
REVIEW ON FORMULATION AND EVALUATION OF CLOVE TOOTHPASTE

Ms. Rutuja Prashant Gahiwad¹, Ms. Apsara Rajjak Shaikh², Ms. Ankita Anil Mahajan³,
Mr. Nazeer Ahmed⁴, Dr. Swapnil Dilip Deo⁵, Mr. Mohammad Awais⁶, Mr. Saeed Ahmad⁷

^{1,2,3}Student, Dr. Uttamrao Mahajan College Of B Pharmacy, India.

^{4,5,6,7}Guide, Dr. Uttamrao Mahajan College Of B Pharmacy, India.

ABSTRACT

Clove are the fragrant flowers of the lilac tree, which belongs to the Myrtle family. They are native to Indonesia's Maluku Islands (or Moluccas) and are often used as a spice. Since different countries have different harvest seasons, cloves are available all year round. Cloves are used as antioxidants that help prevent cancer, kill bacteria, aid heart health, control blood sugar, and help with many other health problems. Lilac tree is an evergreen tree that can reach a height of 81 eaves and 12 meters and has large dark pink flowers in clusters. Clove contains 72 to 90% essential oil extract called eugenol. Clove is an essential oil. Zanzibar and Pemba are currently the world's largest producers of cloves. Clove has anti-inflammatory properties that reduce gingivitis. Clove strengthens healthy gums by stimulating circulation and protects teeth from acid attacks by adding essential minerals to tooth enamel. Lilac Toothpaste is made from high quality, scientifically proven ingredients. Studies have shown that clove essential oil and eugenol have strong preventive effects on various foodborne diseases, and their mechanisms are associated with reducing migration and adhesion, preventing biofilm formation and various virulence factors. This review highlights the importance of CEO (clove essential oil) in the food industry and how coatings can be used to investigate their use in food preservation.

Key Word: syzygium aromaticum, spice, volatile, Antioxidant, Laung.

1. INTRODUCTION

Cloves are used in Ayurveda. It is often called "lavang". Clove (*Syzygium aromaticum*) is an important spice belonging to the Myrtaceae family. Cloves are often used in food preparation. Clove oil has antibacterial, antifungal, antiviral, anti-inflammatory and antioxidant properties [1]. *Syzygium* is the largest genus of the family Myrtaceae, containing approximately 1200 to 1800 species of flowers. It is widely distributed in tropical and subtropical regions of Asia, Africa, Madagascar, and Pacific and fluvial marine areas [2, 3]. Eugenol, the most important component of clove oil, is recognized as a food product by China, the United States, the European Union and other countries and regions [4]. Clove is most typically used directly to the gums for toothaches, pain relief during dental work, and other concerns; however, there is a scarcity of scientific evidence to back up these and other claims. Clove is used as a flavor in foods and beverages. Clove is used in toothpaste, soaps, cosmetics, fragrances, and cigarettes manufacture. Clove cigarettes (also known as kreteks) typically include 60 to 80 percent tobacco and 20 to 40 percent gramina [5].

2. PHARMACOLOGICAL ACTIVITIES

Antioxidant activity: Antioxidants are essential compounds to treat oxidative stress that causes memory loss. Clove oil reduces oxidative stress by reducing glutathione levels and helps restore memory. The powerful antioxidant activity of clove is comparable to synthetic antioxidants such as BHA (butylated hydroxyanisole) and pyrogallol [6]. Clove oil has inhibitory activity and reduces lipid peroxidation due to the maximum hydrogen release capacity determined by the linoleic acid emulsion system. It has also been shown to inhibit hydroxyl free radicals DPPH (2,2-diphenyl-1-picrylhydrazyl), iron-reducing antioxidant ability, and oxygen radical absorption ability. Deoxyguanosine and xanthine oxidase were also used to determine the antioxidant activity of clove [7].

Antimicrobial activity- Clove oil has proved to be effective against *Staphylococcus* species of bacteria and *Aspergillus niger* species of fungi. Germicidal activities against *S. aureus*, *Pseudomonas aeruginosa*, and *Klebsiella pneumoniae* have been shown by dispensing clove oil in (0.4% v/v) concentrated sugar solution [8]. *E. coli* was used to test the antimicrobial activity of clove oil.

Determination of antifungal activity of clove oil was done by Rana et al. reporting a sensitivity scale of fungi [*Mucor* sp. > *Microsporum gypseum* > *Fusarium moniliforme* NCIM 1100 > *Trichophyton rubrum* > *Aspergillus* sp. > *Fusarium oxysporum* MTCC 284] [9]. Solid lipid nanoparticles containing eugenol were formulated using acrylic triglyceride, stearic acid & poloxamer 188 by modified hot homogenization ultrasonication method. These nanoparticles were characterized and evaluated for in-vivo antifungal activity using oral candidiasis model. Therapeutic efficacy of eugenol increased and modification in the drug release behavior was observed after administration of nanoparticles [10].

Anti-inflammatory activity-The anti-inflammatory substance in clove oil is eugenol. Synergistic effects have been observed in animal studies when clove oil extract was added to other anti-inflammatory medications.

such as cod liver oil. On the other hand, flavonoids such as rhamnetin, kaempferol and β -caryophyllene improve its anti-inflammatory property [11].

Antiviral activity -It was observed that the syringe isolated from clove was effective against herpes at a concentration of 10 μ g/ml. Syringin works by inhibiting bacterial DNA polymerase [12]. Aqueous Extract of *S. aromaticum* (L.) Merr. et Perry and some additional herbs such as *Geum japonicum* Thunb., *Rhus javanica* L., and *Terminalia chebula* Retz have been shown to be effective against herpes simplex type 1 when combined with acyclovir (HSV-1). Operationally, a stronger synergistic effect was found in the brain than in the skin and was found to be non-toxic to mice [13].

Antinociceptive activity-Eugenol is a common antiallergic compound found in grape juice and has been used since the 13th century to treat toothaches, joint pain, and as an antispasmodic. It works by activating calcium and chloride channels in ganglion cells [14]. It also acts as a capsaicin agonist, helping to increase energy levels [15].

3. USES OF CLOVE

Since clove has antibacterial properties, it can be used in toothpastes, mouthwashes, and throat lozenges. It acts as a decongestant, relieving pain in emergency situations, and acts as a carminative by increasing hydrochloric acid in the stomach to improve peristalsis [16]. It also supports rapid healing of cuts and bites. Inhaling clove oil helps clear mucus, relieve colds, coughs and asthma, increases blood flow, helps lower blood sugar in diabetics, and relieves muscle pain. Inhale its aroma to relieve headaches, dizziness and irritability.

Oral diseases are the main causes of dental plaque, tooth decay and gum disease. Although periodontal disease is considered a polymicrobial disease, *Porphyromonas gingivalis* (*P. gingivalis*) is thought to be one of the most important pathogens of chronic periodontal disease. These bacteria cause a transition from commensal microbiota to dysbiotic microbiota [17]. The pathogenesis of periodontitis results from the expression of many of the virulence factors, such as but not limited to cysteine proteases, also known as gingipains, which influence the host protection mechanism and control of side effects and degradation [18]. *Porphyromonas gingivalis* is one of the most common bacteria that causes gingivitis. Clove Toothpaste is believed to have many benefits for oral health. Clove antibacterial properties help kill bad bacteria in the mouth, while its anti-inflammatory properties can help cure gum disease. Clove, on the other hand, is thought to have a numbing effect on teeth and gums [19], effectively reducing tooth sensitivity. In addition to these benefits, Clove Toothpaste may also help freshen breath and support overall oral hygiene. *Acacia arabica* has been used in oral care for centuries. The bark, leaves and bark of the clove tree contain various compounds that have antibacterial, antifungal and anti-inflammatory properties [20]. Clove toothpaste has been shown to be effective in reducing plaque buildup, tooth decay and gum disease. Its antibacterial properties help kill bad bacteria in the mouth and reduce the risk of oral cancer. Clove is also believed to have astringent properties that can help tighten gums and reduce the risk of gum disease [21]. Extract is used in toothpaste formulations, mouthwashes and other oral care products. Some studies have shown that toothpaste containing clove extract is more effective at reducing plaque buildup and gingivitis than toothpaste without clove extract. In addition to its oral care benefits, clove toothpaste is also used in traditional medicine due to its antibacterial and antiviral properties. Toothpaste is basic in nature to counteract acidity in the mouth. Toothpaste is basic in nature because in our mouth there are certain types of acids which can also cause tooth decay so we brush our teeth with the basic nature of toothpaste reacts with the acids present in the mouth and hence it becomes neutral. That is the reason why toothpaste is basic in nature.



Fig 1 .Clove

Vernacular names in indian languages.

Table.1

Languages	Names used
Bengali	Lavanga
Gujarati	Lavang
Hindi	Laung, Laumg, Lavang
Kannada	Lavanga, Daevakusuma, Krambu
Malayalan	Grampu, Karampu, Karayampu
Marathi	Lavang
Oriya	Labanga
Punjabi	Laung
Sanskrit	Bhadrasriya, Devakusuma, Devapuspa, Haricandana, Karampu, Lavanga, Lavangaka,
Tamil	Kirampu, KIraambu, Grambu

Synonyms- Clovos, Caryophyllus, Lavang, Laung, Grambu, Grampus, Krambu.

Biological source- It consist of a dried flower bud of *Eugenia caryophyllus*.

Botanical Classification

Kingdom- Plantae

Sub Kingdom- Tracheobionta

Super Division- Spermatophyta

Division-Magnoliophyta

Class- Magnoliopsida

Subclass- Rosidae

Order-Myrtales

Family- Myrtaceae

Genus- Syzgium

Species- aromaticum

Chemical constituent

Eugenol makes up 72to90% of clove essential oil and is the chemical that gives cloves their aroma. The extraction takes 80 minutes in high water at 125 °C (257 °F) to complete. Ultrasonicassisted and microwaveassisted extraction technologies provide faster extraction rates while using less energy[2]. Potential toxicity such as acetyl eugenol, beta-caryophyllene, vanillin, maslinic acid, tannins such as dianol, gallotannin, methyl salicylate (inflammation), flavonoids such as syringin, kaempferol, rhamnetin and eugenol, pensionoids. oleanolic acid, stigmasterol, campesterol and sesquiterpene eugenol are not yet classified[22].

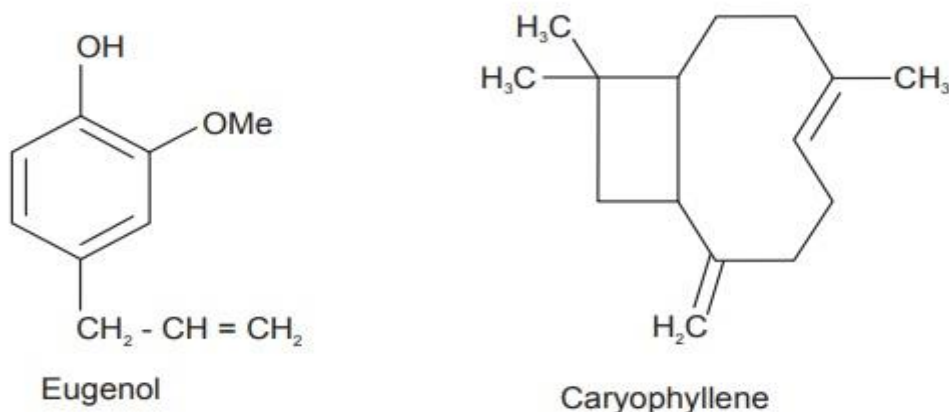


Fig 2.

4. CULTIVATION

Lilac tree is an evergreen tree that reaches 15 to 20 meters in height. For planting, sow the seeds in suitable, well-drained soil, approximately 25 cm apart. Clove growth requires a climate with balanced rainfall, humidity, warmth and consistency. When planting, plants need to be protected from pests and diseases. Initially, the seeds cannot withstand full sun, so they should be protected with a house frame about 1 meter high and covered with banana leaves.

Banana leaves are slowly rotting and the sun is shining on the seedlings. The seeds can withstand sunlight when they are about 9 months old. The frame is then removed and transplanted to a distance of 6 meters at the beginning of the rainy season when the seedlings reach a height of about 1 meter. Plant bananas on shady trees in the first two to three years of young lilacs. Wood can be harvested every year from trees between 6 and 70 years old. 3 to 4 kilos of cloves can be harvested per tree per year. New facilities are added every year for continuity and continuity[23].

5. ADULTERATION

Cloves are often classified as waste cloves, clove fruits, machine cloves, and clove stems. Refined cloves are cloves whose essential oil has been partially or completely removed through distillation. The cloves sent are black in color and can be recognized by their floating appearance in fresh and cold water. Clove fruit is dark brown and contains less oil. These can be identified by the starch in the fruit. Blown Cloves are entirely developed clove flowers from which corolla and stamens get separated. While separation, sometimes the stalks are incompletely removed and the percentage of volatile oil in clove stalk is only 5%. As clove stalks contain prism type of calcium oxalate crystals and thick-walled stone cells which are absent in clove the clove stalk can also be detected[24].

6. APPLICATIONS AND EFFICACY

- Small fissures (anal fissures) are located on the sides of the anus. Preliminary research suggests that using clove oil cream for 6 weeks to treat rectal tears will lead to faster healing than rectal softeners and lidocaine cream.
- There is plaque on the teeth. Using a toothpaste or mouthwash containing ingredients such as cloves may reduce the buildup of plaque on your teeth according to a preliminary study.
- Get a hangover. Taking clove bud extract before drinking alcohol may reduce hangover symptoms in some people, according to a preliminary study.
- Excessive sweating (hyperhidrosis). Applying clove oil to your palms for two weeks may reduce excess sweat, according to preliminary research.
- Mosquito repellent is a product used to kill mosquitoes. Preliminary research shows that clove oil or clove oil gel applied directly to the skin repels mosquitoes for up to 5 hours.
- I can not breathe. Leaving ground clove gel on the skin for 5 minutes before acupuncture may reduce needle discomfort, according to a preliminary study.
- Prediabetes is a type of diabetes in which blood sugar levels are very high, research first. However, since there was no control group in the experiment, the effect of clove on diabetes is unknown.
- It itches. Early research suggests that applying clove oil gel solution to the skin may help reduce itching.
- Toothache is a pain. Clove oil and eugenol (a compound it contains) have long been used to treat tooth decay and gum disease, but the FDA recently classified it as eugenol, reducing its effectiveness. The FDA believes that there is currently insufficient data to approve eugenol for the treatment of dental caries.
- Gingivitis is a mild inflammation of the gums (gingivitis)
- Bad breath is a problem.
- Coughing.
- Diarrhea is a common ailment.
- Socket that is completely dry (alveolar osteitis),
- Natural gas.
- Men's early orgasm.
- Irritability.
- Nausea and vomiting are common side effects.
- Inside the mouth, there is swelling (inflammation) and sores (oral mucositis)
- Other circumstances. [25]
- **Ideal properties of toothpaste:**
- Good abrasive effect
- Non irritant and non toxic
- Impart no stain in tooth
- Keep the mouth fresh and clean

- Prolonged effect
- Cheap and easily available

7. FORMULATION OF CLOVE TOOTHPASTE

Using a home blender, dry all the herbal ingredients and grind them into powder. Measure the required amount of ingredients and put them into the mortar. Calcium is a mineral found in sodium lauryl sulfate, carbonates, methyl water, cellulose, honey and glycerin. The above mixture was supplemented with gum arabic. Add it dropwise into a mortar containing herbal ingredients and grind thoroughly until it reaches a paste consistency[26].

Chemical Composition of Formulation

Table.2

Ingredients	Quantity in (gm)
Clove	2
Calcium Carbonate	20
Glycerine	5
Sodium Lauryl Sulphate	1
Acacia Gum	0.5
Sodium Chloride	0.5
Sodium Saccharin	0.5
Para Hydroxide Benzoic Acid	1
Distilled Water	60-80 ml

Procedure:

- In a Mortar-pestle, 2 gm of clove extract were triturated with 1 gm of para hydroxyl benzoic acid and 0.5 gm of sodium chloride (as a preservative).
- As a foaming agent, 1 gm sodium lauryl sulphate is used, and sodium saccharin is used as a sweetener.
- Glycerine was added as a humectant, and acacia gum was employed as a binder. The mixture was triturated well, and 80 ml of distilled water was added to bring the total weight to 100gm.
- A solution of sodium hydroxide is used to alter the pH. Clove oil is used to mask the bitterness of the taste[26].

8. EVALUATION OF TOOTHPASTE

A. Evaluation:

- **Colour:** Colour of the prepared toothpaste was evaluated for its colour. The colour was checked visually.
- **Odour:** Odour was found by smelling the product.
- **Taste:** Taste was checked manually by tasting the product.

B. Physical characterization test:

a. Determination of Ph:

Put 1 g of toothpaste in a 150 ml beaker and add 10 ml of freshly boiled and cooled water (27°C). Mix well to obtain a complete suspension. Determine the pH of the suspension within 5 minutes using a digital pH meter. The results are stated.

b. Foamability:

Measure the foaming ability of the product by taking a small sample, add water to the graduated cylinder, fill the initial volume, and then shake 10 times. Record the final volume of foam[.

C. Study of rheological properties:

i. Spreadability:

Spreading time refers to how easily the cream spreads to the application area. One of the criteria for a good paste is that it has a good spread. Weigh out approximately 1g of toothpaste and place it in the center of a glass plate (10 x 10cm), then carefully place another glass glass on top. A 1 kg weight is placed in the middle of the board (to prevent the board from slipping). Diameter of the paste in centimeters after 15 minutes.

Spreadability (S) can be calculated by the formula $S = m.l/t$, where S-spreadability. m - weight added to the upper slide. l-long moving glass slide. t - time.

ii. Tube extrudability:

Clear, painted aluminum collapsible oneounce tube with 5 mm nose opening in study design and use finger pressure to tube. The extrudability of the tube is then determined by measuring the amount of paste that comes out of the tip when pressure is applied to the tube paste.

iii. Viscosity:

Paste viscosity measurement was evaluated using a Brookfield digital viscometer (LV D-II Ultras Programmable Remoter, USA) using axis 3 with increasing shear rate to demonstrate the flow behavior of the paste. All viscosity measurements were made at a temperature of 300°C.

9. CONCLUSION

Cloves (cloves) have been shown to have the ability to prevent diseases. Antibiotic resistance of various antibiotics has been shown to be important for all diseases tested. This finding suggests that the activity is due to many botanicals in the extract. The results show that the antibacterial activity of the toothpaste is determined by the presence of active ingredients in the extract and therefore the activity is well controlled when added back into the toothpaste.

Studies show that herbal toothpastes are more effective and accepted in dental research, contain fewer harmful chemicals and are safer than synthetic ones. Antibacterial properties of toothpastes designed to prevent bacteria can be found in toothpastes and oral care products. When the model is compared to the business plan, it becomes clear that it shows the same pride and passion that was shown in the introduction of the model (Colgate, Dabour Red and Dantkanti). The developed toothpaste has a bright future in naturopathic research and public health.

10. REFERENCE

- [1] Milind P. and Deepa k. : Clove: A Champion Spice, Int J. of Res Ayu & Pharm, 2011, 2(1) 47-54.
- [2] Hussain S. , Rahman R. , Mushtaq A. ,[...] : Clove: A Review of a precious with multiple uses: Int J. of Che & Bio Sci, 2017.
- [3] Cock I. E. , Cheesman M. (2018), Plant of the genus syzygium (Myrtaceae): A review on ethnobotany, medicinal properties & Phytochemistry. Bioactive comps. Of Med. Plant. Ed Goyal MR, Ayeleso A Apple Academic Press, USA.
- [4] Hu Q. , Zhou M. , & Wei S. : Progress on the Antimicrobial activity research of clove oil and eugenol in the food antiseptis field :J. Of Food sci, Vol 83, Iss 6, 2018.
- [5] <https://www.webmd.com/vitamins/ai/ingredientmono-251/clove>
- [6] Dorman HJD, Surai D, Deans SG. In vitro antioxidant activity of a number of plant essential oils and Phytoconstituents. Journal of Essential Oil Research, 2000; 12:241-248.
- [7] Dudonné S, Vitrac X, Coutière P, Woillez M, Mérillon JM. Comparative study of antioxidant properties and total phenolic content of 30 plant extracts of industrial interest using DPPH, ABTS, FRAP, SOD, and ORAC assays. J Agric Food Chem. 2009; 57(5):1768-1774.
- [8] Briozzo J, Nunez L, Chirife J, Herszage L, D'Aquino M. Antimicrobial activity of clove oil dispersed in a concentrated sugar solution. J Appl. Bacteriol. 1989; 66(1):6975
- [9] Burt SA, Reinders RD. Antibacterial activity of selected plant essential oils against Escherichia coli O157:H7. Lett Appl Microbiol. 2003; 36(3):162-167
- [10] Garg A, Singh S. Enhancement in antifungal activity of eugenol in immunosuppressed rats through lipid nanocarriers. Colloids Surf B Biointerfaces. 2011; 87(2):280-288.
- [11] Ghelardini C, Galeotti N, Di Cesare Mannelli L, Mazzanti G, Bartolini A. Local anaesthetic activity of β -caryophyllene 11. Farmaco, 2001; 56:387-389
- [12] Chaieb K, Hajlaoui H, Zmantar T, Kahla-Nakbi AB, Rouabhia M, Mahdouani K, et al. The chemical composition and biological activity of clove essential oil, *Eugenia caryophyllata* (*Syzygium aromaticum* L. Myrtaceae): a short review. Phytotherapy research. 2007; 21(6):501-506..
- [13] Kurokawa M, Nagasaka K, Hirabayashi T, Uyama S, Sato H, Kageyama T, et al. Efficacy of traditional herbal medicines in combination with acyclovir against herpes simplex virus type 1 infection in vitro and in vivo. Antiviral Res. 1995; 27(1-2):19-37.
- [14] Healthcare T. PDR for herbal medicines. 4th ed. Montvale: Thomson Healthcare, 2004. 38 International Journal of Botany Studies www.botanyjournals.com
- [15] Ohkubo T, Shibata M. The selective capsaicin antagonist capsazepine abolishes the antinociceptive action of eugenol and guaiacol. J Dent Res. 1997; 76(4):848-851.

-
- [16] Ghelardini C, Galeotti N, Di CesareMannelli L, Mazzanti G, Bartolini A. Local anaesthetic activity of β -caryophyllene 11. *Farmaco*, 2001; 56:387-389
- [17] Hajishengallis G, Lamont RJ. Beyond the Red Complex and into More Complexity: The Polymicrobial Synergy and Dysbiosis (PSD) Model of Periodontal Disease Etiology. *Mol. Oral Microbiol.* 2012;27(6):409-419. DOI: 10.1111/j.2041-1014.2012.00663.x
- [18] Dr. Gupta A, Dr. Bhowate R, Dr. Srivastava R, Dr. Kumar S, Dr. Devasthale SV, Dr. Sastry JLN. Clinical Evaluation of Babool Neem Toothpaste in Oral Hygiene and Dental Care. *Int. J Pharmacol. Res.* 2016;8:2-57.
- [19] Singhal R, Agarwal V, Rastogi P, Khanna R, Tripathi S. Efficacy of Acacia arabica Gum as an Adjunct to Scaling and root Planing in the Treatment of Chronic Periodontitis: A Randomized Controlled Clinical Trial. *Saudi Dent. J.* 2018 Jan;30(1):53-62. (EPUB November 3 2017). DOI: 10.1016/j.sdentj.2017.10.006.
- [20] Clark DT, Gazi MI, Cox SW, Eley BM, Tinsley GF. The Effects of Acacia arabica Gum on the in vitro Growth and Protease Activities of Periodontopathic Bacteria. *J Clin. Periodontol.* 1993 April;20(4):238-243. DOI: 10.1111/j.1600-051x.1993.tb00351.x
- [21] Pradeep AR, Agarwal E, Bajaj P, Naik SB, Shanbhag N, Uma SR. Clinical and Microbiologic Effects of Commercially Available Gel and Powder Containing Acacia arabica on Gingivitis. *Aust. Dent. J.* 2012 Sep;57(3):312-318. DOI: 10.1111/j.1834-7819.2012.01714.x
- [22] <https://en.wikipedia.org/wiki/Clove>
- [23] <https://www.yourarticlelibrary.com/biology/plants/clove-sources-cultivation-and-uses-with-diagram/4986>
- [24] CPAINDIA/posts/q195-adulterants-of-clove-include-all-of-the-following-except-_____a-clove-stalk/279818348818961/
- [25] <https://www.webmd.com/vitamins/ai/ingredientmono-251/clove>
- [26] <https://www.jpsr.pharmainfo.in/Documents/Volumes/vol12issue01/jpsr12012020.pdf>
- [27] Moran J., "Comparison of a phenolic and a 0.2% chlorhexidine mouthwash on the development of plaque and gingivitis", *Clin. Prev. Dent.* 1991; 13 (4):31-35.