

BAB I

INTRODUCTION

1.1. Research Background

Oral and dental health is one of the many things that affect quality of life. Many diseases are caused by teeth and mouth that are not kept clean.¹ In addition to the health factor, teeth are also a source of human aesthetics.² If the teeth are clean and brightly colored, it tends to increase self-confidence. So from this problem, the thing to do is to maintain oral hygiene. The simplest way is to brush your teeth using toothpaste at least twice daily. The level of public awareness in brushing teeth makes many types of toothpaste on the market. This is because public awareness of environmental sustainability is also increasing, so many organic toothpastes use natural ingredients that are expected to have minimal irritating effects on teeth and mouth and are environmentally friendly. Toothpaste can be made from natural ingredients that can replace synthetic ingredients.

Toothpaste is a paste or gel used with a toothbrush to maintain and improve oral health and aesthetics. When it was first introduced, toothpaste was made from a suspension of crushed eggshells or ash to form a complex formula containing approximately 20 ingredients. Toothpaste contains ingredients to fight dental caries, gum disease, bad odor, calculus, erosion and dentin hypersensitivity. The main ingredients in toothpaste preparations are abrasives material which function to clean and whiten teeth, flavorings to freshen breath, and colorants for better visual appeal.³ Toothpaste on the market already has various types such as calcium toothpaste and whitening toothpaste to whiten teeth.

Many kinds of toothpastes on the market contain synthetic teeth-whitening ingredients. Chemicals used for teeth whitening have side effects that

¹ Debby Yulianthi Maria, "Smile Dental Program : Pendidikan Kesehatan Tentang Cara Menyikat Gigi Yang Baik Dan Benar" 2, No. 1 (2020).

² Diana Soesilo, "Perawatan Internal Bleaching Untuk Estetik Gigi Pasca Perawatan Endodontik" 10, No. 2 (2016).

³ Frank Lippert, "An Introduction To Toothpaste - Its Purpose, History And Ingredients," In *Monographs In Oral Science*, Ed. C. Van Loveren, Vol. 23 (S. Karger Ag, 2013), 1–14, <https://doi.org/10.1159/000350456>.

can irritate. The combination of eggshell waste and charcoal in this toothpaste preparation is expected to clean and reduce tooth discoloration. Thus improving oral and dental health and hygiene. So from this, toothpaste was made from natural abrasives, namely eggshells which are more environmentally friendly and charcoal as a preventive material for tooth discoloration.⁴

Tooth discoloration is a condition in which teeth become darker in color. It is classified into three factors: extrinsic, intrinsic, and a combination of both. Extrinsic tooth stains are caused by foods and beverages such as coffee, tea, red wine, carrots or tobacco.⁵ Intrinsic tooth discoloration is caused by the absorption of chromatogenic materials in enamel and dentin during odontogenesis or when teeth have erupted. Tooth discoloration can occur when exposed to high fluoride levels, tetracycline use developmental disorders and trauma during the pre-eruption period.⁶

Many methods can be used to make teeth lighter in color eliminate tooth discoloration and maintain dental health.⁷ One of them is brushing teeth using toothpaste that contains teeth whitening. The teeth whitening content commonly used in toothpaste is carbamide peroxide with concentrations ranging from 3%-45%. But in its use, carbamide peroxide 10% is the most commonly used. Carbamide peroxide 10% will break down into 3.5% hydrogen peroxide solution and 6.5% urea solution.⁸ Carbamide peroxide has side effects on soft tissues because it can cause redox reactions, causing oxygen free radicals that can break the epithelial cell membrane of the oral mucosa and its corneum layer. Breaking

⁴ Liana Febrianti, Desy Nawangsari, And Adita Silvia F, "Formulasi Sediaan Pasta Gigi Dengan Arang Aktif Tempurung Kelapa (*Cocos Nucifera* L) Sebagai Pemutih Gigi," *Jurnal Farmasi & Sains Indonesia* 4, No. 2 (October 20, 2021): 50–57, <https://doi.org/10.52216/Jfsi.Vol4no2p50-57>.

⁵ Any Setyawati And Syifa Nabila Farah Fauziah Nur, "The Effectiveness Differences Between Watermelon (*Citrullus Lanatus*) Extract 100% And Carbamide Peroxide Gel 10% In Tooth Whitening (Ex Vivo)," *Journal Of Indonesian Dental Association* 3, No. 1 (February 20, 2020): 31, <https://doi.org/10.32793/Jida.V3i1.429>.

⁶ A Sucheta Et Al., "All About Dental Stains: A Review (Part 1)" (*Annals Of Dental Specialty*, June 2016).

⁷ Ulliana And Dkk, *Kesehatan Gigi Dan Mulut*, 1st Ed. (Purbalingga, 2023).

⁸ Elmourad And Alqahtani, "Effects Of Pre- And Post-Simulated Home Bleaching With 10% Carbamide Peroxide On The Shear Bond Strengths Of Different Adhesives To Enamel."

in a chronic state can cause inflammation of the gums.⁹ These side effects have led to the utilization of natural materials.

Natural ingredients that are often used are charcoal which includes in activated carbon and is one of the ingredients that can absorb dirt and is very good at cleaning gaps in teeth that are difficult to clean. Activated charcoal has the ability to absorb dirt because activated charcoal has many pores so it will absorb dirt through the potential energy between the surface of activated charcoal and the substance being absorbed.¹⁰ The absorbency of charcoal is determined by the surface area of particles activated by heating at high temperatures or by chemicals. The absorbency of charcoal will be higher in proportion to the level of heating and activation of charcoal using chemicals that will change the physical and chemical properties of charcoal so that charcoal becomes active.¹¹ In this formula, charcoal is combined with eggshells.

Eggs are one of the food sources that are rich in protein at an affordable price. In Indonesia, eggs are one of the foods that are often consumed because they are practical in processing, causing egg consumption to increase throughout the year.¹² So from the high consumption of eggs, eggshell waste is increasingly accumulating. Overcoming the accumulated eggshell waste can be overcome by utilizing the waste itself to become something more valuable.¹³ Eggshells are rich in calcium carbonate (CaCO_3). One of the benefits of Calcium carbonate is that it has abrasive properties that can be used as an ingredient to make toothpaste

⁹ Endang Suprastiwi, "Penggunaan Karbamid Peroksida Sebagai Bahan Pemutih Gigi" (Indonesian Journal Of Dentistry, 2005).

¹⁰ Uce Lestari, Syamsurizal Syamsurizal, And Yustika Trisna, "The Anti plaque Efficacy And Effectiveness Of Activated Charcoal Toothpaste Of *Elaeis Guineensis* In Smokers," *Indonesian Journal Of Pharmaceutical Science And Technology* 1 (January 5, 2022): 75, <https://doi.org/10.24198/Ijpsst.V1i1.32664>.

¹¹ Meilita Tryana Sembiring And Tuti Sarma Sinaga, "Arang Aktif (Pengenalan Dan Proses Pembuatannya)," 2003.

¹² Bogor Agricultural University Et Al., "Kualitas Fisik, Mikrobiologis, Dan Organoleptik Telur Konsumsi Yang Beredar Di Sekitar Kampus Ipb, Darmaga, Bogor," *Jurnal Ilmu Produksi Dan Teknologi Hasil Peternakan* 4, No. 2 (June 30, 2016): 275–79, <https://doi.org/10.29244/Jipthp.4.2.275-279>.

¹³ Fillian Lathifah Nurhadi Putri And Rizal Pratama Nugroho, "Analisa Kandungan Kalsium Pada Serbuk Cangkang Telur Ayam Hasil Pengeringan Dan Kalsinasi," N.D.

because it can remove plaque on the teeth.¹⁴ Abrasives are materials that remove material from most substrates, during the relative movement of the abrasive and the substrate dirt on the tooth surface, such as pellicle, is removed.¹⁵ The two components of eggshell and charcoal are expected to overcome the existing public aesthetic problem of tooth discoloration.

This research is important to maintain oral health by reducing tooth discoloration which is an aesthetic problem for the community. In this study, natural ingredients were used to make an herbal toothpaste of eggshell and coconut shell charcoal (*Cocos nucifera L.*) as a tooth discoloration preventative that is expected to reduce the risk of side effects often associated with synthetic chemicals in commercial toothpaste. The effectiveness of this toothpaste will be tested to provide a reliable alternative for consumers who are looking for a more natural and safe teeth whitening product because the resources used are more environmentally friendly. And can open up innovation opportunities that attract the interest of a market that is increasingly aware of the importance of natural products.

Maintaining oral and dental hygiene is one of the recommendations of the Prophet SAW. in Hadith Abu Hurairah the Prophet SAW. said:

قَالَ رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ تَحَلَّلُوا فَإِنَّهُ نَظَافَةٌ وَالنَّظَافَةُ تَدْعُو إِلَى الْإِيمَانِ وَالْإِيمَانُ

مَعَ صَاحِبِهِ فِي الْجَنَّةِ [رواه الطبراني]

From the Messenger of Allah SAW. He said: "Remove the remains of food from your teeth, for this is cleanliness, and cleanliness leads to faith, and faith will be with the one who has it in Paradise." (HR. At-Tabrani).

The hadith explains that the Prophet SAW encouraged his people to clean the remnants of food on their teeth. By brushing the teeth, it is expected to remove

¹⁴ Wahyu Margi Sidoretno And Azlaini Yus Nasution, "Analisis Fisikokimia Pasta Gigi Yang Mengandung Kalsium Berasal Dari Tulang Ikan Patin (*Pangasius Hypophthalmus*)" 12, No. 2 (2020).

¹⁵ Sunilkumar Rath Et Al., "Abrasive Of Dentrifices: An Update," *Srm Journal Of Research In Dental Sciences* 7, No. 2 (2016): 96, <https://doi.org/10.4103/0976-433x.182662>.

food debris and dirt in the teeth and mouth. If the teeth and mouth are clean, it will be close to faith.

1.2. Research Problems

The formulation of the problem in this study is:

1. What is the physical quality of herbal toothpaste preparations of eggshell and coconut shell charcoal (*Cocos nucifera L.*) as a prevention of tooth discoloration in various formulations in terms of organoleptic, homogeneity, pH, spreadability, and stability?
2. What is the effectiveness of eggshell and coconut shell charcoal (*Cocos nucifera L.*) herbal toothpaste as a tooth discoloration preventative?

1.3. Research Objectives

The purpose of this research is:

1. Knowing the physical quality of herbal toothpaste preparations of eggshell and coconut shell charcoal (*Cocos nucifera L.*) as prevention of tooth discoloration in various formulations in terms of organoleptic, homogeneity, pH, spreadability and stability of the preparation.
2. To determine the effectiveness of eggshell herbal toothpaste and coconut shell charcoal (*Cocos nucifera L.*) as tooth discoloration prevention.

1.4. Research Benefits

1. Theoretical Benefits

The results of this study can be used as reference material for further research on calcium carbonate substitutes in eggshell-based toothpaste preparations and the use of coconut shell charcoal as a natural tooth-whitening agent.

2. Practical Benefits

The results of this study are expected to increase the treasury of scientific knowledge and increase insight for readers to utilize waste that can be utilized for

health, hygiene, and industry interests in making environmentally friendly products. This research can open up opportunities for innovation in the dental health industry and can attract market interest which is increasingly aware of the importance of natural and sustainable products.

1.5. Authenticity Research

Research on eggshell herbal toothpaste and coconut shell charcoal (*Cocos nucifera L.*) has been conducted by several researchers as shown in table 1 below.

Table 1. Authenticity of Research

Research Title	Research Methods	Variable	Results	Research Differences
Formulation of Toothpaste Preparations with Coconut Shell Activated Charcoal (<i>Cocos nucifera L.</i>) as a Teeth Whitener ¹⁶	Laboratory experiment	Dependent : The activity of activated charcoal as a tooth whitener Independent : Variations of coconut shell activated charcoal (<i>Cocos nucifera L.</i>) toothpaste formulations	Able to provide discoloration of teeth. Statistical tests on coconut shell-activated charcoal toothpaste preparations show that they have significant differences in activity as a natural tooth-whitening ingredient	Dependent : Eggshell natural abrasive and the effect of reducing tooth discoloration Independent : Variation of toothpaste preparation formulations of egg shell and coconut shell charcoal combination
Physicochemical Analysis of Ggi Paste	Laboratory experiment	Dependent: Catfish flour (<i>Pangasius</i>	Catfish bone meal (<i>Pangasius hypophthalmus</i>) can be	Dependent: eggshells can be used as a

¹⁶ Febrianti, Nawangsari, And Silvia F, "Formulasi Sediaan Pasta Gigi Dengan Arang Aktif Tempurung Kelapa (*Cocos Nucifera L.*) Sebagai Pemutih Gigi."

Research Title	Research Methods	Variable	Results	Research Differences
Containing Calcium Derived from Patin Fish Bone (<i>Pangasius Hypophthalmus</i>) ¹⁷		<i>Hypophthalmus</i>) can be used as a substitute for calcium carbonate. (CaCO ₃)	formulated as a toothpaste preparation and can be used as a natural calcium source	substitute for calcium carbonate (CaCO ₃)
		Independent: Variation of toothpaste formulations of catfish bone meal preparation (<i>Pangasius Hypophthalmus</i>)		Independent: Variation of toothpaste dosage formulations with eggshells as natural abrasives

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¹⁷ Sidoretno And Nasution, "Analisis Fisikokimia Pasta Gigi Yang Mengandung Kalsium Berasal Dari Tulang Ikan Patin (*Pangasius Hypophthalmus*)."