INTERNATIONAL JOURNAL OF
Clinical and Pharmaceutical Innovations
An International Peer Reviewed Open Access Journal

Research Article

ISSN (Online): 3142-8665
CODEN (USA): IJCPSM

2026, Volume 1, Issue 5, Page No: 284-292.

DEVELOPMENT OF A NATURAL TOOTH GEL: A STUDY ON NEEM AND GINGER BASED FORMULATION

Yashashwini G.[1]*, Niveditha H. A.[1], P. M. Yashaswini[1], Kaveri[2]

[1]*Department of Pharmaceutics, Akshaya Institute of Pharmacy, Tumakuru.
[1]Associate Professor, Department of Pharmaceutics, Shridevi Institute of Pharmaceutical sciences, Tumakuru.
[2]Department of Pharmaceutics, Akshaya Institute of Pharmacy, Tumakuru.

Article Info: **Received:** 02 July 2026, **Revised:** 23 July 2026, **Accepted:** 13 August 2026

***Corresponding Author: Yashashwini G.**

Department of Pharmaceutics, Akshaya Institute of Pharmacy, Tumakuru.

DOI: https://doi.org/10.5281/zenodo.21945557

Citation:
Yashashwini G.*, Niveditha H. A.[1], P. M. Yashaswini[1], Kaveri[2]. (2026). Development Of A Natural Tooth Gel: A Study On Neem And Ginger Based Formulation. International Journal of Clinical and Pharmaceutical Innovations, 1(5), 284-292.

ABSTRACT
The goal of the study was to create and assess Tooth gel with Neem and Ginger as the main ingredient to treat dental caries. It is chosen for the treatment of dental caries because of its broad range of antibacterial activity against several dental caries pathogens. The creation the assessment of a tooth gel for the treatment of dental conditions is the primary goal of this project. Globally, dental disease is a serious health issue. Neem and Ginger is used as a medicinal agent, Carbopol 940/Tragacanth used as a gelling agent, Sodium benzoate is used as a preservative, glycerine is used as a humectant, Sorbitol is used as a sweetener, Peppermint oil is used as a Flavouring agent give, after flavouring agent, Triethanolamine as a P^H adjuster and the necessary amount of distilled water is used as a vehicle. The gel's phytochemical screening was performed. The gel's appearance and viscosity were assessed, and the findings were excellent. The prepared Natural tooth gel was evaluated for various properties such, as PH spreadability, homogeneity, odour, appearance. The Carbopol based formulation (F1) exhibited superior clarity, smoothness, spreadability, and stability compared to the based formulation(F2). Both formulations maintained P^H within the acceptable oral range (6.5-7.0). The results indicate that the optimized Carbopol gel (F1) provides better physical properties Hence, the developed herbal tooth gel represents a safe, effective, and friendly alternative for maintaining oral hygiene and preventing dental infections.

KEYSWORDS: Neem, Ginger, Tragacanth gum, Tooth gel, Anti-microbial.

INTRODUCTION

Around the world, dental disease is regarded as a serious health issue. Long care is frequently necessary for dental diseases, which can be either acute or chronic. A high enough meditation concentration at the site of action without any negative side effects is necessary for the effective use of antibacterial medicines to treat a variety of dental issues.

Dental products come in three different forms: paste, gel, and powder. In order to maintain oral hygiene and clean and polish teeth, dental products are often applied with a toothbrush. A Light abrasive, detergent, flavouring ingredient, fluoride, and binder are usually included. Other typical Deodorants, humectants, desensitizers, and a number of drugs to stop plaque, dental cavities, and numerous other gum conditions like halitosis are among the constituents.[1]

A dysbiosis in the oral microbiome causes dental caries, a microbial illness. Ecological stressors, like frequent sugar consumption and/or decreased salivary flow, might cause the biofilm to experience prolonged low P^H and alter the ratios of the typical resident species. Consequently, this increases the incidence of dental caries by leading to the selection of species with an acid-producing/acid-tolerating phenotype. The equilibrium between demineralization, which is brought on by biofilm dysbiosis, and remineralization, which is reliant on calcium, phosphate, and fluoride, determines how dental caries lesions advance to cavitation. Dental caries is still a serious public health issue that affects individuals of all ages and is still one of the most prevalent unmet medical requirements of economically disadvantaged groups, even though its prevalence has significantly decreased in many parts of the world. Furthermore, many population groups are at higher risk due to the disease's unequal distribution. Current methods for managing dental cavities include for instance, encouraging a balanced diet that includes frequent dental cleaning with fluoride-containing toothpaste and little exposure to fermentable carbs and sugars. But even Caries lesions can still appear even with consistent fluoride administration.

Therefore, in order to target people who are at risk, measures to prevent demineralization and/or promote remineralization of caries lesions must be improved and promoted in addition to strategies to minimize sugar consumption.[2]

Naturally occurring on teeth, plaque contributes to the host's defences mechanisms by preventing external (and frequently harmful) microbes from colonizing the enamel. Plaque is an illustration of a biofilm that demonstrates how the characteristics of bacteria linked to a surface within a biofilm can change significantly from those of the same cells growing in liquid broth. The most disease-prone surfaces are those that are shielded and stagnant, where plaque is most prevalent. Bacteria constantly and dynamically attach themselves to the tooth surface, grow, separate, and then reconnect. Nonetheless, a number of unique mechanisms are discernible: Salivary proteins, glycoproteins, and a few bacterial compounds are absorbed and create a conditioning film (the acquired pellicle) on the tooth surface.[3]

Streptococcus mutans is a significant endocarditis agent in addition to dental caries and associated pyogenic dental infections. Interest in understanding the microorganism's susceptibility to antimicrobial treatments has increased due to its involvement in both oral and non-oral disorders. However, the antibiotics should only be used in medications because they are not suitable for regular usage as antiplaque agents. Chlorhexidine is one of the broad-spectrum antimicrobials that works against both Gram-positive and Gram-negative bacteria from among all the antibacterial agents. The standard international concentration for plaque management in dentistry is now 0.2% chlorhexidine. However, it has been shown to have a number of negative side effects, including altered taste, supragingival calculus formation, and discoloration of teeth, restorative material, and the dorsum of the tongue. It has been demonstrated that a variety of phytochemicals or extracts from medicinal plants prevent dental biofilms from forming by decreasing microbial pathogens adherence to the tooth surface, which is a key step in the development and progression of dental decay.[4] Natural products are currently being used more often in both urban and rural regions to prevent and treat oral diseases. Aloe Barbadensis Miller, also referred to as aloe vera, is one of the many plants with therapeutic potential that has been utilised as a Phyto therapeutic agent due to its antibacterial, anti-inflammatory, antioxidant, and restorative quantities.[5]

Properties of Neem

Antimicrobial activity

A. Indica exhibits strong antibacterial action against several infections that impact human health. Neem has been extensively studied for its dental applications and antibacterial qualities.[6] Neem extract produces the maximum zone of inhibition on Streptococcus mutans at 50% concentration.

Anti-diabetic activity

The Neem phytochemical Nimbidin (200 mg/kg) considerably delayed the rise in blood glucose following oral glucose delivery. Neem has been shown to have antihyperglycemic properties. The usage of neem significantly reduced blood glucose levels.[7]

Anti-oxidant activity

The antioxidant activity of Azadirachta indica leaf and bark extracts has been investigated, and the findings of the study unequivocally showed that all of the examined leaf and bark extracts/fractions of neem cultivated in the foothills possess noteworthy antioxidant qualities.

Effect of neem and its constituents on apoptosis

According to a study, leaf extract increased the expression of Bim, caspase-8, and caspase-3 the buccal pouch while decreasing that of Bcl-2, suggesting that it has apoptosis-inducing properties in the target organ. Neem primary ingredients and isolated compounds exhibit a variety of actions on several targets and contribute to the activation of apoptotic cell death in cancer.[8]

Effect of neem anti inflammatory

Phytochemical study reveals anti-inflammatory properties in neem, including triterpenes, flavonoids, tannins, saponins, nimbidin, sodium nimbidate, gallic acid, catechin, and polysaccharides. The negative effects of contemporary nonsteroidal anti-inflammatory medicines (NSAIDs) have led to a growing demand for herbal alternatives.[9]

Neuroprotective activity
The neem significantly reduces the enhanced effect of oxidative and nitrosative stress, inflammatory mediators, and Bax and (inducible Nitric Oxide Synthase) iNOS mRNA expression in animal models.[10]

Anti-caries activity
It has been discovered that neem extract is particularly effective against the organisms that cause dental cavities, having the power to both stop their growth and reverse early caries. Azadirachta indica is a natural product, it should be given the appropriate weight age in order to be marketed for the benefit of humanity. Its components can be very helpful in preventing and reversing dental cavities.[11] In addition to its benefits on reversing incipient carious lesions, Azadirachta indica mouthwash was observed to have an impact on the salivary levels of Lactobacilli and Streptococcus mutans. Neem mouthwash, either with or without alcohol, and chlorhexidine both inhibited Streptococcus mutans, whereas chlorhexidine by itself prevented lactobacillus growth. Therefore, the finding seems to support its potential to reverse an early carious lesion, while longer term clinical.[12]

Properties of ginger
Skin conditions: Addresses psoriasis, eczema, and acne. Used to lessen scarring and promote wound healing.
Digestive disorders: Treats irritable bowel syndrome (IBS), bloating, and indigestion. Prevents ulcers and safeguards the stomach lining.
Respiratory health: Aids in the treatment of colds, bronchitis, and asthma. Has antiallergic and expectorants properties.
Arthritis and joint pain: Lessens osteoarthritis and rheumatoid arthritis pain and inflammation.
Cancer prevention: Prevents and inhibits the development of several types of cancer.
Cardiovascular health: Prevents plaque development, enhances blood flow, and lowers cholesterol.
Controlling diabetes: Lowers blood sugar and guards against consequences like diabetic nephropathy.

Liver protection: Prevents liver damage and detoxifies the liver.[13] For centuries, it has been a key component of Chinese, Ayurvedic, and Tibbe-Unani herbal remedies used to treat conditions like diabetes, constipation, asthma, stroke, gingivitis, toothache, rheumatism, catarrh, and neurological disorders. Numerous evaluations of this plant have been published in the literature, which may be a reflection of its widespread use as a spice and medicinal herb.[14] The food, chemical, and pharmaceutical industries are becoming more interested in ginger as a spice and medicinal plant. Over the past ten years, there has been a noticeable rise in the use of goods made from medicinal plants. Over the 80% of the world's population uses medicinal plants as their main source of healthcare due to their properties, either in the form of plant extracts or their active ingredients.[15]

Tooth gel
Tooth gel is an oral care product. It is a gel-like material that is applied to the teeth and gums for a number of reasons, including cleaning, breath freshening, plaque reduction, gum irritation relief, and the delivery of active substances such fluoride desensitising agents.

Advantages of gel formulation
- In contrast to other semisolid dosage forms, gels are simple to make.
- A gel is a sophisticated, oil-free composition.
- By entangling the polymer multiple times, it can be utilised as a controlled release formulation.
- Gels adhere well to the application location.
- They're both biocompatible and biodegradable.
- Compared to other topical dose forms, gels have a longer retention period.
- They are very tolerant of some stressful situations.
- They cover the application place with a protective layer.
- They are naturally harmless and washable.
- Due to solvent evaporation, they offer superior spreadibility and cooling.
- Their long-term stability problems are relatively minor.[16]

MATERIALS AND METHODS

Table 1: List Of Material's Used.

SL.NO	Ingredients	Intended for use
1	Neem	API
2	Ginger	API
3	Carbopol/ Tragacanth gum	Gelling agent
4	Glycerin	Humectants, smooth texture.
5	Sorbitol	Sweetener, humectants
6	Peppermint oil	Flavoring and freshening agent
7	Triethanolamine [TEA]	p^H adjuster
8	Propylene Glycol	Solvent, humectants
9	Purified water	Solvent.

METHODOLOGY

Add 70% of total purified water to a cleaned beaker with gentle stirring. Dissolve, sodium benzoate and sodium saccharin.

Sprinkle Carbopol 940 slowly into Phase A under 300–500 rpm to avoid lumping; allow 20–30 min to fully hydrate.

In a secondary vessel mix sorbitol (70%) and glycerine. Gradually add hydrated silica to the humectant mixture while stirring to form a smooth slurry (avoid dust).
Add Phase B into Phase A under moderate shear.
Add slowly, Premix Neem and Ginger extracts in a small quantity of glycerine (helps dispersion of resinous extracts) and incorporate into the batch under low shear.
Slowly add TEA dropwise while monitoring p^H; stop at p^H 6.5-7.0, gel should thicken as Carbopol neutralizes. Adjust final water to bring batch to 50g.
Add flavour and colour at low speed. Deaerate under vacuum (50–70 kPa) if available. Fill into laminated tubes or airless dispensers.

EXTRACTION PROCESS OF NEEM AND GINGER

Sample preparation

Gather fresh Neem leaves and Ginger.
Clean and let them air dry in the shade for 5-7 days.
Use a grinder to grind to coarse powder.

Weighing The Sample

Weigh about 50g of powdered dry Neem and Ginger powder.

Fig No. 01

Fig No. 02

Filling And Thimbling

After the powders has been weighed, put it in the Soxhlet extractor in a thimble or wrap it in filter paper.

Solvent

Add 150ml of ethanol into the round bottom flask.

Assembly

Assemble the Soxhlet apparatus by connecting the water input and outlet to the condenser and then placing the round-bottom flask on top of the Soxhlet extractor.

Heating

Using a heating mantle, slowly heat the flask. Let the solvent concentrate and boil. Add required quantity of solvent to the round bottom flask as it evaporates with continuous heating process. The chemicals are extracted when the solvent vapour condenses and drips onto the sample. The solvent with dissolved compounds will be returned to the flask via the syphon tube. The solvent in the syphon tube should turn colourless after 6 hours of extraction.

Solvent Recovery

After completing the 6 hours extraction, let the apparatus allow to cool. Either use a rotary evaporator to remove the solvent or let it evaporate on its own in a fume hood.

Crude Extract

The neem and ginger extract that remains after further drying or concentration/purification is the residual residue.[17]

Phytochemical evaluation test for neem and ginger

1. Test For Alkolides

Wagner's test

Add 2ml of the plant extract and carefully mix with 2 drops of Wagner's reagent along the sidewalls of the test tube.

Mayer's test

Add 2ml of the plant extract and carefully mix with 2 drops of Mayer's reagent along the sidewalls of the test tube.

Dragendorff's test

Add 2ml of the plant extract and carefully mix with 2ml of Dragendorff's reagent along the sidewalls of the test tube.[18]

2. Test For Carbohydrates

2ml of the extract was mixed with 2 drops of alcoholic α-naphthol, followed by the addition of 1ml of concentrated sulfuric acid along the sides of the test tube.[1]

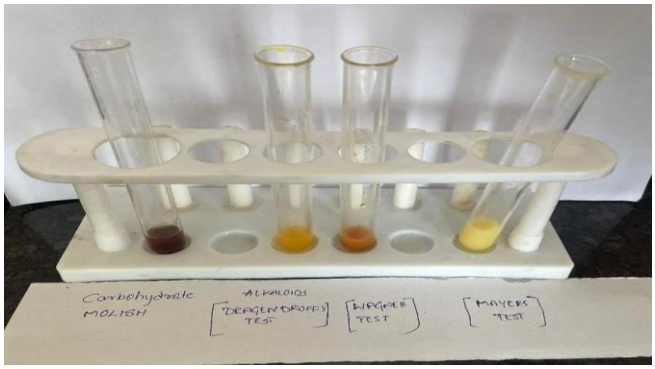


Fig No.03

3. Test For Cardiac Glycosides

Keller-killani test

Dissolve the extract in 1ml of glacial acetic acid with 1 drop of ferric chloride solution, it was under layered with 1ml of concentrated sulfuric acid.

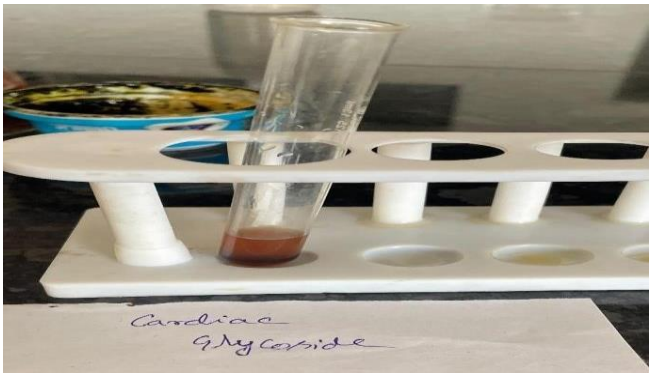


Fig no:04

4. Test For Tannins

Ferric chloride test

3ml of distilled water was mixed with 1ml of the extract, followed by the addition of 3 drops of 5% ferric chloride solution.

Lead acetate

3 drops of lead acetate solution were added to 1ml of the filtrate of extract.

5. Test For Saponins

Foam test

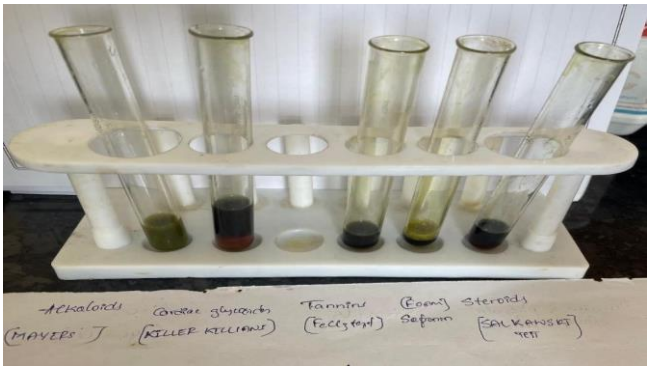
Take 0.5g of plant extract with 2ml of water and shake vigorously.

6. Test For Flavonides

Shinoda test: Take 1 ml of the plant extract in a clean test tube. Add a small piece of magnesium ribbon or turnings to the extract. Carefully add 1–2 ml of concentrated hydrochloric acid along the sides of the test tube.

7. Test For Steroids

Add 2 ml of chloroform to the extract, followed by a few drops of sulfuric acid.[19]



FigNo.05

EVALUATION TESTS FOR TOOTH GEL

Physical appearance, pH, viscosity, spreadability, extrudability, homogeneity, were all assessed for each manufactured gel formulation.

1. Physical appearance

- **Colour**: The colour of the formulation was examined against a white background.
- **Odour**: The odour of the gels was checked by mixing the gel in distilled water and taking the smell.
- **Consistency**: By applying on to the skin, the consistency was examined.
- **Greasiness**: The greasiness was assisted by applying on the skin.
- **Appearance:** Tooth gel formulation had a greenish colour.

2. Determination of P^H

A digital p^H meter was used to measure the gel p^H by fully submerging the glass electrode in the gel solution.[20]

Fig No: 06

Fig No: 07

3. Spreadability

Glass slide equipment was used to measure spreadability. After placing two grams of gel on one slide and another slide on top of it, the gel was sandwiched between the two slides. The slides were drawn in opposing directions. After a while, measure the gel spreading. Formula was used to calculate Spreadability.

S=M×L/T

Where, S= Spreadability
M= Weight in the pan (tied to the upper slide)
L= Length moved by the glass slide
T= Time (sec) taken to separate the upper slide from the ground slide

Fig No:08

Fig No:09

4. Transparency

About 5ml of the prepared gel were placed in a 10ml test tube, and the transparency of the gel was visually examined.

5. Smoothness

Testing the gel formulation's smoothness involved rubbing it between the fingers to determine whether it was smooth, clumped, homogeneous, or rough.

6. Determination of viscosity

The Brooke field viscometer was used to measure the viscosities of the prepared gels. Spindle number seven and spindle speed of 60 rpm at 25 °C were utilized for the gel, and the viscometer's corresponding dial reading was recorded.

7. Determination of homogeneity

Each formulated gel was visually inspected to ensure homogeneity for their appearance and the existence of any aggregates were examined.

8. Extrudability

The determination was made by filling a tube with gel and measuring the amount of gel extruded through the tip of tube when pressure was applied.[21]

RESULTS

Table 2: Phyto Chemical Evaluation of Gel.

SL.NO	Phytochemicals	Test chemicals	Observation	Neem	Ginger
1	Alkaloids	Mayer's test Dragendorff's test Wagner's test	Creamy white ppt Reddish brown ppt Reddish brown ppt	positive	positive
2	Flavonoids	Shinoda test	Pink to purple colour	Negative	positive
3	Tannins	5% $FeCl_3$ test Lead acetate test	Brown black colour White ppt	positive	positive
4	Steroids	Salowski test	Reddish brown colour at interface	positive	Negative
5	Saponins	Foam test	Persistent foam for 10 min	Negative	positive
6	Glycoside	Killer-killani test	Reddish brown colour at interface	Negative	positive
7	Carbohydrates	Molisch's test	Voilet ring at the junction	Negative	Negative

Table 3: Physicochemical Parameters of Tooth Gel.

SL.NO	Parameters	F1	F2
1	Colour	Greenish	Greenish
2	Odour	Mild or medicated mint odour	Characteristic herbal mint odour
3	Consistency	No lumps, Smooth gel	Smooth and uniform gel
4	Greasiness	Soft	Gritty
5	Appearance	Light green coloured slightly opaque	Smooth green colour

Table 4: Evaluation of tooth gel formulation.

Sl.No	Evaluation Test	F1	F2
1	Determination p^H	6.5	7.2
2	Spreadability (gcm/sec)	7.2	6.8
3	Transparency	Slightly opaque	Opaque
4	Smoothness	Smooth	Slightly course
5	Homogenicity	Very good	Good
6	Determination of viscosity (cP)	47,200	55,800
7	Extrudability	Gel extrudes smoothly under light pressure	Requires slightly more pressure

Fig No: 10 Tooth gel formulation.

DISCUSSION

- The formulation was developed by using Carbopol 940 and Tragacanth as Gelling agent.
- The phytochemical evaluation of Neem and Ginger extract was performed by doing different tests given in Table no.2.
- All the two formulations were evaluated for physical and chemical properties. All the formulations were greenish in colour and had a mild medicated mint odour shown in Table no.3.
- The F1 formulation (Carbopol 940) showed superior clarity, uniform texture, and desirable viscosity. It provided excellent Spreadability and extrudability, allowing easy application over the teeth surface. The gel was transparent, elegant, and retained its consistency throughout the study period, indicating good stability.
- The F2 formulation (Tragacanth), while completely natural, produced a slightly opaque and less uniform gel. This was attributed to the fibrous nature of Tragacanth gum, which swells unevenly in water, leading to a less smooth texture.
- The p^H of the F1 formulation is 6.5 and F2 formulation is 7.2 as shown in Table no. 4, which was well within the normal p^H range of buccal cavity 6 to 7.5, which substantiates that the prepared gels will be irritation free.
- The homogeneity of the two formulations was shown in Table no. 4. All the formulations were homogeneous and free from aggregates.
- The spreadability of the F1 formulation gel was found to be in the range of 7.2 gm cm/sec, confirming that F1 formulation gel spread smoothly and uniformly, when compare to F2 formulation gel.
- The results indicate that the Carbopol-based formulation (F1) is the optimized gel, showing better Clarity, Spreadablity, Smoothness, Transparency and Extrudability compared to the Tragacanth-based formulation (F2).

CONCLUSION

- The present work successfully developed and evaluated herbal tooth gel formulations incorporating Neem (Azadirachta indica) and Ginger (Zingiber officinale) extracts using Carbopol 940 and Tragacanth gum as gelling agents. The study aimed to create a safe, effective, and natural formulation for improving oral hygiene and preventing common dental issues such as plaque, gingivitis, and bacterial infections.
- Both formulations (F1-Carbopol, F2-Tragacanth) exhibited good organoleptic characteristics, homogeneity, pH compatibility (6.5–7.0), and physical stability. The Carbopol-based formulation (F1) showed superior clarity, smooth texture, spreadability, and extrudability, while the Tragacanth-based formulation (F2) provided a more natural appearance but was less transparent and slightly viscous.
- Based on the overall evaluation, the Carbopol gel (F1) was identified as the optimized formulation, demonstrating the most desirable physical and mechanical properties. The results validate that a Neem and Ginger based Carbopol gel can serve as a stable, effective, and natural alternative to conventional synthetic toothpaste formulations for promoting oral health and hygiene.

REFERENCES

1. Haque M, Singh AK, Maurya SK, Seth A. Formulation development, physico-chemical characterization and evaluation of anti-microbial activity of herbal tooth gel. J Chem Pharm Res., 2014; 6(3): 1279-85.
2. Featherstone JD, Fontana M, Wolff M. Novel anticaries and remineralization agents: future research needs. Journal of dental research, 2018 Feb; 97(2): 125-7.
3. Devi BP, Rama subramania raja R. Dental caries and medicinal plants-An overview. J Pharm Res., 2009 Nov; 2(11): 1669-75.
4. Jain I, Jain P, Bisht D, Sharma A, Srivastava B, Gupta N. Use of traditional Indian plants in the inhibition of caries-causing bacteria-Streptococcus mutans. Brazilian dental journal, 2015 Mar; 26: 110-5.
5. Silva TM, Fonseca BM, Sales AL, Holleben P, Valera MC, AraÚjo MA. Effects of fluoride and Aloe vera tooth gel in artificial white spot lesions in vitro. RGO-RevistaGaúcha de Odontologia, 2016 Jan; 64: 56-61.
6. Baby AR, Freire TB, Marques GD, Rijo P, Lima FV, Carvalho JC, Rojas J, Magalhães WV, Velasco MV, Morocho-Jácome AL. Azadirachta indica (Neem) as a potential natural active for dermocosmetic and topical products: A narrative review. Cosmetics, 2022 Jun 2; 9(3): 58.
7. Wylie MR, Merrell DS. The antimicrobial potential of the neem tree Azadirachta indica. Frontiers in pharmacology, 2022 May 30; 13: 891535.
8. Salam R, Sarker BK, Haq MR, Khokon JU. Antimicrobial activity of medicinal plant for oral health and hygiene. Int j nat soc sci., 2015; 1(2): 1-2.
9. Alzohairy MA. Therapeutics role of Azadirachta indica (Neem) and their active constituents in diseases prevention and treatment. Evidence-Based Complementary and Alternative Medicine, 2016; 2016(1): 7382506.
10. Naik MR, Bhattacharya A, Behera R, Agrawal D, Dehury S, Kumar S. Study of anti-inflammatory effect of neem seed oil (Azadirachta indica) on infected albino rats. Journal of Health Research and Reviews (In Developing Countries), 2014 Sep 1; 1(3): 66-9.
11. Agboola OE, Agboola O, Ayinla ZA, Agboola SS, Olaiya OE, Oyinloye OM, Fajana OM, Idowu OT, Omotuyi OI, Ilesanmi OS, Oyinloye BE. Integrated Virtual Screening for Anti-Caries Compounds from Neem: Dual-Target Inhibition of Biofilm Formation

and Bacterial DNA Replication. Biomedicines, 2025 Sep 8; 13(9): 2202.
12. Gupta A, Verma U, Lal N, Ojha S. Evolution and exploration of Azadirachta indica in dentistry: an update. British Journal of Medicine and Medical Research, 2017 Jan 10; 21(8): 1-5.
13. Dewangan C, Sahu SK, Patel D, Sinha D, Sahu S, Sahu Y, Nema RK. Formulation and Development of Dental Gel for Anti-Inflammatory as Well As Analgesic Effect. International Journal of Scientific Research and Technology, 2025 Jun 13; 2(6).
14. Ali BH, Blunden G, Tanira MO, Nemmar A. Some phytochemical, pharmacological and toxicological properties of ginger (Zingiber officinale Roscoe): a review of recent research. Food and chemical Toxicology, 2008 Feb 1; 46(2): 409-20.
15. Remadevi R, Surendran E, Ravindran PN. Properties and medicinal uses of ginger. InGinger, 2016 Apr 19; (pp. 509-528).
16. Un Nabi SA, Sheraz MA, Ahmed S, Mustaan N, Ahmad I. Pharmaceutical gels: a review. RADS J. Pharm. Pharm. Sci., 2016 Jun 19; 4: 40-8.
17. Pandey, A., Tripathi, S., & Tripathi, Y. B. (2014). Extraction and Evaluation of Bioactive Compounds from Neem (Azadirachta indica A. Juss.) Using Soxhlet Extraction Method. International Journal of Pharma and Bio Sciences, 5(4): 305–312.
18. Umeoka N. Phytochemical and Proximate Screening of Ginger Rhizome (Zingiber Officinale) as a Medicinal Plant. Journal of Health, Wellness and Safety Research, 2024 May 31; 4(3).
19. Shaikh JR, Patil M. Qualitative tests for preliminary phytochemical screening: An overview. International journal of chemical studies, 2020 Mar 1; 8(2): 603-8.
20. Shahidulla SM, Begum S, Atif S, Haneef S. Formulation and In Vitro Evaluation of Dental Gel by Using Melaleuca alternifolia Oil, 2024 July 7; (14).
21. Chavan S, Nadre S, Nawale R, Nayak A, Paikrao A. Review on Formulation And Evaluation of Ayurvedic Tooth Gel, 2024; 2(2): 479-487.

