International Journal of Research in Pharmacy and Pharmaceutical Sciences
www.pharmacyjournal.in
ISSN: 2455-698X
Received: 28-07-2024, Accepted: 27-08-2024, Published: 11-09-2024
Volume 9, Issue 3, 2024, Page No. 68-73

An over view on antibacterial herbal cream

Benguluri Ramesh Tejaswini[1], Divya S Kumar[2*], Gururaj S Kulkarni[1], Padmaa M Paarakh[3], Muthukumar A[4]
[1] Department of Pharmaceutics, The Oxford College of Pharmacy, Bangalore, Karnataka, India
[2] Assistant Professor, Department of Pharmaceutics, The Oxford College of Pharmacy, Bangalore, Karnataka, India
[3] Department of Pharmacognosy, The Oxford College of Pharmacy, Bangalore, Karnataka, India
[4] Department of Pharmacology, The Oxford College of Pharmacy, Bangalore, Karnataka, India

Abstract

Creams are semisolid dosage forms that are frequently utilized for cosmetic and topical medication administration. Because of their special qualities and few adverse effects, herbal and antibacterial creams have become more and more popular. The creams were made via combining, slabbing, and triturating techniques, among other approaches. Organoleptic characteristics, pH, spreadability, homogeneity, emulsion type, homogeneity, ease of removal, viscosity, extrudability, identification of the kind of cream, and testing for anti-microbial susceptibility were all included in the evaluation of the creams. Herbal creams made with organic components including papaya, neem, turmeric, aloe vera, and tulsi have all demonstrated promise in healing rashes, eliminating acne and skin irritation, improving dry skin, and decreasing wrinkles. Antimicrobial creams with bioactive ingredients derived from different plants showed antibacterial action against germs like *Staphylococcus aureus and Escherichia coli*. The study shows that herbal and antibacterial creams can be used as secure and efficient substitutes for skincare products and medications. Antibiotic resistance and environmental damage brought on by synthetic medications may be resolved by using natural components in creams.

Keywords: Topical medication, antimicrobial susceptibility, herbal and antibacterial creams, skin infections, natural and pharmaceutical components

Introduction

A topical preparate ion that is usually applied to the skin is called a cream [1]. Creams are also used for applying to mucous membranes, including the vaginal or rectum [2]. While even cosmetic creams are made using pharmacy-developed procedures and creams may be considered to be pharmaceutical items [1]. Creams are semisolid dosage forms which can be dissolved or dispersed in a suitable medium to contain one or more pharmacological substances. This word has historically been used to refer to semisolids that have a slight viscosity and can be produced as either water in oil or oil in water [3]. More recently, though, the phrase has been limited to goods manufactured of water washable, more visually appealing long-chain fatty acid or alcohol aqueous microcrystalline dispersions or oil-in-water emulsions. Drugs can be delivered vaginally using creams (such as Triple Sulfa Vaginal Cream). Sunburns are treated with creams. Cold cream can be useful for maintaining skin hydration throughout the year, particularly during the winter. These are some excellent home-made cold cream recipes. As winter approaches, skin problems become more prevalent. Your skin becomes parched and devoid of moisture. It extends, and over the lips and cheeks, little lines of crack occur. If appropriate maintenance is not applied, these fissures could get even redder. Using cold cream in the winter prevents skin issues from getting worse. There are so many cold creams on the market that it could be difficult to choose which one is best for your skin type. Skin problems can be effectively treated by making a cold cream at home using only natural components [1, 2]. The recipe for cold cream was devised in the second century by the Greek physician Galenis credited with its discovery. He mixed rose petals with beeswax to create an emulsion. These were the main moisturizing components within the chilled cream he created. This cream was also known by its vernacular moniker, Galen's cream. In addition to moisturizing the skin, cold creams are used to remove temporary tattoos and cosmetics. Tattoo marks are removed with a cotton ball once the cream has been applied. Cold cream is also used in the production of kid-friendly face paints [4].

Herbal cream

The availability of herbal cosmetics has led to a rise in demand for cosmetics. The remarkable qualities and minimal incidence of adverse effects of herbal formulations are driving up their popularity. In addition, it gives the skin the nutrition and hydration it needs [5]. All that the herbal cream is an oil and water emulsion. Numerous organic components, such as neem, papaya, aloe vera, Tulsi, and turmeric, were used to make the herbal cream. These particular components were chosen because of their special attributes. Aloe vera is used externally to relieve acne and provide hydration. Asian cosmetics, like turmeric, help to brighten the complexion. It also possesses anti-inflammatory and antibacterial properties [6]. Neem is useful in the handling of eczema, dry skin, and psoriasis, among other skin disorders [7]. Tulsi is used to promote wound healing and give skin a glowing appearance. Apart from its health-promoting attributes, tulsi is suggested for the treatment of several ailments, including as skin diseases and coughs [8]. The well-known anti-inflammatory, anti-wrinkle, and enzyme-rich qualities of papaya are widely recognized. The primary goal is to create an herbal cream with several uses, such as moisturizing, reducing acne and skin irritation, reducing wrinkles, rashes, and dry skin [9].

Herbal antibacterial cream

Traditional medicine uses hundreds of various herbs collected from across the world to treat bacterial illnesses [10].

Due to their abundance of bioactive components, plants can be used to create a variety of medications and antibacterial agents [11].

Skin infections brought on by fungi and bacteria are becoming more common. This has grown to be a serious health issue in many developing and impoverished nations. It is especially common in densely populated places with high humidity and unhygienic circumstances [11].

The problem of dermatological infections being resistant to various interest in researching the antibacterial properties of natural pharmaceutical sources that successfully battle the primary infections has increased as a result of over-the-counter treatments. Causing skin diseases. Drug-resistant strains are making a number of illnesses, including more serious skin conditions such burn wound sepsis, folliculitis, impetigo, and carbuncles. Resistance to antimicrobial agents increases the length of hospital stays, which raises the expense of patient treatment. Using novel substances not derived from commercially available synthetic antibacterial drugs is one strategy to stop pathogenic species from developing antibiotic resistance. In addition to the issue of resistance, the improper use of conventional drugs has led to pollution, expense, and environmental damage. These factors have raised interest in nature as a safe and dependable source of alternatives for treating human illnesses [11].

Escherichia coli and *Staphylococcus aureus* are the two primary bacteria that result in skin infections. One global health problem is the growth of antibiotic microorganism resistance. Because most plants have few side effects and are safe, they are valuable sources of possibly beneficial ingredients for the development of novel pharmaceuticals [12].

Types of creams

Skin creams are categorized according to:

FUNCTION	PARTICULAR QUALITIES
• Massage • Foundation • Washing	• Chilling cream • Disappearing cream

There are seven types of creams were shown in (Fig 1)

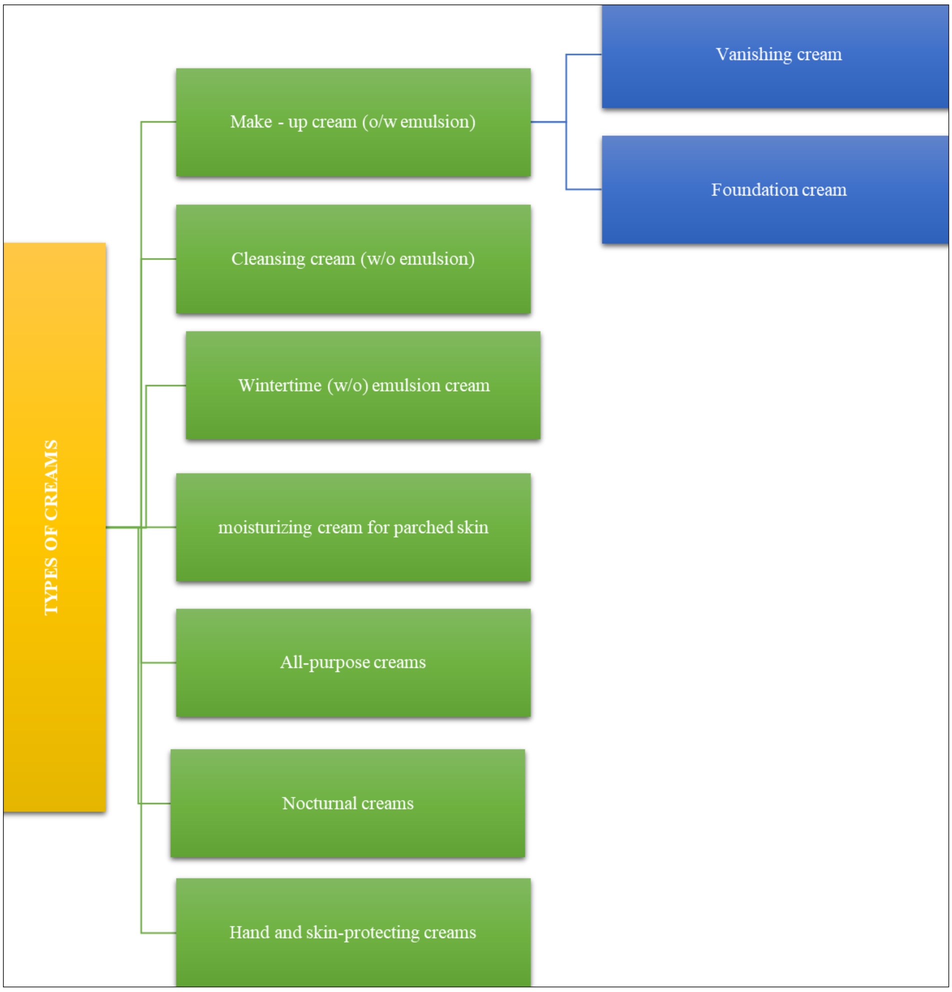

Fig 1: Types of creams

Topical drug delivery

The human body has been treated with medications in a number of ways throughout the last few decades, including nasal, topical, sublingual, oral, rectal, and more. In order to limit the pharmacological effects of the medication to the skin's surface or interior, topical administration refers to the direct application of a drug-containing combination to the skin for the treatment of skin diseases or exogenous indicators of a general medical condition (such as psoriasis). Even with the use of foams, sprays, medicated lotions, and other topical administration techniques, a range of semisolid formulations dominate the topical delivery system [13].

Advantages

- Avoiding the metabolism of first pass.
- Practical and easy to use.
- Steer clears of peril.
- The drawbacks of intravenous therapy and different variables related to absorption, include changes in pH, the presence of enzymes, the duration of gastric emptying, etc.
- Sustained drug administration results in efficacy even at lower total daily dosages of the medication.
- Prevent drug concentrations from changing both within and across patent variations [14].

Disadvantages

- Contact dermatitis or skin irritation may be brought on by the medicine and/or excipients.
- Certain drugs have little skin permeability.
- The possibility of allergic reactions.
- Only applicable to drugs whose effects are dependent on very low plasma concentrations.
- One of the epidermis's enzymes may denature drugs.
- Larger-particle drugs are harder for the skin to absorb [15].

Table 1: Qualities of the organic antimicrobial substances

Herbal Materials	Type	Main Biological Compounds	Target Of Bacteria	Medicinal Applications	Ref.
Clove	Essential oil	Eugenol, α-humulene, eugenyl acetate, 2-heptanone, and β-caryophyllene	*L. monocytogenes, S. aureus, S. typhimurium, and E. coli*	Antimicrobial, anti-mutagenic.	[16]
Garlic	Extract	Allicin, phenolic, and polysaccharide chemicals are examples of organosulfur	*E. coli*	Antimicrobial, antidiabetic, cardioprotective, anticancer.	[17]
Portulaca	Extract	Ascorbic acid, a-tocopherols, apigenin, gallotannins, quercetin, kaempferol, and omega-3 fatty acids	*S.aureus*	Antimicrobial, neuroprotective, anticancer.	[18]
Thyme	Essential oil	Carvacrol, thymol and phenols	*Klebsiella pneumoniae*	Antimicrobial, expectorant, antitussive.	[19]
Mint	Extract	Phenolic compounds	*E. coli*	Antimicrobial, anti - inflammatory.	[20]
Tribulus	Metanolic extract	Tannin, phenolic acids and flavonoids	*S. aureus, P. aeruginosa, E. coli, and E. faecali*	Cardiovascular protective, antimicrobial	[21]
Ginger	Essential oil	Shogaols, gigerols, phenolic acids and paradols	*S. aureus*	Antimicrobial, analgesic.	[22]
Fennel	Essential oil	Phenolic compounds	*S. dysenteriae*	Antimicrobial and antioxidant.	[23]
Turmeric	Essential oil	d-sabinene, d-phellandrene, zingiberene, tumerone, vitamin C, cineone and borneol	*B. coagulans, S. aureus, and B. subtilis*	Antimicrobial, anticoagulant.	[24]
Primrose	Methanol extract	Flavonoids, tocopherols, sterols, hydrocarbons and flavanoids	*Listerene monocytogenes*	Antimicrobial, anti-neuropathic and anti-ulcerogenic.	[25]
Mallows	Ethanol extract	Vitamin C, vitamic E, β-carotene anf flavanoids	*S. aureus, S. pyogenes, P. vulgaris, and P. aeruginosa*	Antimicrobial, hepatoprotect.	[26]
Pennyroyl	Alcoholic extract	Menthone, neo-menthol and pulegone	*Klebsiella and S. aureus*	Antimicrobial, anti-genotoxic.	[27]
Eucalypts	Essential oil	Flavonols, hydrolysable tannins and hydroxybenzoic	*S. aureus and E. coli*	Antimicrobial, antipyretic.	[28]
Cinnamon	Extract	Cinnamaldehyde and eugenol	*S. aureus*	Antimicrobial, cholesterol-lowering and immunomodulatory.	[29]
Burdock	Extract	Rutin, o-hydrobenzoic acid, caffeic acid, p-coumaric acid, and chlorogenic acid	*S. aureus*	Antimicrobial, anti-proliferative.	[30]
Chamomile	Alcoholic extract	Phenolic compounds, apigunin, metricin, flavonoids and terpenoids	*Klebsiella pneumoniae*	Antimicrobial, anti-stress.	[31]
Lemonbalm	Essential oils	Phenolic compounds such as thymol and carvacol	*Listerene strain*	Antimicrobial, antispasmodic and anti-Alzhemer.	[32]
Eryngium	Essential oil	Phenolic acids, coumarins and flavanoids	*S. aureus*	Antimicrobial, antioxidant and anti-inflammatory.	[33]

Materials and methods

Methods of preparation

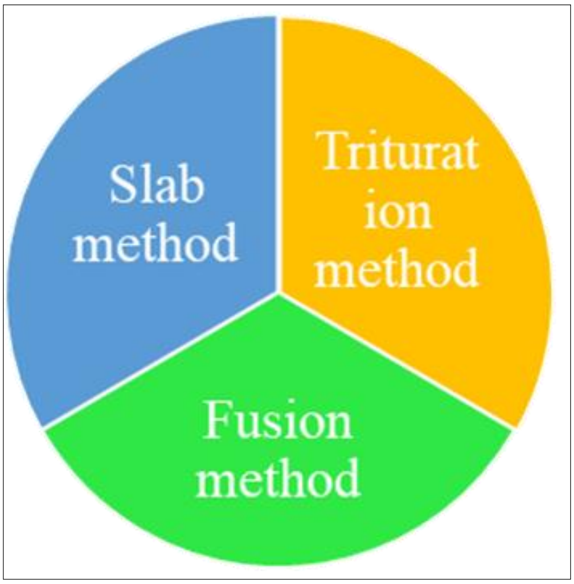

Fig 2: Methods for the preparation of cream

Slab Method

The ingredients are combined until a homogenous mixture is obtained. One method uses a modest scale, such as impromptu compounding, while the other uses a cream mill. A cream component may react with metal, in which case a hard rubber spatula can be utilized. To blend all the components and give the cream a smooth texture, spread it out over the slab, mix it in a geometric pattern, and if required, add a few drops of distilled water. This process of making cream is known as the spontaneous method or slab technique [9].

Trituration method

Use the trituration method for liquids or finely split insoluble powder particles. To add insoluble powder, use geometric dilution. To add liquid, create a well in the middle and prevent the production of air pockets. Using a stainless-steel spatula, reduce the solid medication to a fine powder and mix it with a tiny amount of base on an ointment slab until a homogenous result is formed [9].

Fusion method

The process of melting or liquefying anything by applying heat. By using the fusion process, all or some of the ingredients of an ointment are mixed, melted, and continuously stirred while cooling until the mixture congeals. The melting points of the ointment bases are melted in decreasing sequence. Materials with a low melting point have to be melted after high melting point materials. This keeps materials with low melting points from overheating. Stir well and gradually add the medicine to the melting mass until homogeneous products are formed and the mass cools [9].

Evaluations

Here we can discuss about the Organoleptic properties, pH of the cream, Spredability, Uniformity of weight, Emulsion test type, Homogeneity, Ease of removal, Viscosity, Extrudability, Determination of cream type, The creams antimicrobial susceptibility test.

Organoleptic test

A review of the texture, od or, and appearance of the product was conducted. Several sense organs, like the nose, eyes, and so on, were used to determine them [34].

PH of the cream

A digital pH meter was used to measure the pH of many combinations. After being kept for two hours, one gram of the cream was weighed and dissolved in one hundred milliliters of distilled water. The pH of each formulation was measured three times, and the averages were calculated [35].

Spredability

A minute later, the diameter of the sample dispersed (1 g) between a pair of horizontally plates of glass (10 cm x 20 cm) was measured to determine the spreadability of the formulations. To the upper plate, a normal weight of 25 g was placed. Each formulation was put through three tests [36].

$$S = ML/t$$

Where S stands for spreadability and M, in grams, for the mass connected to the upper slide L the length in centimetres, and T the amount of time required for separating the slides of glass [37].

Uniformity of weight

Ten bottles in all were filled at random and weighed. Each bottle's ointment and creams were taken out, and methanol was used to clean each empty bottle. After being dried, the empty bottles' weights were determined. The net weight of the ointment and bottle cream was determined by calculating the difference between the two weights. Ten bottles' net weights of lotions and ointments were averaged and recorded [38].

Total content of 10 bottles divided by the number of bottles = Average bottle content

Emulsion test type

The dilution test and dye test were used to identify the type of emulsion. In a dye test, a cream was combined with amaranth, a water-soluble dye, and investigated with a microscope. If the continuous phase appeared colourless, the emulsion was classed as w/o type; if it appeared red, it was defined as o/w type. The cream was used in the dilution test to determine the amount of oil in the water emulsion. A tiny quantity of cream should be dissolved in a small amount of water. If the cream dissolves entirely, the emulsion is o/w; in the absence of this, it is w/o [37].

Homogeneity

Under a microscope, the creams' homogeneity was assessed. In addition, eye inspection and to check for homogeneity, the cream was squeezed between the thumb and index finger [39].

Ease of removal

This was assessed by using running tap water to remove the cream that had been applied to a particular body area [40].

Viscosity
The creams' consistency was assessed at 28°C using a Brookfield viscometer. Spindle 4 revolved at 6, 12, 30, and 60 rpm after being inserted into the creams. It was found that the displayed readings [41].

Extrudability
The amount of cream that extruded out of the tube at a given force was used to measure extrudability. The matching formulations were contained in foldable lacquered metal tubes with ten-millimetre openings. One kilogram of formulation was put into each tube, and it was recorded how much of the tube was opened, and formulation was extruded sixty seconds later [42].

Determination of cream type
For this, dye tests and dilution tests were employed. The creams were combined with a crimson dye. A cover slip was placed over the cream drop once it was placed on a slide for microscopic inspection. It was noticed what hue the distributed globules were and what background they had. In a beaker, a gram of cream was diluted with ten millilitres of distilled water. It was carefully blended and checked for disintegration [43].

The creams' antimicrobial susceptibility test
Using the disc diffusion method, the creams' antibacterial activity was assessed. After being ready and cleaned, MHA and SDA were put in Petri dishes to crystallize. Using sterile cotton swabs, the test fungi and bacteria were introduced to them, respectively. The sterile blank discs were placed onto the infected Petri dishes once each individual Petri plate had been impregnated with the corresponding cream formulations. On the other hand, the Petri plates holding the bacteria were inverted and incubated for 24 hours at 37°C, while the plates holding the fungus were incubated for 48 hours at 25°C. The IZDs were measured to the closest millimetre in order to assess the antibacterial activity. The IZDs were measured to the closest millimetre in order to assess the antibacterial activity [40].

Conclusion
The study's antibacterial herbal creams showed high stability, physicochemical characteristics, and antimicrobial effectiveness against *S. aureus and E. coli.* For the topical treatment of skin infections, the creams might be utilized as secure and efficient substitutes for synthetic medications. To assess the therapeutic effectiveness and safety of the creams on human subjects, more research is required.

References

1. Sahu T, Patel T, Sahu S, Gidwani B. Skin cream as topical drug delivery system: a review. Journal of Pharmaceutical and Biological Sciences,2016:4(5):149.
2. Kavitha K, Sivaramakrishnan M, Nalini CN, Nappinnai M. Formulation and evaluation of topical drug delivery systems of fluconazole. Indian drugs,2003:40(12):720-3.
3. Esoje E, Muazu J, Madu SJ. Formulation and *in-vitro* assessment of cream prepared from *Allium cepa* L., bulb. Asian J. Pharm. Sci. Technol,2016, 6:1-5.
4. Sonawane TN, Chaudhari DD, Mali SD, Shaikh AZ. A Short Review on skin cares Cream. Research Journal of Topical and Cosmetic Sciences,2021:12(1):1-3.
5. Mali AS, Karekar P, Yadav AV. Formulation and evaluation of multipurpose herbal cream. International journal of science and research,2015:4(11):1495-7.
6. Christaki EV, Florou-Paneri PC. Aloe vera: a plant for many uses. J Food Agric Environ,2010:8(2):245-9.
7. Debjit Bhowmik DB, Chiranjib C, Jitender Yadav JY, Tripathi KK, Kumar KP. Herbal remedies of Azadirachta indica and its medicinal application,2010:2(1):62-72.
8. Sah & AK, Vijaysimha M, Mahamood M. The Tulsi, Queen of Green Medicines: Biochemistry and Pathophysiology–A Review, 2018.
9. Davkhar SS, Bhandari AS, Akolkar SA. Formulation and Evaluation of Multipurpose Herbal Cream. Systematic Reviews in Pharmacy, 2023, 14(1).
10. Martin KW, Ernst E. Herbal medicines for treatment of bacterial infections: a review of controlled clinical trials. Journal of Antimicrobial Chemotherapy,2003:51(2):241-6.
11. Azubuike CP, Ejimba S, Idowu AO, Adeleke I. Formulation and evaluation of antimicrobial activities of herbal cream containing ethanolic extracts of Azadirachta indica leaves and Aloe vera gel,2015:5:137-142
12. Handali S, Hosseini H, Ameri A, Moghimipour E. Formulation and evaluation of an antibacterial cream from Oxalis corniculata aqueous extract,2011:4(4):255-260.
13. Yadav R, Thakur SK, Parihar R, Chauhan U, Chanana A, Chawra HS. Pharmaceutical Preparation and Evaluation of Cold Cream, 2023, 8(5).
14. Dogra S, Kanwar AJ. Skin diseases: psychological and social consequences. Indian Journal of Dermatology,2002:47(4):197-201.
15. Strom EJ, Collier WS, Stewart FR, Bronaugh LR. Metabolism of xenobiotics during percutaneous penetration: role of absorption rate and cutaneous enzyme activity. Toxicological Sciences,1990:15(1):132-41.
16. Anwer MK, Jamil S, Ibnouf EO, Shakeel F. Enhanced antibacterial effects of clove essential oil by nanoemulsion. Journal of oleo science,2014:63(4):347-54.
17. Martins N, Petropoulos S, Ferreira IC. Chemical composition and bioactive compounds of garlic (*Allium sativum* L.) as affected by pre-and post-harvest conditions: A review. Food chemistry. 2016:211:41-50.
18. Zhou YX, Xin HL, Rahman K, Wang SJ, Peng C, Zhang H. *Portulaca oleracea* L.: a review of phytochemistry and pharmacological effects. BioMed research international, 2015.
19. Oliviero M, Romilde I, Beatrice MM, Matteo V, Giovanna N, Consuelo A, *et al*. Evaluations of thyme extract effects in human normal bronchial and tracheal epithelial cell lines and in human lung cancer cell line. Chemico-biological interactions,2016:256:125-33.
20. Mimica-Dukic N, Bozin B. *Mentha* L. species (Lamiaceae) as promising sources of bioactive secondary metabolites. Current Pharmaceutical Design,2008:14(29):3141-50.
21. Tian C, Chang Y, Zhang Z, Wang H, Xiao S, Cui C, *et al*. Extraction technology, component analysis, antioxidant, antibacterial, analgesic and anti-

inflammatory activities of flavonoids fraction from *Tribulus terrestris* L. leaves. Heliyon, 2019, 5(8).
22. Singh A, Rani R, Sharma M. Medicinal herbs of Punjab (India). InBiol. Forum,2018:10:10-27.
23. Diao WR, Hu QP, Zhang H, Xu JG. Chemical composition, antibacterial activity and mechanism of action of essential oil from seeds of fennel (Foeniculum vulgare Mill.). Food control,2014:35(1):109-16.
24. Sharma S, Ghataury SK, Sarathe A, Dubey G, Parkhe G. Curcuma angustifolia Roxb, (*Zingiberaceae*): Ethnobotany, phytochemistry and pharmacology: A review. Journal of Pharmacognosy and Phytochemistry,2019:8(2):1535-40.
25. Munir R, Semmar N, Farman M, Ahmad NS. An updated review on pharmacological activities and phytochemical constituents of evening primrose (*genus Oenothera*). Asian Pacific Journal of Tropical Biomedicine,2017:7(11):1046-54.
26. Paul D. A review on biological activities of common Mallow (*Malva sylvestris* L.). J. Life Sci. 2016; 4:1-5.
27. Miraj S, Kiani S. Study of pharmacological effect of Mentha pulegium: A review. Der Pharmacia Lettre,2016:8(9):242-5.
28. Mallard I, Bourgeois D, Fourmentin S. A friendly environmental approach for the controlled release of Eucalyptus essential oil. Colloids and Surfaces A: Physicochemical and Engineering Aspects,2018:549:130-7.
29. Willis S, Sunkara R, Hester F, Shackelford L, Walker LT, Verghese M. Chemopreventive and anti-inflammatory potential of select herbal teas and cinnamon in an *in-vitro* cell model. Food and Nutrition Sciences,2019:10(9):1142-56.
30. Fierascu RC, Georgiev MI, Fierascu I, Ungureanu C, Avramescu SM, Ortan A, *et al*. Mitodepressive, antioxidant, antifungal and anti-inflammatory effects of wild-growing Romanian native *Arctium lappa* L. (Asteraceae) and Veronica persica Poiret (Plantaginaceae). Food and Chemical Toxicology,2018:111:44-52.
31. Miraj S, Alesaeidi S. A systematic review study of therapeutic effects of Matricaria recuitta chamomile (chamomile). Electronic physician,2016:8(9):3024.
32. Pirbalouti AG, Nekoei M, Rahimmalek M, Malekpoor F. Chemical composition and yield of essential oil from lemon balm (*Melissa officinalis* L.) under foliar applications of jasmonic and salicylic acids. Biocatalysis and agricultural biotechnology,2019:19:101144.
33. Soumia B. Eryngium campestre L.: polyphenolic and flavonoid compounds; applications to health and disease. Polyphenols: Mechanisms of Action in Human Health and Disease, 2018, 69-79.
34. Okafo SE, Anie CO, Nwanua MC. Formulation and evaluation of antimicrobial topical creams from ethanol extract of Vernonia ambigua leaves. Nigerian Journal of Pharmaceutical Research,2019:15(2):249-55.
35. Bathsa Liza Johnson, Bhanuprakash Arakareddy, Kezia K.Sam. Formulation of anti-bacterial cream from plantoxalis corniculate and its evaluation. International journal of current pharmaceutical research,2020:12(5):40-44
36. Chen MX, Alexander KS, Baki G. Formulation and evaluation of antibacterial creams and gels containing metal ions for topical application. Journal of pharmaceutics, 2016.
37. Shrishail M Ghurghure, Sapna O Kale, Anjali G Atkare. Formulation and evaluation of antibacterial cream containing nigella sativa for topical use. EPRA International Journal of Research and Development, 2022, 7(5).
38. El-Gied AA, Abdelkareem AM, Hamedelniel EI. Investigation of cream and ointment on antimicrobial activity of Mangifera indica extract. Journal of advanced pharmaceutical technology & research,2015:6(2):53.
39. Hartiadi LY, Sahamastuti AA. Protective effect of Caesalpinia sappan L. extract against H2O2-induced oxidative stress on HaCaT and its formulation as antioxidant cream. J Res Pharm,2020:24(4):1-0.
40. Sekar M, Jalil NS. Formulation and evaluation of novel antibacterial and anti-inflammatory cream containing Muntingia calabura leaves extract. Asian Journal of Pharmaceutical and Clinical Research, 2017, 376-9.
41. Okafo SE, Anie CO, Alalor CA, Nwankwo LU. Evaluation of physicochemical and antimicrobial properties of creams formulated using Pterocarpus santalinoides seeds methanol extract. Journal of Applied Pharmaceutical Science,2023:13(5):126-35.
42. Ugandar RE, Deivi KS. Formulation and evaluation of natural palm oil-based vanishing cream. International Journal of Pharmaceutical Sciences and Research,2013:4(9):3375.
43. Swabrick J, Rubino JT, Rubino OP. Coarse dispersion. Remington. The science and practice of pharmacy. 21st edition, Pharmaceutical Press, London, UK, 2005, 319-7.