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## MIRACULOUS EFFECTS OF THYME: A REVIEW

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*Thymus Vulgaris* L. is an aromatic flowering plant in the mint family Lamiaceae and is widely use medicinal plant in pharmaceutical industries. Among various species of *Thymus*, *Thymus Vulgaris* is extensively used. The species *Thymus* has pharmlological and biological properties due to its main components, Thymol and Carvacrol. It is rich is antioxidant and is widely used in folk and therapeutic medicine. There are some wide-ranging evidences in traditional medicine for effectiveness of *Thymus Vulgaris*, on the whole, It has been used by rural as herbal medicine to treat many diseases including inflammation related ailments. In modern medicine, the oil of thyme has been recommended as it has anti-inflammatory, antifungal, and antibacterial properties. However this review paper aims to provide a comprehensive view on the medicinal value and health benefits of *Thymus Vulgaris*.

**Keywords:** Thyme, *Thymus Vulgaris*, Carvacrol, Eugenol, Thymol

## INTRODUCTION

Aromatic plants rich in bioactive phyto-chemicals are increasingly used in food due to growing concern among consumers about chemical additives in food. Phyto-chemicals have become a topic of attraction as the use of synthetic antioxidants have gained a negative approach due to the shift of consumer's approach towards naturally occurring antioxidants (Nieto *et al.*, 2011; and Raghiv *et al.*, 2015). Researches on aromatic plants have focused on their extract and oil as they are potentially rich with natural antioxidants and antimicrobial agents (Raghiv *et al.*, 2015). These herbal extract acts as microbial agent and helps in resistance to antibiotics which increasingly led to major health benefits (Javed *et al.*, 2013). These aromatic plants are used either directly or indirectly to cure pulmonary infections, cataract, bronchitis, angina, indigestion, stomach sore and inflation (Biskup and Saez,

2002; and Javed *et al.*, 2013). Economically, these medicinal and aromatic plants are readily and cheaply available as a healthcare alternative to reduce human miser (Javed *et al.*, 2013; and Komaki *et al.*, 2016). Since ancient times, these plants have been used in the management of illness and continuously grown over time as complementary medicine. These days the budding trend of using the crude extract and dry sample of medicine and aromatic plant have gain scientific interest. The crude extract of these plants may have promising therapeutic effect in the treatment of various diseases (Komaki *et al.*, 2016). According to WHO, Medicinal plants are the richest source to obtain the variety of drugs. They inhibit various Phyto-Chemical components and several chemical components having multiple biological effects that help in bringing physiological effects in human body (Javed *et al.*, 2013).

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### THYME (*THYMUS VULGARIS*)

*Thymus Vulgaris* is herbaceous, aromatic plant belonging to Lamiaceae family (Reddy *et al.*, 2014), grows in mountainous area, used for medicinal and spice purposes, usually incorporated in tea or some food to give it an acceptable flavor (Grigore *et al.*, 2010; Javed *et al.*, 2013; and Dauqan and Abdullah, 2017). It is cultivated in Europe, Asia, Africa and North America (Komaki *et al.*, 2016; and Abramovic *et al.*, 2018). Thyme grows in temperate to heat, sunny and dry climate (Reddy *et al.*, 2014). The plant is used in folk medicine to treat infection in stomach, mouth, intestine, GI tract and to strengthen the heart (Ocana and Reglero, 2012; Queiroz *et al.*, 2012; Sharangi and Guha, 2013; Javed *et al.*, 2013; and Dauqan and Abdullah, 2017). The herb is pungent in taste and contain protein, fat, crude fibre, moisture, vitamin A, B1, B2 and C (Sharangi and Guha, 2013; Komaki *et al.*, 2016; and Dauqan and Abdullah, 2017). The Figure 1 explains numerous Constituents of Thyme (Sharangi and Guha, 2013; Komaki *et al.*, 2016; and Dauqan and Abdullah, 2017).

The medicinal variety is known as common Thyme or Garden Thyme. It has natural antibiotic properties due to presence of Thymol as a chemical constituent (Javed *et al.*, 2013; and Dauqan and Abdullah, 2017).

### ORIGIN AND DISTRIBUTION

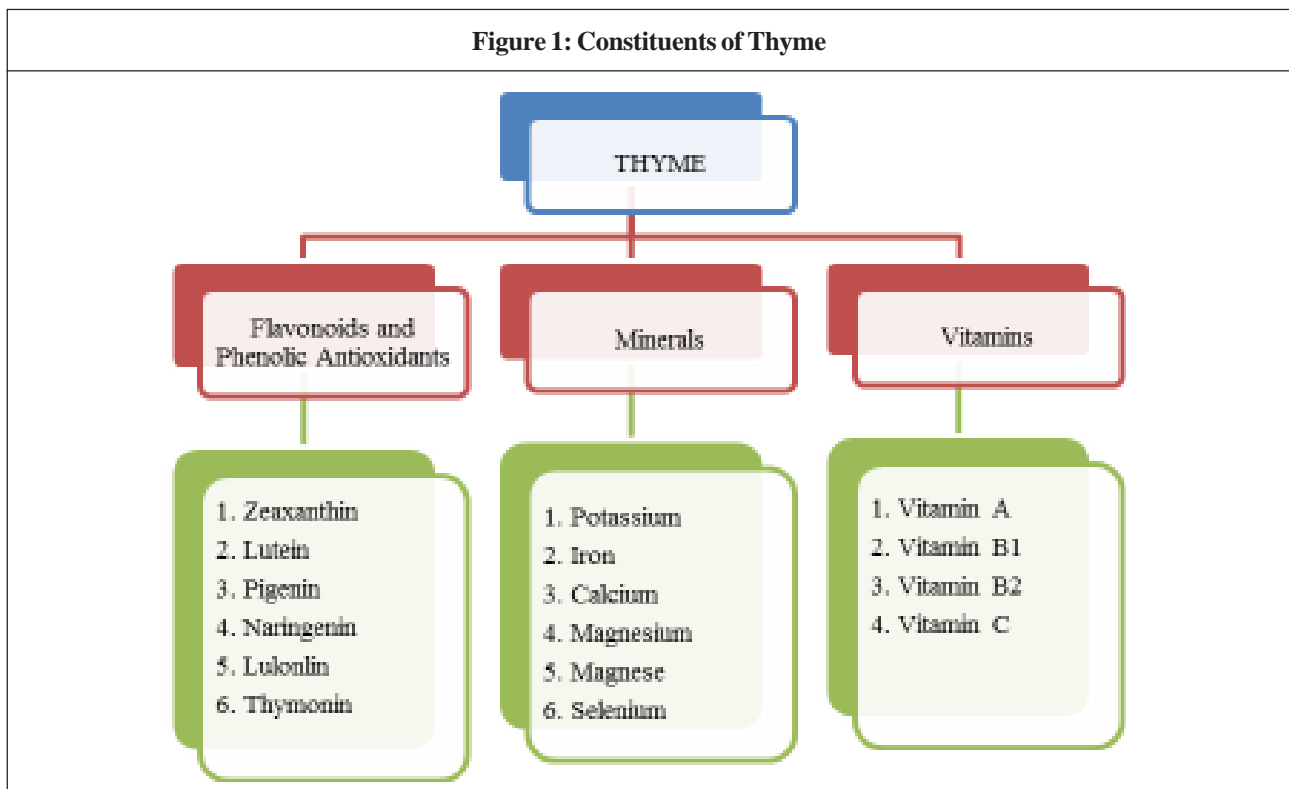
Thyme is the native of Europe, Africa, Asia and North America (Komaki *et al.*, 2016; and Dauqan and Abdullah, 2017). It belongs to Lamiaceae family that contains 250 species in the world (Arzani *et al.*, 2014).

The name “Thyme” is originated from Greek, which means “to fumigate” either because they used it as incense for its balsamic odor, or as sweet smelling herbs (Dauqan and Abdullah, 2017).

### PLANT DESCRIPTION

*Thymus Vulgaris* (Thyme) is a tiny perpetual perineal shrub and generally notable semi evergreen plant with in the region of the range of 220 genera and practically 4000 species worldwide. The plant seldom grows quite to (40 cm) with horizontal and upright habits. Its leaves are tiny, usually 2.5 to 5 mm long and vary significantly in form and hair covering depending upon the species (Javed *et al.*, 2013; Hanna *et al.*, 2014; Hossein Zadeh, 2015; and Dauqan and Abdullah, 2017). The leaves are oval to rectangular in shape (Dauqan and Abdullah, 2017). They grow in dry, warm and sunny climate. It attains full potential growth with bright sun (Hossein Zadeh, 2015).

Figure 1: Constituents of Thyme



**Table 1: Classification of *Thymus Vulgaris***

Kingdom	<i>Plantae</i>
Sub Kingdom	<i>Tracheobionta</i>
Class	<i>Magnoliopsida</i>
Order	<i>Lamiales</i>
Family	<i>Lamiaceae</i>
Genus	<i>Thymus L.</i>
Species	<i>Thymus Vulgaris</i>

### NUTRITIVE VALUE OF THYME

The miraculous benefits of thyme can be attributed to its nutritional value. These nutrients have disease preventing properties which helps in promoting good health. The detailed nutritional profile of *Thymus Vulgaris* is given below (Dauqan and Abdullah, 2017):

### HISTORY OF THYME AS TRDITIONAL MEDICINE

- In ancient Rome, the best honey to be considered was the thyme honey.
- Pliny recommended Thyme as an antidote for “Poison from sea creatures” and snake as well.

**Table 2: Nutritive Value of Thyme**

Principle	Nutrient Value	% of RDA
Niacin	1.824 mg	11%
Pantothenic Acid	0.409 mg	8
Pyridoxine	0.348 mg	27
Riboflavin	0.471 mg	36
Thiamin	0.48 mg	4
Vitamin A	4751 $\mu$	158
Vitamin C	160.1 mg	266
Potassium	609 mg	13
Calcium	405 mg	40.5
Iron	17.45 mg	218
Magnesium	160 mg	40
Zinc	1.81 mg	16.5
Carotene $\beta$	2851 $\mu$ g	-

- The Egyptians were aware of the preservative and antiseptic properties of thyme and it was being used as an ingredient in embalming fluid (Natura foundation).

### QUALITY AND PROCESSING OF THYME

Thyme, a perennial shrub, grows quite 40 cm long, it has a semi evergreen ground cover. Its leaves are extremely small and are well grown in fully drained soil with a pH of 5.0 to 8.0. The best quality of thyme grows in coarse rough soil (Reddy *et al.*, 2014; and Hossein Zadeh, 2015).

For the use of thyme leaves, it needs to be separated from the stem, the dried processed to get rid of the stem by various drying methods available from sun to classy driers. These methods are successfully being used to process the thyme leaves. However, the sun drying leads to poor quality of the volatile oil. Artificial drying leads to higher management of product quality. An air flow drier could be an appropriate system to dry the better quality leaves (Kader and Mohamed, 2012; Reddy *et al.*, 2014; and Malik *et al.*, 2016).

The drying range of temperature should not up to 40° to reduce the loss of flavor through volatilization of volatile oil and to retain a decent green color (Kader and Mohamed, 2012; and Reddy *et al.*, 2014).

A study based on the effect of drying method on the composition of Thyme recommended the combination of CPD-VMFD, i.e., Connective Pre Drying combined with vacuum microwave finish drying. However, the best results were showed in CPD (Connective Pre-Drying) at 40° and VMFD (Vacuum microwave finish drying) at 240 W (Sanchez *et al.*, 2013).

In an another study, the changes in Total Phenol (TP), Rosmarinic Acid content and Antioxidant capacity of thyme was investigated by using three methods of drying (Air, Freeze and Vacuum oven drying). The study concluded that Air-dried samples had significantly higher TP, Rosmarinic acid content and Antioxidant capacity than freeze and vacuum oven drying method (Hossain *et al.*, 2010).

Another study was executed to evaluate the effect of drying temperature on flavor of Thyme. The study concluded that drying temperature shows no influence on the flavor of dehydrated Thyme. However, higher drying temperature leaded to dark green color of Thyme (Zhang *et al.*, 2015).

The international standard (ISO 6754:1996) for dried Thyme prescribes that the whole Thyme leaves should contain a minimum of 0.5% essential oil, which is equal of 5 ml/kg dried herb, and ground thyme must contain 0.2% volatile oil (D'andrea, 1989; and Reddy *et al.*, 2014)

### PHARMACEUTICAL IMPORTANCE

According to WHO, herbal medicines serve the health needs of about 80% of the world's population (Basch *et al.*, 2004).

Medicinal quality of a plant relies on the presence of different phytochemical components (Javed *et al.*, 2013). However, traditionally Thyme is used for its Antiseptic, Antipasmodic, Anti-inflammatory, Antiviral, Antibacterial and insecticidal activity (Sharangi and Guha, 2013; Reddy *et al.*, 2014; and Hanna *et al.*, 2014). It has excellent antioxidant effect (Kraft and Hobbs, 2004). The herb is used in herbal remedies and for treatment of Asthma, Cough and many more (Loghmanieh and Bakhoda, 2013; and Dauqan and Abdulalah, 2017). According to WHO, more than 80% of the people in developing countries use herbs to treat numerous diseases (Hashemi *et al.*, 2017).

The medicinal history of thyme is so rich that it appears in the time of Hippocrates as a healing herb. 'According to Dioscorides', Thyme is helpful in alleviating stomachache, asthma, phlegm and dissolving blood clots (D'andrea, 1989).

Thyme leaves and flowers are mainly used for medicinal preparations. These are being used in drinking tea and prove to be helpful in relieving Arthritis (Dauqan and Abdullah, 2017). It also prevent toothache, UTI, hardening of arteries and dyspepsia (Javed *et al.*, 2013). Thyme, when used externally or as infusion helps in treating injuries, bruises, infected ulcers, cutaneous ulcers, abscesses and various other types of ulcers. It improves blood flow and the oxygenation of the scalp and regenerates the capillary glands. A variety of respiratory tract illnesses are also being cured by thyme when consumed orally (Biskup and Saez, 2002; and Kraft and Hobbs, 2004).

Thyme has so many benefits that 'Bardeau' in 1973, stated thyme is "an indispensable plant which should be consumed to conserve health".

### DOSAGE AND DURATION OF USE

There are limited scientific facts supporting dosage of thyme. However, with natural products it is often not clear what the optimal dosage are to be consumed to balance efficacy and safety (Basch *et al.*, 2004).

Dosage available in older and contemporary standard, herbal and pharmaceutical reference texts are given below:

<b>Table 3: Common Standardization (Krafts and Hobbs, 2004; and Soni, 2012)</b>	
<b>Dosage and Duration of Use</b>	
<b>Internal Use</b>	<b>External Use</b>
Tea: Steep 1.5-2 g (1 to 1.5 teaspoons) of the herb in 1 cup of boiled water for 10 minutes.	Compresses: prepare using 5% infusion.
Dosage: Three times daily	
Daily dose: 10 g herb with a 0.3% phenol content calculated as Thymol.	Baths: Steep 500 g of the herb in 4 liters of boiled water for 10 minutes then add to bath water.

<b>Table 4: Adult Dosing (18 Years and Older)</b>		
Oral	General	1-2 Grams of Thyme extract in divided doses.
	Tea	Steep 1-2 Grams of dried herb in 150 mL for curing upper respiratory tract infection/ bronchitis.
	Oil	2-3 drops on a sugar cube daily, up to 3 times.

<b>Table 5: Pediatric Dosing (Younger than 18 Years)</b>
Though there are not enough scientific facts to recommend medicinal use of thyme in children. However a combination of product containing 1% Chlorhexidine/Thymol varnish was tolerated in 110 healthy children of 8-10 year, when taken 3 times within 2 weeks. (Basch <i>et al.</i> , 2004).

## CHEMICAL CONSTITUENT OF THYME

Classification of Chemical Constituents of *Thymus Vulgaris* on the basis of their biological activities (Javed *et al.*, 2013; and Dauqan and Abdullah, 2017).

<b>Chemical Constituent</b>	<b>Biological Activity</b>
Thymol	Antiseptic, Antibacterial, Anti fungal, Antioxidant
Carvacol	Antimicrobial, Antithrombic, Anti-inflammatory
Apigenin	Anti-carcinogenic, Anti-inflammatory, Antioxidant
Eugenol	Neuro-protective, Anti-cancer, Antibacterial and Anti-anaphylactic activities

### Thymol

Garden Thyme is a natural antibiotic due to the presence of Thymol (Agili, 2014). Thymol is monoterpenoid phenol, the major compound found in Thyme and various other plants of Lamiaceae family. It has strong antioxidant, antiseptic, antibacterial and antifungal properties (Dauqan and Abdullah, 2017). Thymol has an ability to increase appetite and also expels fungus from stomach and intestine (Javed *et al.*, 2013). In the 18<sup>th</sup> century, a German Apothecary found that thyme essential oil contains powerful disinfectant called Thymol which is effective against fungi and bacteria. It also acts as expectorant and loosening phlegm in the respiratory tract (Moghtader, 2012). The significant effects of Thymol are largely attributed to its:

- A. Anti-inflammatory effects—as it helps in inhibiting recruitment of cytokines and chemokines (Zaborowska *et al.*, 2012; Queiroz *et al.*, 2012; and Alagawany *et al.*, 2015).
- B. Anti-oxidant effects—as it removes free radicals, enhance the enzymatic and non-enzymatic antioxidant and it also enhance the chelation of metals (Queiroz *et al.*, 2012; Zaborowska *et al.*, 2012; and Meeran *et al.*, 2017).
- C. Anti-hyperlipidemic effects—as it increase the level of high density lipoprotein cholesterol and decrease the level of low density lipoprotein cholesterol (Kulisic *et al.*, 2007; Queiroz *et al.*, 2012; Zaborowska *et al.*, 2012; and Meeran *et al.*, 2017).

### Carvacrol

It is another monoterpenoid present in thyme and is believed to have antithrombotic, anti-inflammatory, antimicrobial and acetyl cholinesterase inhibitory properties (Boskovic *et al.*, 2015; and Dauqan and Abdullah, 2017). It helps in modification and activation of GI tract structure, inhibits the cancer growth. It is used as an antioxidant to enhance growth and productive performance. It also prevents free radicals and hazardous compounds from interacting with cellular DNA. It improves digestion through modifying the gut microflora (Alagawany *et al.*, 2015). Generally Carvacrol considered being safe for consumption of human beings. According to Food Drug Administration, it has been approved to be use in food and Council of Europe has added Carvacrol in the list of chemical flavoring that can be found in frozen dairy, Chewing gums, Non-alcoholic beverages, alcoholic beverages, baked food, gelatin pudding and soft candies (Suntres, 2015).

### Eugenol

It is present in medicinal herbs and is effective in dentistry due to its analgesic properties. In addition, it possesses other pharmlological properties like Neuro-protective, anti-bacterial and anti-anaphylactic (Dauqan and Abdullah, 2017). It prevents free radical formation and repair oxidative damage it also prevents mutation which is an important mechanism in cancer prevention (Pavithra, 2014). FDA has confirmed Eugenol to be considered non- carcinogenic and non-mutagenic. However, Food and Agriculture Organization (FAO) and World Health Organization (WHO) defines the permissible daily uptake of eugenol is up to 2.5 mg/kg body weight for humans (Bendre *et al.*, 2016). Studies have shown the efficacy of eugenol against various microorganism of different origin. These finding indicates the possibility of use if eugenol as a therapeutic as a therapeutic tool against extensive variety of diseases.

### Apigenin

It is a flavonoid and exhibits anti- mutagenic, anti-carcinogenic, and anti-inflammatory and antioxidant properties (Dauqan and Abdullah, 2017). It is being utilized by human beings in the form of plant extract for the treatment of numerous disorders and inflammatory conditions. Based on the in vivo, in vitro and clinical trials, it is been suggested that apigenin can be consumed to overcome diseases such as rheumatoid arthritis, autoimmune diseases and various types of cancer (Ali *et al.*, 2017; and Madunic *et al.*, 2018).

## CONCLUSION

The present review showed that *Thymus Vulgaris* plant contains extensive amount of flavonoids and exhibited antioxidant, antibacterial, anti viral and anti-inflammatory activities due to the presence of its main components that is Thymol, Carvacrol, Eugenol and apigenin. Thyme can be used as an easily available source to cure many disorders. It can be used in food and drugs as it is safe for the consumption of human beings. However, many experiments attest its potential towards many diseases. However, more clinical and pathological studies need to be conducted to explore the unknown potential of *Thymus vulgaris*.

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