

CLOVE OIL AND ITS ROLE IN ORAL HEALTH- A REVIEW

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ABSTRACT:

Syzygium aromaticum commonly known as clove is an aromatic flower buds of a tree belonging to the family *Myrtaceae*. It is used as a spice in Asia, Africa and in the Middle Eastern countries .It is used in the Ayurvedic and Chinese medicine, western herbalism and in dentistry also. It has an antimicrobial,anti-inflammatory, anti-stress ,anti-fungal ,anti-malarial and antioxidant property and been in use for many centuries serving many medicinal uses. Oral diseases are the major health problems which are growing widely, so people go in search of natural products to prevent these. Clove is one among the natural product to be used to cure the dental problems.

KEY WORDS: *Syzygium aromaticum*, clove, oral diseases.

BOTANICAL DESCRIPTION OF CLOVE:

Kingdom –Plantae

Phylum –Angiosperms

Order- Myrtales

Family –Myrtaceae

Genus –*Syzygium*

Species –*aromaticum*

Binomial name-*Syzygium aromaticum*

Syzygium aromaticum belonging to Myrtaceae family is a small-medium sized evergreen tree, 8-30 m tall. Leaves glabrous. Small, in terminal cymose clusters, each peduncle bears 3-4 stalked flowers at the end. Fruit olive-shaped, 1-seeded, popularly referred to as ‘mother of clove’. Most of the plant’s parts are aromatic (leaves, flowers and bark). The clove tree is monoecious, flowers are hermaphrodite and self-pollinating (1,2)

INTRODUCTION:

Clove (commonly called as “lavangam” in Tamil) is the oldest spice which has been in use for many years. It was used in China for more than 2000 years for checking decay of the tooth and also for halitosis (bad breath). The oldest records of clove being used in china for medicinal property were as early as 240AD. It is a tree with a height ranging from 10 to 20 meters which is growing in islands of Indonesia, Tanzania, Sri Lanka Madagascar, India and Malaysia(3,4).Records say that clove was one of the spice traded first, and the evidence of these were found in the vessels which dated back 1721 BC , native to Malucca islands. For Romans cloves were the treasured commodity. The Chinese people were also using clove from 226 BC.Cloves were the precious spices of the 16th and 17th century. By the end of 18th century the spice spread to other parts of the world like Zanzibar, Madagascar, Brazil, Mauritius, Ternate, Tidore, and Tanzania (5) Clove is used as a spice in foods in India. It relieves stomach pain, nausea and vomiting (6). Clove has a deodorizing property and so used in perfumes and in cosmetics (7). It shows analgesic activity in people suffering from tooth pain (8). Clove oil is obtained by distillation of the leaves, flowers, buds and stem of the clove tree (9).The main component of the clove oil is the eugenol which acts as an anesthetic, analgesic, anti-inflammatory activity (10).The essential oils of clove oil have biocidal activity against *A. albopictus* (tiger mosquitos) , thereby helping in the control of malaria(11).Stress which is very common in every individual can also be relieved with the help of hydro-alcoholic extracts of clove oil (12). Because of its anti-oxidant activity it serves in the prevention of cancer (13) Oral problems like dental plaque and caries , periodontal diseases , etc are growing widely these days because of the change in lifestyle and food habits but the advantages is that it can be cured easily

so people are going in search of natural products to treat these diseases as there is no toxic effects (4). Clove contains 14-20% of volatile oil that includes eugenol, acetyleugenol, sesquiterpenes (α - and β -caryophyllenes) and small quantities of esters, ketones and alcohol. Clove also contains tannins, sitosterol and stigmasterol(15) Oils of clove can be rubbed against the sore tooth or gums to relieve toothache , and whole clove can be chewed to control bad breath. The name comes from the French name “clou” meaning nail. Since the buds resemble the shape of nail it has been named in such a way(2). The generic name is derived from the Greek syzygios (paired), on account of the leaves and twigs that in several species grow at the same point. The specific epithet means aromatic.(1)

Fig(i) (16)



OTHER NAMES: (1)

(Amharic) : k'rinfudm (Arabic) : qaranful (Burmese) : ley nyim bwint (Chinese) : ding heung, ting hsiang (Dutch) : kruidnagel (English) : clove tree (French) : clou de girofle (German) : gewürznelke, nelke (Greek) : garífalo (Gujarati) : lavang (Italian) : chiodo di garofano (Japanese) : choji (Malay) : bunga cingkeh (Portuguese) : cravo (Spanish) : clavo (Swahili) : karafuu (Swedish) : kryddnejlikor, nejlikor (Thai) : khan plu (Vietnamese) : hanh con
Sanskrit name: Devapuspa English name: Clove Scientific name: Syngium aromaticum

Other Names: Clovos, caryophyllus, Syzygium aromaticum & Eugenia aromaticum
Syzygium aromaticum

Uses of clove oil:

The oil extracted from a clove is known as eugenol. Depending on where the oil is extracted from either the bud, leaf, or stem . The concentration of eugenol generally ranges from 60 to 90%.Clove oil is generally used in dentistry to treat pain from a dry socket, as well as used in a number of temporary restorative materials. Because the aroma of the oil is very strong, clove oil often leaves a lingering, aromatic presence in the dental office. Clove oil can be found in most natural health stores and in some grocery stores (17)

Considerations for Using Clove Oil (18)

Clove oil, although natural, is known to be toxic in specific amounts, so people wishing to use the oil for dental pain should be cautious of the amount they are using at a time. Clove oil may cause soft tissue irritation, which may include:

- A burning sensation in the tissue
- Pain in the area where the oil was placed
- Nerve damage

If ingested in larger quantities, clove oil may cause:

- A sore throat
- Vomiting
- Kidney failure and/or damage to the liver
- Seizures
- Difficulty breathing

.FORMS OF CLOVE: (7)

Three different forms of clove is been in use

- Grounded cloves – these will have a less potency when compared to the other two because it has lost almost all the oil content in it

Fig (ii) (19)



- Whole clove- this form has a medium potency because some amount of oil is still present in it

Fig (iii) (20)



- Clove oil- this form only has the highest potency which can be diluted with carrier oils to get a better result

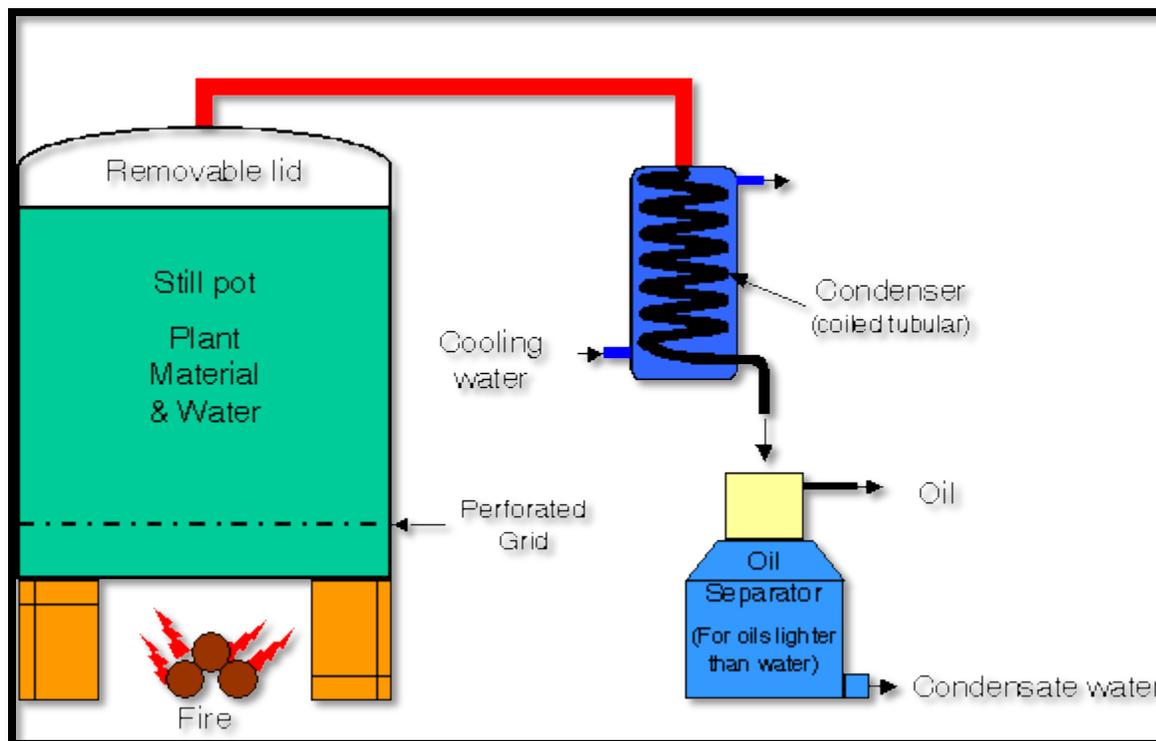
Fig (iv) (21)



CLOVE OIL EXTRACTION:

Clove oil belongs to a large class of natural products called the essential oils. Many of these compounds are used as flavorings and perfumes and, in the past, were considered to be the “essence” of the plant from which they were derived. Oil of cloves are prepared by steam distillation method. Three steps are there for extraction of clove oil steam distillation, extraction, distillation of the extracts. The distillation process is based on the Daltons law,(22) In brief, the dried flower buds were grinded and 120 g weighed out, placed in a round bottom flask and water was added to approximately three-quarter full. The distillation apparatus was then connected to the flask. The trap arm was filled with water to allow the oil to condense on the water layer, heat was applied from the heating mantle, and as the water in the flask boiled, steam carrying the volatile oil rose through the neck of the flask condensing on the surface of the condenser onto the water on the graduated trap arm. Distillation was continued until there was no more difference in successive readings of the oil volume. The oil was drained off and dried over anhydrous sodium sulphate (BDH) (23)

Fig (v) (24)



TYPES OF CLOVE OIL: (25)

There are three types of clove oil

- **Bud oil** is derived from the flower-buds of *S. aromaticum*. It consists of 60–90% eugenol, eugenyl acetate, caryophyllene and other minor constituents.
- **Leaf oil** is derived from the leaves of *S. aromaticum*. It consists of 82–88% eugenol with little or no eugenyl acetate, and minor constituents.
- **Stem oil** is derived from the twigs of *S. aromaticum*. It consists of 90–95% eugenol, with other minor constituents.

EFFECTS OF CLOVE OIL ON ORAL HEALTH:

ANTIMICROBIAL ACTIVITY AGAINST ORAL PATHOGENS:

Clove oil has an inhibitory action against various organisms like *S. aureus*, *L. monocytogenes*, and *Aspergillus* (26). Synergistic effects of clove oil along with other oils of

cilantro, dill, coriander, and eucalyptus showed a higher level of inhibition on gram-negative bacterias(27), thus proving that the synergism aggravates the anti-microbial activity of clove oil(28). *Streptococcus mutans* are the main causative organism for dental caries (29). *Streptococcus mutans* is the normal flora present in every individuals oral cavity(30). They are coccus shaped non motile bacteria *S. mutans* are the predominant one found in dental plaque, which uses the sugar contents present in our food particles and grow and secretes a sticky polysaccharides which then leads to the plaque formation in our teeth. It produces enzymes which metabolises sugars and releases lactic acids as their by-products, the acids will slowly corrode the enamel thereby leading to dental caries. If these dental caries are left untreated they enter the pulp chamber and destroys it completely so the tooth becomes non-vital.(31) Dorman *et al* in UK in 2000 (32) and Betoni *et al* in Brazil in 2006 (33) has studied the anti-microbial activity of the clove oil. The principal constituent of distilled clove bud oil (60-90%) is eugenol (4-allyl-2-methoxyphenol). The oil also contains about 10% acetyleneugenol and small quantities of gallic acid, sesquiterpenes, furfural and vanillin and methyl-n-amyl ketone. Other constituents include flavonoids, carbohydrates, lipids, oleanolic acid, rhamnetin and vitamins. (34). Compared to all other oil extracts clove oil extract shows a strong inhibition at very low concentration (35)

CLOVE OIL AS AN ANALGESIC AND LOCAL ANAESTHETICS:

People visit the dentist only if there is a pain in their oral cavities, which is caused due to dental caries. But they experience a throbbing pain only during night times, so immediately as a home remedy clove oil can be used. Eugenol and clove oil is used to reduce pain in the oral cavity may be due to the dental caries. Recent researches have been done on the use of clove oil as a general anesthesia in amphibians. Clove oil contains eugenol which effectively relieves pain and serves as an analgesic and also removes all the microbes present in that region of the tooth. Whole clove also can be crushed and used but it has a sore taste so clove oil is always the best and effective way to get relieved from tooth ache. Hosseini *et al* demonstrated the analgesic property of clove oil on mice and then concluded that Eugenol depresses the action potential of A and C fibres(36) and also inhibits Na⁺ currents in the dorsal

nerve root gangliona, which explains its analgesic property (37). Other studies shows that clove oil will predominantly block the peripheral main mechanism (38) and the eugenol present in the clove oil is also believed to depress the sensory receptors of pain(39). Using clove oil will reduce the pain and also helps in the removal of infection from the abcess(40).Benzocaines some times produce allergic reactions to some patients , so for these kind of patients natural alternativ should be used has to be. Clove oil has that anesthetic effect and so I can be used as an alternative , but if excess amount is injested this will cause respiratory and liver disorders also both clove oil and benzocain has the same effects so the clove oil is used as an anaesthetic (41).

How to Use Clove Oil for Tooth Pain (42)

1. Place two to three drops of the oil in a clean, small container. Add 1/4 to 1/2 teaspoon of olive oil. This mixture will prevent any soft tissue irritation that is common when using clove oil on its own.
2. Soak a small piece of cotton in the oil mixture until it is saturated. Blot the cotton on a piece of tissue to remove the excess oil before placing the cotton in your mouth.
3. Using a clean pair of tweezers, hold the cotton on the painful area for 10 seconds, making sure you do not swallow any of the oil.
4. Once complete, rinse your mouth with saline solution. This step may be repeated two to three times daily.

. Clove oil should only be used as a temporary way to relieve pain from a toothache. The best pain remedy is to see the dentist.

CLOVE OIL AS AN ANTIOXIDANTS :

Our oral cavity is exposed constantly to food , alcohol, nicotine, dental materials and procedures and tobacco product , since the oral cavity is very delicate all these can cause damage to the tissues by releasing free radicals Antioxidants are the remedy for the reduction in the levels of free radicals .the antioxidants acts by retarding the oxidative process (43). Clove oil possess the antioxidant property and so can effectively reduce the levels of the free raicals present in the oral cavity. Gulcin et al (44) conducted a study to investigate the antioxidant property of the clove oil and found that clove oil inhibits lipid peroxidation, ferric ions (Fe³⁺) reducing antioxidant power assay (FRAP), DPPH_ radical scavenging, ABTS_+ radical

scavenging, superoxide anion radical scavenging in the riboflavin/ methionine/illuminate system, hydrogen peroxide scavenging and ferrous ions (Fe³⁺) chelating activities

CLOVE OIL TO TREAT HALITOSIS:

Halitosis is widespread and is believed to affect one quarter of the population around the world and most people (45) Halitosis(bad breath) is mainly due to the pathogens present in the oral cavity , these pathogens will proteolyse the amino acid and releases volatile sulphur(46). Clove oil can be a short term remedy for halitosis since it is anti-microbial, but cannot be used long term because it lacks the pro-biotic activity(47). The Chinese used cloves to get rid of bad breath over 2000 years ago

DIS-ADVANTAGES OF CLOVE OIL:

Using clove oil as a dental pain reliever is not recommended for everyone .When undiluted clove oil is consumed in large doses it can be hazardous. It may cause sore throat, vomiting, difficulty in breathing, seizures, fluid in the lungs, bleeding disorders and in extreme cases, kidney and liver damage. Its use in children has not yet been evaluated by the Food and Drug Administration (FDA), and as a matter of fact, the FDA currently does not strictly regulate herbs and supplements, such as clove oil. People with bleeding disorders should not use clove oil, as it is known to cause increased bleeding. Also, oil of cloves is known to decrease blood glucose levels, so diabetics should use caution when considering the use of clove oil for dental pain. For some people clove oil could be allergic and can cause an anaphylactic reaction which includes itching, shortness of breath, and rashes. Clove oil is restricted to pregnant women and children below two years because even small quantities causes serious side effect (48)

CONCLUSION:

Clove oil has been in use for many centuries, it has many medicinal values like antimicrobial ,anti-inflammatory, anti-stress ,anti-fungal ,anti-malarial and antioxidant property like among which its contribution to dentistry is of major concern. Though it has minor disadvantages still it is been used as an immediate home remedy for all dental problems. It prevents infections, inflammations, and helps in reduction of pain

REFERENCES:

- 1) A tree species reference and selection guide <http://www.worldagroforestrycentre.org/sea/products/afdbases/af/asp/SpeciesInfo.asp?SpID=18033>
- 2) D.J.Charles, Antioxdant roperty of herbs and other sources. D.O.I 10.1007/978-1-4614-4310-0 © Springer science + business media New York 2013
- 3) Arung ET, Matsubara E, Kusuma IW, Sukaton E, Shimizu K, Kondo R. 2011.Inhibitory components from the buds of clove (*Syzygium aromaticum*) on melanin formation in B16 melanoma cells. *Fitoterapia*, 82:198-202.
- 4) Tyler VE, Brady LR, Robbers JE. 1988. *Pharmacognosy*. Lea & Febriger, Philadelphia, PA. Links.
- 5) History of cloves . <http://www.indepthinfo.com/cloves/story.shtml>
- 6) Recent Trends in Indian Traditional Herbs *Syzygium aromaticum* and its Health Benefits. Debjit Bhowmik, K.P. Sampath Kumar ,Akhilesh Yadav, Shweta Srivastava, Shravan Paswan, Amit Sankar Dutta. *Journal of Pharmacognosy and Phytochemistry* Vol. 1 No. 1 2012
- 7) Daniel AN, Sartoretto SM, Schmidt G, Caparroz-Assef SM, Bersani-Amado CA, Cuman RKN. 2009. Anti- inflammatory and antinociceptive activities A of eugenol essential oil in experimental animalmodels. *Revista Brasileira de Farmacognosia*, 19:212- 217.
- 8) Tyler VE, Brady LR, Robbers JE. 1988. *Pharmacognosy*. Lea & Febriger, Philadelphia, PA. Links.
- 9) Anderson, W.G., McKinley, R.S., Colavecchia, M., 1997. The use of clove oil as an anaesthetic for rainbow trout and its effects on swimming performance. *North Am. J. Fish. Manage.* 17, 301–307.
- 10) Diaz MR, Sembrano JM. 1985. A comparative study of the efficacy of garlic and eugenol as palliative agents against dental pain of pulpal origin. *The Journal of the Philippine Dental Association*, 35:3-10.
- 11) Biocidal potential of clove oils against *Aede albopictus* – A comparative study Sumangala K. Bhat* and Vivek Kempuraj *African Journal of Biotechnology* Vol. 8 (24), pp. 6933-6937, 15 December, 2009

- 12) *Anti –stress activity of hydro alcoholic extracts of Eugenia caryophyllus bud (clove)*
[Anand Kumar Singh](#), [Sunil S. Dhamanigi](#), and [Mohammed Asad](#) Indian journal of pharmacology 2009 February; 41(1): 28–31
- 13) Encyclopedia of Spices [Internet]. [updated 2003]. Cloves. The Epicentre. [Cited 2012 July 30].
- 14) Antimicrobial efficacy of five essential oils against oral pathogens: An *in vitro* study
Nilima Thosar, Silpi Basak, Rakesh N. Bahadure, Monali Rajurkar
- 15) Evans WC. Trease and Evans pharmacognosy. 14th ed. London: Saunders; 2001
- 16) Fig (i) Picture of clove plant .(spicesofkitchen.blogspot.com)
- 17) The Use of Clove Oil in Dentistry Natural Medicine and Dentistry By Shawn Watson
Updated September 22, 2010 Written or reviewed by a board-certified physician.
- 18) The National Institute of Health - MedlinePlus Health Information. Clove (*Eugenia aromatica*) and clove oil (eugenol). <http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-clove.html> Accessed June 30, 2010.
- 19) Fig (ii) Grounded form of clove (store.vapeny.com)
- 20) Fig (iii) Picture of whole clove (joshcurbe.wordpress.com)
- 21) Fig (iv) Picture of clove oil (letsgohealthy.blogspot.com)
- 22) G. A. Ayoola¹, F. M. Lawore, T. Adelowotan, I. E. Aibinu, E. Adenipekun, H. A. B. Coker and T. O. Odugbemi. Chemical analysis and antimicrobial activity of the essential oil of *Syzigium aromaticum* (clove) African Journal of Microbiology Research. Vol.(2) pp. 162-166, July, 2008. Available online <http://www.academicjournals.org/ajmr> ISSN 1996-0808 ©2008 Academic Journals
- 23) Harbone JB (1998). Essential oils, In: Phytochemical Methods: A guide to modern techniques in plant analysis, 3rd ed. Chapman & Hall, PA, USA. pp. 110-124.
- 24) Fig (v) Picture of clove oil extraction by steam distillation.
http://www.fao.org/inpho_archive/content/documents/vlibrary/ad420e/ad420e15.htm
- 25) Lawless, J. (1995). The Illustrated Encyclopaedia of Essential Oils. [ISBN 1-85230-661-0](#)
- 26) Snyder O.P. Hospitality Institute of Technology and Management [Internet]. [updated: 21 June 2012]. 1997. Antimicrobial Effects of Spices and Herbs. [Cited 2012 July 30]. Available from: <<http://www.hi-tm.com/Documents/Spices.html>>. 2012 July 11.

- 27) Delaquis P.J., Stanich K., Girard B., and Mazza G. 2002. Antimicrobial activity of individual and mixed fractions of dill, cilantro, coriander and eucalyptus essential oils. *International Journal of Food Microbiology* Vol. 74 (Issue 1 and 2): pp. 101-109. PubMed ID: 11929164. [Cited 2012 July 30]. Available from: <<http://www.sciencedirect.com/science/article/pii/S0168160501007346>>.
- 28) Burt S. 2004. Essential oils: Their antibacterial properties and potential applications in foods - a Review. *International Journal of Food Microbiology* Vol. 94 (Issue 3): pp. 223-253. *SciVerse Science Direct*. [Cited 2012 July 30]. Available from: <http://www.sciencedirect.com/science/article/pii/S0168160504001680>
- 29) Allmann A. [updated 2012 July 31]. *Streptococcus mutans: Tooth decaying Bacteria*. [Cited 2012 July 30]. Available from: http://bioweb.uwlax.edu/bio203/s2007/allmann_ambe2012_July_20.
- 30) Loesche WJ (1996). "Ch. 99: Microbiology of Dental Decay and Periodontal Disease". In Baron S, et al.. *Baron's Medical Microbiology* (4th ed.). University of Texas Medical Branch. ISBN 0-9631172-1-1. PMID 21413316
- 31) Mukhtar S., and Ghorri I. 2012. Antibacterial activity of Aqueous and Ethanolic Extracts of Garlic, Cinnamon and Turmeric Against *Escherichia coli* ATCC 25922 and *Bacillus subtilis* DSM 3256. *International Journal of Applied Biology and Pharmaceutical Technology* Vol. 3 (Issue 2): pp. 131-136. [Cited 2012 July 31]. Available from: <[www.ijabpt.com/pdf/74018-Sana%20Mukhtar\[1\].pdf](http://www.ijabpt.com/pdf/74018-Sana%20Mukhtar[1].pdf)>.
- 32) Dorman HJ, Deans SG. Antibacterial agents from plants: Antibacterial activity of plant volatile oils. *J Appl Microbiol* 2000;88(2):308-16.
- 33) Betoni JE, Mantovani RP, Barbosa LN, Di Stasi LC, Fernandes Junior A. Synergism between plant extract and antimicrobial drugs used on *Staphylococcus aureus* diseases. *Mem Inst Oswaldo Cruz* June 2006;101(4):387-90.
- 34) Available from: [http://www.drugs.com.Natural products \(Pro\) Clove](http://www.drugs.com.Natural%20products%20(Pro)%20Clove)
professional information from [Drugs.com](http://www.drugs.com)
- 35) Lalit Kumar D Chaudhari et al Antibacterial Activity of Commercially Available Essential Oils Against *Streptococcus mutans* *The Journal of Contemporary Dental Practice*, January-February 2012;13(1):71-74

- 36) Mahmoud Hosseini, Mina Kamkar Asl, Hassan Rakhshandeh Analgesic effect of clove essential oil in mice Avicenna Journal of Phytomedicine Received: Feb 20, 2011; Accepted: Apr 18, 2011 Vol. 1, No. 1, Summer 2011, 1-6
- 37) Cho JS, Kim TH, Lim JM, Song JH. 2008. Effects of eugenol on Na⁺ currents in rat dorsal root ganglion neurons. *Brain Res*, 1243:53-62.
- 38) Kurian R, Arulmozhi DK, Veeranjanyulu A, Bodhankar SL. 2006. Effect of eugenol on animal models of nociception. *Indian journal of Pharmacology*, 38:341
- 39) Daniel AN, Sartoretto SM, Schmidt G, Caparroz-Assef SM, Bersani-Amado CA, Cuman RKN. 2009. Anti-inflammatory and antinociceptive activities A of eugenol essential oil in experimental animal models. *Revista Brasileira de Farmacognosia*, 19:212- 217.
- 40) Robbers JE, Tyler VE. 1999. *Tyler's Herbs of choice: the therapeutic use of phytomedicinals*: CRC. Saeed S,
- 41) Well Remedies: Clove Oil for Tooth Pain By Anahad O'Connor February 17, 2011
- 42) The National Institute of Health - MedlinePlus Health Information. Clove (*Eugenia aromatica*) and clove oil (eugenol). <http://www.nlm.nih.gov/medlineplus/druginfo/natural/patient-clove.html> Accessed June 30, 2010.
- 43) Dental antioxidants (www.dentalantioxidants.com/antioxidants and oral health)
- 44) Ilhami Gulcin et al Antioxidant activity of clove oil – A powerful antioxidant source *Arabian Journal of Chemistry* (2012) 5, 489–499
- 45) Meskin LH. A breath of fresh air. *J Am Dent Assoc* 1996;127:1282, 1284,1286
- 46) The aetiology and treatment of oral halitosis: an update *Hong Kong Med J* Vol 10 No 6 December 2004
- 47) Natural Ways to Treat Bad Breath and the Problems Associated with It .Essential Oils, Overall Health Are Both Effective Ways Nick Meyer, Jul 21, 2013
- 48) What Are the Side Effects of Clove Oil? http://www.ehow.com/about_5643228_side-effects-clove-oil_.html