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A Review On Eggshell And Tulsi (*Ocimum Sanctum*) Based Toothpaste

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1) ABSTRACT

A dentifrice in the shape of a smooth, semi-solid, homogenous mass that contains relevant chemicals including humectants, surface active agents, abrasives/polishing agents, binding agents, and other compounds suitable for maintaining oral health is what is referred to as toothpaste. Eggshell powder has been employed as an abrasive in toothpaste for the current project.

After a number of formulations were created and assessed, It has been observed that formulations based on eggshells are effective in treating dental caries and tooth hypersensitivity.

In the present work Eggshell powder has been used as abrasive in toothpaste. Eggshell based formulation is reported useful in treatment of dental caries and tooth hypersensitivity.

Calcium plays active role in remineralization of enamel and eggshell powder has a very high percentage of bio-available calcium. For treatment of dental caries and tooth hypersensitivity many formulations are commercially available but eggshell based toothpaste is seems to be most effective and economic product. The composition of an eggshell is very similar to that of our bones and teeth.

Tulsi, known for its antimicrobial, anti-inflammatory, and antioxidant properties, serves as a natural therapeutic agent that aids in the prevention of oral infections, gingivitis, and bad breath.

The prepared formulations were evaluated for organoleptic characteristics, pH, foaming ability, abrasiveness, and microbial activity. Results indicated that the herbal toothpaste exhibited good stability, acceptable texture, and effective antimicrobial activity against common oral pathogens. The study concludes that eggshell- and Tulsi-based toothpaste provides a safe, eco-friendly, and economical alternative to synthetic formulations, promoting sustainable oral hygiene practices.

Key Words: Eggshell, Calcium, Abrasive, Dental Carries, Hypersensitivity, *Ocimum Sectum.*

2) INTRODUCTION

Toothpaste is defined as a dentifrice in the form of a smooth, semisolid, homogeneous mass Containing acceptable ingredients such as abrasives/polishing agents, surface active agents, Humectants, binding agent, and other appropriate substances for oral health maintenance.
The product can be opaque, transparent or combination thereof, coloured or white, packed in a suitable container from which it can be extruded in the form of a continuous mass.

Fig .1 Toothpaste

Toothpaste is a paste or gel dentifrice used with a toothbrush as necessary to clean and maintain the aesthetics and health of teeth. Toothpaste is used to promote oral hygiene it serves as a abrasive that aids in removing dental plaque and food from the teeth, assists in suppressing halitosis, and deliver active ingredients (most commonly fluroride) to health prevent tooth and gum disease.[1]

Dentin hypersensitivity (DH) is a major health care problem affecting both younger and older populations. It is characterized by a short, sharp pain of unexplained reason that might occur in response to chemical (e.g., excessive acidic drinks or bleaching) or mechanical factors (e.g., vigorous tooth brushing). In older population, DH can be associated with root exposure especially after periodontal treatment[7]

Calcium plays active role in remineralization of enamel and eggshell powder has a very high percentage of bio-available calcium. For treatment of dental caries and tooth hypersensitivity many formulations are commercially available but eggshell based toothpaste seems to be most effective and economic product. The composition of an eggshell is very similar to that of our bones and teeth. [1]

In recent years, there has been a growing interest in finding new sources of calcium carbonate (CaCO3). Early studies on the composition of eggshell showed that it is made up by approximately 97% of CaCO3. Moreover, eggshell can also provide a great protective barrier against the penetration of microorganisms, and at the same time it is constituted by numerous porous layers permeable to water and gases, which allow the embryo to breathe. In addition, eggshell is composed of a bioceramic composite material to guarantee the calcium necessary for the skeletal formation .[8]

In recent years, there has been a growing interest in developing eco-friendly and natural alternatives to chemical-based dental care products. Among these, herbal and bio-waste-derived toothpastes have gained significant attention for their safety, sustainability, and therapeutic benefits. One such innovative formulation combines eggshell powder and Tulsi (Ocimum sanctum) — two natural ingredients known for their exceptional health-promoting properties.

Eggshells, which are often discarded as kitchen waste, are an abundant source of calcium carbonate (CaCO3) — a vital mineral that strengthens tooth enamel, promotes remineralization, and protects against dental erosion. The use of eggshells in toothpaste not only supports waste recycling and sustainability, but also enhances the hardness and gloss of teeth, making them healthier and more resistant to decay.

On the other hand, Tulsi, known as the “Queen of Herbs,” has been treasured in Ayurveda for centuries due to its antibacterial, antifungal, and anti-inflammatory properties. Tulsi extracts help in preventing

plaque formation, reducing bad breath, and healing oral infections, thereby promoting overall oral hygiene naturally.

When combined, Eggshell and Tulsi form a powerful natural blend — the calcium-rich eggshell helping to restore and strengthen enamel, while Tulsi provides protection against microbial growth and maintains fresh breath. This unique combination represents a perfect balance of modern scientific innovation and traditional herbal wisdom.

Thus, the formulation of Eggshell and Tulsi-based toothpaste offers a promising, sustainable, and safe alternative to conventional toothpaste, catering to the growing demand for natural and eco-conscious dental care solutions.

- **Ideal Properties of Paste**:[15,16,17,18,19,20,]

  - High Abrasive Effectiveness.
  - Non toxic and Non-irritating substances.
  - Leave no coloration in the tooth.
  - Leave the mouth fresher than before.
  - Lasting action.
  - Not too costly and available.
  - Prevention of gums as well as gingivitis.

THE EGGSHELL

Egg shells are one of the best sources of calcium, which is absorbed by organism in approximately 90% and it is easier for your body to digest and absorb. One whole medium sized eggshell makes about one teaspoon of powder, which yields about 750 – 800 mgs of elemental calcium plus other microelements, i.e. magnesium, boron, copper, iron, manganese, molybdenum, sulphur, n, zinc, etc.

Fig.2. Eggshell

Eggshells are an abundant agro-waste, with over 100 billion eggs produced annually worldwide generating millions of tons of eggshell waste. Discarded eggshells pose environmental challenges, yet they consist primarily of calcium carbonate (~94– 95% $CaCO_3$) along with minor organic and inorganic components. Notably, the crystalline calcium matrix of eggshell closely resembles the mineral component of human teeth and bone, suggesting its suitability for promoting enamel remineralization. Prior studies have explored eggshell powder as a natural abrasive and remineralizing agent in toothpaste, finding improved

enamel hardness and effective cleaning without harsh abrasives. Utilizing eggshell powder in oral care aligns with waste valorization and provides bioavailable calcium to strengthen teeth.[4]

Eggshell is rich in minerals like calcium carbonate, magnesium, phosphorous and traces of other microelements like iron, manganese, zinc, cobalt, chromium, lead etc. Egg-shell membrane has protein, fat, collagen, silica, amino acids,

glycoprotein, proteoglycan, moisture.[9] Egg-shell is believed to be a substitute for enamel because there is a change in

pH and enamel erosion due to many acidic beverages. Various experiments have also been done to clearly understand the

relation between egg-shell and dental enamel to establish the remineralization capacity on teeth.[10]

The calcification process is used for making egg-shell powder for better mechanical and physical properties.[11] A large

number of egg-shell waste is generated globally, so it can be used to treat dental erosion to enhance remineralization of

the tooth and reduce the cost of treatment.[12] This study …

COMPOSITION OF EGGSHELL

Eggshells primarily consist of:

i) Calcium carbonate ($CaCO_3$): ~94–97% ii) Organic matrix (proteins, glycoproteins): ~1–3%
iii) other minerals: Magnesium, phosphorus, strontium, and trace elements

METHOD OF PREPARATION OF EGGSHELL POWDER

- Collecting Eggshells
- Cleaning of Eggshells
- Drying of Eggshells
- Powder the Eggshells by grinding and passing through suitable sieve.
- Storage of Eggshell powder.

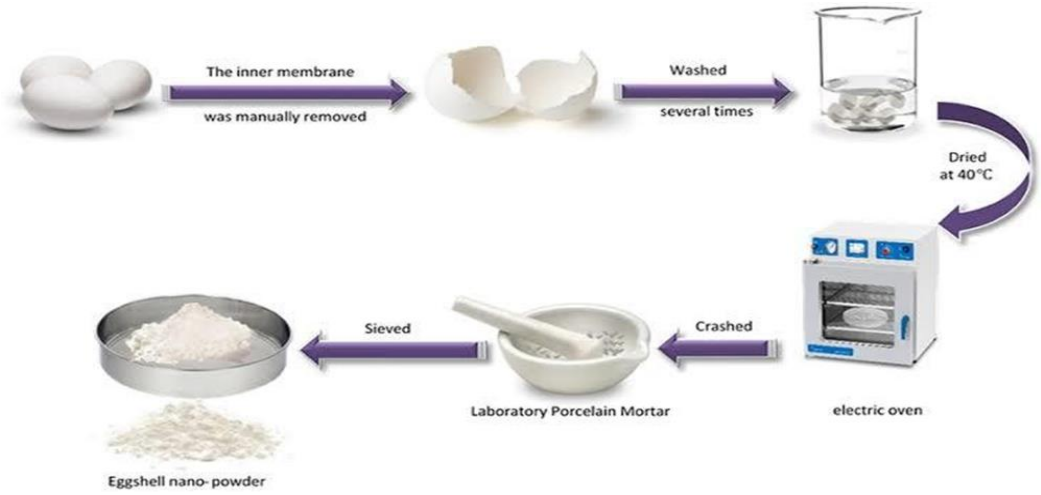

Fig. 3 – Preparation of eggshell powder

A) Collection of Eggshells Egg shells were collected.

B) Cleaning of Eggshells The eggshells were cleaned in distilled water then the eggshells were kept in a hot water bath At 100°C for 10 minutes followed by removing the membrane.

C) Drying of Eggshells Egg shells were air dried.

D) Powdering of Eggshells Then the eggshells were crushed using a mortar, pestle and sieved to collect the fine powder Through 150µ I.S sieve.

E) Storage of Eggshell Powder Powdered Eggshell was stored in air tight container [2]

❖ **TULSI**

Fig. 4 – Ocimum sanctum

TULSI

It is a holy plant that has both medicinal and spiritual properties. In Ayurveda, it is known by different names such as "Mother Medicine of Nature" and "The Queen of Herbs".Tulsi is beneficial in relieving cough and cold symptoms due to its antimicrobial, anti-inflammatory, antitussive (cough-relieving) and anti-allergic properties.

Taking a few leaves of Tulsi along with honey helps relieve cough and flu as it improves immune health. Taking Tulsi tea on a daily basis has a calming effect and helps reduce stress. According to Ayurveda, Tulsi helps reduce asthmatic symptoms due to its Kapha-balancing property.Tulsi is also useful in managing ringworm infection. Applying a paste of Tulsi leaves on the affected area helps prevent infection and also relieves inflammation as well as pain

Tulsi is a popular healing herb in Ayurvedic medicine. It is widely used in the treatment of several systemic diseases because of its anti-microbial property. However, studies documenting the effect of Tulsi on oral disease causing organisms are rare. Hence, an attempt was made to determine the effect of Tulsi on a periodontal microorganism in human dental plaque. Aim To determine if Ocimum sanctum (Linn.) has an anti-microbial activity (Minimum Inhibitory Concentration and zone of inhibition) against Actinobacillus actinomycetemcomitans in human dental plaque and to compare the antimicrobial activity of Ocimum sanctum (Linn.)

➢ **Pharmacognostic account of tulsi**

1. **Common name: -** Tulsi, holly Basil
2. **Botanical Name: -** *Ocimum sanctum*
3. **Family: -** Liliaceae

4. **Plant Type: -**
   Perennial shrub, aromatic
5. **Leaves: -**
   Green or purple depending on the variety oval with slightly toothed margins

6. **Flower: -**
   small purple or white arranged in terminal spikes

- **Variety Tulsi: -**

i. **Rama tulsi (Ocimum sanctum): -**

Green leaves, mild aroma

ii. **Krishna Tulsi (Ocimum Tenuiflorum):-**

Dark purple leaves, stronger test aroma

iii. **Vana Tulsi (Ocimum Gratissimum): -**
wild variety large green leaves, lemony scent

Fig.5:- ***ocimum sanctum***

Phytochemical constituents: -

Tulsi contains a range of biologically active compounds

i. **Essential Oils:** - Eugenol, Methyl Eugenol, Caryophyllene, linalool

ii. **Flavonoids: -**
Apigenin, luteolin, orientin, vicenin

iii. **Phenolics: -**
Orosmarinic acid, caffeic acid

iv. **Triterpenoids: -**

Ursolic acid, Oleanolic acid

These Compounds contribute to its antimicrobial, anti-inflammatory, antioxidant, and adaptogenic properties.

- **Pharmacological Properties**

Tulsi has a wide spectrum of therapeutic activities:

1. **Adaptogenic:**

   Helps the body adapt to stress
2. **Antioxidant:**

   Neutralizes free radicals
3. **Anti-inflammatory**:

   Reduces inflammation
4. **Antimicrobial**:

   Active against bacteria, fungi, viruses
5. **Immunomodulatory**:

   Enhances immune response
6. **Hepatoprotective**:

   Protects the liver
7. **Antidiabetic:**

   Lowers blood glucose levels
8. **Anticancer:**

   Cytotoxic effects on certain cancer cells (under research)
9. **Cardioprotective:**

   Reduces cholesterol and blood pressure

- **Medicinal Uses**

A. **Common Cold and Cough:**

   Used in teas or decoctions

B. **Asthma and Bronchitis:**

   Acts as an expectorant and bronchodilator

C. **Fever:**

   Especially helpful in viral and malarial fever

D. **Stress and Anxiety:**

   Acts as a natural adaptogen

E. **Skin Disorders:**

Used in creams or pastes for acne, wounds, and infections

F. F. **Dental Health:**
Tulsi extracts used in toothpaste and mouthwashes

- **Side Effects**

i. Generally safe when used in moderate amounts

ii. May lower blood sugar; caution in diabetics

iii. Avoid during pregnancy (insufficient data)

iv. May interfere with blood clotting due to eugenol content

Diseases of Teeth and Gums

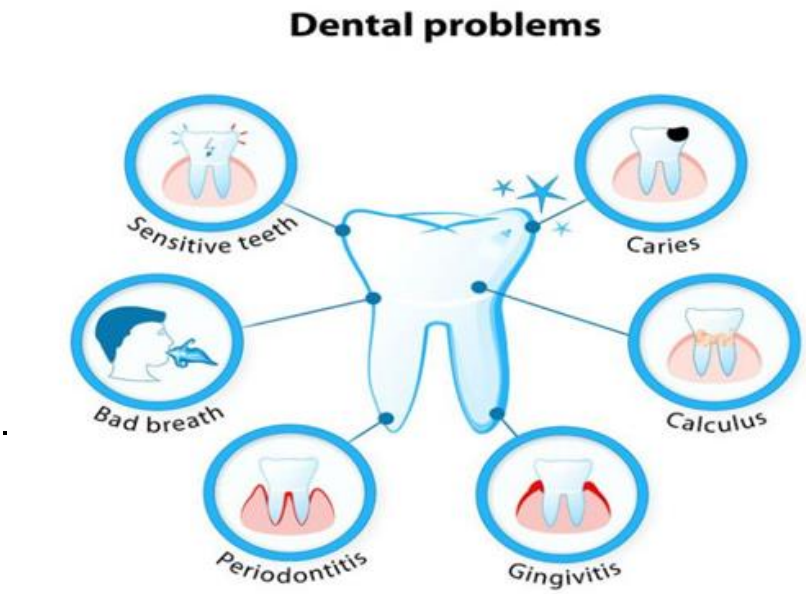

Fig.6:- Common adults dental problem

1. Dental Caries (Tooth Decay)
Dental caries is the gradual destruction of the tooth's hard surface (enamel and dentin) by acids produced from bacteria.
It usually occurs when food containing sugar or starch is left on the teeth.
The bacteria form plaque and produce acid, creating small holes called cavities.
If not treated, the decay can reach the pulp and cause severe pain or infection.
Regular brushing and avoiding sugary foods help prevent caries.

2. Gingivitis
Gingivitis is the inflammation of the gums caused by the buildup of plaque around the teeth.
The gums become red, swollen, and may bleed during brushing or flossing.
It is an early and reversible stage of gum disease.
If ignored, it can develop into a more serious condition called periodontitis.
Maintaining good oral hygiene and regular dental cleaning can easily control gingivitis.

3. Periodontitis

Periodontitis is a serious gum infection that damages the soft tissue and bone supporting the teeth.
It starts from untreated gingivitis and leads to deep pockets between the teeth and gums.
As the disease progresses, the bone level decreases, and teeth may become loose.
Symptoms include bad breath, bleeding gums, and tooth mobility.
Professional cleaning, antibiotics, and sometimes surgery are required for treatment.

4. Tooth Erosion

Tooth erosion is the loss of enamel caused by acids from foods, drinks, or stomach acid, not by bacteria.
It often occurs due to frequent consumption of soft drinks, citrus fruits, or vomiting.
As enamel wears away, teeth may become sensitive and appear yellowish.
It cannot be reversed, but fluoride and dental treatment can protect remaining enamel.
Avoiding acidic drinks and using a straw can help prevent further damage.

5. Tooth Sensitivity

Tooth sensitivity is sharp pain or discomfort when teeth come in contact with hot, cold, sweet, or sour substances.
It happens when enamel is worn away or gums recede, exposing the inner dentin.
This allows sensations to reach the tooth nerve, causing pain.
Using desensitizing toothpaste and avoiding acidic foods can reduce the problem.
Regular dental check-ups help identify and treat the cause of sensitivity.

6. Tartar (Calculus)

~~Tartar is hardened dental plaque that firmly attaches to the tooth surface and cannot be removed by~~ brushing.
It forms when plaque is not cleaned regularly and minerals from saliva harden it.
Tartar irritates gums and leads to inflammation, bad breath, and gum diseases.
It also makes it easier for more plaque to build up.
Only a dentist can remove tartar through a professional cleaning process called scaling**.**

3) METHOD AND MATERIALS

- **MATERIAL**

Sr. no.	Ingredient	Function	Form used	Quantity
1	Eggshell powder	Mild abrasive, natural calcium carbonate, remineralizes enamel	Powder form	20 gm
2	Tulsi powder	Antibacterial antiinflammatory, prevents gum disease	Powder form	10 gm
3	Coconut oil	Base, binds ingredients has antibacterial properties	Oil form	40 gm

4	Baking soda	Mild abrasive ph neutralizer odor control	Powder form	10 gm
5	Xylitol	Sweetner anticavity effect	Oil form	5 gm
6	Pepperimient oil	Flavor and antimicrobial fresh breath	Oil form	5-10 drops
7	glycerin	humectant	Oil form	10 gm
8	Distilled water (if needed)	Adjust consistensy	Water form	Few ml

- **Methods:-**

1. Preparation of Materials:
All the required ingredients such as eggshell powder, tulsi powder, coconut oil, baking soda, xylitol, peppermint oil, glycerin, and distilled water were collected.

2. Weighing of Ingredients:
Each ingredient was weighed accurately according to the quantities mentioned in the materials table.

3. Mixing of Dry Ingredients:
Eggshell powder, tulsi powder, and baking soda were taken in a clean dry mortar and pestle and mixed thoroughly to obtain a uniform powder mixture.

4. Addition of Oils and Sweetener:
Coconut oil was added slowly to the powder mixture with continuous stirring.
Then peppermint oil and xylitol were added to improve flavor, sweetness, and antibacterial properties.

5. Addition of Glycerin and Water:
Glycerin was added to provide smooth texture and moisture.
If required, a few drops of distilled water were added to adjust the consistency of the paste.

6. Final Mixing:
The whole mixture was stirred properly until a smooth, uniform paste was obtained.

4) CONCLUSION

The study shows that toothpaste made from eggshell and Tulsi is a good natural alternative to chemical toothpaste. Eggshell helps to make teeth strong by adding calcium, and Tulsi keeps the mouth clean by killing germs. Both ingredients are safe, easily available, and help in keeping our teeth and gums healthy. So, eggshell and Tulsi-based toothpaste is a useful and eco-friendly choice for good oral care

eggshell and Tulsi-based toothpaste highlights the potential of natural ingredients as effective and eco-friendly alternatives to conventional toothpastes. Eggshell, being rich in calcium carbonate, supports enamel remineralization and strengthens teeth, while Tulsi provides strong antibacterial, antifungal, and anti-inflammatory properties that help maintain oral hygiene and prevent infections. Together, these ingredients offer a holistic approach to dental care by combining remineralizing and antimicrobial effects. Therefore, eggshell and Tulsi-based toothpaste can be considered a promising, safe, and sustainable option for promoting overall oral health.

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