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## Potential of clove and its nutritional benefits in physiological perspective: A review

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### Abstract

Clove [*Syzygium aromaticum* (L.) Merril and Perry, Syn. *Eugenia aromaticum* or *E. caryophyllata*] is one of the most ancient and valuable spices of the orient. Portuguese first discovered in the sixteenth century the origin of clove plants is Molucca islands. But the use of clove in ayurvedic and homoeopathy medicine was well known before that time. The major part of the world's consumption of the clove spice is in the home kitchens. Cloves have been used for their antiseptic and analgesic effects and studied for use in platelet aggregation inhibition, antithrombotic activity and chemoprotective and antipyretic effects. Like many culinary spices, cloves help relax the smooth muscle lining of the digestive tract. The oils of the cloves have been known to stimulant and it may increase blood circulation. The present paper reviews health benefits from the use of clove, covering its chemical constituents, phytopharmacology, nutritional and medicinal value.

**Keywords:** cloves, muscle lining, nutritional, medicinal

### Introduction

The clove plant grows in warm climates and is cultivated commercially in Tanzania, Sumatra, the Molucca Islands and South America. The clove spice is the dried flower bud. The clove plant is an evergreen tree that can reach a height of thirty or forty feet high. The clove tree is frequently cultivated in coastal areas at maximum altitudes of 200m above. The sea level *syzygium* is the largest genus of *Mirtaceae* family. Comprising of about 1200 to 1800 species of flowering plants. It has been employed for centuries as food preservative and medicine because of its antimicrobial and antioxidant properties. Clove is known by different vernacular names in different languages. It is known as qaranful (Arabic), Karamfil (Bulgarian), Dingxiang (Chinese), Kruidnagel (Danish), Garifalo (Greek), Mikhaks (Georgian), Nelke (German), Szegfu (Hungarian), Cengkeh (Indonesian), Choji (Japanese), Jeonghyang (Korean), Krustnaglinas (Latvian), Lwaang (Nepalese), Cravo de India (Portuguese), Clavo, Clavode olor (Spanish), Dhing huong (Vietnamese), Giroflier (French) and Laung (Urdu/Punjab/Hindi).

### Methodology

The study is exclusively based on secondary data and descriptive one. The secondary data for the study have been collected from the annual reports of spices Board, various journals, research books, article reports, review of theoretical literature, periodicals and reports published by the Spices Board, newspaper, internet and books. In addition to above, elaborate discussions with ayurvedic doctors of Central and State Government, Medical Colleges and Research Centre have been held in relation to perspective on the medicinal potential of spices.

### History and Mythology

Cloves are an ancient spice whose use dates back over 2000 years when they were used to "sweeten the breath" of those who had an audience with the Chinese Emperor. In recent discovery archaeologists discovered cloves inside a pottery vessel in Syria along with proof dating the find to be within a few years of 1721 BC. Decades of archaeological exploration has sought to uncover evidence for the rich kingdoms of ancient Sri Lanka. Mantai on the northern tip of the island was one of the port settlements of Anuradhapura kingdom (377 BC to

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1017AD). The use of clove as a spice reached Europe around the 4<sup>th</sup> century A.D. when commercial trading really started with the Arabs. Two major naval European powers in the 17<sup>th</sup> and 18<sup>th</sup> centuries namely the Dutch and the Portuguese were involved in along tussle over completion for cloves. It is assumed that introduction of clove into India by East India Company about 1800 A.D. In ayurveda cloves are considered to enhance circulation, digestion and metabolism and help counter stomach disorders such as gas, bloating and nausea. The clove contributes the pungent and astringent tastes.

#### Traditional uses of cloves

The use of clove in the TCM or the traditional Chinese Medicine dates back to 207 BC called as Dingxiangs. This miraculous herb is being used for alleviating infections in the kidneys digestive disorders, impotence, have nausea, hernia and various skin problems like ringworm and certain other fungal infections. Clove oil has antioxidant property that controls the growth of free radicals response for cellular damage and cancerous (Duke Ja *et al.*, 2003) [3].

Clove oil extracted from the leaves flower buds, and fruit has been valued for centuries for its variety of medicinal applications in Indian Ayurveda medicine, Chinese medicine, herbalism, and dentistry clove oil has been used to improve digestive functions, fight off intestinal parasites, as an antibacterial agent.

#### Medicinal and Pharmacological uses of cloves

Like many culinary spices cloves help relax the smooth muscle lining of the digestive tract and eating cloves is said to be aphrodisiac.

The volatile oils of clove is effective against several genera of bacteria including animal and plant pathogene and food poisoning and spoilage bacteria (Aisha *et al.*, 2012) [1].

It has also been found that 0.05% solution of eugenol is sufficient to kill B tuberculosis. Clove oil showed antimicrobial activity against some human pathogenic bacteria (Miland *et al.*, 2011).

In some studies investigated eugenol and acetyt eugenol for potential anti-inflammatory action on Cox-2 and Lox enzymes (Deans *et al.*, 1987) [4].

Clove and Eugenol possess strong activity. It also showed a significant inhibitory effect against hydroxyl radicals and act as an iron chelator (Arora *et al.*, 1999) [2].

Clove oil and its main component eugenol show moderate antifungus activity against candida as per gillus and dermatophyle species and also resists against clinically relevant fungi including fuconazole resistant strains (Daniel *et al.*, 2009) [5].

**Table 1:** Nutrient composition of 100g of clove.

Composition	USDA (ground)
Water (g)	5.40-6.86
Food energy (Kcal)	323
Protein (g)	5.98
Fat(g)	20.06
Carbohydrate (g)	61.22
Ash (g)	5.88
Ca (g)	0.646
P(mg)	105
Na (mg)	243
K(mg)	1102
Fe (mg)	8.68
Thiamin (mg)	0.115
Riboflavin (mg)	0.267
Niacin (mg)	1.458
Ascorbic acid (mg)	80.81
Vitamin A (RE)	53

Source: Tainter and Grenis (1993) [10]

**Table 2:** Volatiles of clove oils.

Component	% Composition			
	Leaf oi <sup>1</sup>	Bud oil <sup>2</sup>	Stem oil <sup>3</sup>	Leaf oil <sup>2</sup>
$\alpha$ -Pinene	-	0.42	-	-
$\beta$ -Pinene	-	0.44	0.16	0.09
2-Hexanone	-	0.48	0.13	0.09
2-Heptanone + 1.8-cineol	-	0.50	0.11	0.10
$\alpha$ -Terpinene t- limonene	-	0.53	0.14	-
$\rho$ -Cymene	-	0.56	0.09	0.07
2-Heptanol	-	0.60	-	-
2-Nonanof	-	0.64	-	0.02
Benzaldehyde	-	0.69	-	0.01
$\beta$ -Terpineol (t)	-	0.81	0.01	0.02
$\alpha$ -Cubebene	-	0.90	0.66	0.70
$\alpha$ -Terpineoi	-	0.92	0.93	0.96
$\beta$ -Caryophylliene	2.91	1.00	7.22	7.59
Benzyl alcohol	-	1.10	0.59	0.57
$\delta$ -Cadinene	-	1.18	0.31	0.44
$\alpha$ -Caryophyllene	-	1.34	0.07	0.22
Isoeuganol	-	1.51	-	1.00
Eugenol acetate	-	1.54	24.59	16.71
Farnesol (c,t)	-	1.59	-	-
Farnesol (t,t)	-	1.66	-	0.93
Vanillin	-	1.82	0.89	1.15
Asarons (t)	-	2.06	1.17	1.47
(E)- $\beta$ -Ocimene	0.03	-	-	-
Linalool	0.08	-	-	-
Terpinen-4-ol	0.03	0.87	-	0.01
Nerol	0.79	-	-	-
Eugenol	94.41	1.41	59.14	60.82

$\alpha$ -Copaene	0.04	-	-	-
$\alpha$ -Humuene	0.36	10.60	1.24	1.44
(E,E)- $\alpha$ -Farnesene	0.06	-	-	-
$\gamma$ -Cadinene	0.18	1.14	0.45	0.45
(E)-Nerolidol	0.03	-	-	-
$\beta$ -Caryophyllene oxide	0.67	-	-	-
Humulane oxide II	0.07	-	-	-
t-Cadinol	0.07	-	-	-
Cadaiene	0.18	-	-	-
Hexadecyl acetate	0.09	-	-	-

Source: Raina *et al.* (2001) <sup>[9]</sup>; <sup>2</sup>Gopalakrishnan *et al.* (1988) <sup>[6]</sup>.

**Table 3:** Aglycones in clove buds and leaves.

Component	Clove buds		Clove leaves	
	$\alpha$ -Amyloglucosidase	$\beta$ -Glucosidase	$\alpha$ -Amyloglucosidase	$\beta$ -Glucosidase
Pentan-3-ol	t	t	t	t
Hexen-3-ol	t	t	t	t
Heptan-3-ol	t	0.5	1.5	t
Octanol	t	t	t	t
Nonan-2-ol	t	t	t	t
Linalool oxide	t	0.5	t	0.4
Linalool	t	0.9	t	0.9
Benzyl alcohol	t		t	t
$\beta$ -Phenylethyl alcohol	t	t	t	t
$\alpha$ -Terpineol	t	t	t	t
Nerol	0.5	t	t	0.5
Geraniol	0.3	2.6	t	0.8
Eugenol	3.4	62.6	12.0	76.1
cis-Isoeugenol	2.5	1.6	2.3	1.1
trans-Isoeugenol	2.0	3.7	2.6	3.6
cis-Nerolidol	4.1	1.8	2.6	0.3
Farnesol	54.3	1.9	59.8	2.0

t = trace.

Source: Menon and Narayanan; 1992) <sup>[7]</sup>.

### Health properties of Cloves

Clove is used to treat various digestive disorders including loose motion, flatulence, nausea and dyspepsia. The spice is very helpful to cure onychomycosis and Athlete's foot disease. It is prevent the break down in eye's retina, which assists vision in the old age. Western studies have supported the use of cloves and clove oil for dental pain. Chewing roasted clove is a wonderful medicine in case of pharyngitis. It can be applied topically to relieve muscle spasms or in a tea to ease coughing. Cloves are used as a kidney tonic to warm the body, increase circulation and as a digestive aid. In Ayurveda cloves are used to treat respiratory and digestive ailments, flatulence, nausea and vomiting. Clove contains physical, mental and emotional health benefits. Clove is enriched good amount of minerals like potassium, manganese, iron. Manganese can also act as an antioxidant that protects body from free radicals and potassium controls heart rate and blood pressure.

### Conclusion

Based on the information it could be concluded that clove represents a very interesting plant with an enormous potential as food preservative and as a rich source of antioxidant compounds. The present review sought to investigate to the nonvolatile constituents of clove, this may lead to indentifying new properties and novel molecules. More research is needed to confirm the efficacy of these findings.

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