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Preparation and evaluation of herbal tooth pain relief gel: An over view

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Abstract

This review seeks to create and assess a natural herbal gel for alleviating tooth pain, utilizing ingredients celebrated for their analgesic, antiseptic, anti-inflammatory, and antioxidant properties. The main objective of this research is to produce and evaluate a dental gel which eliminates discomfort from cavities in teeth. One of the major global public health issues, tooth cavity pain affects people of all ages, genders, and socioeconomic backgrounds. This dental gel's main medicinal ingredients are clove extract, turmeric extract, garlic extract, aloe vera, guar gum, vitamin E oil. Numerous characteristics of the prepared gel, including pH, spreadability, and antimicrobial activity, were evaluated.

Key words : Herbal medicine, toothache relief, clove oil, gaur gum, turmeric, garlic, aloe vera, olive oil, vitamin E, glycerin.

A major worldwide health concern that impacts people of all ages and backgrounds is tooth pain, especially that which results from dental cavities. Dental cavities can cause a great deal of distress, which can negatively impact a person's everyday life and general health.

Traditional means of treating tooth pain, like analgesic drugs and dental procedures, are commonly used, but they may have adverse consequences or not be easily available to all groups of people. As a result, people are becoming more interested in natural and herbal remedies as effective substitutes for dental pain, particularly those who favor holistic and non-invasive dental care.

In its long history of therapeutic use, herbal medicine has come to be recognized for its ability to treat a wide range of health issues, including dental pain. Many herbal ingredients are praised for their analgesic, anti-inflammatory, antimicrobial, and antioxidant qualities, making them useful in the formulation of topical treatments for tooth pain and oral health.

Often utilized plants and extracts in this context include clove oil, turmeric, garlic, aloe vera, and other naturally occurring substances.

The purpose of this review is to examine the creation and evaluation of a herbal tooth pain relief gel that contains a combination of these beneficial ingredients. For example, clove oil has long been known to have numbing properties, while turmeric and garlic are known to havestronganti-inflammatory and antimicro bialeffects; aloevera and glycerinarefrequently used for their calming and hydrating qualities, which enhance the gel's comfort and effectiveness; and vitamin E, which has antioxidant qualities, may help heal gum tissues and promote the general health of the oral cavity. For the preparation of the manuscript relevant literature[1-15] has been consulted.

Merits :

- ✓ Targeted relief
- ✓ Multiproperties. Demerits:
- ✓ Limited Duration Ofaction

Aim and objectives :

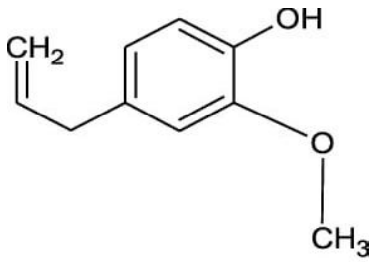
- ✓ The main goal is to create an herbal tooth pain relief gel and assess its efficacy.
- ✓ The objectives consist of: Identifying and sourcing natural ingredients with validated therapeutic effects.
- ✓ Creating a gel that blends these ingredients in optimal ratios.
- ✓ Conducting preformulation assessments to evaluate the gel's stability and effectiveness.
- ✓ Testing the gel through experimental research and clinical trials.

Plan of work :

- ✓ Exhaustive literature survey
- ✓ Selection of drug and excipients
- ✓ Procurement of materials
- ✓ Final formulations
- ✓ Evaluation

Plant profile *:* ***Clove :***

Figure 1: Clove extract



Eugenol

Figure 2: Structure of Eugenol

Synonym : *Caryophyllum;* Clove flower, Clove bud; launge

Biological source : Cloves consist of dried flower buds of Eugenia caryophyllus (Myrtaceae). It should contain not less than 15% (v/v) of clove oil Clove oil, extracted from Syzygium aromaticum, and is extensively utilized in dental practices owing to its powerful analgesic and antimicrobial traits. Its primary active ingredient, eugenol, functions as a natural

anesthetic by desensitizing sensory neurons through sodium ion channel inhibition, providing remarkable pain alleviation for various dental conditions (Bhojraj etal.,2024) (My Library). The pain-killing action of eugenol parallels that of conventional local anesthetics, which explains the historical inclusion of clove oil in dental care, particularly for toothaches stemming from cavities or inflammation. Beyond its pain relieving qualities, clove oil exhibits broad-spectrum antimicrobial properties, especially against oral pathogens like *Streptococcus* mutants and *Lactobacillus acidophilus.* These bacteria are chief contributors to tooth decay, and clove oil's capacity to inhibit their growth may assist in controlling infections linked to dental pain (The chemical composition and biological activity of clove essential oil, *Eugenia caryophyllata*, PubMed, 2024) (My Library). The dual functionality of pain relief and antimicrobial action makes clove oil an invaluable ingredient in herbal formulations aimed at alleviating symptoms and combating underlying infections in dental pain relief contexts.

Turmeric:

Figure 3: Turmeric

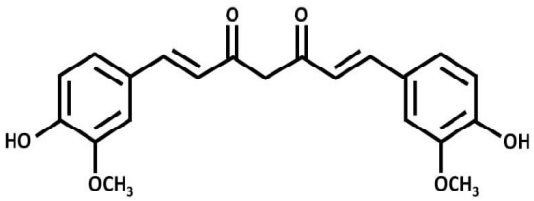


Figure 4: Structure of Curcumin

Synonyms : *Curcuma,* Genus *Curcuma, Curcuma longa*, Haldi, *Rhizoma curcumae*

Biological Source : Turmeric is the dried rhizome of *Curcuma longa* Linn. belonging to the family zingiberaceae.

Chemical Constituents : Curcumin, Curcuminoid, Desmethoxycurcumin, Bisdemethoxy curcumin, Vanillidene acetone, Curcumol, Germacrone, Curcumenol, Zingiberene, Bisacurone.

Turmeric (*Curcuma longa*) is celebrated for its anti-inflammatory and antioxidant benefits, largely due to the active compound curcumin. Curcumin's inhibition of the COX-2 enzyme, relevant in inflammatory reactions, can greatly mitigate pain in conditions such as gingivitis and periodontitis. Research suggests that turmeric powder may prevent the formation of dental plaque, under scoring its importance in preserving oral health and potentially curbing the onset of periodontal concerns (Bhojraj *et al*., 2024) (My Library). This implies that turmeric can boost the efficacy of herbal pain relief formulations through its antiinflammatory properties.

Raw garlic :

Figure 5: Garlic

Synonyms : *Allium sativum*

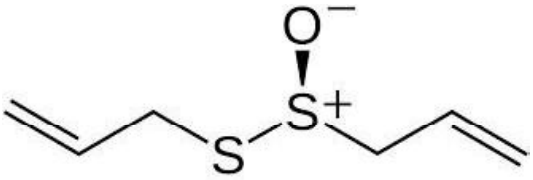


Figure 6: Structure of Allicin

Biological source : Garlic is the ripe bulb of *Allium sativum* Linn., belonging to family Liliaceae.

Chemical constituents : Allicin, a yellow liquid responsible for the odour of garlic, is the active principle of the drug. It is miscible with alcohol, ether, and benzene and decomposes on distilling. The other constituents reported in Garlic are alliin, volatile and fatty oils, mucilage and albumin. Alliin, another active principle, is odourless, crystallized from water acetone and practically insoluble in absolute alcohol, chloroform, acetone, ether, and benzene. Upon cleavage by the specific enzyme alliinase, an odour of garlic develops, and the fission products show antibacterial action similar to allicin. Essential oil (0.06–0.1%) contains allyl propyl disulphide, diallyl disulphide, and allicin. Γ-Glutamyl peptides are isolated from the Garlic. The amino acids present in the bulb are leucine, methionine, Spropyl-L-cysteine, S-propenyl-L-cysteine, S-methyl cysteine, S-allyl cysteine sulphoxide (alliin), S-ethyl cysteine sulphoxide, and S-butyl-cysteine sulphoxide.

Garlic (Allium sativum) show cases extensive antimicrobial properties, mainly due to allicin, which can inhibit pathogens responsible for oral infections. Allicin also exhibits anti-inflam-matory effects by regulating NF-κB activity, a transcription factor involved in Inflammation (Wang *et. al.*, 2023) (My Library). Incorporating garlic into dental pain relief formulations could thus be advantageous for reducing inflammation while tackling the microbial origins of oral discomfort (Bhojraj *et al*., 2024) (My Library).

Standard procedure for allicin : 400mg of fresh garlic were combined with 10 mL of water, and the mixture was shaken for two minutes to extract allicin. Purified allicin was extracted from the garlic aqueous extract using the solid phase extraction (SPE) technique.

Phenomenex/ 8BS001JCH's C18 SPE cartridge (SPE C18E 1g/6mL cartridge) was utilized. Three column volumes (18 mL) of mobile phase (methanol:water 50:50) were used to condition the SPE column after it had been washed with 6 mL of methanol. Using the same mobile phase (methanol: water), allicin was eluted and collected. Allicin's concentration in the separated fraction was carried out and gathered using the same mobile phase (methanol: water). According to the

HPLC analysis, spectrophotometry was used to standardize the amount of allicin in the isolated fraction. A 1cm quartz cuvette was used to measure the collected fraction's absorbance at 240 and 254 nm. The absorbance ratio (240 nm/254 nm) is typically between 1.4 and 1.5. For the allicin solution to be employed as a standard, the percentage of impurity per peak region must be less than 12%, and the chromatographic purity was utilized as an acceptance criterion for the calibration solution. To prepare standards for a linearitycurve-spanningroughly5to80 µg/mLfor HPLC analysis, the working standard was diluted with water. They were held at ≤ 0°C until they were needed, and the normal temperature was kept cool. Sample preparation: 0.7 to 0.9 g of garlic samples were weighed and added to 25 mL of cooled water (4°C), where they were rapidly agitated for 30 seconds. Another 25 mL of cold water was then added, and the mixture was swirled for another 30 seconds to create the aqueous extract. For HPLC analysis, the samples were passed through a 0.45 µm filter membrane.

Aloevera :

Figure 7. *Aloe vera*

Synonyms : *Aloe barbadensis, Aloe humilis* Blanco, *Aloe indica* Royle, nomennudum, *Aloe perfoliata* var. *vera* L., *Aloe vulgaris* Lam.

Biological Source : *Aloe* is the **dried juice collected by incision**, from the bases of the leaves of various species of *Aloe*.

Family: Asphodelaceae (Liliaceae)

Chemical constituents :

The two-main class active constituent of the *Aloe vera* plant extract are chromone and anthraquinone and its glycoside derivatives, alongside others such as phenylpyrone derivatives, flavonoids, phenylpropanoids, coumarins, phytosterols, naphthalene analogs, lipids, and vitamins.

Aloe vera (Aloe barbadensis) is acknowledged for its calming and wound-healingproperties, attributed to acemannan, a polysaccharide that aids cell proliferation and wound repair in the oral mucosa (Atif *et al*., 2024) (My Library). Its hydrating effects can ease dryness often linked to oral distress, rendering *Aloe vera* a fitting foundation for gels designed for sustained relief. *Aloe vera's* compatibility with other active substances also facilitates the stabilization and effectiveness.

Vitamin E oil :

The antioxidant characteristics of vitamin E oil shield oral tissues from oxidative damage, lessening inflammation and promoting healing. Incorporating vitamin E oil into dental pain relief formulations boosts their stability by preventing the oxidative degradation of active ingredients, thus extending the shelf life

of the product[2].

This makes vitamin E oil a valuable addition to formulations that address both immediate and prolonged relief.

Glycerin :

Glycerin, a hygroscopic agent, maintains moisture and hinders the gel from drying out, enhancing its stability and extending the therapeutic effects of other components. Glycerin's mild antimicrobial attributes also help reduce bacterial growth in the oral cavity (Atif *et. al*., 2024) (My Library). Its ability to preserve moisture levels in the gel formulation aids in the consistent delivery of active ingredients, maximizing the product's efficacy.

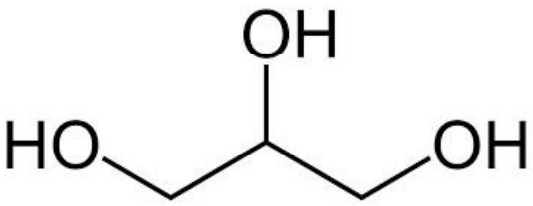


Figure 8: Structure of Glycerine

Synergistic Potential and Formulation Implications :

The amalgamation of these herbal constituents' offers a holistic approach to managing tooth discomfort, tackling both pain alleviation and the underlying issues of unease, such as inflammation and infection. Clove and peppermint oils provide immediate numbing effects, while turmeric, garlic, and *Aloe vera* render anti-inflammatory and antimicrobial support. Carrier oils like coconut and almond oil, along with glycerin, ensure a stable, hydrating base that maintains the gel's effectiveness. The synergistic operation of these elements promotes the creation of an effective herbal pain relief formulation, presenting a promising alternative to conventional dental analgesics.

Guar gum :

Figure 9: Guar Gum

Guar gum is a gel-forming galactomannan obtained by grinding the endosperm portion of *Cyamopsis tetragonolobus,* a leguminous plant grown for centuries mainly in India and Pakistan where it is a most important crop that has long been used as food for humans and animals (Chandirami 1957). The guar plant is essentially a sun-loving plant, tolerant of high environmental temperatures but very susceptible to frost (Whistler and Hymowitz 1979; Kay 1979).

Evaluation parameters :

- Physiological Studies :

1. pH Measurement: Check the gel's pH to make sure it is between the appropriate ranges for oral application (usually pH 6-7).
2. Viscosity: To make sure the gel has the right consistency for application, use a viscometer to measure its viscosity.
3. Spreadability: Evaluate the gel's spreading

properties at the application site. A spreadability test that measures the spread diameter of a set quantity of gel between two glass slides can be used to do this.

4. Homogeneity: Verify the gel's homogeneity visually to make sure there are no lumps or phase separation.
5. Appearance: Analyze the gel's color, clarity, and general aesthetic appeal

✠ *Stability Studies :*

1. Physical stability: Evaluate the gel's stability over time under various storage settings (such as room temperature or refrigeration). Keep an eye out for any variations in phase separation, color, or consistency.
2. *Chemical stability:* Utilizing methods such as high-performance liquid chromatography (HPLC), examine the stability of active substances over time, especially clove oil.

✠ *Microbiological evaluation :*

1. Sterility Testing: Use sterility testing to make sure the gel is free of microbiological contamination.
2. *Antimicrobial efficacy:* To verify the gel's antimicrobial efficacy, test it against common oral infections such *Lactobacil lus acidophilus, Streptococcus mutans,* and *Candida albicans*.

Safetyand Biocompatibility :

- Cytotoxicity Tests: As demonstrated by *in vitro* cytotoxicity tests, the gel ought tobe nontoxic to oral mucosal cells.
- Biocompatibility: The gel must be gentle on oral tissues and not irritate or react negatively when applied.

Clinical Evaluation :

- Pain Relief: Clinical testing on the gel should show that it is an effective analgesic by significantly reducing tooth pain.

This review advocates the formulation of a herbal dental tooth pain relief gel comprising clove oil, peppermint oil, turmeric powder, raw garlic, *Aloe vera* gel, coconut or almond oil, vitamin E oil, and glycerin. Each ingredient brings specific therapeutic effects, and their combined usage enhances the potential for effective, natural management of tooth pain. As the demand for natural, safe, and sustainable healthcare products continues to rise, such formulations present significant potential in the realm of oral care.

References :

1. Haque, and Mridul, *et al*. (2014). *J Chem Pharm Res. 6.3:* 1279-85.
2. Hayatir, Saria, and Handayanir. (2024). Formulation and antibacterial activity of herbal toothpaste based on aceh traditional medicine *9:* 121–28.
3. Llewelyn J. (1980). *Br Dent 148*(4): 103-104.
4. Jamadar Mohsin J, *et.al*., (2017). Preparation and evaluation of herbal gel formulation, *Journal of pharmaceutical reaserch and education. 1*(2): 203.
5. Mithal BM, and RN. Saha (2006). A hand book of cosmetics, 2nd edition, Vallabh Prakashan, New Delhi, 52-60.
6. Mudgil D, S Barak, and BS. Khatkar (2011). Guargum:processing, properties and food applications—A Review. 2011; *51:* 409–18.
7. Nandlal B., K, S. P. Mull, G. P. Vinutha M., and M. Manjunath (2024). *Journal of Clinical Advances in Dentistry*. *8*(1):

013–019. https://doi.org/10.29328/journal.jcad.1001041

8. Neel JM, DP Neel, J Patel, DH Shastri, and PK. Shelat (2013). *RJPBCS 4*(1): 221-228.
9. Patil AG, PO Patil, AH Jobanputra, and DK. Verma (2017). Herbal Formulations for Treatment of Dental Diseases: Perspectives, Potential, and Applications. In Engineering Interventions in foods and Plants. Nov 14 (pp. 27-50). Apple Academic Press.
10. Patil VP, RM Kamble, KB Kamble, PD Chopade, SK Jadhav, and Metkarini lamuttam *et. al*. (2022). Formulation and Evaluation of dental gel containing clove oil for the treatment of periodontal diseases. *9:* e358–59.
11. Prati P., C.M. Henrique, A.S. DeSouza, V.S.N. DaSilva, and M.T.B. Pacheco (2014). *Food Science and Technology*. *34*(3): 623–628. https://doi.org/10.1590/1678-457x.6397
12. Soni Abhishek, Amit Chaudhary, and Shivali Singh (2019). *Journal of pharma research. 6*(8): 431.
13. Telrandhe R, P Deshmukh, and M. Gunde (2017). Formulation and evaluation of herbal toothpaste: compared with marketed preparation.
14. Wilkinson, JB, and RJ Moore. (1982). Harry's Cosmeticology, 7th Edtion, Chemical Publishing, New York, 608-622.
15. Zaini A.S., N.R. Putra, Z. Idham, N.S.M. Norodin, N.A.M. Rasidek, and M.A.C. Yunus, (2020). *IOP Conference Series Materials Science and Engineering*. *932*(1): 12-23. https://doi.org/10.1088/1757-899x/932/1/012023