

DESIGN OF PHYTO-BASED NANOEMULGEL FOR TARGETED ACNE THERAPY

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ABSTRACT

Acne Vulgaris Is A Common Skin Condition That Mainly Affects Teenagers And Young Adults And Is Linked With Inflammation, Bacterial Growth, And Excessive Sebum Production. Although Conventional Treatments Are Effective, They Often Lead To Side Effects Such As Skin Irritation, Dryness, And The Development Of Antibiotic Resistance. The Present Study Focuses On The Formulation And Evaluation Of A Polyherbal Nanogel Containing Natural Ingredients With Anti-Inflammatory, Antimicrobial, And Antioxidant Activities. The Selected Herbal Components Include Turmeric (*Curcuma Longa*), Neem (*Azadirachta Indica*). These Ingredients Were Incorporated Into A Carbapol-Based Nanogel System Using Water As A Solvent, While Triethanol -Amine Was Used To Adjust The Ph. High-Speed Homogenization Was Employed To Achieve Uniform Mixing And Nanoscale Dispersion Of

The Active Compounds. The Prepared Nanogel Was Evaluated For Various Physicochemical Properties Such As Ph, Spreadability, Viscosity, Washability, Consistency, Greasiness, And Appearance. The Formulation Showed A Ph Of 5.7 And Exhibited Good Stability, Smooth Texture, Non-Greasy Nature, And Acceptable User-Friendly Characteristics.

KEYWORDS: Acne Vulgaris, *Azadirachta Indica*, *Curcuma Longa*, Antimicrobial, Anti-Inflammatory, Antioxidant, Anti-Acne Gel, Herbal Formulation.

1. INTRODUCTION

Herbal Cosmetics Are Formulated Using Bioactive Compounds Obtained From Various Plant Sources, Which Help In Enhancing Skin Function And Providing Essential Nourishment.^[1] Due To The Common Belief That Synthetic Chemical-Based Cosmetics May Damage The Skin, Along With The Increasing Preference For Natural Remedies, The Use Of Plant-Based Ingredients And Extracts In Cosmetic Formulations Has Gained Significant Popularity.^[2] Additionally, Herbal Medicines Are Generally Associated With Fewer Side Effects Compared To Conventional Drugs, Making Them A Safer And Healthier Option For Users.^[3] Acne Vulgaris Is A Widespread Dermatological Condition Involving Inflammation Of The Pilosebaceous Units.^[4] The Bacterium *Propionibacterium Acnes* Significantly Contributes To The Development Of Acne By Intensifying Inflammatory Responses Within Hair Follicles. Conventional Therapies Typically Include Topical Agents Such As Benzoyl Peroxide, Retinoids, And Antibiotics. While Effective, These Treatments Are Often Associated With Unwanted Side Effects Like Redness, Peeling, Dryness, And A Burning Sensation.^[5] As A Result, Attention Has Increasingly Shifted Toward Alternative Treatments Based On Natural Ingredients. Such Remedies Are Considered More Suitable For Long-Term Use, As They Tend To Produce Fewer Side Effects And Are Generally Better Tolerated.^[6]

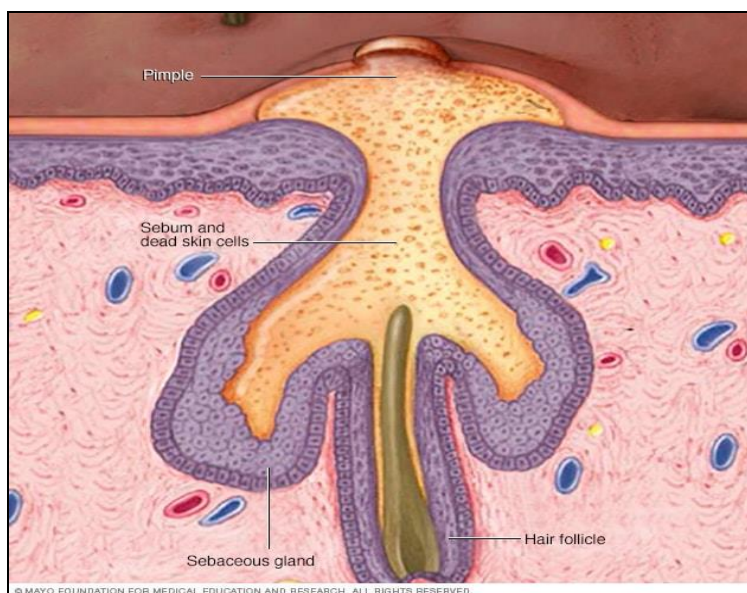


Fig. No. 01: Acne Causing to Skin.^[7]

Nanogels Are An Advanced Form Of Controlled Drug Delivery System, Consisting Of Nanoparticles With Hydrogel Networks Formed Through Physical Or Chemical Cross-Linking. They Function As Efficient And Biodegradable Carriers For Drug Delivery.^[8] These

Systems Can Be Categorized Based On Their Responsiveness To External Stimuli And The Nature Of Their Cross-Linking. Nanogels Offer Several Advantages, Such As Enhanced Drug Penetration Across Biological Membranes And Sustained Release Of Active Ingredients, Making Them Especially Useful For Topical Applications. Compared To Conventional Transdermal Formulations Like Creams, Oils, And Lotions, Nanogels Provide Improved Stability And Controlled Drug Release.^[9]

Oil-Free Gel Formulations Are Generally Preferred For Skin Treatments; However, Many Commercially Available Anti-Acne Products Contain Synthetic Chemicals That May Lead To Adverse Effects. Therefore, This Study Focuses On The Formulation And Evaluation Of A Polyherbal Anti-Acne Nanogel. Natural Ingredients Such As Neem (*Azadirachta Indica*), Turmeric (*Curcuma Longa*) Are Known For Their Antimicrobial, Anti-Inflammatory, And Antioxidant Properties, Which Make Them Effective In Managing Acne.^[10,11]

Topical Formulations Are Commonly Applied In Cosmetic And Dermatological Care For Managing Both Normal And Affected Skin Conditions.^[12] These Preparations Are Available In Various Forms, Including Solid, Semisolid, And Liquid Dosage Forms. Nanoemulgel Is A Modern Topical Delivery System That Combines The Characteristics Of Emulsions And Gels Into A Single Formulation.^[13] It May Consist Of Either Oil-In-Water Or Water-In-Oil Emulsions Incorporated Within A Gel Base, Offering Improved Stability And Patient Convenience. Advanced Polymers Are Often Used As Gelling And Emulsifying Agents Because They Help Lower Surface Tension And Increase The Viscosity Of The Aqueous Phase, Thereby Supporting The Formation Of Stable Emulsions. Such Systems Facilitate Effective Drug Delivery Through The Skin.^[14]

1.1 Types Of Acne^[15,16]

- **Blackheads:** The Dirt Inhibits Them From Growing. It Appears Black And Develops On The Skin's Surface. Blackheads Are Black In Color, Not Because Of The Dirt. The Protein Known As Keratin Is Often Oxidized By Air.
- **Whiteheads:** These Are Kinds Of Minor Pimples That Lie Under The Skin's Surface.
- **Nodules:** Nodules Are Large, Painful, Solid Pimples That Are Easily Visible On The Skin's Surface But Are Located Deep Within The Skin.
- **Papules:** These Are Noticeable, Tiny, Delicate Pink Pimples That Appear On The Skin's Surface.

- **Pustules:** Pustules Are Skin Lesions That Appear On The Skin's Surface. They Are Red At Their Bottom And Consist Of Pus On Top.
- **Cysts:** Cysts Are Very Painful And Visible On The Skin.

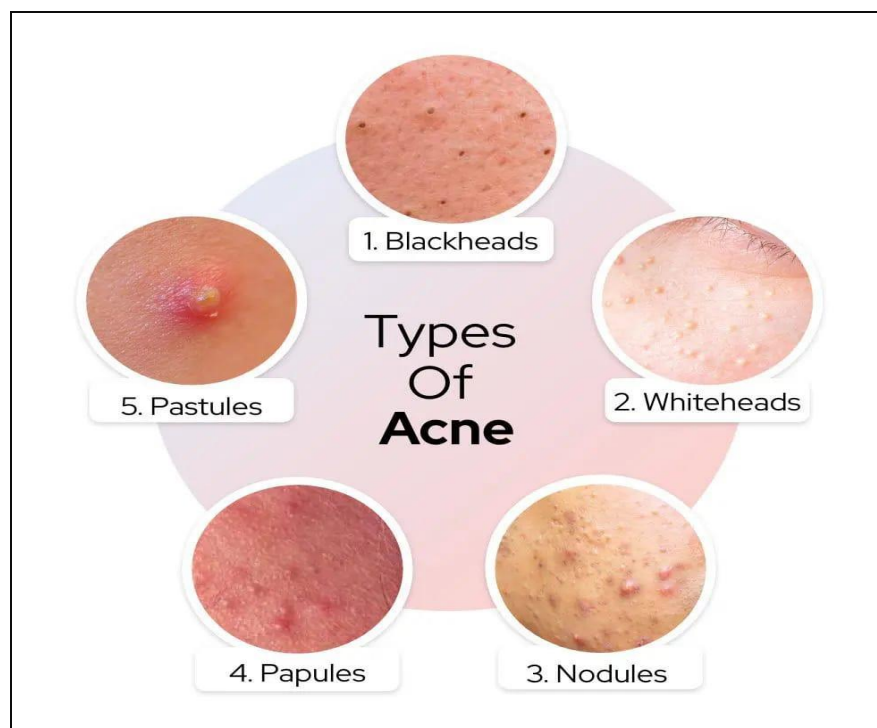


Fig. No. 02: Types Of Acne.^[17]

1.2 ADVANTAGES

- ❖ Better Drug Penetration.
- ❖ Less Side Effect.
- ❖ Improved Stability.
- ❖ Multi-Functional Activity.

1.3 DISADVANTAGES

- ❖ **Complex Formulation:-** Complex Formulation: Preparation Of Nanogels Requires Specialized Techniques And Equipment.
- ❖ **Stability Issues:-** Herbal Components May Degrade Over Time If Not Properly Formulated.
- ❖ **Batch Variation:-** Natural Ingredients May Show Variation In Activity Due To Source Differences.

2. DRUG AND EXCIPIENTS PROFILE

API (Drug

❖ Neem Oil

Table 1: Pharmacognostic And Therapeutic Profile Of Neem (Azadirachta Indica) Extract Used In Polyherbal Anti-Acne Nanogel Formulation.^[18,19]

Parameter	Details
Name Of Extract	Neem Extract
Botanical Name	Azadirachta Indica
Family	Meliaceae
Biological Source	Leaves, Bark, Seeds, And Oil Derived From The Neem Tree
Active Constituents	Nimbin, Nimbidin, Azadirachtin, Quercetin, And Flavonoids
Therapeutic Uses	Antibacterial, Antifungal, Anti-Inflammatory, Antioxidant
Mechanism Of Action	Inhibits Bacterial Growth, Reduces Sebum Production, Suppresses Inflammation
Role In Nanogel	Reduces Acne-Causing Bacteria, Soothes Inflammation, Prevents Secondary Infections



Fig. No. 03: Neem (Azadirachta Indica).

❖ Turmeric Oil

Table 2:- Pharmacognostic And Therapeutic Profile Of Turmeric (Curcuma Longa) Extract Used In Polyherbal Anti-Acne Nanogel Formulation.^[20,21]

Parameter Details	Details
Name Of Extract	Turmeric Extract
Botanical Name	Curcuma Longa
Family	Zingiberaceae
Biological Source	Dried Rhizome (Underground Stem) Of Curcuma Longa
Active Constituents	Curcuminoids(Primarily Curcumin)
Therapeutic Uses	Anti-Inflammatory, Antibacterial, Antioxidant
Mechanism Of Action	Inhibits Inflammatory Pathways, Scavenges Free Radicals, Suppresses Microbial Growth
Role In Nanogel	Helps Reduce Acne Inflammation, Prevents Bacterial Growth, Enhances Skin Healing



Fig. No. 04:- Turmeric (*Curcuma Longa*).

Excipient

❖ Tween 80

Table 3: Following Surfactant Is Used In Polyherbal Anti-Acne Nanogel Formulation.^[22,23]

Chemical Name	Polyoxyethylene (20) Sorbitan Monooleate
Common Name	Tween 80
Category	Non-Ionic Surfactant
Chemical Formula	$C_{64}H_{124}O_{26}$
Appearance	Yellowish Viscous Liquid
Odour	Mild, Characteristic
Functions In Formulation	Used As An Emulsifier → Helps Mix Oil And Water



Fig. No. 05: Tween 80.

❖ Polyethylene Glycol

Table 4: Following Co-Surfactant Used In Polyherbal Anti-Acne Nanogel Formulation.^[24]

Chemical Name	Polyethylene Glycol
Common Name	PEG
General Formula	$H-(O-CH_2-CH_2)_n-OH$
Category	Polymer, Solvent, Excipient
Appearance	Low MW (PEG 200–400): Clear Liquid High MW (PEG 1000+): Waxy Solid
Functions In Formulation	Used As A Co-Surfactant To Improve Solubility



Fig. No. 06: Polyethylene Glycol.

❖ **Carbopol**

Table 5: Following Gelling Agent Is Used In Polyherbal Anti-Acne Nanogel Formulation.

Chemical Name	Carbomer
Common Name	Carbopol
Category	Gelling Agent / Thickening Agent
Appearance	White Fluffy Powder
Nature	Synthetic High Molecular Weight Polymer Of Acrylic Acid
Functions In Formulation	Used As Gelling Agent To Increase Thickness



Fig. No. 07: Carbopol.

❖ **Triethanolamine**

Table 6: Following pH Adjuster Is Used In Polyherbal Anti-Acne Nanogel Formulation.^[26]

Chemical Name	Triethanolamine
Short Name	TEA
Chemical Formula	$C_6H_{15}NO_3$
Category	pH Adjuster / Neutralizing Agent / Emulsifying Agent
Appearance	Clear, Colorless To Pale Yellow Viscous Liquid
Odour	Mild Ammonia-Like Odour



Fig. No. 08:-Triethanolamine.

❖ Methyl Paraben

Table 7: Following Preservative Is Used In Polyherbal Anti-Acne Nanogel Formulation.^[27]

Chemical Name	Methyl Parahydroxybenzoate
Common Name	Methyl Paraben
Chemical Formula	$C_8H_8O_3$
Category	Preservative
Appearance	White Crystalline Powder
Odour	Odourless Or Faint Characteristic Odour



Fig. No. 09: Methyl Paraben.

3. METHODOLOGY

❖ Formulation Of Herbal Nanoemulgel^[28,29,30]

Various Formulation Batches Were Prepared According To The Table.

I. Preparation Of Carbopol Gel (Aqueous Phase)

Dissolve Carbopol In Water In Beaker With Stirring Until A Gel Forms (Aqueous Phase). Allow It To Swell For 20-30 Min And Stir Gently To Remove Lumps And Form Uniform Dispersion.

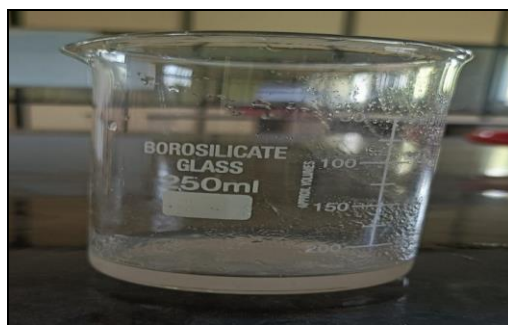


Fig. No. 10:- Aqueous Phase.

II. Preparation of Oil Phase

The Drug Is Dissolved In Another Beaker With Stirring (Organic Phase). Add Tween 80 To Oil Phase Then Add Polyethylene Glycol And Mix It And Add Small Amount Of Water Droplet With Continuous Stirring.

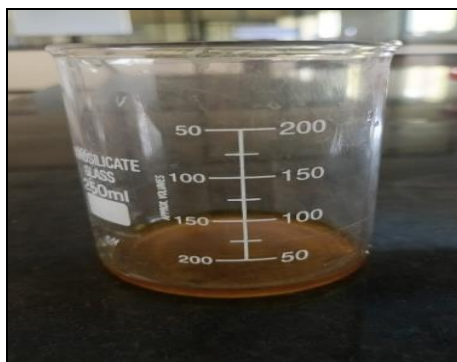


Fig. No. 11: Oil Phase.

III. Preparation of Nanoemulgel

Add The Drug Phase Is Added Dropwise Into The Aqueous Phase During High-Speed Homogenization To Form Nanodroplets. Triethanolamine Is Added With Continuous Stirring To Form Nanoemulgel, Then Add Preservative After Filled In A Suitable Container, And Labelled Accordingly.^[31]

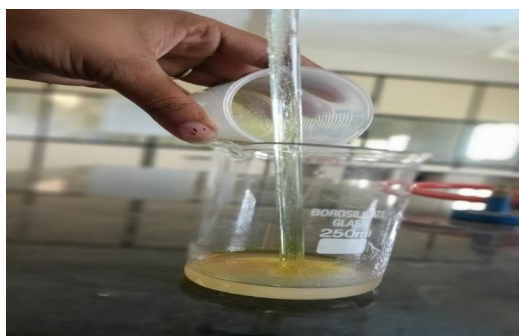


Fig. No. 12: Oil Phase Into Aqueous Phase.

❖ Formula of Nanoemulgel

Ingredients	Category	F1	F2	F3	F4	F5
Neem Oil	Anti-Bacterial	2 ml	2 ml	2 ml	2 ml	2 ml
Turmeric Oil	Anti-Oxidant	2 ml	2 ml	2 ml	2 ml	2 ml
Tween 80	Surfactant	3.3 ml	3.3 ml	3.3 ml	3.3 ml	3.3 ml
PEG	Co-Surfactant	3.3 ml	3.3 ml	3.3 ml	3.3 ml	3.3 ml
Carbopol	Gelling Agent	0.7gm	0.12 gm	0.10 gm	0.15 gm	0.2 gm
Triethanolamine	Ph- Adjuster	Q. S	Q. S	Q. S	Q. S	Q. S
Methyl Paraben	Preservative	0.02 gm	0.02 gm	0.02 gm	0.02 gm	0.02 gm
Distilled Water	Vehicle	Q.S Upto 15 ml	Q.S Upto 15 ml	Q.S Upto 15 ml	Q.S Upto 15 ml	Q.S Upto 15 ml



Fig. No. 13:- Formulation of Nanoemulgel [F1 To F5 Batch].

4. RESULT

❖ Table 8: Physical Evaluation.

Sr. No	Formulations	Colour	Odour	Homogeneity	Grittiness
1.	F1	Pale Yellow	Charateristics	Good	No Grittiness
2.	F2	Pale Yellow	Charateristics	Good	No Grittiness
3.	F3	Pale Yellow	Charateristics	Excellent	No Grittiness
4.	F4	Pale Yellow	Charateristics	Good	No Grittiness
5.	F5	Pale Yellow	Charateristics	Satisfactory	No Grittiness

❖ Table 9:- pH Examination.

The Ideal pH Examination Value For Topical Nanoemulgels Is Generally In The Range Of: 6– 7 pH.

Sr. No	Formulations	pH	Observation
1.	F1	5.2	Fail
2.	F2	5.5	Fail
3.	F3	6.5	Pass
4.	F4	7.2	Fail
5.	F5	7.5	Fail

❖ **Table 10:- Spreadability Test**

The Ideal Spreadability Value For Topical Nanoemulgel Is Generally In The Range Of: 13 – 17 G.Cm/Sec.

Sr. No	Formulations	Spreadability	Observation
1.	F1	10.2	Fail
2.	F2	12.1	Fail
3.	F3	14.8	Pass
4.	F4	11.6	Fail
5.	F5	10.9	Fail

❖ **Table No. 11:- Extrudability Test.**

Sr. No	Formulations	Extrudability	Observation
1.	F1	Poor	Fail
2.	F2	Fair	Fail
3.	F3	Excellent	Pass
4.	F4	Fair	Fail
5.	F5	Poor	Fail

❖ **Table No 12:- Stability Test.**

The Samples Are Observed For A Specific Period (1 To 30 Days).

Sr. No	Formulations	4°c [Refrigerator]	25°c [Room Temperature]	Observation
1.	F1	Stable	Slight Viscosity Change	Fail
2.	F2	Stable	Slight Viscosity Change	Fail
3.	F3	Stable	Stable	Pass
4.	F4	Stable	Minor Viscosity Change	Fail
5.	F5	Stable	Viscosity Reduction, Colour Change	Fail

❖ **Table No 13:- Viscosity Test.**

The Ideal Viscosity Value For Topical Nanoemulgels Is Generally In The Range Of: 6000 – 7000 Cp (Centipoise)

Sr. No	Formulations	Viscosity (Cp)	Observation
1.	F1	4200 Cp	Fail
2.	F2	5100 Cp	Fail
3.	F3	6800 Cp	Pass
4.	F4	5600 Cp	Fail
5.	F5	4300 Cp	Fail

❖ **Table No. 14: Skin Irritation Test.**

Sr. No	Formulation	Irritancy
1.	F1	No Irritation
2.	F2	No Irritation
3.	F3	No Irritation
4.	F4	No Irritation
5.	F5	No Irritation

❖ **Table No. 15: Washability Test.**

Sr. No	Formulation	Washability	Observation
1.	F1	Taken Few Sec.	Fail
2.	F2	Moderate Washable	Fail
3.	F3	Easily Washable	Pass
4.	F4	Taken Few Sec.	Fail
5.	F5	Difficult To Wash	Fail

5. CONCLUSION

This Study Successfully Formulated A Herbal Emulgel Containing Neem Oil, Turmeric Oil With Notable Antibacterial Properties. Five Different Formulations (F1–F5) Were Prepared And Evaluated For Various Parameters Including Ph, Physical Appearance, Stability, Spreadability, Extrudability, And Antibacterial Activity. Among All Formulations, F3 Exhibited The Most Effective And Satisfactory Performance, Showing Enhanced Antibacterial Action Along With Desirable Physicochemical Characteristics. The Antibacterial Potential Of The Emulgel May Be Attributed To The Bioactive Phytoconstituents Naturally Present In Neem And Turmeric Oil. Therefore, The Developed Herbal Emulgel Can Be Considered A Promising Topical Drug Delivery System And May Serve As An Effective Alternative Treatment Option For Acne Management.

6. REFERENCE

1. Larson, S.C Bergkvist, L. Naslund, I. Rutegard, J Wolk, A. Vitamin A, Retinol And Carotenoids And The Risk Of Gastric Cancer: A Prospective Cohort Study *Am. J. Clin. Nutr.*, 2007; 85(2): 497- 503.
2. Kumar Sumit, Swarnakarvivek, Sharma Sujata, Baldiashish, *Herbal Cosmetics : Used For Skin And Hair*, December, 2012; 1.
3. Gaikward A K, *Transdermal Drug Delivery System: Formulation Aspects And Evaluation*, 2013; 1: 1-10.
4. Vasam M, Korutla S, Bohara RA. *Acne Vulgaris: A Review of The Pathophysiology, Treatment, And Recent Nanotechnology Based Advances. Biochem Biophys Rep.*, 2023;

- 36: 101578. DOI: 10.1016/J.Bbrep.2023.101578; PMCID: PMC10709101; PMID: 38076662
5. Ahmad J, Gautam A, Komath S, Bano M, Garg A, Jain K. Topical Nano-Emulgel For Skin Disorders: Formulation Approach And Characterization. *Recent Pat Antiinfect Drug Discov*, 2018; 14(1): 36–48. DOI: 10.2174/1574891x14666181129115213; PMID: 30488798.
 6. Mukherjee PK. *Quality Control Of Herbal Drugs: An Approach To Evaluation Of Botanicals*. New Delhi: Business Horizons, 2002.
 7. <https://doi.org/10.5281/zenodo.17615778>
 8. Sultana F, Manirujjaman M, Imran-Ul-Haque M, Arafat M, Sharmin S. An Overview Of Nanogel Drug Delivery System. *Journal Of Applied Pharmaceutical Science*, 2013; 3(8): 95–105.
 9. Ferreira S A, Vulcanova M. Polymeric Nanogel As Vaccine Delivery System. *Nanomed, Nanotechnology Bio. Med.*, 2013; 9: 159-173. Doi: 10.1016/ J Nano.2012.06.001
 10. Biswas K, Chattopadhyay I, Banerjee RK, Bandyopadhyay U. Biological Activities And Medicinal Properties Of Neem (*Azadirachta Indica*). *Current Science*, 2002; 82(11): 1336–1345.
 11. Aggarwal BB, Harikumar KB. Potential Therapeutic Effects Of Curcumin, The Anti-Inflammatory Agent, Against Various Diseases. *International Journal Of Biochemistry & Cell Biology*, 2009; 41(1): 40–59.
 12. Mohamed MI. Topical Emulsion- Gel Composition Comprising Diclofenac Sodium. *AAPS Journal*, 2004; 6(3).
 13. Mohamed MI. Optimization Of Chlorphenesin Emulgel Formulation. *AAPS Journal*, 2004; 6(26).
 14. Rieger MM, Lachman L, Lieberman HA. Editors. *The Theory And The Practice Of Industrial Pharmacy*. Philadelphia, 1986; 3.
 15. Shashank Gupta, Varsha Kumari, Kamal Ahamad. *World Journal Of Pharmaceutical Research*, 2025; 14(22): 955–969.
 16. Pineapple Fruit Extract (*Ananas Comosus L. Merr*) As An Antioxidant And Anti-Acne Agent Made With The Nano-Emulsion Gel Delivery System — Lutfi Chabib Et Al. *Pharmacy Education*, 2023.
 17. American Academy Of Dermatology Association □ “Types Of Acne.” Accessed May 10, 2026.
 18. Jabeen B, Mirani ZA, Muneeb A, Nirkiwale A, Farooqui WA, Aslam K, Ahmed MA,

- Vohra F. Comparison Of Chlorhexidine Gluconate, Sodium Hypochlorite, Neem Extract, And Microwave Radiation For Disinfection Of Type IV Dental Stone. *European Journal Of Dentistry*, May 2025; 19(02): 346-53.
19. Ali J, Hussain A, Abbas J. In Vitro Control Of Post-Harvest Fruits Rot Pathogenic Fungi Using *Azadirachta Indica* (Neem) Seeds And Leaves Extracts. *Bulletin Of Biological And Allied Sciences Research*, May 5, 2025; 2025(1): 102.
20. Singh RK, Nallaswamy D, Rajeshkumar S, Varghese SS. Green Synthesis Of Silver Nanoparticles Using Neem And Turmeric Extract And Its Antimicrobial Activity Of Plant Mediated Silver Nanoparticles. *Journal Of Oral Biology And Craniofacial Research*, Mar. 1, 2025; 15(2): 395-401.
21. Thanawala S, Shah R, Alluri KV, Bhupathiraju K, Prasad N, Agarwal Y. Efficacy And Safety Of A Novel Low-Dose Water-Dispersible Turmeric Extract In The Management Of Knee Osteoarthritis: A Randomized, Double-Blind, Placebo-Controlled Clinical Trial. *Journal Of Pain Research*, Dec. 31, 2025; 411-27.
22. Rowe RC, Sheskey PJ, Quinn ME. *Handbook Of Pharmaceutical Excipients*. 6th Ed. London: Pharmaceutical Press, 2009.
23. Aulton ME, Taylor KMG. *Aulton's Pharmaceutics: The Design And Manufacture Of Medicines*. 4th Ed. Churchill Livingstone Elsevier, 2013.
24. Rowe RC, Sheskey PJ, Cook WG, Fenton ME. *Handbook Of Pharmaceutical Excipients*. 7th Ed. London: Pharmaceutical Press And American Pharmacists Association, 2012.
25. Tripathi KD. *Essentials Of Medical Pharmacology*. 8th Ed. New Delhi: Jaypee Brothers Medical Publishers, 2019.
26. Allen LV, Popovich NG, Ansel HC. *Ansel's Pharmaceutical Dosage Forms And Drug Delivery Systems*. 9th Ed. Philadelphia: Lippincott Williams & Wilkins, 2011.
27. Sweetman SC (Ed.). *Martindale: The Complete Drug Reference*. 36th Ed. London: Pharmaceutical Press, 2009.
28. Muniraj S N, Yogananda R, Nagaraja T S, Bharathi D R, Preparation And Characterization Of Nanogel Drug Delivery System Containing Clotrimazole An Anti-Fungal Drug ISSN NO: 2231-6876, 2020; 1014, 1015.
29. Inamdaryashashri, Ranebhushan, Jain Ashish, Preparation And Evaluation Of Betasterolnanogel: A Carrier Design For Targeted Drug Delivery System *Asian Journal Of Pharmaceutical Research And Development*., 2018; 6(3): 82.
30. Swati Talele, Preetamnikam, Brajaghosh, Chaitalideore, Ashwinijaybhav, Anil Jadhav,

- A Research Article On Nanogel As Topical Promising Drug Delivery For Diclofenac Sodium, 2017; 51: 581.
31. Sahoo S, Panda PK, Rana AC. Formulation And Evaluation Of Topical Gel Drug Delivery System: A Review. *International Journal Of Pharmaceutical Sciences Review And Research*, 2010; 4(3): 33–38.
 32. Sultana SS, Swapna G, Lakshmi GS, Swathi S, Jyothi GN, Devi AS. Formulation And Evaluation Of Herbal Emulgel Of Lantana Camara Leaves Extract For Wound Healing Activity In Diabetic Rats. *Indo American Journal Of Pharmaceutical Research*, 2016; 6(8): 6404-17.
 33. Soni N, Dhiman RC. Larvicidal And Antibacterial Activity Of Aqueous Leaf Extract Of Peepal (*Ficus Religiosa*) Synthesized Nanoparticles. *Parasite Epidemiology And Control*, 2020; 1, 11: E00166.
 34. Thomas AB, Dapkekar M, Nagore D, Doke R, Bankar N, Surve N. Herbal Emulgel Containing *Azadirachta Indica* (Neem) And *Nigella Sativa L.*(Black Cumin) Oils In Wound Management: Preclinical Investigations. *Ancient Science Of Life*, 2024; 1, 38(3&4): 141-9.
 35. Bhavyashree T, Chandur VK, Shabaraya AR. Formulation And Evaluation Of Gel Containing Extract Of *Camellia Sinensis* For Treatment Of Periodontitis. *World Journal Of Pharmaceutical Sciences*, 2021; 9(5): 79-84.
 36. Singla V, Saini S, Rana A C, “Development And Evaluation Of Topical Emulgel Of Lornoxicam Using Different Polymer Bases.” *IPS*, 2012; 2(3): 2231-5896.
 37. Thomas AB, Dapkekar M, Nagore D, Doke R, Bankar N, Surve N. Herbal Emulgel Containing *Azadirachta Indica* (Neem) And *Nigella Sativa L.*(Black Cumin) Oils In Wound Management: Preclinical Investigations. *Ancient Science Of Life*, 2024; 1, 38(3&4): 141-9.
 38. Jain Ashish, Preparation And Evaluation Of Betasterolnanogel: A Carrier Design For Targeted Drug Delivery System *Asian Journal Of Pharmaceutical Research And Development.*, 2018; 6(3): 82.
 39. OECD. OECD Guideline For The Testing Of Chemicals No. 404: Acute Dermal Irritation/Corrosion. Paris: Organisation For Economic Co-Operation And Development, 2015.
 40. Muniraj S N, Yogananda R, Nagaraja T S, Bharathi D R, Preparation And Characterization Of Nanogel Drug Delivery System Containing Clotrimazole An Anti-Fungal Drug ISSN NO: 2231-6876, 2020; 1014, 1015.