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Research Article

Design And Evaluation of Lemongrass Lotion for Skin Nourishment

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ABSTRACT

This project aims to develop an herbal lotion using the extract of lemon grass, stearic acid, almond oil, cetyl alcohol, glycerol, methyl paraben, triethanolamine, and water. Lemon grass extract contains antioxidants and antimicrobial properties, which make it an ideal ingredient for skincare products. Stearic acid and cetyl alcohol act as emulsifiers and help in forming a stable emulsion with water. Almond oil provides moisturization and nourishment to the skin. Glycerol acts as a humectant and prevents excessive dryness by attracting moisture to the skin. Methyl paraben is a preservative that helps inhibit microbial growth in the product. Triethanolamine is used to adjust the PH of the lotion. The formulation of the lotion was optimized through various tests such as PH, viscosity, and stability tests. The final product is a smooth and creamy lotion that provides excellent moisturization and nourishment to the skin, thanks to the unique blend of natural ingredients

INTRODUCTION

Skin:

The largest organ of the body, accounting for approximately 15% of the total adult body weight, is the skin. It serves several crucial functions, including protection against external physical, chemical, and biologic assailants, as well as the prevention of excessive water loss from the body and involvement in thermos regulation. The skin is a continuous structure, with the mucous membranes lining the body's surface .[1] The integumentary system comprises the skin and its derivative structures .. The skin is composed of three layers: the epidermis, the dermis, and the subcutaneous tissue (kanitakis, 2002). The outermost layer, the epidermis, consists of a specific constellation of cells called keratinocytes, which synthesize keratin, a long, threadlike protein with a protective function. The middle layer, the dermis, primarily consists of the fibrillar structural protein known as collagen. The dermis rests on the subcutaneous tissue, or panniculus, which contains small lobes of fat cells known as lipocytes. The thickness of these layers varies significantly

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depending on the anatomical location on the body. For instance, the eyelid has the thinnest epidermal layer, measuring less than 0.1 mm, while the palms and soles of the feet have the thickest epidermal layer, measuring approximately 1.5 mm. The dermis is thickest on the back, where it is 30-40 times thicker than the overlying epidermis.[2]

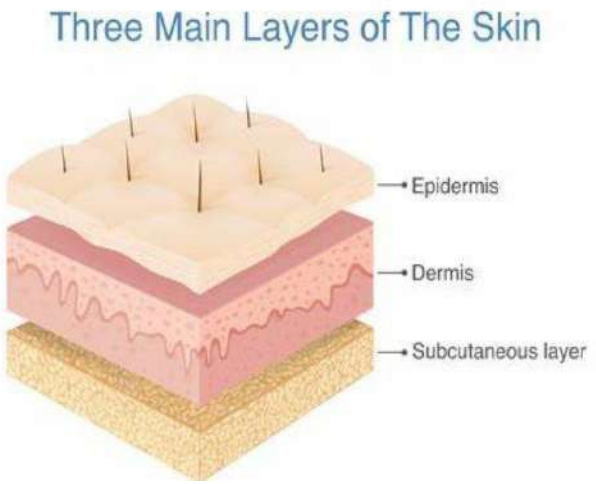


fig.1. Layers of the skin

Epidermis:

The epidermis, a stratified and squamous epithelium layer, is primarily composed of two types of cells: keratinocytes and dendritic cells. Keratinocytes can be distinguished from dendritic cells by their possession of intercellular bridges and a significant amount of stainable cytoplasm (murphy, 1997). While other cell populations such as melanocytes, langerhans cells, and merkel cells also exist within the epidermis, keratinocytes make up the majority of the cell type. The epidermis is commonly divided into four layers based on the morphology and position of keratinocytes as they differentiate into horny cells. These layers include the basal cell layer (stratum germinativum), the squamous cell layer (stratum spinosum), the granular cell layer (stratum granulosum), and the cornified or horny cell layer (stratum corneum) (james et al., 2006; murphy). The lower three layers, which consist of living and nucleated cells, are sometimes referred to as the stratum malpighii and rete malighii (murphy). Furthermore, the epidermis is a continuously renewing layer that gives rise to derivative structures such as pilosebaceous apparatuses, nails, and sweat glands. The basal cells of the epidermis undergo proliferation cycles to ensure the renewal of the outer epidermis. As a dynamic tissue, the epidermis experiences constant unsynchronized motion among its cells (murphy).[2]

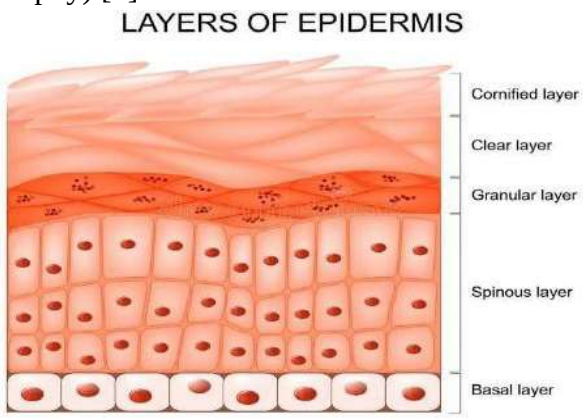
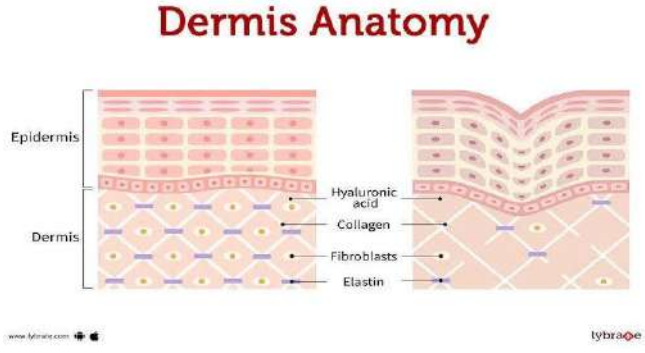


fig.2. Structure of the epidermis

Dermis:

The dermis is a complex network of connective tissue that plays a crucial role in the functioning of the skin. It consists of fibrous, filamentous, and amorphous components that provide support and flexibility to the skin. Additionally, the dermis houses nerve and vascular networks, epidermally derived appendages, fibroblasts, macrophages, and mast cells, which collectively contribute to its functionality.[2]



Various blood-borne cells, such as lymphocytes, plasma cells, and other leukocytes, also enter the dermis in response to different stimuli. This interaction between the dermis and these cells helps in maintaining the overall health and well-being of the skin. Moreover, the dermis is responsible for protecting the body from mechanical injuries, retaining water, regulating body temperature, and housing receptors for sensory stimuli. The dermis works in conjunction with the epidermis to maintain the properties of both tissues. During development, they collaborate in the formation of the dermal- epidermal junction and epidermal appendages. Furthermore, they interact during the healing process of wounds, aiding in the repair and remodeling of the skin. Unlike the epidermis, the dermis does not undergo a distinct differentiation process. However, the structure and organization of its connective tissue components follow a predictable pattern based on depth. The matrix components, including collagen and elastic connective tissue, also vary in a depth-dependent manner and undergo turnover and remodeling in response to normal skin processes, pathological conditions, and external stimuli.The constituents of the dermis originate from the mesoderm, except for nerves, which, like melanocytes, derive from the neural crest. During fetal development, the dermis initially consists of dendritic-shaped cells filled with acid-mucopolysaccharides, which serve as precursors for fibroblasts. As development progresses, fibroblasts actively synthesize reticulum fibers, elastic fibers, and collagen. A vascular network forms, and fat cells appear beneath the dermis. In infants, the dermis is composed of small collagen bundles, while in adults, thicker bundles of collagen are present. Numerous fibroblasts are also found within the dermis. Overall, the dermis is a vital component of the skin, providing it with strength, flexibility, and protection. Its intricate structure and interactions with other skin layers contribute to the overall health and functioning of the skin.[2]

Subcutaneous:

During the later stages of the fifth month, adipocytes start to form in the subcutaneous tissue. These clusters of adipocytes, also known as lipocytes, are separated by fibrous septa composed of large blood vessels and collagen. The thickness of the subcutaneous tissue, known as the panniculus, varies depending on the location on the skin. Apart from its structural role, the subcutaneous tissue also functions as an endocrine organ, providing buoyancy to the body and serving as an energy reservoir. Within the panniculus, hormonal conversion occurs, where androstenedione is converted into estrone by the enzyme aromatase. Additionally, lipocytes within the subcutaneous tissue produce leptin, a hormone responsible for regulating body weight.!

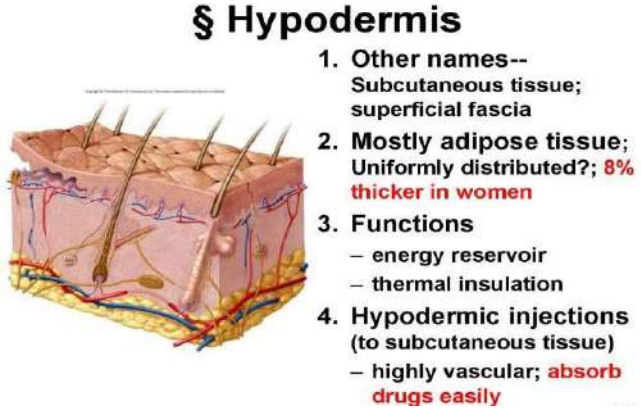


Fig.4. Subcutaneous aka hypodermis

Different types of skin infection :

1. **Bacterial skin infection:**

Bacterial skin infections occur when bacteria infiltrate the skin, either through external sources or due to their presence on the skin. These bacteria can enter the skin via a hair follicle or after a wound has occurred. Anthrax is a specific type of bacterium that can enter the body from the surrounding environment. Staphylococcus and

streptococcus are bacteria commonly found on the skin, which only pose a problem under certain circumstances. Lyme disease, on the other hand, is an infection transmitted by ticks that leads to skin-related symptoms. Bacterial infections can be categorized as either systemic or local. Systemic infections can manifest symptoms throughout the entire body, such as fever, while local infections only impact a specific area. Some bacterial infections may originate in one area and subsequently spread throughout the body. Certain bacterial skin infections, like impetigo, have the potential to spread between individuals through direct skin contact, bodily fluids, contaminated food or water, or contact with surfaces harboring bacteria. Conversely, infections like cellulitis are not contagious. Various types of bacterial skin infections include cellulitis, impetigo, boils, and Hansen's disease (leprosy). Systemic infections that can result in skin rashes encompass syphilis, tuberculosis, and leptospirosis.[3]

2. Viral Skin infection :

Viral skin infections encompass a variety of infections that manifest with skin symptoms. These include shingles (herpes zoster), chickenpox, molluscum contagiosum, warts, measles, and hand, foot, and mouth disease. It is important to note that these viral infections are highly contagious and often affect the entire body.

3. Fungal skin infection:

Fungal skin infections, caused by a fungus, tend to occur in areas of the body where surfaces meet and moisture is present, such as the feet, armpits, or skin folds. Occasionally, symptoms may manifest in areas unrelated to the primary infection due to an allergic reaction to the fungus. For example, an individual with a fungal infection on their foot may experience a rash on their fingers. This occurrence is not a result of direct contact with the foot. Various types of fungal infections include athlete's foot, yeast infection, ringworm, nail fungus, oral thrush, and diaper rash. Fungal skin infections, caused by a fungus, tend to occur in areas of the body where surfaces meet and moisture is present, such as the feet, armpits, or skin folds.[3]

4. Parasitic skin infection:

These types of skin infections are caused by a parasite. These infections can spread beyond the skin to the bloodstream and organs. A parasitic infection isn't life-threatening but can be uncomfortable.

Different types of parasitic skin infections include:

1. Lice:

Body lice, which are small insects with an oblong shape, rely on human blood as their source of nourishment. Indications of body lice bites encompass skin irritation and itchiness, accompanied by small, discolored bite marks. To address and prevent body lice infestations, it is advisable to engage in daily bathing and ensure regular washing of clothing and bedding, with a minimum frequency of once per week. In cases of severe body lice infestations, the utilization of medications can aid in their eradication.

2. Bed bugs:

Bedbugs, small wingless insects that are reddish-brown in color, are typically blood-sucking creatures. In most cases, bedbug bites tend to resolve on their own within a week or two, without requiring any treatment. While bedbugs are not known to transmit diseases, they can trigger allergic reactions or severe skin responses in certain individuals.these apple seed-sized pests tend to conceal themselves in the crevices and gaps of beds, box springs, headboards, bed frames, and other objects in close proximity to beds. They emerge during the night to feed on their preferred hosts, which are humans. The likelihood of encountering bedbugs is higher in locations where

there is frequent turnover of overnight guests, such as hotels, hospitals, or homeless shelters.

Symptoms :

- inflamed spots, often with a darker spot in the middle
- itchy- arranged in a rough line or in a cluster

3. Scabies:

Scabies is a pruritic dermatological condition resulting from the infestation of sarcoptes scabiei, a minuscule mite that burrows into the skin. The affected area experiences severe itching, which may intensify during nighttime. Scabies is highly contagious and can rapidly spread through direct and close interpersonal contact within familial, child care, educational, geriatric, or correctional settings. Due to its ease of transmission, healthcare professionals frequently advise treating the entire family or any individuals in close proximity. Scabies can be effectively treated through the use of medicated skin creams or pills, which eliminate the mites responsible for causing scabies as well as their eggs. However, it is important to note that the itching sensation may persist for several weeks following the treatment.

4. Cut huaneous larva migrans

Cutaneous larva migrans is caused by ancylostoma, a species of hookworm. Hookworms are parasitic organisms that rely on a host for nutrition and can live either on or inside the host. This particular species of hookworm is considered a parasite because it resides in the intestines of dogs and cats during one stage of its life, and in human skin during another stage. The eggs of the hookworm are expelled in the feces of infected dogs and cats, and when exposed to warm and moist soil or sand, they develop into larvae. These larvae eventually mature into a form that can penetrate the skin of individuals who walk barefoot or sunbathe on contaminated soil or sand. While cutaneous larva migrans can be found worldwide, it is most commonly observed in tropical environments. The occurrence of this condition in previously unaffected regions is believed to be linked to climate change.psoriasis is a chronic autoimmune and non-communicable inflammatory disease affecting the skin and joints. The term "psoriasis" originates from the greek word "psora," meaning itchy, and "iasis," indicating a condition. This condition has a global prevalence of two percent, with a higher occurrence of approximately 4.6% in developed nations. It is characterized by distinct scaly, red, coin-sized skin lesions, primarily found on the elbows, knees, scalp, hands, and feet. Common symptoms include itching, irritation, stinging, and pain. In rare cases, the entire body's skin surface may be affected. The diagnosis of psoriasis involves identifying specific signs such as the koebner phenomenon and auspitz's sign.stress is a commonly observed etiological factor in patients with chronic disorders such as crohn's disease, making them more susceptible to psoriasis. Several drugs, including beta-blockers, lithium, synthetic antimalarials, nonsteroidal anti-inflammatory drugs (nsaids), and tetracyclines, have been found to have a strong causal relationship with psoriasis. Patients with a severe form of this disease also face an increased risk of cardiac co-morbidities.this review briefly discusses the immunopathogenesis of psoriasis and the existing therapies for its treatment. Additionally, the review focuses on newer target-based therapies. The biologics currently approved by the fda for psoriasis, as well as those still in the pipeline for approval, are also reviewed.

Pathophysiology :

The pathophysiology of this chronic inflammatory disease is largely unclear. However, it has been observed that dendritic cells or antigen presenting cells (apc) detect stress signals generated by

keratinocytes when antigens come into contact with them. This activation of naïve t cells leads to the secretion of various cytokines, which further differentiates the naïve t cells into effector cells such as th1, th2, and th17. Each differentiated effector cell then secretes cytokines like interferon (ifn-a), tumor necrosis factor (tnf-a), and interleukin (il-2).the differentiation of naïve t cells into th1 and th17 cells depends on the presence of two different cytokines, il-12 and il-23, respectively. Th1 cells facilitate the secretion of tnf-a, ifn-a, and il-2, which in turn activate apc to secrete more signals and activate more t cells. Th17 cells, on the other hand, secrete il-17, which plays a crucial role in the pathogenesis of psoriasis. Il-23 promotes the expression of il-17a, il-17f, and il-22 by th17 cells.tnf-a binds to its receptor on the keratinocyte, activating hyperproliferation and leading to the development of lesions. It also activates other immune cells involved in the inflammatory response

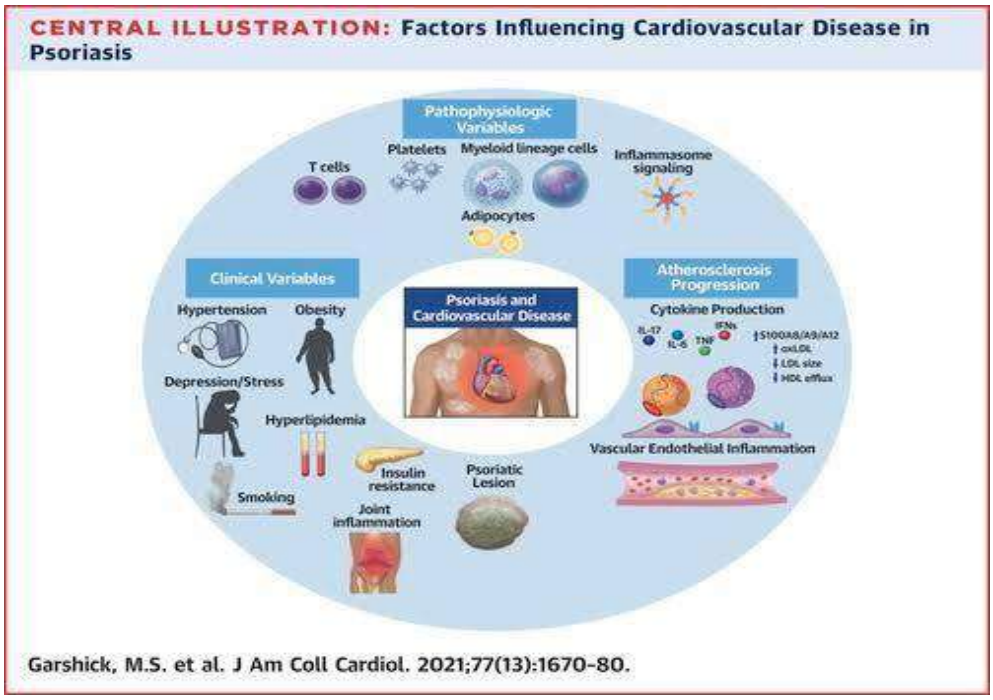


Fig.5. Central illustrtion

Lemongrass plant :

Lemongrass is a tall, aromatic plant with striking striped leaves that have an irregular edge. Its distinct smoky, sweet, herbaceous, and lemony scent makes it a popular ingredient in soups, curries, and teas.[5] Cymbopogon flexuosus, the variety commonly used for culinary purposes, is known for its calming properties. This sweet-smelling sedge is native to tropical and sub-tropical regions of southeast asia and africa, and belongs to the poaceae family.[6] Another variety, cymbopogon citratus, is a grass that grows in pakistan, india, and sri lanka, and is used for medicinal purposes. Lemongrass is widely used in asia for its essential oils, which contain a fine lemon flavor and are used as sedatives for the central nervous system.[7] The essential oils of cymbopogon are characterized by their monoterpene constituents, including limonene, citral, elemol, citronellal, 1,8 cineole, citronellol, linalool, geraniol, methylheptenone, b-carophyllene, geranylformate, and geranyl acetic

acid derivation. Citral, a significant ingredient in the oil of some cymbopogon species, has a variety of industrial uses, including as a raw material for vitamin a, confectionery, and perfumery. Lemongrass can be grown in a pot or garden bed, adding both textural beauty and a lemony, ginger flavor to any dish. For an extra kick, combine lemongrass with chile peppers.[8]

Fig 6. Lemongrass Plant

Lemongrass history

Lemon grass, a perennial plant commonly cultivated in the sub-tropics and tropics, refers to two distinct species: west indian (cymbopogon citrates) and east indian (cymbopogon flexuosus).[9] Various species of lemon grass are native to south east asia, south asia, and australia, hence its name as the tropical asia east indian lemon grass. The east indian lemon grass, also known as cochin or malabar grass, is native to sri lanka, india, thailand, and burma, while the west indian lemon grass is associated with cymbopogon citratus.[10] Both species are now cultivated worldwide. In the philippines, lemon grass has been distilled for export since the 17th century. Samples of closely related citernolla oil were showcased at the crystal palace in london during the 1951 world's fair. In india, it has been a favored oil for many years and is locally known as "choomana polu," referring to the plant's red grass stem. Indigenous australians used citrus fruit to make a drink and for washing skin cuts and eyes. Lemongrass is commercially cultivated in india, guatemala, paraguay, the people's republic of china, sri lanka, england, and other parts of africa, indochina, south america, and central america. The plants grow in dense clumps, reaching up to 2m in diameter with leaves up to 1m long. This genus is native to south asia, australia, and southeast asia. Lemongrass is widely used in herbal teas, non-alcoholic beverages, baked goods, and confections.[12] The essential oil derived from lemongrass is commonly used as a fragrance in perfumes and cosmetics, including creams and soaps. Citral, extracted from lemongrass oil, is used to flavor soft drinks, scent detergents and soaps, fragrance perfumes and cosmetics, and mask unpleasant odors in various industrial products. Citral is also utilized in the production of ionones used in perfumery. Lemon grass also has medicinal properties.[13]

Botany, morphology, ecology

Lemongrass is a perennial sedge with a dense rhizome and leaf clusters. It can grow up to 1.8 meters tall with long, green, glaucous leaves that taper upwards linearly and have short ligules. The sheaths are cylindrical, with widened barren shoots at the base and narrow separating shoots at the bottom. This plant is a short-day plant and produces abundant flowers in south india, with an inflorescence that can reach up to 1 meter in length. Lemongrass is an aromatic plant from the gramineae family[14], known for its high-quality essential oils and low production cost. It is a clumped, perennial grass that can grow up to 1 meter tall, with linear leaf blades that can expand up to 50 cm in length and 1.5 cm in width. The leaf-sheath is tubular and acts as a pseudo-stem, and this plant generates flowers during its mature growth phase.[15]

Leaves :

The strap-like leaves are 0.5-1 in (1.3-2.5 cm) wide, about 3 ft (0.9 m) long and have gracefully drooping tips. The evergreen leaves are bright bluish-green and release a citrus aroma when crushed Leaf arrangement: most emerge from the soil, usually without a stem

Flower :

The lemongrasses plants that you are likely to encounter are cultivars and do not typically produce flowers, or flowering panicles are rarely formed

Inflorescence :

Inflorescences are 30-60-cm- long and nodding, the partial inflorescences are paired racemes of spikelets subtended by spathes

Pharmacology Action :

- **Antibacterial activity :**

The agar plate's essential oil chromatographic fraction exhibited activity against bacillus subtilis, escherichia coli, staphylococus aureus[36–37], salmonella paratyphi, and shigella flexneri[38]. These activities were observed in two out of the three main components of the oil, which were identified using chromatographic and mass spectrometric methods. While the individual components α-citral (geranial) and β-citral (neral) demonstrated antibacterial effects on both gram-negative and gram-positive organisms, the third component, myrcene, did not exhibit any observable antibacterial activity on its own[36]. Furthermore, the extract remained active even after the volatile oil extract was oxidized using the active oxygen method.

- **Antimicrobial activity :**

The potential of cymbopogon citratus (dc) stapf. (lemongrass) essential oil to reduce microbial population in cream-filled baked goods was investigated by assessing its antimicrobial activity against food-borne pathogens. The chemical composition of the oil was analyzed using gas chromatography (gc)/mass spectrometry (ms), revealing the presence of fifteen components. Among these, neral (39.0%), geranial (33.3%), limonene (5.8%), and geranyl acetate (4.2%) were found to be the most abundant constituents. Cream-filled cakes were contaminated with five common food-borne pathogens, namely staphylococcus aureus, escherichia coli, candida albicans, bacillus cereus, and salmonella typhimurium. Lemongrass essential oil exhibited strong antimicrobial activity against these microorganisms. The minimum inhibitory concentration (mic) values for the essential oil were determined to be 0.5 µl/disc for all tested microorganisms, except for s. Aureus, where the oil was ineffective. When 1 µl/ml of essential oil was used, a reduction of more than 99.9% in susceptible microorganisms was observed. After baking the cream-filled cake with the four main susceptible pathogens manually added, no observable microorganisms were detected after 72 hours. Consistent with previous studies, lemongrass essential oil is recommended as a safe natural preservative and food spoilage inhibitor. Its use can also help mitigate the risk of diseases associated with the consumption of contaminated products.

- **Antidiarrheal activity :**

Diarrhea is a major cause of preventable death in developing countries, particularly among children and infants. In the libo kemekem district of northwest ethiopia, the leaf of justicia schimperiana is commonly used as a natural remedy for diarrhea. To investigate its effectiveness, the researchers conducted a study using an 80% methanolic leaf extract of j. Schimperiana on mice. The results showed that the extract significantly reduced the frequency of defecation and diarrhea, as well as inhibited the

production of wet feces. Furthermore, it also demonstrated a significant reduction in intestinal contents and gastrointestinal movement. These findings support the traditional use of j. Schimperiana as an antidiarrheal agent.

- **Antifungal activity :**

Colletotrichum musae primarily affects the musa genus, which includes bananas and plantains. It is well-known for causing anthracnose, which indicates ripeness in bananas and affects the quality of fruits by causing black and brown rots. Aspergillus niger is a contaminant of food and produces black mold on certain fruits and vegetables like grapes, apricots, onions, and peanuts. Lemongrass, scientifically known as cymbopogon citratus, is an herb belonging to the gramineae family. Its name is derived from its lemon-like odor, which is due to the presence of citral, a cyclic monoterpene. Lemongrass contains various phytoconstituents such as tannins, flavonoids, alkaloids, and essential oils. The secondary active metabolites of its components have been associated with the diverse pharmacological effects of this plant. Lemongrass possesses antimicrobial properties. The antifungal activity of lemon grass leaf extracts (both fresh and dried) using cold and hot water, as well as solvents like ethanol and methanol, was evaluated against aspergillus niger (a soil habitat) and colletotrichum musae (a plant pathogen) using the agar well method at three different concentrations. The methanol dried leaves extract exhibited the largest zone of inhibition (10.90 mm) against aspergillus niger, followed by the methanol fresh leaves extract (10.20 mm), while the ethanol fresh leaves extract showed the smallest zone of inhibition (5.20 mm) against colletotrichum musae.

- **Anti-inflammatory activity :**

Cymbopogon citratus, commonly known as lemongrass, is a herb that is widely consumed as an aromatic drink and is used in traditional cuisine in both its fresh and dried forms. However, there is limited knowledge regarding the specific mechanism by which c. Citratus exerts its anti-inflammatory effects. In this study, we aimed to investigate the impact of c. Citratus on the production of nitrioxide (no), a molecule involved in the development of acute and chronic inflammation. To evaluate the effects of c. Citratus, we utilized a skin-derived dendritic cell line (fsdc) and induced no production using lipopolysaccharide (lps). We tested the infusion of dried leaves from c. Citratus, as well as its polyphenolic fractions, which included flavonoid-rich (ff), tannin- rich (tf), and phenolic acid-rich (paf) fractions. Our findings revealed that the infusion of c. Citratus significantly inhibited the lps-induced no production and the expression of inducible no synthase (inos) protein. Furthermore, all the polyphenolic fractions tested demonstrated a reduction in inos protein levels and no production in fsdc cells stimulated by lps. Importantly, these effects were observed without any impact on cell viability. Among the fractions, the ones containing mono- and polymeric flavonoids (ff and tf, respectively) exhibited the strongest effects. Additionally, our results indicated that the anti-inflammatory properties of ff were primarily attributed to luteolin glycosides.In conclusion, our study highlights the no scavenging activity of c. Citratus and its ability to inhibit inos expression. These findings suggest that c. Citratus holds potential for the treatment of inflammatory diseases, particularly those affecting the gastrointestinal tract. Further exploration of c. Citratus as a therapeutic option is warranted.

- Antimalarial activity :

The antimalarial activity of an herbal infusion and the entire cymbopogon citratus plant was evaluated in two experimental models of malaria.

The plant was dried for 10 days at room temperature, milled, and sieved to obtain a powder. This powder was then administered to cba/ca mice infected with plasmodium chabaudi as or p. Berghei anka. Two different doses (1600 and 3200 mg/kg) were analyzed, along with the herbal infusion and chloroquine as a positive control. The prophylactic antimalarial activities of the entire c. citratus plant and the combination of the plant with chloroquine were also assessed. The results showed that the entire C. citratus plant exhibited prolonged antimalarial activity against both P. chabaudi AS and P. berghei ANKA. Interestingly, the low dose of the plant displayed higher antimalarial activity than the high dose against P. berghei ANKA. As a prophylactic treatment, the entire plant demonstrated higher antimalarial activity compared to the herbal infusion or chloroquine. Furthermore, the combination of the entire C. citratus plant and chloroquine exhibited higher activity than chloroquine alone against P. berghei ANKA patent infection. In conclusion, this study demonstrated the antimalarial activity of the entire citratus plant in two experimental models. The entire plant showed higher anti-malarial activity than the herbal infusion or chloroquine.

Fig 7. Botanical Classification

Chemistry :

Lemon grass, scientifically known as cymbopogon citratus, belongs to the poaceae family. This particular plant possesses medicinal properties, as it contains compounds that can effectively control pathogens and enhance the resistance of herbal remedies against diseases caused by pathogens. Apart from its medicinal uses, lemon grass is also cultivated for its aromatic qualities, which make it valuable in the production of perfumes. Additionally, it is grown specifically to extract essential oils for commercial purposes. The pleasant aroma of lemon grass makes it a popular ingredient in the manufacturing of colognes, deodorants, and soaps within the pharmaceutical industry [25]. The main constituents of lemon grass are citral monoterpenes, which are a mixture of geranial and neral isomers, as well as myrcene. Both citral monoterpenes and myrcene possess antibacterial properties and hold medicinal significance. Furthermore, the citral monoterpenes exhibit antifungal and antimicrobial actions, making them particularly interesting in the field of agronomy[12]

Chemical composition

Lemongrass, scientifically known as cymbopogon citratus, is widely recognized for its high citral content. The timing of harvesting, whether it is done early or delayed, has an impact on the essential oils and citral levels in lemongrass. Various factors such as temperature, light intensity, soil moisture, fertilizer, and maturity of the plant also influence the essential oils and citral components. As the plant matures, it transitions from a vegetative stage to a reproductive stage. The yield of essential oils is closely linked to the biomass yield of the plant. To obtain essential oils of superior quality with a higher citral content (around 75%), it is crucial to harvest lemongrass at a specific stage, considering the ratio of young

leaves to older leaves. Different methods, including solvent extraction, accelerated solvent dense co2 extraction, soxhlet extraction, solid-phase matrix extraction, and supercritical fluid extraction, are commonly employed to obtain lemongrass essential oils. However, due to the complex nature of the essential oil components, advanced techniques like high-performance liquid chromatography coupled with gas chromatography (hplc-gc) are preferred for analysis. Hplc is particularly effective in separating a wide range of compounds in a sample, which can then be further separated using gc for enhanced separation.[117]

Benefits

Lemongrass is a rich source of vitamins a and c, which are essential for restoring, nourishing, and replenishing your skin with the necessary nutrients. Additionally, it possesses astringent properties that aid in minimizing your pores and balancing the oil production in your skin, thereby reducing the occurrence of unsightly pimples.[22]

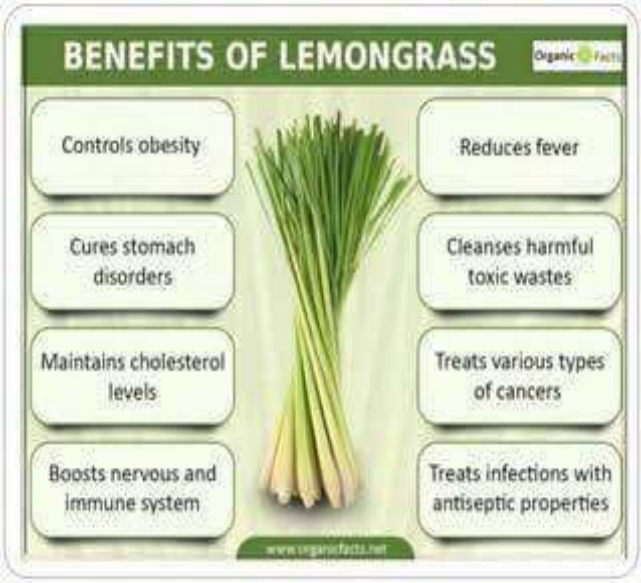


Fig 8. Benefits of Lemongrass

Skin care :

Skin care encompasses a variety of techniques aimed at maintaining the health and appearance of the skin, as well as alleviating any skin-related issues. These practices may involve adopting a balanced diet, protecting the skin from excessive sun exposure, and utilizing suitable moisturizers.

Dry skin treatment :

Coconut oil :

Coconut oil is derived from the fruit or seed of the coconut palm tree, scientifically known as Cocos nucifera, which belongs to the Arecaceae family. It has a melting point of 24 to 25 ºC (75- 76 ºF), allowing it to be easily used in both liquid and solid forms. This versatility makes it a popular choice for cooking and baking purposes. Additionally, coconut oil is highly regarded for its moisturizing and softening properties when applied to the skin. A study has demonstrated that extra virgin coconut oil is not only effective but also safe as a moisturizer, showing no adverse reactions. Furthermore, another study has revealed that coconut oil can help prevent protein loss from hair during wet combing, even after being used for a duration of fourteen hours.

Aloe :

The aloe vera plant, originating from southern Africa, possesses succulent leaves adorned with spiky teeth and vibrant red or yellow flowers. Due to its remarkable ability to heal, moisturize, and soften the skin, it is widely utilized as an ingredient in numerous cosmetic products. To obtain the soothing gel, one can effortlessly extract it by simply cutting one of the aloe vera leaves.

Review literature :

[Syed Nyamath, et.Al 2018] Based on the aforementioned findings, it can be concluded that lemongrass leaf extracts exhibit a high level of efficacy in managing various types of pathogenic microorganisms. However, additional research is required to explore and assess the additional properties of lemongrass that could potentially be utilized in medicinal applications. [26]

[Dr.sorabh sehajapal, et.Al 2023] The essential oil of c. Citratus is composed of various bioactive compounds, both principal and potential. The primary constituents of this oil are citral α (48.26%) and citral β (39.85%), with limonene (1.70%), propyl amyl ketone (1.88%), isogeranial (1.43%), and caryophyllene oxide (1.07%) following closely behind. Citral, which is a major component of c. Citratus oil, is responsible for its antifungal properties.[27]

[P.B.lunkar, et.Al 2013] The quality of the 1% powder level for tea/extract preparation was determined to be superior based on the 9 point hedonic score method. Among the different varieties of lemongrass, the powder prepared from the 'krishna' variety was found to be the best in terms of essential oil, powder color, extract color, extract aroma, taste, and overall acceptability. Even after 6 months of storage in 200 gauge polythene bags at ambient conditions, all powder samples remained in good condition. Further research is required to study the preparation of lemongrass powder on a pilot scale and to assess its acceptability among mass consumers, in order to maximize the utilization of lemongrass.[27]

[Maya sarah, et.Al 2023]. The study utilized the sequential us-mahd method, which involved a 90-minute extraction process. The solvent-plant ratio was set at 10:1 (v/m), with an ultrasonic temperature of 30°c and a microwave power of 300 w. This particular combination resulted in the highest yield of 1.82 mg/g. The extracted oil met the iso 3848:1976 standard and exhibited a strong lemon scent, pale yellow color, relative density of 0.917 mg/l, refractive index of 1.472, and solubility in 80% ethanol at a ratio of 1:2 (v/v). The main constituents of the oil were citronella (17.79%), geraniol (46.69%), citronellol (12.45%), limonene (3.10%), and citral (3.30%). The study concluded that the us-mahd extraction of citronella oil from lemongrass offers several advantages. Firstly, ultrasonic extraction acts as a preliminary step by damaging cell walls and releasing oil from the plant matrix. Microwave heating further enhances this process by re-orienting polar molecules and increasing temperature, resulting in a higher yield of citronella oil. Secondly, this method requires a relatively small amount of solvent, making it suitable for commercial-scale extraction without the need for large vessels. Lastly, the extraction process can be carried out with low power requirements (300 w). However, there are challenges to implementing this method on a commercial scale, such as the design of cost-effective ultrasonic and microwave irradiation systems. Further research is needed to develop this extraction technique using ultrasonic and microwave hybrid extractors.[28]

[Vishakh Shinde, et.Al 2020] In developing countries, herbal medicine remains the primary source of healthcare for the majority of the population. As a result, extensive research is being conducted in this area. The ph of the cream prepared with the herbal extract was found to be approximately 6, which is suitable for topical application since the skin's ph ranges from 4.5 to 6. The spreadability of the formulation was found to be superior to that of the marketed cream, making it a viable alternative. The results of the ph and spreadability tests are presented in table 02. The stability studies revealed that there were no significant changes in the visual appearance, nature, or ph of the formulations after two months of testing, as shown in table 02. Patch tests on formulations i and ii revealed no redness, edema, inflammation, or irritation, indicating that they are safe for use on the skin. Further research is needed to investigate the growth of pathogenic

microorganisms by culturing them on agar medium.[29]

[Mohamanad Mukarram, et.Al 2021] M Leo has gained acknowledgement as a naturally occurring blend, abundant in potent bioactive compounds, which could potentially be utilized for its antibacterial, antifungal, and anthelmintic properties. Additionally, it holds promise for maintaining and preserving food quality, as well as benefiting agriculture and animal health. The advantageous impact of leo on healthy cells, coupled with its anticancer properties, may pave the way for novel approaches in cancer treatment. However, further research is necessary to substantiate these initial findings and ascertain the antioxidant and anticancer mechanisms exhibited by the constituents of lemongrass, both in laboratory settings and in living organisms.[30]

[Mariam Yaseen, et.Al] In this study, the spf value of sunscreen emulsions was determined using the in-vitro spectrophotometry method, which is a straightforward and uncomplicated approach. To assess the antioxidant potential, the dpph radical scavenging capacity assay was conducted, revealing that lemongrass extract had an antioxidant potential of 94.20%, and the lemongrass sunscreen lotion had an spf value of 22. The lotion's ph was 5.5, which is in line with the skin's ph, and the viscosity profile indicated good rheology during handling. The formulation was stable, as evidenced by the absence of phase separation after centrifugation, freeze-thaw, and thermal stress tests. The natural product could be a cost-effective and readily available ingredient in sunscreen products, in addition to its numerous benefits and safety.[31]

[Okpo Samson Onoride, et.Al 2024] Lemongrass essential oils are composed of numerous volatile molecules that have a wide range of applications in various industries such as pharmaceuticals, cosmetics, agriculture, food, and aromatherapy. There are several methods for extracting these oils, but innovative techniques that reduce chemical risks, extraction time, and energy input while maintaining the quality of the yield are being sought after. Green technologies such as sfe, sde, and sfme are recommended for their solvent-free nature, time and energy efficiency, and environmental friendliness. The chemical composition of lemongrass essential oil varies depending on factors such as geographical origin, cultivation practices, plant age, photoperiod, harvest period, cultivars, and extraction methods. This review highlights the significant potential of lemongrass essential oil in the development of drugs for treating infectious diseases and other human ailments, as well as its numerous applications in various industries.[32]

Plant Profile:

Content of the lotion

- **Lemongrass**

Biological name: cymbopogon scientific name:
plantae kingdom: plantae
domain: eukaryote
Part typically used: leaves
Description: Plants are the eukaryotes that form the kingdom Plantae; they are predominantly photosynthetic. This means that they obtain their energy from sunlight, using chloroplasts derived from endosymbiosis with cyanobacteria to

produce sugars from carbon dioxide and water, using the green pigment chlorophyl

Constituents: Lemongrass essential oil (LEO) carries a significant amount of numerous bioactive compounds, such as citral (mixture of geranial and neral), isoneral, isogeranial, geraniol, geranyl acetate, citronellal, citronellol, germacrene-D, and elemol, in addition to other bioactive compounds.[31]

Material and methodology :

Material

Collection of plant Material :

The leaves of lemongrass (Cymbopogon) were collected from the local area in Shrirampur. The leaves were meticulously sun dried, carefully pulverized, and then stored in sealed bottles for the studies. Sun drying allows for the preservation of the leaves natural qualities, ensuring they remain intact for future use and research purposes.

Material Use :

Lemon grass is a versatile plant that can be used in various ways. In culinary applications, it adds a citrusy flavor to dishes and is commonly used in Southeast Asian cuisine for curries, soups, and stir- fries. Lemon grass tea is enjoyed for its calming properties and high antioxidant content. In aromatherapy, lemon grass essential oil is used to promote relaxation and reduce stress. It is also utilized in skincare products for its antimicrobial properties and to cleanse and purify the skin. Additionally, lemon grass serves as a natural insect repellent due to its strong scent. Lastly, in traditional medicine, it is used to treat digestive issues, fever, coughs, colds, and menstrual cramps. With such diverse uses, lemon grass is valued for its versatility and beneficial properties.[18]

Methodology :

1. preparation of material: cut the lemongrass into small pieces to increase the surface area for extraction.
2. loading the soxhlet apparatus: place the lemongrass material into a thimble made of filter paper or cloth. Put this thimble into the soxhlet extractor.
3. solvent selection: select a suitable solvent for extracting lemongrass oil. Common solvents include ethanol or hexane. Pour the chosen solvent into the round-bottom flask attached to the soxhlet apparatus.
4. heating and condensation: heat the round-bottom flask containing the solvent. As the solvent evaporates, it will travel up through the soxhlet extractor, extract the essential oils from the lemongrass, and then drip back down into the round-bottom flask due to condensation.
5. extraction duration: soxhlet extraction typically runs for several hours or overnight, allowing for multiple cycles of solvent circulation through the sample.
6. collection: after completion, the solvent containing the extracted lemongrass oil is collected in the round-bottom flask.
7. separation: use techniques like rotary evaporation or distillation to separate the extracted oil from the solvent.
8. storage: store the obtained lemongrass oil in a dark, airtight container away from heat and light to preserve its quality.

It's crucial to ensure safety precautions during the process, as solvents can be flammable and toxic. Adequate ventilation and appropriate protective gear should be used when handling chemicals. The specific details, including solvent choice, extraction duration, and equipment used, may vary depending on the desired quantity and quality of the extracted lemongrass oil.

Formulation and Evalution of lemongrass lotion :

Procedure:

Heat water (waterproof container)

Addition of emulsifying wax & essential oil (70 %) in this waterproof heat water

Take another container warm distilled water (both oil and water phase at same approximate temperature [70 to75degree]

Slowly pour warm water – critical step to insure emulsified

Stir until mixer cool (it become thicken and creamy)

Add lemon grass extract oil / extract

Add essential oil for fragrance (not compulsory)

Addition of preservative (methyl paraben)

The given formulation (lotion)

Store in container

1. Sanitization:

Sterilize all tools, containers, and utensils that will come in contact with the lotion to ensure cleanliness and prevent contamination.

2. Prepare Water Phase:

Heat distilled water or a hydrosol in a separate heat-resistant container. Do not boil. If using additives like aloe vera gel, this is the phase to mix it in.

3. Prepare Oil Phase:

In another container, combine the carrier oils, emulsifying wax, and any optional additives except the essential oil. Heat gently until the wax melts and the oils blend.

4. Combine Phases:

Once both phases are adequately heated (around 70-75°C), slowly pour the water phase into the oil phase while stirring continuously. Use a hand blender or mixer for better emulsification. Mix until the lotion starts to thicken and form a consistent texture.

5. Cooling:

Let the mixture cool to around 40-45°C. This is the ideal temperature to add essential oils, as high heat can degrade their quality. Add the lemongrass essential oil and stir well to distribute evenly.

6. Final Mixing:

Allow the lotion to cool further to room temperature while continuing to stir occasionally. At this stage, check the consistency and adjust if necessary by adding more distilled water or thickening agents

7. Preservation:

If you haven't used distilled water or if your formula lacks a preservative, consider adding one following the manufacturer's guidelines. This helps extend the lotion's shelf life and prevents microbial growth.

8. Packaging:

Once the lotion reaches room temperature and achieves the desired consistency, transfer it into clean, sterilized containers or jars.

Preparation of extract:

Approximately 500 grams of plant powder were subjected to ethanol extraction for a duration of seven days, with regular agitation. This extraction procedure was repeated three times using the same sample. The resulting filtrates were gathered and subsequently evaporated using a water bath. The lemon juice, obtained through squeezing, was further concentrated using a water bath.

Table No 1 : Formulation of Herbal lotion

Ingredients	F1	F2	F3
Extract of lemongrass	1.5	1.0	2.0
Stearic acid	10	10	10
Cetyl alcohol	5	5	5
Almond oil	5	5	5
Glycerol	4	4	4
Methyl Paraben	0.01	0.01	0.01
Triethanolamine	q.s	q.s	q.s
Water	q.s	q.s	q.s

Ingredient

Table No 2: Formulation table for a lemongrass lotion [40]

Ingredients	Action
Extract of lemongrass	Anti- Inflammatory
Stearic acid	Emulsifier lubricant
Cetyl alcohol	Moisturizer
Almond oil	Dermatitis
Glycerol	Protect skin from irritant
Methyl Paraben	Preservative
Triethanolamine	Stabilizer
Water	Vehicle

Ingredient	Percentage (%)
Distilled Water	68.5
Lemongrass essential oil	2.0
Emulsifying wax	6.0
Shea butter	8.0
Sweet almond oil	10.0
Vegetable glycerine	3.0
Preservative	1.5

1. **Exatract of lemograss (Anti-inflammatory)**

Approximately 500 grams of plant powder were subjected to ethanol extraction for a duration of seven days, with regular agitation. This extraction procedure was repeated three times using the same sample. The resulting filtrates were gathered and subsequently evaporated using a water bath. The lemon juice, obtained through squeezing, was further concentrated using a water bath. The soxhlet extraction method is commonly used to extract essential oils from plant materials, including lemongrass. Here's a basic outline of how you can perform soxhlet extraction for lemongrass oil.

2. **Stearic acid (emulsifier lubricant) :**

Stearic acid, a saturated long-chain fatty acid, possesses a yellow-white waxy texture. Its utilization in skincare and cosmetic products is attributed to its manifold properties and advantages. Acting as an emollient, emulsifier, and lubricant, stearic acid aids in the softening and moisturizing of the skin. Additionally, it effectively binds various ingredients, ensuring their cohesion and preventing disintegration. The chemical formula of stearic acid is c18h36o2.

- **Stearic acid alternative :**

Cetyl alcohol, ceteryl alcohol

Property	Values
Boiling point	361 degree Celsius
Melting point	69.3
Ph	5.5
Solubility	Insoluble in water & soluble in oil
Viscocity	7.79 cp

- **Safety profile**

Stearic acid, an ingredient deemed halal, is considered safe for both skin and hair as long as it is used in moderate amounts. It is suitable for all skin types without any exceptions. Nevertheless, it

is advisable to conduct a patch test before incorporating it into your routine.

- **Used of stearic acid :**

Stearic acid serves the purpose of thickening the products and binding the ingredients together. With its moisturizing and anti-inflammatory properties, this ingredient has gained immense popularity in the realm of cosmetic and skincare products.

3. Cetyl alcohol (moisturizer) :

The combination of hexadecanol and octadecanol is utilized as steryl alcohol, serving as a protective agent on the site to prevent water evaporation. Cetyl alcohol acts as a membrane, allowing rainwater to pass through and mix with the water body, while also preventing the evaporated portion of water from mixing with the surrounding environment. This study focuses on measuring the overall volume of water storage in the village. We determine the total volume of water that has evaporated from the water body using the evaporation pan method.

- **Effect of cetyl alcohol over the surrounding factors:**

Cetyl alcohol, a mixture of fatty acids, is known for its insolubility in water. This compound is susceptible to degradation through both chemical processes and microbial oxidation. With a purity of 95%, cetyl alcohol is derived from natural oils and is commonly used as an ingredient in cosmetics. It presents as a white, flaky, waxy solid, resulting from the combination of cetyl and steryl alcohol, which naturally occur in plants and animals. Typically sourced from coconut, palm, and corn vegetable oil, cetyl and steryl alcohol can also be obtained from corn plants. The u.s. Food and drug administration (fda) has approved the safe use of cetyl alcohol as both a direct and indirect food additive. Furthermore, the cosmetic ingredient review panel (cir) has determined that fatty alcohols, including steryl alcohol, pose no harm when used in cosmetic products. Clinical studies have shown that cetyl alcohol exhibits no significant toxicity and is non-mutagenic, meaning it does not alter DNA.

4. Almond oil (dermatitis) :

Almond oil, also known as oleum amygdalae, has been widely utilized in the field of complementary medicine due to its numerous health benefits. While there is no conclusive scientific evidence, almonds and their oil possess various properties such as anti-inflammatory, immunity- boosting, and anti-hepatotoxicity effects. Animal studies have indicated that almond oil can improve colon movement and bowel transit, suggesting its potential in managing irritable bowel syndrome. Additionally, there have been associations between almond oil consumption and a reduced risk of colonic cancer. Furthermore, almond oil has been recognized for its cardiovascular benefits, as it increases levels of high-density lipoproteins (hdl) while decreasing low-density lipoproteins (ldl). Since ancient civilizations in india, china, and greece, almond oil has been valued for its health and beauty benefits. Today, it is widely used by beauticians, aromatherapists, and massage therapists for its natural emollient and skin-rejuvenating properties. In the practice of aromatherapy, almond oil is highly sought-after due to its rich concentration of oleic and linoleic essential fatty acids. The cosmetic industry also utilizes almond oil for its moisturizing, penetrating, and restructuring properties. Moreover, almond oil serves as a carrier oil in combination with essential oils for aromatherapy purposes. This paper provides an overview of the almond's natural history, the biochemical composition of its oil, and the properties that contribute to its widespread use in the cosmetic industry. Oleum amygdalae is derived from

different types of almonds and is a glyceryl oleate. It possesses a mild scent and a nutty flavor. While it is nearly insoluble in alcohol, it easily dissolves in chloroform or ether. This oil serves as a replacement for olive oil due to its comparable carrier properties. Sweet almond oil, on the other hand, is extracted from the dried kernel of the plant. It has long been utilized by massage therapists to moisturize the skin during massage sessions and is highly regarded by many individuals.

- **Health benefit :**

Oleum amygdalae is derived from different types of almonds and is a glyceryl oleate. It possesses a mild scent and a nutty flavor. While it is nearly insoluble in alcohol, it easily dissolves in chloroform or ether. This oil serves as a replacement for olive oil due to its comparable carrier properties. Sweet almond oil, on the other hand, is extracted from the dried kernel of the plant. It has long been utilized by massage therapists to moisturize the skin during massage sessions and is highly regarded by many individuals.

5. Glycerol (protect skin from irritant) :

Glycerol, a trihydroxy alcohol, has long been included in topical dermatological preparations. It also plays a role in skin hydration, cutaneous elasticity, and epidermal barrier repair. The aquaporin-3 transport channel and lipid metabolism in the pilosebaceous unit have been identified as potential pathways for the delivery and metabolism of endogenous glycerol in the skin. Numerous effects of glycerol on the skin have been documented. Its actions on the epidermis include improving hydration of the stratum corneum, enhancing skin barrier function and mechanical properties, inhibiting the lipid phase transition of the stratum corneum, protecting against irritating stimuli, promoting desmosomal degradation, and accelerating wound-healing processes. It has even been shown to have antimicrobial properties. The topical application of glycerol-containing products has been found to improve skin properties in conditions characterized by dryness and impaired epidermal barrier function, such as atopic dermatitis. The increase in epidermal hydration provided by glycerol is particularly important in skin conditions worsened by dry and cold environmental conditions, such as winter xerosis. This article presents a comprehensive review of the effects of glycerol on the skin, its mechanisms of action, and its potential applications in dermatology.

6. Methyl paraben (preservatives) :

Parabens are commonly used as preservatives in personal care products, but they are also a subject of controversy. This article explores the chemistry and effects of parabens, and offers a range of experiments that students can conduct to investigate the effects of parabens as preservatives in cosmetics. The experiments aim to shed light on the structure-property relations of parabens. [16]

Skin creams and body lotions are frequently used by many individuals on a daily basis. These creams are often packaged in small pots, and when applying the cream, we typically use our fingers without washing our hands beforehand. Consequently, germs from our hands can contaminate the cream pots. The conditions inside these pots are ideal for rapid microbial growth due to the creams' high water content and the warm environment of bathrooms. Therefore, it is crucial to take special measures to prevent the cream from spoiling. Preservatives are added to almost every skin cream and body lotion to prevent the accumulation and spread of germs, which can lead to skin problems or even dermatitis. Parabens are among the most commonly used preservatives in

cosmetic products. They can be found in a wide range of products such as shampoos, lotions, deodorants, scrubs, and eye makeup. However, parabens have become a topic of critical discussion in the public and media. There have been reports in newspapers about the estrogenic effects of parabens, which have been linked to speculations about fertility problems in men and the promotion of breast cancer in women

7. Triethanolamine (stabilizer) :

Structure :

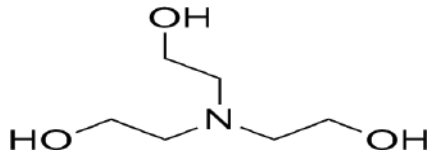


Table NO .3

Common name	**Triethanolamine**
Density	1.2±0.1 g/cm3
Molecular Formula	C6h15no3
Molecular weight	149.188
Boiling point	335.4±0.0 °c at 760 mmhg
Melting point	21

Synonyms :

- Triethanolamine
- Trolamine
- 2,2',2''-nitrilotriethanol

Triethanolamine, also known as tea, is a tertiary amino compound where each hydrogen atom is replaced by a 2-hydroxyethyl group. It serves as a buffer and surfactant, and is classified as a tertiary amino compound, triol, and amino alcohol. It shares functional similarities with triethylamine and acts as the conjugate base of triethanolammonium. Trolamine, another name for triethanolamine, is a tertiary amine and triol. It possesses characteristics of both alcohols and amines, and contains trace amounts of diethanolamine and ethanolamine. Additionally, it acts as an antioxidant to prevent the auto-oxidation of animal and vegetable fats. Trolamine is commonly utilized as a ph adjuster and surfactant in various industrial and cosmetic products, including skin and hair conditioning products.[21]

- **Phytochemical Test :**

Parameter	**F1**	**F2**	**F3**
Appearance	Cream like	Cream like	Cream like
Color	Reddish brown	Reddish brown	Reddish brown
Homogenecity	Uniform and homogenous	Uniform and homogenous	Uniform and homogenous
Consistency	Good	Good	Good
Texture	Smooth	Smooth	Smooth
Irritation	No	No	No
Spread ability	22.73	20.41	19.88

- **Physical parameter:** Appearance ,color and homogeneity
- **Subjective Parameter:** Constituency, feel on application and irritation

1. Spread ability :

Two glass slides with standard dimensions of 20 × 5 cm were chosen. The cream formulation was applied onto one of the slides. The other slide was then placed on top of the cream, creating a sandwich with the formulation in between. The area occupied by the cream was 7.5 cm, and a weight of 100 gm was evenly placed to create a thin layer. After removing the weight, any excess cream sticking to the slides was scraped off. The two slides were positioned at a 45° angle without any disturbance, ensuring that only the lower slide

was securely held by the clamps while allowing the upper slide to freely slide off due to the force of the weight tied to it. Carefully, a weight of 60 gm was attached to the upper slide. The time it took for the upper slide to travel a distance of 5 cm and separate from the lower slide under the influence of the weight was recorded. The experiment was conducted three times, and the average was calculated for three different dimensions. The recorded results were then analyzed. The Spread ability can be determined using the formula: S = M*L/T. In this particular experiment, the weight tied to the upper slide was 60 gm and the length of the glass slide was 7.5 cm. The data presented illustrates the Spread ability of various formulations.[19]

2. PH determination :

The pH of the lotion was determined using a digital pH meter. A 10% solution of the lotion was prepared and then placed into the pH meter for measurement. The resulting pH value was then record

3. Viscosity :

The measurement of cream viscosity was conducted using the Brookfield viscometer. The appropriate spindle (spindle no. 4) was chosen for the specific product, and the operating conditions were established. The viscosity was then directly measured at a speed of 6 rpm while maintaining a constant torque. The average value was obtained and the results are presented in Table no. 02. The viscosity was determined using the formula: Viscosity = Dial Reading × Factor. For LV-4 at 6 RPM, the factor is 1M.[19]

4. Sensitivity Test :

Six volunteers had a portion of lotion applied to their forearms and it was left for a duration of 20 minutes. Any occurrence of irritation, if observed, was duly recorded after the specified time period.[19]

5. Washability :

A small amount of lotion was administered onto the surface of the hand and permitted to be carried away by the pressure of running tap water for a duration of 10 minutes. The moment at which the lotion was entirely eradicated was recorded.

RESULT AND DISCUSSION:

Based on the tests and analysis conducted, we can conclude that the herbal lotion with the ingredients extracted from lemon grass, stearic acid, almond oil, cetyl alcohol, glycerol, methyl paraben, triethanolamine, and water has shown positive results. The lotion was evaluated for properties such as texture, viscosity, ph, and stability. The lotion had a smooth texture, silky feel, easy spreadability, and was absorbed quickly by the skin. The ph of the lotion was found to be within the acceptable range of 5.5 to 6.5. Finally, the lotion was stable and did not show any signs of separation or phase change during storage. The use of natural ingredients in personal care products has become increasingly popular due to the growing trend towards green and sustainable living. Lemon grass has been traditionally used for medicinal and cosmetic purposes in many cultures. The extract of lemon grass contains citral, a potent antimicrobial and anti-inflammatory agent that helps to soothe and rejuvenate the skin. Stearic acid and cetyl alcohol are fatty acids that provide a creamy texture and act as emulsifying agents. Almond oil and glycerol nourish and hydrate the skin while methyl paraben and triethanolamine preserve the lotion from bacterial growth. In conclusion, the herbal lotion made with the ingredients extracted from lemon grass is a promising product that combines natural ingredients and modern science to offer a safe, effective, and aesthetically appealing solution for skincare needs.

CONCLUSIONS:

The herbal lotion made with the ingredients extracted from lemon grass has shown promising results. The combination of stearic acid, almond oil, cetyl alcohol, glycerol, methyl paraben, triethanolamine, and water in the lotion formula has provided an emollient effect, moisturizing properties, and mild preservative functions. Additionally, the appealing fragrance of lemon grass makes the lotion suitable for use in aromatherapy. The formulation can be further improved by conducting more tests on compatibility, skin irritation, microbial safety, and other factors. The oil-in-water lotion was created using a specific formulation consisting of Trigonella foenum-graecum, Citrus lemon, Matricaria chamomilla, and Cymbopogon citratus in a ratio of 1:1:1:2. This optimal formulation was carefully designed with ratios of 2.52:9.35 for triethanolamine and stearic acid. During sensitivity testing, the lotion formulation demonstrated no signs of redness, edema, inflammation, or irritation, indicating its safety for use. By combining these various plant extracts, it is possible to enhance and synergize the cosmetic properties of the final products compared to using individual extracts alone. Furthermore, the study revealed that the lotion remained stable at both room temperature and accelerated temperature conditions for a minimum of three months.

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