topically to aid in tissue repair, reduce inflammation, regulate bleeding, and soothe irritated skin . The plant's anti-inflammatory, analgesic, and antimicrobial properties contribute to its effectiveness in treating skin conditions such as wounds, eczema, dermatitis, and burns [59] . Additionally, the presence of triterpenoids, glycosides, and volatile oils in calendula further enhances its wound healing capabilities .

Fig. 4 – Overview of Chamomile Plant

3.1. (MOA) of Soothing Properties of Calendula Extract

Calendula officinalis extract is commonly used in herbal cold creams for its soothing and anti-inflammatory properties, which make it effective for relieving skin irritation. The mechanisms of action (MOA) of calendula extract in this context can be attributed to several biochemical and pharmacological processes:

3.1.1. Anti-Inflammatory Activity

Calendula extract contains several compounds that exhibit anti-inflammatory properties:
Triterpenoids: Compounds such as faradiol, lupeol, and taraxasterol inhibit pro-inflammatory enzymes like cyclooxygenase (COX) and lipoxygenase (LOX). By reducing the production of inflammatory mediators like prostaglandins and leukotrienes, these triterpenoids help to diminish inflammation and associated irritation.
Flavonoids: Quercetin, isorhamnetin, and kaempferol present in calendula act by inhibiting the release of histamines and other inflammatory agents from mast cells. They also reduce the expression of inflammatory cytokines such as TNF-α and IL-1β [60].

3.1.2. Antioxidant Properties

The antioxidant components in calendula extract help to protect the skin from oxidative stress:
Carotenoids: Compounds like lutein and β-carotene scavenge free radicals, preventing oxidative damage to skin cells. This reduces inflammation and promotes the healing of irritated skin.
Flavonoids: These compounds also contribute to antioxidant defense, protecting skin cells from damage caused by reactive oxygen species (ROS) [61].

3.1.3. Moisturizing and Hydrating Effects

Calendula extract enhances skin hydration and barrier function:
Polysaccharides: These molecules form a protective film on the skin's surface, preventing water loss and maintaining hydration. This helps soothe and protect irritated skin.
Saponins: They have mild cleansing properties while maintaining the lipid balance of the skin, ensuring it remains moisturized and less prone to irritation[62].

3.1.4. Antimicrobial Action

Calendula extract has antimicrobial properties that help prevent secondary infections in irritated skin:
Essential Oils: Components like α-cadinol and calamenene exhibit antimicrobial activity against a range of bacteria and fungi, reducing the risk of infection in compromised skin areas.
Flavonoids: Their antimicrobial effects further support the skin's defense against pathogens, ensuring that irritated skin does not become infected, which could exacerbate the irritation[63].

3.1.5. Wound Healing and Tissue Repair

Calendula promotes tissue repair and regeneration:
Triterpenoids and Flavonoids: These compounds stimulate collagen production and epithelialization, speeding up the healing process of irritated and damaged skin [64].

4. Conclusion

It also brought out figures which proved that chamomile and calendula extracts are capable of fighting skin inflammations, a skin ailment that leads to itching, redness, and swelling. The herbal cold creams present an array of therapeutic values once introduced to the market for consumers due to varied chemical concentrations and interactive effects of extract solutions. Thus, Chamomile owing to the active ingredients Bisabolol, Chamazulene and Flavonoids it contains for instance reveals clearly expressed anti-inflammatory properties, stable antioxidant and antimicrobial activity. They can imply that the preparations contribute to the reductions in inflammation, prevent the skin from oxidative damage, combat infections, and facilitate the skin repairing processes, such as elevating the skin barrier functions. Likewise, it contributes to modernity since calendula extract, which contain triterpenoids, flavonoids, and carotenoids are effective in improving the skin health since they inhibit enzyme likes 5-Lipoxygenase, cyclo-oxygenase and free radicals and increase skin moisture content. Calculation for the plant has the diverse pharmacological activity of inflammatory, bacteriological, angiogenic and antioxidant activity eliminates the issue of inflammation, skin injuries and skin defense mechanisms. Besides, the inclusion of these aromatic plants in cold cream formulations will not only augment their own activities, but also enhance the lucency of handling irritated skin by applying combinations of many methods. Examined here are several studies analyzed towards comparing the properties of chamomile and calendula extracts in relation to their utility in mitigating various skin ailments, thus entitling these extracts for dermatological practical uses. Since all of them are natural products, their merits are sourced from plant products and minimize the impacts thus appropriate for the current world needs in natural products for treatment. However, it is not that such possible side effects can not remember that the right preparation type, the first trial and

standardization are to be followed to the dot regarding the utilization of the herbal remedies. Hence, with the understanding that chamomile and calendula extracts are components of herbal cold creams, it can be considered positive natural remedy for skin irritation remedies encouraging improved skin health of the patient that leads to improved quality of life.Polysaccharides: They support cell proliferation and migration, which are crucial for wound healing and skin repair[64].

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