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Research Paper

Formulation And Evaluation of the Anti- inflammatory Potential of Shata Dhauta Ghrita enriched Moringa Oleifera Seed Emulgel for Topical Application

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ABSTRACT

This study focused on the development and evaluation of a herbal emulgel for topical anti-inflammatory application using Moringa oleifera seed extract incorporated into Shata Dhauta Ghrita. Emulgel, a combination of emulsion and gel, enhances drug penetration and provides better stability for both hydrophilic and hydrophobic components. Three formulations (F1,F2 and F3) were prepared using varying concentrations of Moringa oleifera extract, cucumber extract, and lemongrass oil. All formulations were evaluated for physicochemical parameters such as appearance, pH, viscosity, spreadability, homogenicity, washability, drug content, and stability. Results showed that all formulations were suitable for topical use. Among them, F3 exhibited superior performance with high drug content (98%), ideal viscosity, excellent spreadability and good stability without phase separation. The pH was within a skin-friendly range, indicating compatibility. Overall, the developed emulgel demonstrated promising anti-inflammatory properties, but further clinical studies are recommended to confirm its therapeutic efficacy and safety.

INTRODUCTION

Traditional medicines have a significant impact on global health care. Approximately 75% of the global population relies on plant extracts for health care.[1] In order to eradicate the source of cell harm, remove damaged tissue, and start the healing process, inflammation is a defensive reaction involving host cells, blood vessels, and proteins.[2] The ancients identified five cardinal indications of inflammation based on visual observation: redness (rubor), swelling (tumor), heat (calor; solely applicable to the body's extremities), pain (dolor), and loss of function (function laesa). Celsus in ancient Rome (30-38 B. C.) called the first four of these indications, while

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Galen (130-200 A. D.) named the final one.[3] When tissue is damaged by physical trauma, harmful chemicals, or microbiological organisms, inflammation is a natural and defensive reaction. [4]

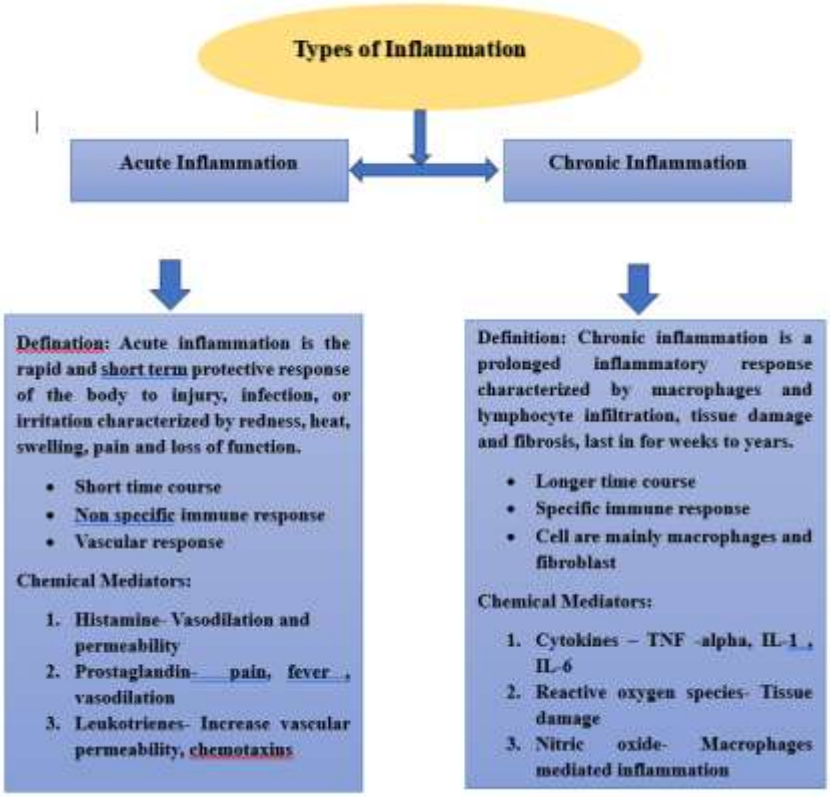


Figure No 1 : Acute VS Chronic Inflammation

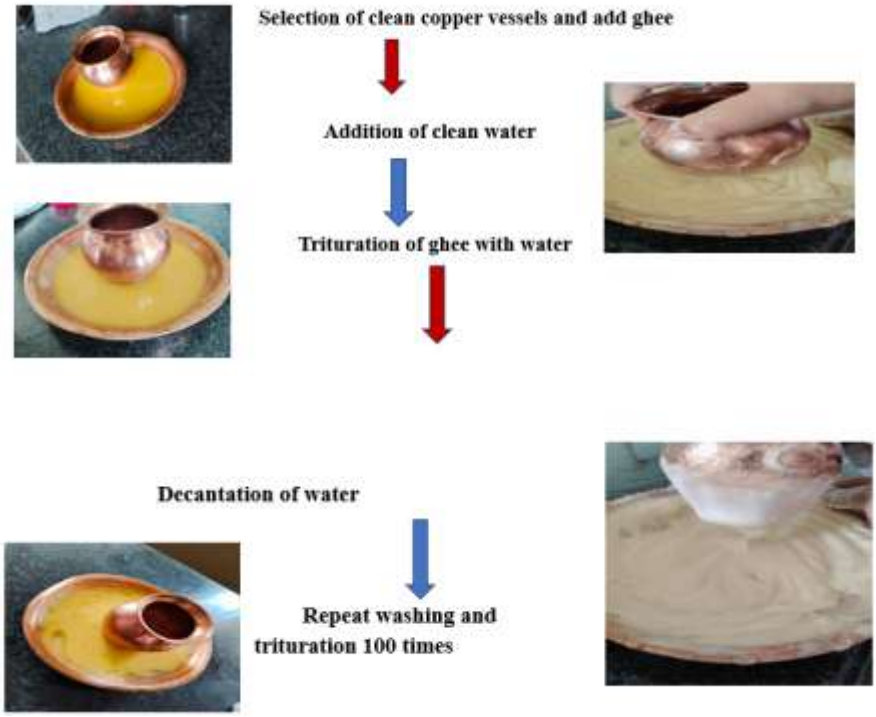
Herbal topical gel formulation important because they offer localized therapeutic action, better patient compliance, and fewer systemic side effects than oral dose forms, herbal topical gel formulations are significant. Gels have several benefits, including improved skin penetration, quick drug release, ease of spreading, and non-greasy nature. Because herbal extract contain bioactive phytoconstituents such flavonoids, tannins, and alkaloids, adding them to topical gels improve their efficacy in treating inflammation, wound healing, burns, acne, and arthritis. Herbal gels are also generally seen as safer, more affordable, and more acceptable for long- term use.[5] Emulgel is a dual controlled drug delivery technology that overcome the drawbacks of traditional topical formulations by incorporating an emulsion (O/W or W/O) into a gel foundation. Emulgel is a new topical drug delivery method that combines the benefits of gels and emulsions, making it particularly useful for delivering both hydrophilic and hydrophobic medications through the skin.[6][7] Traditional topical formulations, such creams and ointments, have restricted drug release, a greasy texture, and poor anti- inflammatory medication penetration. When used topically, many anti- inflammatory drug are less effective because they are poorly soluble in water. By combining the anti- inflammatory medication in an emulsion system distributed throughout a gel base, Emulgel overcomes these drawbacks and improves skin penetration, prolongs local activity, and minimizes systemic adverse effects, making it an excellent choice for treating localized inflammation.[8]

MATERIALS AND METHODS :

Shata Dhauta Ghrita

Ayurveda values ghee for improving intellect, digestion, and body balance, treating various disorders, and supporting modern topical formulations.[9] Shata Dhauta Ghrita is an Ayurvedic preparation made by washing cow ghee 100 times with purified water while chanting Vedic mantras. This process produces an odorless, butter-like, silky cream that can penetrate all seven layers of the skin without clogging pores.[10] Handmade Shata Dhauta Ghrita is an emollient that heals damaged skin by deeply nourishing all tissue layers and is effective for burns, wounds, scars, blemishes, burning sensations, and herpes.[11]

Figure No 2 : Shata Dhauta Ghrita



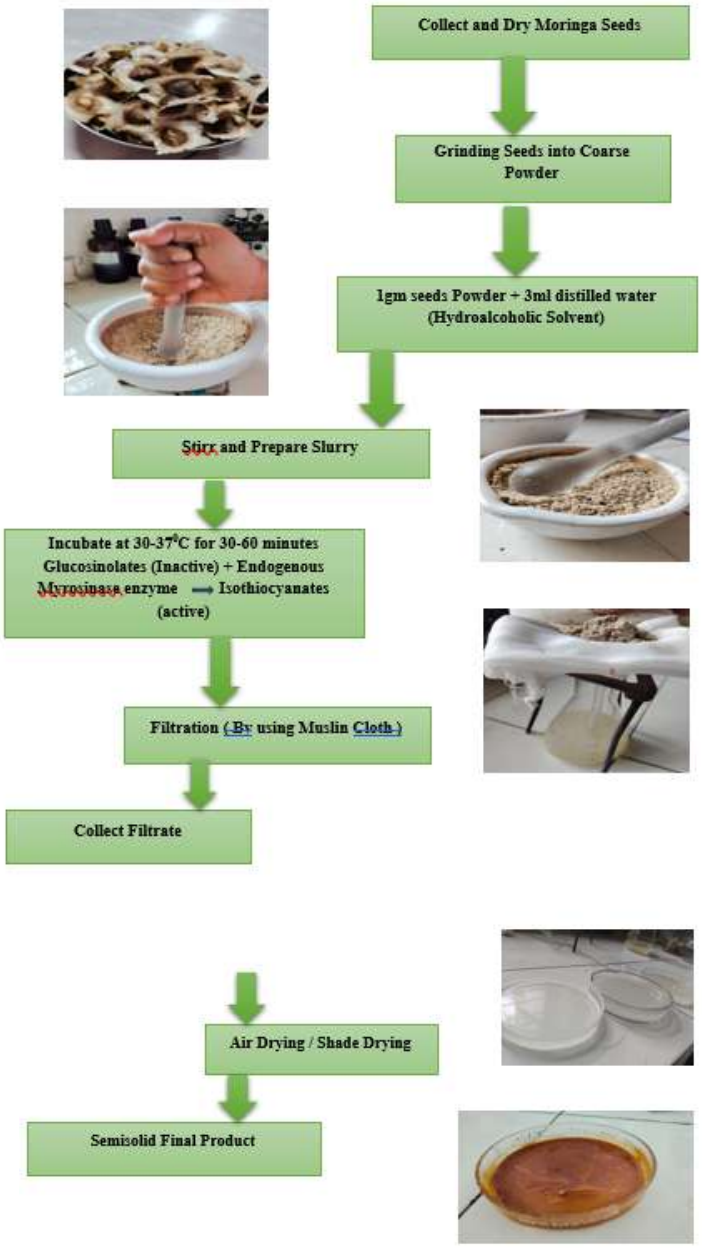
Moringa Oleifera Seeds

Moringa oleifera Lam. is a species of the genus Moringa (family Moringaceae) It is widely grown in India, Pakistan, Afghanistan, Bangladesh, Africa, and Latin America.[12]

They bacteria Staphylococcus aureus and Pseudomonas aeruginosa, which infect the skin, are effectively treated with moringa seeds.[13]In Binga District, Zimbabwe, the Tonga people use root powder mixed with milk as an aphrodisiac and traditional remedy. It is believed to help treat asthma, gout, rheumatism, enlarged spleen or liver, digestive gas, stomach disorders, and to relieve ear and tooth pain.[14][15]

Figure No 3 : Moringa Oleifera seeds

Preparation of Extract :



Cucumber Gel Extract :

Typically, Cucumis sativus L. (C. sativus) is served as a dessert or appetizer.

They are also linked to calming, emollient, cooling, and therapeutic properties. Above all, it is discovered that they have a broad range of activities, including antioxidant.[16][17].

Three unripe cucumbers were washed, dried, and separated into peel and pulp. Each portion was blended with PBS (1:3), incubated at 37^0 C for 8 h, filtered, and centrifuged to obtain the supernatant. The extracts were spay-dried using 5% maltodextrin, and aqueous extracts were prepared similarly using deionized water. Phytochemical screening was performed to identify tannins, flavonoids, alkaloids, saponins, and steroids.[18][19]

Figure No 4 : Cucumber Gel

Lemongrass Oil :

Lemon grass, or Cymbopogon citratus (DC.) Stapf (Poaceae family), is one of the primary aromatic and therapeutic plants grown in Algeria. It is a perennial tropical grass with thin, long leaves [20]

Figure No 5 : Lemongrass Oil

The stalks and leaves of lemongrass were separated, allowed to air dry, and then cut into 4–8 mm pieces. Every extraction used a constant mass of 200 g. Using a Clevenger-type device and distilled water, essential oils were extracted individually by hydro-distillation. Dichloromethane was used to extract the oil, which was then dried over anhydrous sodium sulfate. For additional analysis, the recovered oils were kept at 4–6 °C in the dark.[21]

Formulation of Emulgel :

Master Formula :

Table No 1 : Batch wise Ingredients

Ingredient	F1	F2	F3
Shata Dhauta Ghrita	5gm	5gm	5gm
Moringa Oleifera seeds extract	1gm	2gm	3gm
Cucumber extract	1.5gm	1.5gm	1.5gm
Lemongrass oil	0.3ml	0.3ml	0.4ml
Hydroxy methyl propyl cellulose	2gm	3gm	2.5gm
Liquid Paraffin	3gm	3gm	3gm
Vit. E Acetate	0.5gm	0.5gm	0.5gm
Span 80	0.4gm	0.3gm	0.5gm
Tween 80	1.2gm	1.4gm	1.5gm
Methyl Paraben	0.15gm	0.15gm	0.15gm

Propyl Paraben	0.05gm	0.05gm	0.05gm
Polyethylene Glycol	2gm	3gm	4gm
Purified Water	q.s	q.s	q.s

Optimized Formula :

Table No 2 : Optimized Formula Ingredients

Sr No.	Ingredients	Quantity	Category
1.	Shata Dhauta Ghrita	5gm	Anti-inflammatory base
2.	Moringa oleifera seeds extract	3gm	Active herbal drug (Anti-inflammatory)
3.	Cucumber Extract	1.5gm	Skin Soothing Agent
4.	Lemongrass oil	0.3ml	Anti-inflammatory/ Fragrance
5.	HPMC	2.5gm	Gelling agent
6.	Liquid Paraffin	3ml	Oil phase
7.	Vit.E Acetate	0.5gm	Antioxidant
8.	Span 80	0.5gm	Emulsifying agent
9.	Tween 80	1.5gm	Co- emulsifier
10.	Methyl Paraben	0.15gm	Preservative
11.	Propyl Paraben	0.05gm	Preservative
12.	Propylene Glycol	4gm	Co- Solvent
13.	Purified Water	q.s	Aqueous Phase

Preparation of Emulgel :

1. Preparation of HPMC Gel Base:

This creates the emulsion's aqueous phase. Alcohols and water are often utilized agents.[22] HPMC was dispersed in hot, purified water (70°C) to create the gel in formulas F1, F2, and F3. The gel was then chilled for 15 minutes . [23][24]

Figure No 6 : HPMC Gel base

2. Preparation of Oil Phase :

Tween 80 was dissolved in purified water to creat e the aqueous phase of the emulsion, whereas spa n 60 was dissolved in light liquid paraffin to creat e the oil phase.

Moringa oleifera seed extract was dissolved in et hanol, and methyl and propyl parabens were disso lved in propylene glycol before being combined with the aqueous phase.

The oily and aqueous phases were heated indepen dently to 70°C. [23][24]

Figure No 7 : Oil Phase

3. Gel preparation :

A mechanical shaker was used to continuously swirl various polymer concentrations in distilled water at a moderate speed in order to prepare the gel bases. Triethanolamine (TEA) was used to bring the pH of each formulation down to 6–6.5. [25]

Figure No 8 : Gel Preparation

4. Preparation of Emulgel

The obtained emulsion was mixed with the gel with gentle Stirring to obtain the emulgel.[25]

Figure No 9 : Gel Formulation

Evaluation of Herbal Emulgel

Visual inspection was used to assess the physical appearance, noting color, homogeneity, uniformity, and phase separation.[26]

1.Organoleptic properties

Colour :- Pale yellow to Off white (Uniform Appearance and No Visible Discoloration)

Odour :- Characteristics Pleasant Ghee Odour

Appearance :- Semi solid Consistency Smooth and Glossy Surface No visible particle

Texture:- smooth Soft on touch

Consistency :- Semi solid At room Temperature

Homogenicity :- Appears Uniform No visible particle

2. Evaluation Tests :

Stability Test :

For 35 days at room temperature, the final formulations were assessed for their physicochemical stability criteria, including pH, appearance, odor, homogenicity, Spreadability, Phase Separation and washability.[27]

Dye test :

Take small amount of emulgel on a clean glass slide. Add few drops of suitable dye, Mix gently with a glass rod and Observe under microscope/ eye.[28]

Ease of removal test : Apply small quantity of emulgel on skin. Allow it to remain for fixed time (5-10 min), Wash area with tap water. Observe whether formulation remove easily or leaves residue.[28]

Viscosity Test : Transfer emulgel into Viscometer beaker by using Brookfield Viscometer and by using suitable spindle at specific rpm. Then record viscosity reading in cps.[29]

Spreadability Test : Spreadability of the prepared emulgel was determined to evaluate the ease of application on the skin. A known quantity of the formulation was placed between two clean glass slides. A definite weight was placed over the upper slide to form a uniform thin layer. The time required for the upper slide to move a specified distance under the influence of the applied weight was recorded.[30]

Pharmacological Screening :

In-vitro Anti-inflammatory Activity of Shata Dhauta Ghrita and Moringa oleifera seed extract herbal emulgel by Protein denaturation method

Materials:

Protein Source- Egg albumin/ Bovine albumin
Test Sample- Herbal emulgel (Shata Dhauta Ghrita and Moringa oleifera seed extract)
Standard Drug- Diclofenac sodium
Phosphate Buffer (pH 6.4-6.8)
Distilled water
Water bath, Centrifuge

Procedure:

1. Preparation of Albumin Solution
- Prepare 5% egg albumin solution (5ml egg albumin + 95ml distilled water

2. Preparation of Reaction Mixture
Divide into 3 groups :
A] Control : 2 ml albumin + Phosphate buffer
B] Standard : 2 ml albumin + Diclofenac sodium solution
C] Test (Emulgel) : 2 ml albumin + emulgel extract at different concentrations

3. Incubation
- Incubate all samples at 37^0 C for 15 minutes

4. Calculation
% Inhibition = (Wc-Wt)/Wc x 100
Where :
W_c = Weight of control
W_t= Weight of test

- Control Weight = 2.34
- Test Weight = 0.40

% Inhibition = 2.34-0.40/2.34 x 100
1.94/2.34 x 100 = 82.9 %

The herbal emulgel containing Shata Dhauta Ghrita and Moringa oleifera seed extract showed 82.9 % inhibition of protein denaturation, indicating strong anti- inflammatory activity.[31][32][33]

Evaluation Parameters :

Table No 3 : Evaluation Parameters of Formulation

Sr No.	Parameters	F1	F2	F3	Observation
1	Appearance	Smooth, Slightly thin	Thick, Uniform	Smooth, Semi-solid	F3 has best Appearance
2	Color	Light green	Green	Light Green	All acceptable

3	Consistency	Semi-liquid	Very thick	Smooth gel	F3 has best consistency
4	Homogenicity	Good	Very good	Best	F3 has best Homogenicity
5	pH	6.2	6.5	6.3	All are Skin Friendly
6	Viscosity (cP)	4200	6800	5500	F3 has Optimum Viscosity
7	Spreadability	Moderate	Poor	Easily Spread	F3 has easy spreadability
8	Washability	Good	Moderate	Good	F3 was easily washable
9	Drug content (%)	91%	95%	98%	F3 has high drug content and more activity
10	Skin irritation	No irritation	Slightly redness	No irritation	F1 and F3 was suitable
11	Stability (Room temp)	Stable	Stable	Stable	All are Stable
12	Phase Separation	Slight	None	none	F2 and F3 has no phase separation

FUTURE SCOPE :

The current study demonstrates a novel method for topical anti-inflammatory use by mixing Shata-Dhauta Ghrita with Moringa oleifera extract in an emulgel system. This innovative composition provides a special fusion of contemporary medicine delivery methods with traditional Ayurvedic principles. To further improve medication penetration, targeted administration, and therapeutic efficacy, future research can investigate the creation of sophisticated carriers such phytosomal systems or nanoemulgels. Furthermore, adding additional synergistic herbal extracts could increase the formulation's overall effectiveness.

To confirm its safety and efficacy in human use, more research incorporating in vivo tests and clinical trials is necessary. The bioactive substances causing the observed activity can be identified and standardized using sophisticated analytical techniques. Sustainable development may also take into account stability improvement through the use of natural preservatives and environmentally friendly packaging. Additionally, this formulation has the potential to be expanded into cosmeceutical applications, such as skin healing and anti-aging products, creating new opportunities for herbal therapies innovation and commercialization.

CONCLUSION

An emulgel combining Shata-Dhauta Ghrita and Moringa oleifera extract for topical application was successfully created and assessed in this study. Good consistency, stability, and compatibility for skin application were demonstrated by the produced formulation's satisfactory physicochemical qualities. An innovative and successful method of anti-inflammatory treatment is provided by combining a classic Ayurvedic basis with a botanical extract. The formulation appears to have promising anti-inflammatory potential, which could be helpful in

the treatment of a number of skin-related disorders, according to the observed results. All things considered, the study is in favor of combining herbal components with contemporary formulation methods to create topical medication delivery systems that are both safe and efficient. With better patient compliance and fewer adverse effects, the emulgel may be a viable substitute for traditional synthetic formulations. To establish its clinical efficacy and investigate its entire therapeutic potential, more research is advised. An emulgel of Shata-Dhauta Ghrita and Moringa oleifera extract with acceptable physicochemical characteristics that may be used topically was effectively created by the study. The mixture showed encouraging anti-inflammatory capabilities, suggesting that it could be used to control skin inflammation. All things considered, it is a novel, safe, and efficient herbal substitute; nonetheless, additional research is needed for clinical confirmation.

RESULT & DISCUSSION

The physicochemical properties of Shata-Dhauta Ghrita and Moringa oleifera extract emulgel were good. It was discovered that the preparation had a uniform distribution of the ingredients since it was smooth, homogenious, and grittiness-free. The formulation pH was within an acceptable range for topical administration, indicating good skin compatibility. Appropriate application ease was demonstrated by the spreadability test, which is crucial for patient compliance. Furthermore, during the research period, the formulation showed good stability with no phase separation or notable appearance changes.

The synergistic impact of Moringa oleifera extract and Shata-Dhauta Ghrita is demonstrated by the reported anti-inflammatory action. The findings imply that the topical distribution of herbal components is successfully improved by the emulgel formulation. All things considered, the results validates this formulation's applicability as a possible herbal substitute for the treatment of inflammatory skin disorders. It advised that more research be done to confirm these findings by clinical and in vivo assessments.

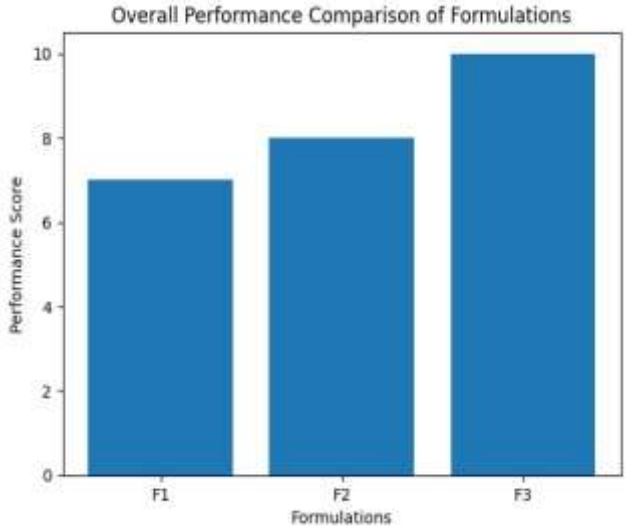


Figure No 10 : Overall Performance Comparison of Formulations

Shata-Dhauta Ghrita and Moringa oleifera extract emulgel demonstrated acceptable physicochemical characteristics, such as spreadability, homogeneity, and consistency. It was discovered that there was no phase separation or noticeable appearance changes in the formulation. Skin compatibility was indicated by the pH being within an appropriate range for

topical use. Additionally, the formulation showed significant anti-inflammatory efficacy, indicating that it might be useful as a topical herbal therapy.

REFERENCES

1. Johnson AW, Snook ME, Wiseman BR: Green leaf chemistry of various turfgrasses: differentiation and resistance to fall armyworm. Crop science 2002; 1-6.
2. Robbins & Cotran: Pathologic Basis of Diseases, 10th Edition, Elsevier.
3. Hurley JV : Acute inflammation. 1972, Edinburgh, London: Churchill Livingstone.
4. Burke, A., Smyth, E., & FitzGerald, G. A. Analgesic antipyretic agents; pharmacotherapy of gout. In L.B. Brunton, J.S. Lazo & K.L. Parker (Ed.) Goodman & Gilman's the pharmacological Basis of Therapeutics (pp. 671-715). New York: McGraw-Hill. 2005.
5. Kumar L., Verma R. In vitro evaluation of topical gel prepared using natural polymerInternational Journal of Drug Delivery, 2010; 2(1): 58–63.
6. Panwar A.S., Upadhyay N., Bairagi M., Gujar S.Emulgel: A reviewAsian Journal of Pharmacy, 2011; 5(2): 72–79.
7. Khullar R., Kumar D., Seth N., Saini S.Formulation and evaluation of mefenamic acid emulgel Saudi Pharmaceutical Journal, 2012; 20(1): 63–67.
8. Singla V. et al. Emulgel: A new platform for topical drug deliveryInt. J. PharmTech Research, 2012; 4(1): 297–310.
9. R.N shah, B.M Methal, A handbook of cosmetics.
10. Kashinath S. Chaturvedi Gorakhnath edited Charak Samhita of Agnivesha. Revised by Charak and Dridhabala, Part II, Chaukhamba Bharati Academy, Varanasi, Reprint. 2009:75-6.
11. Ravindra, R.P. and Muslim, P.K., 2013. Comparison of physical characteristics of vanishing Cream base, cow ghee and shata-dhauta ghrita as per pharmacopoeial standards. International Journal of Pharma and Bio Sciences, 4(4),14-21.
12. Oliveira JTA, Silveira SB, Vasconcelos KM, Cavada BS, Moreira RA(1999) Compositional and nutritional attributes of seeds from themultiple purpose tree Moringa oleifera Lamarck. J Sci Food Agric 79:815-820.
13. Oliver-Bever B. Medicinal Plants in Tropical West Africa. Cambridge University Press, 1986, Cambridge.
14. Maroyi A. The Utilization of Moringa oleifera in Zimbabwe: A Sustainable Livelihood Approach. J Bot Sci. 2007 23:172 – 185.
15. Chu, Y. F., Sun, J., Wu, X. and Liu, R. H. (2002) Antioxidant and antiproliferative activities of common vegetables. J Agric. Food Chem., 50: 6910-6916.
16. Repka, V. and Fischerova, I. (1999) Induction and distribution of amylolytic activity in Cucumis sativus L. in response to virus infection. Acta Virol., 43: 227-235.
17. Harborne, J. B. (1998) Phytochemical Methods- A Guide to Modern Techniques of plant analysis. London: Chapman and Hall.
18. Tiwari, P., Kumar, B., Kaur, M., Kaur, G. and Kaur, H. (2011) Phytochemical screening and Extraction: A Review. Internationale Pharmaceutica Sciencia. 1 (1): 98-106.
19. Akhila A. Essential oil-bearing grasses: the genus Cymbopogon. New York: CRC Press; 2010.
20. Kawther, F. A. 2007. Antimicrobial Activity of Essential Oils of Some Medicinal Plants from Arab Saudi. Saudi Journal of Biological Sciences 14 (1): 53-60.
21. Vikas singla Seema saini baibhav joshi And A.C Rama Emulgel:- New platform for

Topical drug delivery in journal of International Journal of pharma And Bio.

22. Howard CA, Loyd V, Allen JR, Nicholns GP. In: Ansel's Pharmaceutical Dosage Forms and Drug Delivery Systems 8th ed. Lippincott Williams and Wilkins; 2005.
23. 10. Masar BM. Formulation and evaluation of meloxicam as a topical preparation thesis, collage of pharmacy, University of Baghdad; 2004.
24. Raju K, Sneha G, Khatoon R, Ashwini M, Shirisha G, Ajay B, Narendra BR. Formulation and evaluation of ornidazole topical emulgel. World Journal of Pharmacy and Pharmaceutical Sciences. 2019;8(7):1179–1197.
25. Srivastava R, Rai U, Khatoon R. Formulation and evaluation of novel topical gel incorporating moringa and curcumin extracts for skin disorders. Int J Pharm Sci Rev Res. 2024 Jun;84(6):15-19. Doi:10.47583/ijpsrr.2024.v84i06.004.
26. Srilal TL, Hettihewa SK. Development and evaluation of a novel herbal emulgel for potential anti-inflammatory and antioxidant activities in vitro. CINEC Acad J. 2021;5
27. Anfal Alodhaibi et al, 2022;6(4):586–593.https://doi.org/10.24911/IJMDC.51-1635203649.
28. Sonule M, Gunjal SD, Samathoti P, Badmanaban R, Bharath RKC. Development and Evaluation of Emulgel Formulation of Diclofenac Sodium utilizing Lipidium sativum as a Gelling Agent. International Journal of Drug Delivery Technology. 2023;13(4):1321-1327.
29. Devesh Kappor, Ruchi B Vyas, Chaitali Lad. Formulation, Development and Characterization of Emulgel of a NSAID'S. The Pharmaceutical and Chemical Journal, 2014, 1(3): 9-16
30. Khullar R, Saini S, Seth N, Rana AC. Emulgels : A surrogate approach for topically used hydrophobic drugs. Int J Pharm Biol Sci.2011; (3): 117-128.
31. Neha Rana, Piyush Gupta, Vijender Singh, Investigating antiarthritic potential of polyherbal emulgel. Journal of Ayurveda and Integrative Medicine Volume 14, Issue 6, November- December 2023, 100828
32. Mizushima, Y., & Kobayashi M. (1968). Interaction of anti-inflammatory drugs with serum proteins, especially with some biological active proteins. Journal of pharmacy and pharmacology, 20(3), 169-173
33. Kanika Arora and Suman jain, Formulation and evaluation of emulgel containing Shata-Dhauta Ghrita. International Journal of Pharmacy and Pharmaceutical Science Vol. 8, Issue 2, Part A (2026)

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