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Development and Evaluation of a Polyherbal Cold Cream Enriched with Neem, Licorice, Moringa, and Butea Monosperma Extracts for Acne Management

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Abstract: *Acne is a common skin condition occurring in all age groups, which needs prolonged treatment [1]. Standard treatment for acne has side effects like skin dryness and irritation, creating a growing interest in herbal preparations as a safer option [3]. The present work is concerned with the preparation and assessment of an herbal cold cream supplemented with bioactive plant extracts—Neem (Azadirachta indica), Licorice (Glycyrrhiza glabra), and Moringa (Moringa oleifera), Butea monosperma (Butea monosperma) with reported antimicrobial, anti-inflammatory, and antioxidant activities.*

The cream was prepared with an oil-in-water (O/W) emulsion system, to which beeswax, stearic acid, emulsifying wax, calamine, rose water, glycerin, and methyl paraben were added as excipients. 2 drops of lemongrass oil and 3 drops of clove oil were included for their antimicrobial and sebum-controlling properties. Physicochemical characterization of the formulation involved pH measurement, spreadability, viscosity, and stability against different conditions. The findings showed that the herbal cold cream had a smooth, even texture, good spreadability, and pH suitable for the skin (5.5–6.5). The formula was stable with no phase separation by centrifugation and freeze-thaw. The antimicrobial study showed strong inhibition of bacteria, attesting to the promise of this phytoactive-based cold cream in the treatment of acne. This research emphasizes the therapeutic potential of herbal extracts in cosmetics and propounds further clinical efficacy and long-term stability studies for commercialization purposes.

Keywords: Herbal cold cream, Acne control, Neem, Licorice, Moringa, Butea monosperma ,Oil-in-water emulsion, Antimicrobial activity

I. INTRODUCTION

Cosmetics have been in existence for centuries to beautify and improve complexion. The word "cosmetics" comes from the Greek term "kosmestikos," meaning "to embellish". Over the past few years, there has been increasing interest in herbal cosmetics because they are naturally made, increased safety, and could have therapeutic effects [1,3,7]. Herbal cosmetic ingredients provide benefits like antioxidant, anti-inflammatory, antiseptic, and antibacterial effects and are typically reported to have lesser side effects in comparison to man-made alternatives [3,4]. The herbs are not reported to exhibit any kind of side effect on human skin, which was obtained from nature. Nowadays cosmetics are utilized in order to enhance their looks. Cosmetics are preparing and utilizing to enhance their beauty. For different skin diseases formulations such as skin protective, sunscreen, anti-acne, anti-wrinkle, either natural or synthetic. The process of development for cosmetic formulation requires quality standards to be maintained. The herbs employed in cosmetic preparations contain types of properties such as antioxidant, anti-inflammatory, antiseptic and anti-bacterial, etc[41]. herbal products with no side effects in comparison to synthetic formulations. Cold cream is an emulsion that on

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application on skin creates a cooling effect due to the slow evaporation of water in emulsion [2,10]. They are usually made by emulsifying oils and water. In the past cold cream was made with the help of animal fat and vegetable oils [1,2]. Cold creams are herbal cosmetics that give a sensation of coolness when applied as a result of the slow evaporation of water in the emulsion [5]. Cold creams are normally prepared by mixing oils with water through the emulsification method [1,2]. In the past, cold creams were prepared from animal fat and vegetable oil. But with the growing need for natural and safe ingredients, there has been a transition towards the use of natural oils in the development of cold creams. Herbal cold creams have several benefits, such as natural makeup, improved safety, cultural acceptability, versatility in formulation, historical effectiveness, easy availability, affordability, gentle cleaning, normalization of function, richness in nutrients, energy, immune system support, and diversity of phyto-constituents [5]. Yet they possess certain disadvantages like low absorption, risk of skin irritation, poor permeability, risk of allergic reaction, and denaturation of drugs.

Role of Herbal Constituents in Acne Therapy

Neem Extract – Neem has been universally known for its antibacterial as well as anti-inflammatory properties. Neem includes bioactive principles such as nimbidin and azadirachtin, which are responsible for inhibiting acne lesions, calming redness, and inhibiting bacterial proliferation [15,16,18,40].

Figure: Neem Extract

2. Licorice Extract – Licorice includes glabridin and liquiritin, which are strong antioxidants that have been proven to inhibit hyperpigmentation, calm inflamed skin, and regulate excessive secretion of sebum [22,23,24,25,26].

Figure: Licorice Extract

3. Moringa Extract – Moringa is high in vitamins A, C, and E, essential fatty acids, and polyphenols, which contain antimicrobial and wound-healing properties, helping to speed up skin repair [27,28,29,30,34,36,41,42,43].

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Fig. 4: Moringa Extract

4. Butea monosperma (*Butea monosperma*)-Traditionally used in **Ayurvedic medicine,** possesses **anti-inflammatory, wound-healing, and skin-rejuvenating** properties, making it an ideal addition to the formulation [17,18,19,21].

Fig .5: Butea monosperma Extract

Formulation Approach [2,6,9]

The herbal cold cream was developed using an **oil-in-water (O/W) emulsion system**, ensuring a **lightweight, non-greasy, and easily absorbable** formulation. The **aqueous phase** (including rose water, glycerin, and herbal extracts) and the **oil phase** (containing waxes and oils) were prepared separately and emulsified to obtain a **stable cold cream**.

Materials Used

The formulation of the **herbal anti-acne cold cream** was carried out using various natural extracts, oils, emulsifiers, and excipients. The details of the ingredients used are listed below:

1) Herbal Extracts (Active Ingredients)

Ingredient	Scientific Name	Function
Neem Extract	Azadirachta indica	Antibacterial, anti-inflammatory
Licorice Extract	Glycyrrhiza glabra	Skin brightening, anti-inflammatory, reduces pigmentation
Moringa Extract	Moringa oleifera	Antioxidant, anti-acne, wound healing
Butea monosperma Extract	Butea monosperma	Wound healing, anti-inflammatory, skin rejuvenation

2) Oil Phase (Emollients, Emulsifiers, and Stabilizers)

Ingredient	Scientific Name	Function
Beeswax	Natural Wax	Emulsifier, thickening agent
Stearic Acid	Octadecanoic Acid	Thickening agent, stabilizer

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Emulsifying Wax	-	Emulsification, cream stability
Clove Oil	Syzygium aromaticum	Antimicrobial, anti-inflammatory
Lemongrass Oil	Cymbopogon citratus	Antibacterial, reduces excess oil
Vitamin E	Tocopherol	Antioxidant, skin protection
Lavender Oil	*Lavendula aucutifolia*	Clean pores and aromatic property

Table 2: Ingredients Used in the Oil Phase of Cold Cream Formulation

3) Aqueous Phase (Hydrators & Soothing Agents)

Ingredient	**Scientific Name**	**Function**
Calamine	Zinc Oxide & Iron Oxide	Anti-inflammatory, soothing, oil control
Glycerin	-	Moisturizing, humectant
Distilled Water	-	Solvent, hydration
Methyl Paraben	-	Preservative

Table 3: Ingredients Used in the Aqueous Phase of Cold Cream Formulation

Method of Preparation

The herbal anti-acne cold cream was formulated using the **Oil-in-Water (O/W) emulsion method**, which involves the preparation of separate **aqueous and oil phases**, followed by their controlled mixing to form a stable emulsion. The process ensures **uniform distribution of herbal extracts and active ingredients**, maintaining the cream's stability, texture, and therapeutic properties [2,5,6,9,10].

Step 1: Selection and Weighing of Ingredients

All ingredients were accurately weighed as per the formulation design. The active herbal extracts, oils, emulsifiers, and other excipients were selected based on their **anti-acne, moisturizing, and skin-protective properties** [1,2].

Step 2: Preparation of the Aqueous Phase

The **aqueous phase** was prepared by taking **distilled water, rose water, and glycerin** in a beaker [6,9]. The mixture was **heated to 70–75°C** with continuous stirring. **Calamine powder** was gradually dispersed in the heated solution while stirring to avoid clumping. The **herbal extracts (Neem, Licorice, and Moringa)** were then added to the aqueous phase with continuous stirring to ensure uniform dispersion.

Step 3: Preparation of the Oil Phase

In a separate beaker, the **oil phase** was prepared by melting **beeswax, stearic acid, and emulsifying wax**. The mixture was **heated to 70–75°C** to ensure complete melting [2,5]. Once the waxes were fully liquefied, **essential oils (Clove oil and Lemongrass oil) and Vitamin E** were incorporated into the oil phase under gentle stirring to prevent volatilization of the essential oils.

Step 4: Emulsification Process

The **heated oil phase** was then **slowly added** to the heated aqueous phase under **continuous stirring** using a mechanical stirrer or homogenizer. The **mixing process was maintained at high speed for 15–20 minutes** to facilitate proper emulsification. This step ensures that the oil droplets are uniformly dispersed within the aqueous medium, leading to the formation of a **stable Oil-in-Water (O/W) emulsion** [5,10].

Step 5: Cooling and Addition of Preservatives

Once emulsification was complete, the mixture was **allowed to cool gradually to room temperature** while being stirred at a lower speed to prevent phase separation. After cooling, **Methyl Paraben (preservative)** was added and thoroughly mixed to prevent microbial contamination and enhance the shelf life of the formulation [2,6].

Step 6: Final Mixing and Packaging

The final cream formulation was **inspected for uniformity, texture, and stability** before being transferred into **sterile containers**. The containers were then sealed and stored at **room temperature (25°C)** for further **physicochemical and stability evaluations** [2].

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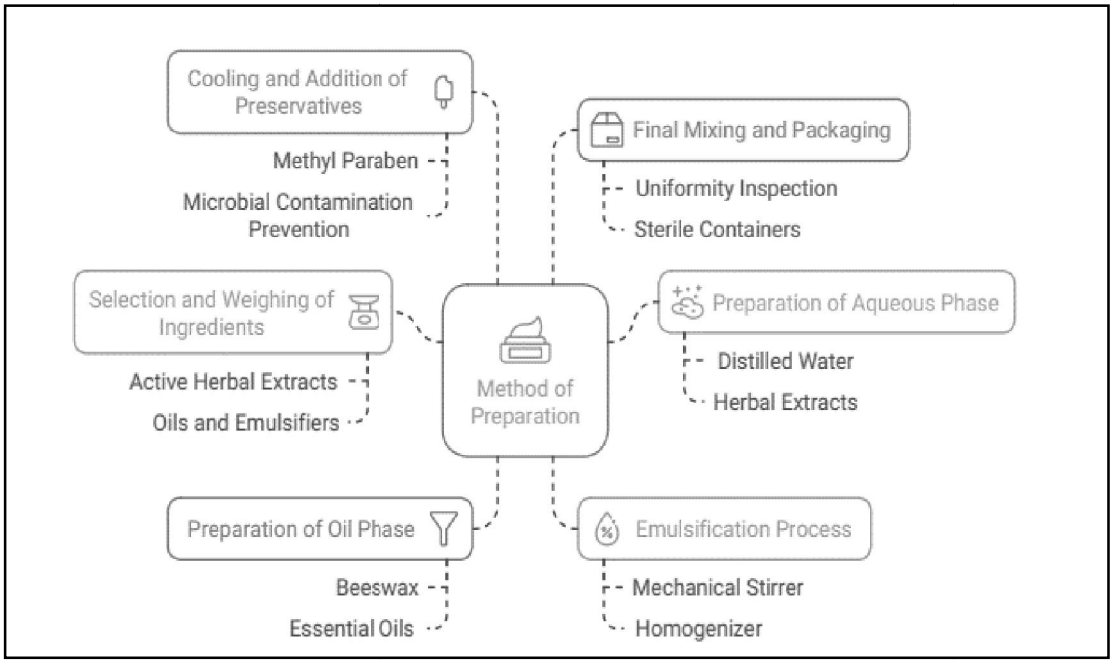

Fig.no 6: Method of preparation of cold cream

Evaluation and observation

Physical properties: The physical properties of formulated cream was observed for colour, odour and appearance.

Sr. no.	Properties	Result
1	Colour	Chocolate cream
2	Texture	Smooth
3	odour	Pleasant

Table 4: Organoleptic and Physical Characteristics of Herbal Cold Cream

pH Measurement: **PH of cold cream was found to be range in 5 which is good for skin.**

Spreadability:

The average spreadability area is 12.18 cm², indicating good consistency for the cold cream. It spreads easily with minimal pressure, making it suitable for cosmetic or dermatological use.

The cold cream formulation exhibited desirable spreadability characteristics, suggesting it can be easily applied and evenly distributed on skin surfaces. No resistance or unevenness was observed.

Trial no.	Weight (g)	Time (min)	Cream (g)	Diameter (cm)	Area (cm²)	Remarks
1	**500 mg**	**1**	**1**	**3.7**	**10.75**	**Smooth, uniform spread**
2	**500 mg**	**1**	**1**	**4.2**	**13.86**	**Better spread than Trail 1**
3	**500 mg**	**1**	**1**	**3.9**	**11.94**	**Moderate spread**
Average	-	-	-	-	**12.18**	**Good spreadability overall**

Table 5: Spreadability Test Results of Herbal Cold Cream

Irritancy Test:

When the formulated cold cream wash applied on hand there is no produce irrigation, edema, and inflammation during the studies. The cream is safe for use.

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Viscosity:

The viscosity of the herbal cold cream formulation was determined using an Ostwald viscometer, which is typically suitable for Newtonian fluids. Since the cold cream is a semi-solid, it was first diluted with distilled water at different concentrations to obtain a flowable dispersion. The diluted samples were allowed to equilibrate at room temperature (25 ± 2 °C), and the flow time was measured between two calibrated marks on the viscometer.

A blank measurement was performed using distilled water to standardize the system. The relative viscosity (η) of the sample was calculated using the formula:

$$\eta 1=\eta 2\times(\rho 2\cdot t2/\rho 1\cdot t1)$$

Where:

η_1 = Viscosity of sample

η_2 = Viscosity of water (known)

ρ_1 = Density of sample

ρ_2 = Density of water

t_1 = Flow time of sample (seconds)

t_2 = Flow time of water (seconds)

The viscosity values obtained at various dilutions were then plotted against their corresponding dilution factors. A linear regression was applied, and the value at zero dilution was extrapolated to estimate the viscosity of the original, undiluted cream formulation.

It was observed that the viscosity decreased with increasing dilution, as expected, due to the breakdown of the semi-solid matrix into a more fluid dispersion. The extrapolated viscosity value reflected the inherent consistency of the herbal cold cream and confirmed the semi-solid, spreadable nature of the formulation. The method provided a reliable estimate of the formulation's viscosity despite the limitations of using a capillary viscometer for semi-solid systems.

Sr. No.	Dilution Factor (Cream : Water)	Flow Time (t_1, sec)	Relative Density (ρ_1, g/cm³)	Viscosity (η, cP)
1	1:4	142	1.03	2.93
2	1:3	162	1.05	3.42
3	1:2	188	1.06	4.05
4	1:1	226	1.07	4.89
5	Undiluted (extrapolated)	—	—	6.10

Table 6: Viscosity Measurement Using Ostwald Viscometer

Dilution Test:

The cream exhibited complete miscibility at all tested dilution ratios without any signs of instability. The formulation remained uniform and homogenous, indicating that the cold cream is an oil-in-water (O/W) type emulsion. This was further supported by the consistent appearance and spreadability of the cream at each dilution level. supported by the consistent appearance and spreadability of the cream at each dilution level.

S. No.	Dilution Ratio (Cream:Water)	Appearance After Mixing	Phase Separation	Emulsion Type
1	1:1	Smooth and uniform	No	Oil-in-water
2	1:2	Slightly fluid, uniform	No	Oil-in-water
3	1:3	More fluid, homogenous	No	Oil-in-water
4	1:4	Flowable but stable	No	Oil-in-water

Table 7: Dilution Test Results of Herbal Cold Cream

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Washability:

Washability test is carried out by appling the small amount of cream on hand and then washing with tap water. The cream was easily removed with plain water, leaving minimal or no greasy residue on the skin. The base ingredients such as emulsifying wax and stearic acid allowed the cream to emulsify effectively with water, contributing to its excellent wash-off ability. The inclusion of light oils and hydrophilic components like glycerin enhanced its water solubility.

Trial No.	Ease of Wash-off	Residue Left	Remarks
1	Excellent	None	Completely washable
2	Excellent	Very minimal	Easily washable
3	Good	None	No greasiness observed

Table 8: Washability Evaluation of Herbal Cold Cream

Stability Test:

The herbal cold cream remained stable over 21 days under varying storage conditions. These results confirm that the formulation is physically and chemically robust and suitable for long-term use under typical environmental conditions.

Day	Storage Condition	Appearance	Color & Odor	pH	Phase Separation	Remarks
0	Room Temp (25 °C)	Smooth, creamy	Herbal, pleasant	6.12	No	Initial formulation
7	Room Temp (25 °C)	Slightly firmer	Slight change	6.08	No	Acceptable
14	Room Temp (25 °C)	Smooth, uniform	No significant change	5.97	No	Stable
21	Room Temp (25 °C)	Mild lumping	No change	5.89	No	Slight variation
0	Refrigerated (4 °C)	Thick, firm	Pleasant	6.15	No	Initial formulation
21	Refrigerated (4 °C)	Slightly grainy	Odor retained	6.05	No	Minor texture change
0	Accelerated (40 °C)	Soft, smooth	Slight scent	6.22	No	Initial formulation
21	Accelerated (40 °C)	Slight separation	Faint odor reduction	5.85	Slightly visible	Monitor recommended

Table 9: Stability Study of Herbal Cold Cream at Different Storage Conditions

Saponification Test:

The saponification value of the given sample was found to be 112.2 mg KOH/g, indicating the amount of potassium hydroxide required to saponify 1 gram of fat/oil in the sample. This value suggests the presence of medium-chain fatty acids, making the sample suitable for use in cosmetic or topical formulations.

SV = ((15 - 11) × 0.5 × 56.1) / 1.0 = 112.2 mg KOH/g sample

II. CONCLUSION

A polyherbal cold cream was formulated using extracts of Neem, Moringa, Liquorice, and Butea monosperma with natural excipients like beeswax, calamine, and essential oils.

The cream was prepared via the oil-in-water (O/W) emulsion method under controlled heating and stirring.It was evaluated for organoleptic properties, pH, spreadability, washability, viscosity, and 21-day stability.The cream showed

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a pleasant appearance, smooth texture, good spreadability, and skin-compatible pH (5.8–6.2).Viscosity results confirmed a moderately thick, easy-to-apply consistency.It remained stable under varied storage conditions with no signs of degradation.Neem and clove oil enhanced anti-acne and antimicrobial activity.Butea monosperma contributed to wound healing and antibacterial effects.Glycerin, calamine, and rose water offered hydration and soothing benefits. The cream shows promise as a multifunctional, natural alternative to synthetic acne products.

Fig .7: Image of the formulated herbal cold cream

REFERENCES

[1]. Panda H. Herbal Cosmetics Handbook. National Institute of Industrial Research; 2000.
[2]. Mali AS, Karekar P, Yadav AV. Formulation and Evaluation of Multipurpose Herbal Cream. International Journal of Science and Research. 2015; 4(11):1495–1498.
[3]. Sonalkar MY, Nitave SA. Formulation and Evaluation of Polyherbal Cosmetic Cream. World Journal of Pharmacy and Pharmaceutical Sciences. 2016; 5(3):772–779.
[4]. Mehta RM. Pharmaceutics-II. 4th ed. Vallabh Prakashan; 2015. p. 222.
[5]. Maruthi N, Nagaraja TS, Uma M, Munaf SA, Arun KA, Jaseem PT, Shaju AM. Formulation, Characterization and Evaluation of Herbal Cold Cream. Indo American Journal of Pharmaceutical Research. 2021; ISSN: 2231-6876.
[6]. Vyas N, Dwivedi S. Herbal Drug Technology – Practical Lab Manual. S. Vikas & Company – Medical Publishers; 2020. p. 33–34.
[7]. Navgire TD, Pawar MB. Formulation and Evaluation of Cold Cream. International Journal of Creative Research Thoughts (IJCRT). 2021; 9(9): ISSN 2320–2882.
[8]. Mali AS, Karekar P, Yadav AV. Formulation and Evaluation of Multipurpose Herbal Cream. International Journal of Science and Research. 2015; 4(11):1495–1498.
[9]. Mali AS, Karekar P, Yadav AV. Formulation and Evaluation of Multipurpose Herbal Cream. International Journal of Science and Research. 2015; 4(11):1495–1498.
[10]. Indian Pharmacopoeia Commission. *Indian Pharmacopoeia 2018, Volume I: General Notices, General Chapters, and Reference Substances*. Indian Pharmacopoeia Commission; 2018.
[11]. C.R. Mitra, H.S. Garg, G.N. Pandey,Identification of nimbidic acid and nimbidinin from Azadirachta indica,Phytochemistry,Volume 10, Issue 4, 1971, Pages 857, 864, ISSN 0031-9422, DOI: 10.1016/S0031-9422(00)97156-5
[12]. Patil MV, Pawar S, Patil DA. Ethnobotany of Butea monosperma (Lam.) Kuntze in North Maharashtra, India. Natural Product Radiance. 2006;5(4):323–325.
[13]. Kirtikar KR, Basu BD. Indian Medicinal Plants. Vol. I, 2nd ed. Allahabad: Lalit Mohan Basu; 1935. pp. 785–788.

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[14]. Council of Scientific and Industrial Research (CSIR). The Wealth of India: A Dictionary of Indian Raw Materials and Industrial Products. Vol. II. New Delhi: Publication and Information Directorate; 1988. pp. 1–344.

[15]. Suguna L, Miriyala S, Panchatcharam M. Efficacy of Butea monosperma on dermal wound healing in rats. International Journal of Biochemistry & Cell Biology. 2005;37(3):566–573. DOI: 10.1016/j.biocel.2004.08.012

[16]. Lavhale MS, Mishra SH. Evaluation of free radical scavenging activity of Butea monosperma Lam. Indian Journal of Experimental Biology. 2007;45(4):376–384.

[17]. Shah KG, Bakxi AJ, Sukla VJ, Dave KK, De S, Ravishankar B. Phytochemical studies and antiestrogenic activity of Butea frondosa (Butea monosperma) flowers. Indian Journal of Pharmaceutical Sciences. 1990;52:272–275.

[18]. Shukla YN, Mishra M, Kumar S. Euphane triterpenoid and lipid constituents from Butea monosperma. Phytochemistry. 2000;54(8):835–838. DOI: 10.1016/S0031-9422(00)00136-9

[19]. Burli DA, Khade AB. A comprehensive review on Butea monosperma (Lam.) Kuntze. Pharmacognosy Reviews. 2007;1(2):333–337.

[20]. Pastorino G, Cornara L, Soares S, Rodrigues F, Oliveira MBPP. Liquorice (Glycyrrhiza glabra): A phytochemical and pharmacological review. Phytotherapy Research. 2018;32(12):2323–2339. DOI: 10.1002/ptr.6178

[21]. Ajagannanavar SL, Battur H, Shamarao S, Sivakumar V, Patil PU, Shanavas P. Effect of aqueous and alcoholic licorice (Glycyrrhiza glabra) root extract against Streptococcus mutans and Lactobacillus acidophilus in comparison to chlorhexidine: An in vitro study. J Int Oral Health. 2014;6(4):29–34.

[22]. Armanini D, Fiore C, Mattarello MJ, Bielenberg J, Palermo M. History of the endocrine effects of licorice. Exp Clin Endocrinol Diabetes. 2002;110(6):257–261.

[23]. Asl MN, Hosseinzadeh H. Review of pharmacological effects of Glycyrrhiza sp. and its bioactive compounds. Phytother Res. 2008;22(6):709–724.

[24]. Chandra JH, Gunasekaran H. Screening of the phytochemical, antimicrobial and antioxidant activity of *Glycyrrhiza glabra* root extract. *J Environ Biol*. 2017;38(1):161–165.

[25]. Damle M**.** Glycyrrhiza glabra (Liquorice)—A potent medicinal herb. *Int J Herb Med*. 2014;2(2):132–136.

[26]. Durgesh KD, Jyotsna D, Anil K, Ratan KG. A multipurpose tree—*Moringa oleifera*. *Int J Pharm Chem Sci*. 2013;2:415–423.

[27]. Dilard CJ, German JB. Phytochemicals: nutraceuticals and human health: a review. *J Sci Food Agric*. 2000;80:1744–1756.

[28]. Awanish P, Rishabh DP, Poonam TP, Gupta JH, Saumya BA. *Moringa oleifera* Lam. (Sahijan)—a plant with a plethora of diverse therapeutic benefits: an updated retrospection. *Med Arom Plants*. 2012;1:1–8.

[29]. Mehta J, Shukla A, Bukhariya V, Charde R. The magic remedy of *Moringa oleifera*: an overview. *Int J Biomed Adv Res*. 2011;2:215–227.

[30]. Coppin JP, Xu Y, Chen H, Pan MH, Ho CT, Juliani HR, et al. Determination of flavonoids by LC/MS and anti-inflammatory activity in *Moringa oleifera*. *J Funct Foods*. 2013;5:1892–1899.

[31]. *.Nadkarni KM. Indian materia medica. 3rd ed. Vol. 1. Bombay, India: Popular Prakashan; 2000. p. 811.*

[32]. Nawale SN. Moringa oleifera: A review on medicinal properties and their commercial applications. Asian J Res Pharm Sci. 2024;14(2):125-8.

[33]. Sandip Gahininath Badadhe, Anuraj Dilip Chavan, Vaishnavi Shankar Deokar. A Comprehensive Review on the Moringa oleifera. Asian Journal of Research in Pharmaceutical Sciences. 2025; 15(1):87-1.

[34]. Sneha Mali, Sonam Bendre, Shital Patil. Overview of Pharmacognostical and Pharmacological properties of Moringa oleifera. Asian Journal of Pharmacy and Technology. 2022; 12(1):77-3.

[35]. Sneha Mali, Sonam Bendre, Shital Patil. Overview of Pharmacognostical and Pharmacological properties of Moringa oleifera. Asian Journal of Pharmacy and Technology. 2022; 12(1):77-3.

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[36]. R. S. Chavan, A. V. Shrirao, N. I. Kochar, A. V. Chandewar. Formulation and Evaluation of Butea monosperma (Lam.) Ointment. Asian Journal of Pharmacy and Technology. 2023; 13(3):175-7.

[37]. Ishtiyak Qadir, R. C. Chhipa. Studies on the Removal of Acid Violet 49 Dye by Activated Carbon obtained from Neem Leaves (Azadirachta indica). Asian J. Research Chem. 2017; 10(3):345-348.

[38]. Sheetal V. Palande, D. K. Swamy. Study of antimicrobial activity of 2-[(1-Naphthalen-1-yl-ethylimino)-methyl]-phenol and its transition metal complexes on E.coli and Staphylococcus aureus.. Asian J. Research Chem. 2018; 11(1):19-22.

[39]. Trapti Rastogi, Deepali S Ghorpade, UA Deokate, SS Khadabadi. Studies on Antimicrobial Activity of Boswellia serrata, Moringa oleifera and Vitex negundo: A comparison. Research J. Pharmacognosy and Phytochemistry 2009; 1(1):75-77.

[40]. Jain A., Dubey S., Sahu J., Gupta A., Tyagi A.K, Kaushik A. Butea monosperma: The Palash- A Versatile Tree Full of Virtues. Research J. Pharmacognosy and Phytochemistry 2010; 2(1): 7-11.

[41]. M. Swapna Reddy, B. Ramya Kuber. Evaluation of Anti-Bacterial Activity of Leaf Extracts of Mimusops elengi and Moringa oleifera. Res. J. Pharmacognosy & Phytochem. 2016; 8(1): 13-15.

[42]. Vengal Rao Pachava, Praveen Thaggikuppe Krishnamurthy, S.P. Dahapal, Pavan Kumar Chinthamaneni. An updated review on "Miracle tree": Moringa oleifera. Res. J. Pharmacognosy and Phytochem. 2018; 10(1): 101-108.

[43]. Suraj T. Jadhav, Nitin A Gaikwad, Indrajeet V Mane, Manohar D Kengar, Abhishek S. Pujari, Shubham B. Devkar. Formulation and Evaluation of Ointment and Liniment using Moringa oleifera Seed Extract. Res. J. Pharmacognosy and Phytochem. 2019; 11(2):45-48.