Republic of Iraq
Ministry of Higher Education
and Scientific Research
University of Mosul
College of Dentistry

Teeth Whitening by Neutral Products

A Project Submitted to
The College of Dentistry, University of Mosul, Department of Pedodontic, Orthodontic and Preventive Dentistry in Partial Fulfillment for the Bachelor of Dental Surgery

By
Rahma Raad Adriei

Supervised by:
Aisha Akram Qasim
Professor

February, 2025

Certification of the Supervisor

I certify that this project entitled "… Teeth whitening by Neutral Products …" was prepared by the fifth-year student .. Rahma Raad Adriei … under my supervision at the College of Dentistry/University of Mosul in partial fulfillment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervisor’s name: Prof. Aisha Akram Qasim

Date : 17 \ 2 \ 2025

Dedication

Special appreciation to those whom I love my family for sharing me this lovely, difficult days and supporting me to have Bachelor's Degree.

Rahma

Acknowledgements

First of all, thanks to "ALLAH" for giving me the patience, willingness and power to complete my study in spite of all hardships I faced during the review projects work. Deep thanks to dental deanship, University of Mosul for their help and support to the students.

I am incredibly grateful to the Pedodontic, orthodontic and preventive dentistry departments for the help and support to the students.

I am heartily thankful to my supervisor Prof. Aisha Akram Qasim for her understanding, supervision, follow up, clinical guidance, encouragement, and support in all work from the beginning till I finished my review projects.

I am extremely grateful to my parents for their love, prayers, caring and sacrifices for educating and preparing me for my future. My Special thanks goes to my friend and brother in for the keen interest shown to complete this thesis successfully.

Rahma

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Abbreviations	***WORD***
CP	Carbamide peroxide
HP	Hydrogen peroxide
et al.,	and others
pH	Potential of Hydrogen
OTC	Over-the-counter
%	Percentage
C14H6O8	Ellagic acid
OH	Hydroxyl group
H2O2	Hydrogen peroxide
B6	Pyridoxine
etc.	And other similar things

INTRODUCTION

Tooth discoloration can be divided into intrinsic and extrinsic. It is can be due to many factors. Extrinsic staining can be attributed to environmental factors. Common ingredients like substances from tea and coffee, as well as antibiotics like tetracycline, or food dyes, can percolate into the teeth, and, as such, these stains may persist in the porous structure of the enamel. Smoking is also contributory to dental discoloration, with toxins of tobacco smoke accumulating in a similar way (Gousalya *et al.*, 2023). Intrinsic staining occurs in early childhood or at birth and cannot be removed through prophylactic stain removal. It is due to age, teeth tend to be discolored with accumulation of various stains in addition to the enamel gradually eroding to expose the yellow dentin (Benahmed *et al.*, 2022), genetics, post-traumatic formation abnormalities, fluorosis, and systemic diseases such as hepatitis (Malcangi *et al.*, 2023). Certain antihistamines, antipsychotics, and high blood pressure medications may cause the teeth to become darker. Cancer treatments may also have this effect. In addition, children exposed to certain antibiotics at a young age may experience tooth discoloration as adults (Wang *et al.*, 2023).

Healthy, white, clean teeth can help enhance life, increase self-confidence, and decrease complaints. This depends on two factors; maintaining oral health through various methods, like tooth brushing and flossing, and using cosmetic treatments to whiten teeth. The safest and most efficient technique to whiten teeth is tooth bleaching. Today's procedures for whitening teeth at home use trays and have low amounts of carbamide or hydrogen peroxide. In contrast, dental professionals put high concentrations of carbamide peroxide or hydrogen peroxide during in-office bleaching methods. Despite the positive color change, peroxide-based whitening has been linked to adverse side effects, including demineralization, erosion, and

tooth sensitivity (Alsabeel and Qasim, 2024). Therefore, tooth bleaching with natural ingredients would be a safe and effective aesthetic procedure to treat subjects with discolored teeth. The natural ingredients listed are known to help whiten teeth more safely than hydrogen peroxide or hydroxyl carbamide alone. Herbal medicines are finding their more and more usefulness in the arena of dentistry (Benahmed *et al.*, 2022).

AIMS OF THE STUDY

The purpose of this review is to outline how to use natural compounds to replace professional tooth whiteners even if without peroxide derived compounds. Also, to reviewing various most common plants, food and drinks whiten teeth. Thus, showing that nature-derived compounds may be endowed with higher safety, respect other approaches, so they should be further investigated.

CHAPTER ONE

REVIEW OF LITERATURE

1.1 Dental Discoloration

Dental discoloration is an alteration of the natural tooth color. It is a common clinical and esthetic problem that has a significant impact on psychological status, social interaction, and wellbeing because it is esthetically displeasing, psychologically traumatizing, and socially unacceptable. The demand for conservative cosmetic dentistry has grown dramatically over the past three decades due to the growing public interest in having whiter, brighter teeth (Hattab, 2024).

1.1.2 Mechanism of Teeth Discoloration

The intrinsic color of a tooth depends on how light is scattered and absorbed on the surface and within the tooth structures. Enamel does not completely cover the color of the underlying dentine, which therefore plays an important role in determining tooth color. It also has a certain porosity that makes it penetrable to particles capable of changing the color of the enamel and dentine itself. Extrinsic discoloration, on the other hand, is due to environmental factors such as smoke, food pigments, amalgam, endodontic cement, and restorations: colored composites can be absorbed in the acquired film or on the tooth surface, resulting in pigmentation (Halabi *et al*., 2020).

1.1.3 Prevention of Teeth Discoloration

While person can’t prevent deep dental stains due to trauma, medications or health conditions, there are things can do to reduce risk of everyday surface discoloration as:

- ❖ Brush teeth two to three times a day using a soft-bristled brush and fluoride toothpaste.
- ❖ Floss between teeth once a day and rinse with mouthwash.
- ❖ Limit foods and drinks that stain teeth, like tea, coffee, cola and red wine.
- ❖ Drink lots of water and rinse mouth after drinking beverages that could cause tooth discoloration.
- ❖ Quit smoking and tobacco use.
- ❖ Schedule regular appointments with dental hygienist for check-ups and dental cleanings (Benahmed *et al.*, 2022).

1.1.4 Treatment of Teeth Discoloration

A simple scale and pumice paste polishing are often sufficient to remove the extrinsic stain. Removing black stains attached to grooved or pitted surfaces can frequently be very challenging. If stains are difficult to remove, a tissue can "blot" out the extra moisture from the pumice and tooth dried to concentrate and further benefit from its abrasives (Janjua *et al.*, 2022).

Enamel micro-abrasion technique associated with dental bleaching is an excellentand successful clinical technique for re-establishing esthetics of severe case, Macro abrasions, Veneering, Placement of porcelain crown and Bleaching: Bleaching is now the single most common esthetic treatment for adults (Kansal *et al.*, 2020).

Vital dental bleaching is a method that yields prompt results and raises the patient's self-confidence and appearance (Maran *et al.*, 2019). Dental bleaching under a dentist's supervision comes in two different forms: at-home and in-office bleaching protocols. Despite the fact that at-home

bleaching is the most popular method, some patients prefer quicker results, so an in-office procedure is preferable (Rezende *et al.*, 2019).

Modern bleaching systems are based on peroxides, namely hydrogen peroxide (HP) and carbamide peroxide (CP), that can be applied to or within the tooth (Malcangi *et al.*, 2023). Oxygen penetrates the dental tissues and breaks up the large pigment molecules, making them shorter and uncolored, also resulting in desaturation of the yellow shade. However, the treatment is not recommended for children under the age of 14 and for pregnant or lactating women. After treatment, one should avoid food, colored drinks, and smoking for at least 24 h (Farronato *et al.*, 2020). Nowadays, common concerns of patients relate to discoloration. Patients request a dental visit precisely because they are dissatisfied with their teeth color are therefore more interested in dental aesthetics. It is known how this problem has an impact on the patient's social life, affecting their self-esteem and behaviors such as laughing, talking, and showing teeth without embarrassment (Pereira *et al*., 2022). The treatment option for this type of problem is tooth bleaching. The dentist or hygienist during patient history must identify all patients who are contraindicated to dental bleaching treatment. The principal contraindications of bleaching are prosthetic rehabilitation, pregnancy, diabetes, respiratory disease, photo-reactive drugs, and allergy to peroxides (Malcangi *et al.*, 2023). On the other hand, the chemical belching products may increases gingival inflammation, changes in the enamel microhardness and increasing surface roughness and exhibits damage the dentin–pulp complex causing pain and shows a cytotoxic effect on the oral mucosa (Martins *et al.*, 2018) and tooth bleaching also has been associated with bone inflammation and resorption processes (Bersezio *et al.*, 2019).

Therefore, any attempt to achieve more efficient tooth bleaching with less or no deleterious effect on the enamel, pulp, and oral mucosa with no

contraindications is desirable (Moldovan *et al.,* 2019). For this reason some natural alternatives to peroxide bleaching have been mentioned as being capable of producing an oxidative reaction and having stain removal effects, without deleterious outcome.

1.2 Natural Teeth Whitening:

Chemically synthesized dental bleachers might have side effects if are wrongfully used. Under these circumstances, more emphasis has been recently put on the assurance of their stability for the human body. There has been mounting interest in alternative whitening using vegetables and fruits as sources of natural dental bleachers. As a result, the assurance of their stability for the human body has recently become important and more interest arises in the alternative whitening using vegetables or fruits as natural dental bleachers (Jung-Hyun Lee and Sung-Suk Bae, 2016).

Many of these teeth whitening methods are much less invasive than professional teeth whitening. Moreover, these are also a lot cheaper than professional teeth whitening services. On the downside, these solutions are unlikely to produce stunning results the first time. These methods will only be effective for removing surface stains, not for removing deep-set stains. Repeated applications are required to achieve the maximum effect (Fiorillo *et al.,* 2019).

Extracts of numerous natural ingredients such as vegetables and fruits such as apple, banana, carrot, lemon, orange, papaya, and strawberry, ect., as well as other substances such as baking soda and activated charcoal are formulated as toothpaste, mouthwash, gel and powder and tested for their efficacy as natural teeth whitening agents (Pirwani *et al.*, 2023).

1.2.1 Advantages of Natural Teeth Whitening Agents (Pirwani *et al.*, 2023).

1) Easily available.
2) Cost effective.
3) Biologically safe.
4) Reduced enamel erosion.

1.2.2 Natural Teeth Whitening Agents

1.2.2.1 Vegetable-Derived Enzymes

Natural compounds, such as enzymes, have been listed as alternative whitening agents. Vegetable-derived enzymes, for example, polyphenol peroxidase, catalase, superoxide dismutase, bromelain, papain and cysteine proteases of natural origin have recently been tested as whitening gels. Cysteine proteases chemically break down proteins by cleaving peptide bonds and thus may represent a possible alternative for whitening teeth. The cleavage of peptide bonds changes the light reflection, which leads to a lighter appearance. Thus, the application of bromelain seems to be an interesting approach for over-the-counter (OTC) teeth-whitening and differs from existing whitening ingredients, since the primary mechanism of action is not an oxidation (Müller-Heupt *et al*., 2023).

Münchow *et al.* (2016) study has evaluated papain and bromelain as dental whitening agents; however, they showed a lower stain removal effect when compared to the carbamide peroxide. This result could be explained because, in that study, the enzymes used were obtained by soy proteases, different from the present study where the enzymes were extracted from the plant itself, ensuring high purity. Additionally, in this study, the pH of the whitening gels was adjusted to ensure the optimum media for maximal enzyme activity (Sarkar *et al.*, 2017).

Another study (Soares *et al.*, 2019) has shown that enzymatic activation with peroxidase improves biocompatibility and aesthetic efficiency of peroxide-based gels.

More recent study showed that the non-peroxide bromelain and ficin gels were effective in dental bleaching, being similar to the carbamide peroxide-based gel. Moreover, the use of bromelain and ficin-based tooth-whitening gels resulted in less enamel damage than carbamide peroxide. These enzymes showed promising results, representing significant clinical potential as active ingredients of peroxide-free whitening products (Ribeiro *et al.*, 2020).

1.3 Most Common Foods, Drinks and Plants that Naturally Whiten Teeth

1.3.1 Baking Soda

One of the most natural teeth-whitening solutions is to use a pinch of sodium bicarbonate or baking soda while brushing one's teeth with regular teeth-whitening toothpaste. Baking soda causes whitening through an abrasive mechanism and acid-buffering function, causing lightening of acid-based food stains. Baking soda has also been used as an abrasive in various dentifrices. Because of its low abrasive potential, and it is less damaging to the teeth (Li, 2017). Abidia *et al.* (2023) concluded that activated baking soda showed significant whitening effects.

1.3.2 Charcoal

Charcoal is a natural products that have been used as whitening home remedies. Despite the visible changes in color observed with the use of activated charcoal, evidence supporting its use is limited (Benahmed *et al*., 2022). The ions in activated charcoal are reported to attach to enamel to remove chromogens, thereby removing stains from teeth. It is also thought

to lighten the tooth through mild abrasion of the enamel. Activated charcoal is one of the most commonly used agents and is also added to different toothpastes. It functions by attaching to the tooth surface and binding to coloring agents or stains. Thus, upon removal, it removes the stains and causes mild abrasion, resulting in whitening (Ghajari *et al.*, 2021).

Figure (1.1): Charcoal (Natural Medicines website, 2020).

Activated charcoal is one of the most popular and appealing products. It is being commercialized as an oral hygiene product due to its adsorption capacity for pigments responsible for tooth color change. Although manufacturers assure whitening, remineralization, and antimicrobial activity, there is insufficient scientific evidence to support these promises (Maciel *et al.*, 2022).

1.3.3 Strawberries

Strawberries (Fragaria x ananassa) are a potential strawberry juice. fruit plant because this fruit contains many phytochemical ingredients, especially phenolic compounds such as flavonoids, alkaloids, tannins, and saponins which are beneficial for health. Apart from that, strawberries also contain vitamin C. anthocyanin, the marker compound quercetin, fiber, potassium, folate, low calories, ellagic acid, and malic acid (Tanjung *et al.*, 2023).

Strawberries have long been known for its many benefits, including whitening tooth enamel, and preventing the formation of plaque. Apart from that, this fruit has been identified as an effective natural ingredient for whitening teeth. This plant contains a significant amount of malic acid. Malic acid is a group of carboxylic acids that have the ability to whiten teeth by oxidizing and neutralizing the surface of tooth enamel to produce a whitening effect (Junior *et al*., 2018; Radhakrishnan *et al*., 2021). However, it's acidic nature may result in enamel erosion hence, this property of strawberry should be minimized to accepted value for safer use (Pirwani *et al.,* 2023).

Kim, (2020) study concluded that the common natural method for whitening teeth is using a paste of strawberry pulp. Thus, Dewiyani *et al.,* (2023) explained that there are natural ingredients from strawberries as a natural teeth whitener because strawberries contain pectin (natural fiber) which helps clean teeth themselves and strawberries are fruits that are rich in phytochemicals such as ellagic acid, malic acid, anthocyanins, quercetin, catechins and vitamins such as ascorbic acid and folic acid. Ellagic acid has a potential OH group which acts as a strong oxidizer. So, the more ellagic acid, the more OH groups produced and the more effective the bleaching process.

1.3.4 Apple and Apple Cider Vinegar

Another natural method that some people swear by is apple cider vinegar. This method is also not recommended as the PH level of the vinegar will soften the enamel of teeth and cause it to wash away.

Apples contain hydrogen peroxide and ellagic acid (C14H6O8), has potential OH clusters. These clusters act as powerful oxidizer. The H2O2 help in process of metabolism. These processes together help in whitening of teeth. The higher the concentration of bleaching chemicals, the greater

the degree of whitening obtained, because the quantity of free radicals combines with the teeth coloring agent and produces a greater amount of smaller and lighter organic molecules (Vilhena *et al.*, 2022).

Figure (1.2): Apple cider vinegar (Natural Medicines website, 2020).

Research conducted by Rosidah (2017) which found that there was an increase in tooth color after immersion in apple juice. This tooth discoloration is due to the fact that apples contain malic acid.

1.3.5 Green Pear

The acid content in Pyrus communis is malic acid, citric acid, oxalic acid, shikimic acid, fumaric acid, tartaric acid and lactic acid. The malic acid and oxalic acid found in green pears (Pyrus communis) are natural ingredients that can remove stains on the surface of the teeth and can whiten teeth (Dianasari *et al*., 2019).

Figure (1.3): Green pears (Natural Medicines website, 2020).

According to research conducted by Utami *et al.* (2016), green pears contain hydrogen peroxide, 100 mg of pear tissue contains about 2 grams of hydrogen peroxide when ripening begins. Tooth discoloration can be

affected by the duration of application of pear juice on the teeth. Fruit juice pears can whiten teeth on application for 7 days and increase on application for 14 days.

1.3.6 Turmeric (Curcumin)

Curcumin is the most bioactive component of turmeric. Turmeric is anti-inflammatory, antibacterial, and anticancer properties, along with its multiple therapeutic uses, could be utilized to address a wide variety of illnesses, not just within dentistry, as well as in general oral health (Umapathy *et al.*, 2022).

It is a popular natural teeth whitener, and it is believed to stand out for its oral healthcare benefits. However, there is little evidence that turmeric is effective for oral health care or for whitening the teeth.

Figure (1.4): Turmeric (Natural Medicines website, 2020).

While many people swear by the effectiveness of turmeric for teeth whitening, the scientific evidence supporting this claim is limited as Maciel *et al.* (2022) which showed that turmeric has low abrasive agent with lower enamel surface roughness alteration, which can be justified by the presence of essential oils on the turmeric composition. When rubbed, turmeric releases its oils, decreasing the abrasiveness, resulting in lower surface roughness. Pigmented solutions such as coffee and tea with high polarity leach out, causing color change through the pigmentation of enamel chromophores. Since turmeric is non-polar, there is no leaching, resulting

in a lower penetration capacity. Therefore, when brushing for a longer period, equivalent to 30 days, the turmeric abrasiveness could remove the initial staining.

1.3.7 Banana Peel

Banana peel contains organic and inorganic substances. Mineral and phytochemical components are among the many ingredients found in banana peel. Alkaloids, flavonoids, phenols, tannins, and saponins make up the phytochemical component. Saponins are glucosides with foam characteristics that can act as cleansers. Saponins consist of polycyclic aglycones and are bound to one or more sugar chains so that saponins can function as cleansers and whiten teeth (Novitasari *et al*., 2019). While the mineral content as calcium, phosphorus, potassium, sodium, manganese, and iron content in bananas are also quite high (Yudhit and WidiPrasetia, 2019). In addition, the most abundant content in banana peels is water, and vitamin C. These ingredients are very useful for the body, especially teeth (Novitasari *et al*., 2019). It is contains also acts as an excellent biosorbent. These contents and its ability to act as a biosorbent makes banana peel a good source of natural teeth whitening agent (Yudhit, and WidiPrasetia, 2019).

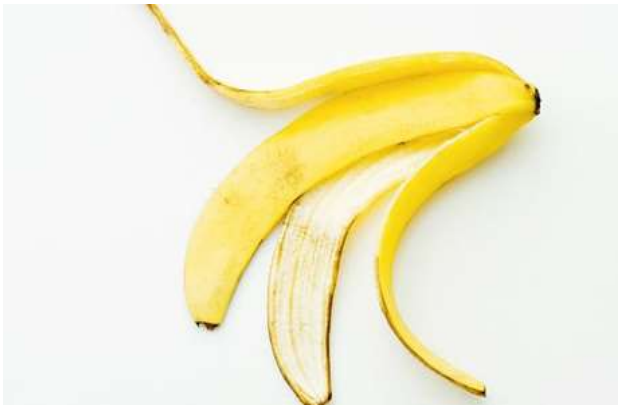

Figure (1.5): Banana Peel (Natural Medicines website, 2020).

1.3.8 Celery and Carrot

Celery and carrot have a high fiber content, operate as a mild abrasives, and efficiently brush away surface stain. Carrots carry lots of water, beta-carotene, vitamin A and B6 that can help naturally break down dental calculus due to their propensity to produce more saliva (Kalliath *et al.,* 2018; Pirwani *et al.*, 2023).

Figure (1.6): Celery and Carrot (Natural Medicines website, 2020).

Kalliath *et al.* (2018) also concluded that celery is an alkalizer that, through controlling acid, also encourages a healthy grin. Thus, celery is crunchy food that can help to clean teeth and gums. The fibrous nature of celery helps to massage the gums and remove plaque from teeth. Celery also contains a high amount of water, which helps to rinse away food particles and other debris.

1.8.9 Dairy Products

Dairy products like cheese, milk, yoghurt contain lactic acid which acts as a natural enamel whitener and stimulates the secretion of saliva. Casein, a protein found in milk, has been shown to stop the demineralization of enamel by stabilizing the high concentrations of amorphous calcium phosphate present on tooth surfaces (Kim, 2020).

1.3.10 Dark Chocolate

Dark chocolate contains polyphenols, which are natural compounds that can inhibit oral microorganisms .Theobromine, a bitter substance in dark chocolate, helps to harden the surface of teeth's enamel. They are also capable of preventing some bacteria from converting sugar and starches into acid and neutralize germs that cause bad breath (Pirwani *et al.*, 2023).

1.3.11 Guava

Guava leaves can be used to treat a range of dental conditions, including plaque, infections, and gum swelling. Its flavonoids and phenols eliminate the oxidative stress that various microorganisms generate on the teeth, which is one of the causes of teeth discoloration. Additionally, it has antioxidant, antibacterial, and anti-inflammatory properties (Ravi *and* Divyashree, 2014).

Figure (1.7): Guava (Natural Medicines website, 2020).

1.3.12 Lemon

Lemons contains malic acid, 5% citric acid, ascorbic acid (vitamin C), magnesium, potassium, calcium, gluaric acid, and polyphenols, which can be used to whiten teeth. Malic acid belongs to a class of carboxylic acids that can whiten teeth by oxidizing the surface of the tooth enamel. This chemical can enter the dentin and break the double bonds of organic and

inorganic molecules in the dentinal tubules, releasing free oxygen (El-Bishbishy, 2021). Thus, the acidity of lemons is at a pH of 2-3 which is very acidic and is below the critical pH of enamel (pH 5.5). This acidic nature causes demineralization, resulting in whiter teeth (Octarina and Aprilianti, 2018).

According to Puspasari *et al.* (2012), apple cider has the ability to whiten the surface of tooth enamel that changes color due to immersion in coffee solution carried out in vitro. Soaking teeth with 75% apple cider is able to restore the color of the blackened tooth enamel surface back to its original color as before soaking in coffee solution.

1.3.13 Orange Peel

Citrus is one of the horticultural plants contains 40 mg of calcium which beneficial to bones and teeth. Orange peel) (Citrus reticulate) contains like Tangeraxanthin, Tangeritin, Terpinen-4-ol, Terpinolene, Tetradecanal, Threonine, Thymol, Thyme-methyl-ether, Tryptophan, Tyrosine, Cis-3-hexenol, Cis-carveol, Citric-acid, Citronellal ‹Citronellic-acid, Citronellyl-acetate, Cystine, Decanal, Decanoic-acid, Decanol, Nobiletin (Pirwani *et al.*, 2023).

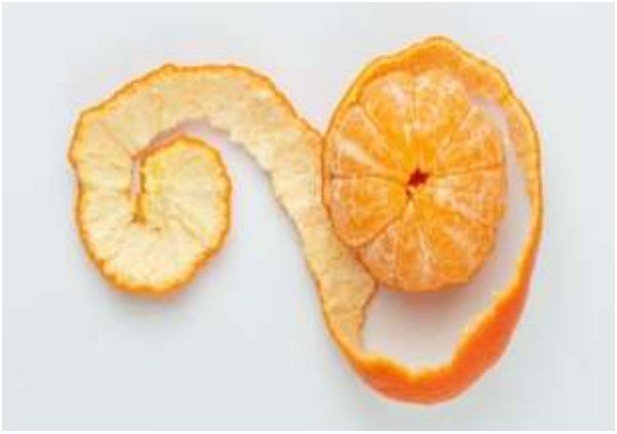

Figure (1.8): Orange Peel (Natural Medicines website, 2020).

Citrus fruit contains a molecule called citric acid, which is known for its capacity to whiten teeth that are discolored. This is due to the presence

of an OH group in its chemical makeup. It also possesses anti-bacterial, anti-fungi, emulsion stabilizer and anti-inflammation on gum activity (Pratiwi *et al.*, 2017).

1.3.14 Papaya

Papaya contains enzymes bromelain and papain. Since both papain and bromelain are proteases, they have the ability to break down large molecules that cause stains and increase the amount of light that reflects off the surface of the tooth, producing a whitening effect (Münchow *et al.*, 2016).

Figure (1.9): Papaya(Natural Medicines website, 2020).

Researches by Kalyana *et al.* (2011) and Choudhary *et al.*(2020) *in vitro* and Alali *et al.* (2020) clinically have shown Pineapple and Papaya extract when used as a bleaching agent resulted in significant color change on stained enamel. Also, the effectiveness of toothpaste containing papain enzymes in removing stains on teeth.

1.3.15 Rosella

Rosella (Hibiscussabdariffa) contains anthocyanins, ascorbic acid, salicylic extract, cardiac glycosides, flavonoids, saponins, alkaloids, cardenolide and anthocyanins. Rosella flower petals are also known to contain important substances that the body needs, such as vitamin C,

vitamin A, essential proteins, calcium and 18 amino acids including arginine and lignin which are beneficial for the rejuvenation of body cells (Sugianti, 2012). Rosella (Hibiscussabdariffa) is a bioactive compound where the foam produced by saponins can bind stains and the substance has the capacity to bind dyes so that it can be used to whiten teeth. In addition, high Vitamin C is thought to help the dental bleaching process (Amelia *et al.*, 2022).

Figure (1.10): Rosella (Natural Medicines website, 2020).

Amelia (2022) conducted the study having aim to determine the effect of rosella extract (hibiscussabdariffa) as an alternative to natural teeth whitening agents. Rosella is a type of plant that contains saponin bioactive compounds which are foams that can bind coloring. Rosella can be used for whitening teeth because it has the ability to bind stains on the tooth surface.

1.3.16 Salvadora Persica

The cortex of Salvadora persica, namely miswak, demonstrates the whitening effects on extracted stained teeth. Miswak has a long history of oral hygiene and tooth whitening in Asian countries. Traditional use of S. persica as an antimicrobial toothbrush stick for oral hygiene and to treat gum inflammation is a part of the Greeko-Arab medical system and is a centuries-old practice. Eucalyptus globulus, Rosmarinus officinalis, and Monarda fistulosa essential oils can also enhance oral health by acting as

an antimicrobial agent, helping to reduce the microbial load and keeping the mouth fresh (Benahmed *et al*., 2022).

Figure (1.11): Salvadora Persica (Natural Medicines website, 2020).

1.3.17 Nuts and Seeds

For many people, nuts and seeds are an essential part of a balanced diet. In addition to providing a range of health benefits, nuts and seeds can also help in the fight against discolored teeth. Not only do nuts and seeds offer tooth-strengthening calcium, but certain nuts and seeds, such as almonds, walnuts and sesame, can actually “scrub” away plaque from your teeth, buffing off stains and discolouration to make your teeth look whiter (Balakrishna *et al.*, 2022).

Figure (1.12): Nuts and Seeds (Natural Medicines website, 2020).

1.3.18 Other Fruit Extracts

Jung-Hyun Lee and Sung-Suk Bae (2016) study found that natural fruit extracts of citron, grapefruit, and plum had teeth-whitening effect. This may have important implication for the development of natural dental bleachers. Kiwifruit contains actinidin which removes surface stains on enamel (Kalliath *et al.*, 2018).

Figure (1.13): Citron, Grapefruit, and Plum (Natural Medicines website, 2020).

Also, watermelons may have the secret to teeth whitening. Watermelons contain a high concentration of malic acid compared to apples and strawberries, which helps increase saliva production. Saliva is known to be very effective at reducing the appearance of discolored enamel and can help reduce plaque build-up on your teeth over time (Setyawati and Nur, 2020).

Figure (1.14): Watermelons (Natural Medicines website, 2020).

CHAPTER TWO

DISCUSSION

2.1 Discussion

Patients are increasingly expecting more from dental aesthetics and spend a lot of money on oral hygiene products such as toothbrushes, toothpaste, mouth rinses, and so on. People who have their teeth whitened feel more socially accepted and satisfied with their appearance (Maciel *et al.*, 2022).

The study on teeth whitening using neutral products highlights the growing interest in safe and effective esthetic dental treatments. Traditional whitening agents, like hydrogen peroxide and carbamide peroxide, can pose risks such as tooth sensitivity and soft tissue irritation. Neutral products, such as sodium bicarbonate or calcium carbonate-based formulations, present an alternative that may significantly reduce these adverse effects while still delivering satisfactory results (Benahmed *et al.*, 2021).

Reguzzoni (2025) indicates that neutral products may enhance enamel surface properties and reduce the risk of demineralization, making them appealing for patients with sensitivity issues also shows that neutral products may have a slower onset of action, they yield desirable outcomes over a more extended period without the associated risks typical of stronger bleaching agents.

One significant finding is the patient satisfaction associated with the use of neutral products, as they tend to prefer methods that minimize discomfort while still offering noticeable results. The dual benefit of whitening and protecting enamel strengthens the case for integrating these alternatives into standard dental practices (Tadin *et al.*, 2023).

However, as chemical whitening agents have a detrimental effect on tooth enamel, individuals are now promoting and using natural teeth

whitening products since natural herbal teeth whitening products perform as well to chemical bleach, they have more advantages in terms of improving oral health, reduction of enamel erosion while bleaching, cost and safety, given that they are non-toxic, inexpensive, and readily available, natural products have been in demand for use in delivering bioactive compounds (Pirwani *et al.*, 2023).

Natural substances are becoming more popular or being used more frequently. Many natural products or substances are discarded because they are deemed to be waste. There are various natural ingredients that are used as teeth whitening agents, however many of these items have not been investigated for the purpose. Therefore, more study is required to comprehend the diverse activities of natural compounds.

CHAPTER THREE

CONCLUSIONS AND SUGGESTIONS

3.1 Conclusions

People are increasingly expecting more from dental aesthetics and person who have their teeth whitened feel more socially accepted and satisfied with their appearance. Natural teeth whitening excipients improve oral health and reduce enamel erosion while bleaching. Popular bleaching products containing agents such as hydrogen peroxide increased the surface roughness of the enamel and decreased the microhardness of the enamel over time. As a result, the current review confirms that teeth whitening using neutral products is a viable option that balances effectiveness with safety, cost-effective and safe alternatives that produce significant results. The gradual but consistent improvement in tooth shade and the minimization of side effects position these neutral agents as a beneficial choice in cosmetic dentistry. As more consumers seek aesthetic improvements without compromising dental health, the demand for such products is likely to increase.

3.2 Suggestions

1. Farther studies and review papers on efficacy of other types of Foods, Drinks and herbal should be carried out in developing countries to establish their therapeutic benefits either alone or in combination with conventional therapies.
2. New medical professionals must be able to assimilate popular knowledge about natural products, update it, and place it in the arsenal of modern medicine for the general benefit of society.
3. Further studies should explore long-term effects and effectiveness of various neutral whitening agents to establish comprehensive guidelines for usage.
4. Dentists should consider incorporating neutral products into their practice, particularly for patients with a history of sensitivity or those seeking a more gentle approach to whitening.
5. Educational initiatives are necessary to inform patients about the benefits and limitations of neutral whitening products, promoting informed choices.

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