

# Summary of studies on thyme in Iran: an integrated analysis study

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## Abstract

**Introduction:** *Thymus Vulgaris* is one of the Breed of mint herbs of lime trees that grows in the form of bushy trees on dry slopes and between the boulders of various Mediterranean regions, including in France, Portugal, Spain, Italy and Greece and the Middle East. Thyme is an herb that is used in the food industry, pharmaceutical, health and beauty industries. This plant is used in the treatment of cough, intestinal parasites, bacterial and fungal diseases, spasms, shortness of breath, bloating and indigestion, whooping cough, bronchitis, lung infections, colds, flu and muscle cramps. The goal of this study was to summarize published studies on the thyme.

**Methods:** After validation studies published in the thyme were selected by a team of experts. To find these studies, the various search engines and keywords of thyme and medication were used. The Period of time to search for the studies was from the beginning to the end of 2016. Data from the study in the form of recorded data was compiled. Information was collected and reported in the form of descriptive analysis.

**Results:** From 25 Verified study, 3 studies (12%) was conducted in clinical trial. In all cases the therapeutic efficacy of thyme was equal or better than synthetic drugs. 4 studies (16%), were related to animal studies. The majority of studies, 18 (72%) were laboratory studies. 17 studies of this type check the effects of antimicrobial, antibacterial and antifungal properties where in most cases, thyme or its combinations had acceptable effectiveness. Only one study was conducted to evaluate the anticancer effects of thyme.

**Conclusions:** The use of thyme in many cases had equal or better efficacy with fewer side effects than chemical drugs. It is necessary to conducted trials and studies in review of this plant.

**Key words:** Thyme, medicines, Iran, pluralization

## Introduction

*Thymus Vulgaris* is one of the breed of mint herbs of lime trees that grows in the form of bushy trees on dry and slopes and between the boulders of various Mediterranean regions, including in France, Portugal, Spain, Italy and Greece and the Middle East (1). In Iran, 14 different species of this genus are naturally occurring in different parts of the country, including 4 species of *Thyme carmanicus*, *Thyme Daenensis* (with two subspecies *Thyme daenensis* subsp. *Daenensis* and *Thyme daenensis* subsp. *Lancifolius*), *Thyme trautvetteri* and *Thyme Persicus* are Iran's exclusive genuses(2). Various species of it are found in the mountainous regions of Iran, especially in the mountains of Euclid city, where it is called *Zataria multiflora*.) Avishan Shirazi (3). In recent years, the use of herbal medicines for medical treatment has been increasing due to low side effects, or no side effects (4).

Among these plants, thyme is widely used in the treatment of bacterial, fungal and parasitic diseases. It is both fresh and dry as an anti-worm, anti-contraction, bronchodilator, stomach acid and digestive enhancer, as well as in the treatment of rheumatic pains, insect bites, wound disinfection, and skin diseases. Used (5). Antibacterial, antifungal and anti-corrosive properties are due to the presence of phenolic substances such as thymol and carvacrol, which are the main components of essential oil of thyme. Thymol has antioxidant effects and inhibits the production of superoxide anions in the xanthine-xanthine oxidase system (4). This plant has high antioxidant properties. What has been considered by researchers over the last two decades is its anti-cancer and anti-carcinogenic properties. The branches of this plant contain essential oils, tannins, bitter basic substances, saponins and infectious agents. Thyme essential oil is one of the ten essential oils that has anti-bacterial and anti-fungal properties, antioxidants, natural food preservatives, and delayed mammalian aging, and has a special place in global trade (6). Akbarinia and colleagues (7) identified 24 compounds in the *Thymus vulgaris*, which included thymol, parasmene, gammadripien, carvacrol methyl ether, cineol, boraneol, and carvacrol. Brazandeh et al. (8) reported 27 compounds in thyme oil, that five of its major components were thymol, paracymene, gamma-tropinone, carvacrol and beta-caryophylline.

Thyme oil has properties such as antispasmodic, anti flatulence, antifungal, disinfectant, anti-corrosive, anti-rheumatism and sputum production (1). Its liquid extract is used in anti-pertussis preparations and as a conditioning agent (9). According to the Congress of the German Drug Commission, this plant has a positive therapeutic status, and it is ranked first in a single copy by the European Commission of Medicinal Plants Commission and the World Health Organization (WHO) Commission. Considering the economic importance of *Thymus vulgaris* plants, its proper recognition and determination of phytochemical properties and their applications is important in pharmaceutical, industrial and horticultural considerations (10). Therefore, this study was conducted to summarize the published studies on thyme and its drug use in various fields.

## Materials and Methods

This study was a meta-analysis study in which articles were searched through the Google Scholar database, the Scientific Information Database (SID), and the Scientific Information Database (Civilica) with the keywords "Thyme "and" medicinal "were obtained. The criteria for entry of articles were the relevance of the subject matter to the thesis, the validity or indexation of the publication in acceptable indexes, the study was done in Iran, the article has scientific writing conditions and is in Persian. All articles in these resources were considered from the beginning until the end of the first half of 2016. Articles that had the above input criteria were reviewed and were originally numbered 45 articles. The findings from these databanks were compared with each other, and repeated cases, as well as articles that, according to experts, did not qualify and did not qualify, were excluded. Finally, after reviewing the titles and studying the abstracts of the articles, 25 related articles were selected for final examination. Structure, Properties, Uses and Effects of thyme were classified into three categories of human intervention, animal intervention and laboratory studies. The collected data were analyzed using descriptive and analytic methods using SPSS software. The specific statistical methods related to Integrated analysis (21 and 20) were used for data analysis.

The use of thyme in the treatment of indigestion, digestive diseases, acute and dry cough, pain and inflammation and relaxation, has had equal or better efficacy with less complications than chemical (non-herbal) drugs. Antimicrobial, antimicrobial and anti-fungal effects include those related to: *Giardia Staphylococcus aureus* cyst, *Streptococcus mutans*, *Listeria* and *E coli*, *Enterococcus faecalis* *Candida albicans*, and *Aflatoxin*. The effects of its anti-cancer cells have been positive only in the laboratory studies. It is suggested that more trials be conducted on the therapeutic topics discussed.

Of the 25 approved studies, 3 (12%) studies were performed as a clinical trial. The subject of treatment of these trials included functional dyspepsia, digestive diseases, dry and acute cough. In all cases, the therapeutic efficacy of thyme was better or equal to chemical drugs. Four studies (16%) were from animal studies. They included two studies of anti-inflammatory, anti-inflammatory and anti-anxiety effects of thyme, a study on gastric ulcer induced in rats and a study on blood factors and hormones. The majority of the articles studied were 18 cases (72%) in laboratory studies. 17 studies of them were on antimicrobial and antifungal effects, including *Giardia* cysts, *Staphylococcus aureus*, *Streptococcus mutans*, *Listeria* and *E coli*, *Enterococcus faecalis* and *Candida albicans* have examined aflatoxin, and which in most cases had thymic acid or its compounds had an acceptable efficacy. In these studies, sodium chloride and chlorhexidine hypochlorite controllers were compared with 0.2% chlorhexidine, 100 mg / ml *Zataria* (Shirazi) *multiflora* or 0.1% chlorhexidine and 50 mg / ml peppermint essential oil. The diameter of non-growth halo in the Thyroid groups was significantly higher than other groups. Only one study of this type examined the anti-

cancer effects of thyme. In all of these studies, the positive results of the use of thyme in comparison with the used drugs were less complicated.

## Discussion

Considering the economic importance of *Thymus vulgaris* plants, its proper recognition and determination of phytochemical properties and their applications in terms of medicine, industry and gardening is important. In this study, the structure, properties, use and effects of thyme were evaluated in three groups of human intervention, animal intervention and laboratory studies.

### Human intervention.

Three studies were found as a clinical trial. Studies have shown that thymic spray drooping, soup spray, thyme mixing, and the combination of dopaminergic rhenitidine and clopramide have reduced the symptoms of 75 percent or more in patients. The final result was that medications containing thyme oil were better than the other medications in the treatment of pain. It was found that the most effective drug is 2% Thyme essential oil. The findings are in keeping with the study of Mohammad Ali Zadeh and his colleagues in Hamadan (11). Hydro-alcoholic extract of garden leaves and flower buds of thyme can increase the cytotoxicity of taxol. Therefore, it can be effective in the treatment of breast cancer and may cause the death of cells by inducing apoptosis. The findings are consistent with the study by Hamta et al., who examined the cytotoxic effects of garden thymus on the breast cancer cell line (6). Comparison of the therapeutic effect of thyme and dextromethorphan essential oil in treating patients with acute and severe cough showed that thyme essential oil in acute cough inhibition has an acceptable therapeutic effect similar to dextromethorphan. Combined syrup of ivy and thyme leaf; used in the treatment of acute bronchitis, showed the mean cough was reduced in 7-9 days after treatment with this compound compared with cough reduction in placebo treatment. This difference was statistically significant and showed the effect of thyme against placebo. The study by Ranjbar et al., also confirmed these results (12). The effect of this medicinal plant on the treatment of gastrointestinal disorders, such as irritable bowel syndrome, and the relief of gastrointestinal symptoms such as abdominal pain, bloating, heartburn, and changes in bowel habits has been shown. Microscopic, macroscopic and biochemical studies showed that Thyme had a good effect on the improvement of colitis in mice. Thyme can even have an effect equivalent to prednisolone versus acetic acid colitis. In a study on the effect of Shariatian thyme on gastrointestinal symptoms of nurses in intensive care units, it was shown that there was a decrease in symptoms score in the Shirazi multiflora group, which was significantly different, so that *Zataria multiflora* could reduce gastrointestinal symptoms (13).

Investigation of Thyroid aerial parts on mice showed that the thyme alcoholic extract at a dose of 800 mg / kg had anti-inflammatory effects. The antinociceptive effects of the thyme juice extract are probably due to the combination of para-cayman, beta-caryophylline, carvacrol and especially thymol (14). In the study of Mohammad Amini et al., who studied the effect of medicinal plants of turmeric, *Thymus*

and Cinnamon on ascites related parameters in broiler chicks of Arian strain, the results showed that medicinal plants had an effect on feed intake, conversion ratio, mean body weight and they did not have a lasting percentage. On the other hand, medicinal plants have a significant effect on the percentage of hematocrit, T4 hormone, T3 ratio to T4 and RV / T hormone. So, the use of medicinal plants tested improved blood parameters such as hematocrit, thyroid hormone levels and ascites heart rate (15). In the study of Narkai et al., which investigated the effect of diet containing the thyme leaf on the anxiety behavior in rats, the findings showed that a diet containing 10% of Shirazi plumage, the duration and number of animals present in the open arms of the Maze Ratio Increased significantly in the control group and cortisol hormone decreased compared to control group (16). Evaluation of the effect of hydroalcoholic extract of thyme on prevention of ethanol-induced stomach ulcer in rats showed decreasing of Index and increasing the percentage of wound inhibition and protective effect of plant extract in dose-dependent groups. (17).

### Laboratory intervention.

Investigating the efficacy of *Thymus vulgaris* on *Giardia* cyst in vitro compared to metronidazole showed that this plant has the highest lethal effect. Therefore, Zyman essential oil can be used as a suitable substitute for metronidazole, which should be designed for proper clinical trials to prove this. Findings of the study by Fresheng and colleagues also confirmed this (4). In the essence of distillation with water and steam, 44 and 57 compounds were identified, respectively. The results showed significant antimicrobial activity of these essential oils and fractions against *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Escherichia coli* and Methicillin Resistant *Staphylococcus aureus* strains. The study of anti-bacterial and antifungal properties of essential oils of three species of thyme and two coccuta ecotypes and Bakhtiari *Saviblia* species showed that the diameter of the growth halo of Bakhtiari Savory essential oil on the bacteria and fungi tested was significantly lower than those of other herbs. Be Thyme essential oil, *Zataria thyme* and *Mazandaran multiflorum* have the most effects on inhibiting the growth of bacteria and fungi, depending on the essence and type of bacteria or fungi, the severity of the effects is different. The essential oil of *Mazandaran* and *Kakotti Shirazi* cacti plants showed the least effect on the different species of bacteria and fungi tested in comparison with other essential oils. Evaluation of antioxidant properties, color and antibacterial effects of Chitosan oral film containing *Zataria multiflora* essential oil against *Listeria monocytogenes* showed that the film containing antimicrobial agents is an active type of packaging that is used to control microbial contamination in foodstuffs. Essential oils also significantly increase the anti-listeria properties of chitosan films, and the active film of chitosan can be prepared using the essential oil of *Zataria multiflora*. The addition of essential oils improved the functional and anti-bacterial properties of the film. The comparison of iron chelating properties, radicalization and anti-thyrosinase of *Thymus vulgaris* essential oil with commercial *Thymus* and *Thymol* showed that the nutritional

value of these plants was to prevent the formation of toxic reactive products, and Thymus can act as a good antioxidant. The study of the biological properties of Thyme essential oil shows that they have good potential for its application in the food and medicine industry (3, 18, 19 and 20). In the real study that evaluated antifungal activity of thyme, parsley, cumin and cumin essential oils on *Candida albicans* compared to fluconazole, it was shown that the essential oils of thyme, parsley, cumin and cumin Antifungal works against the standard strain of *Candida albicans*. As a result, the plant essential oils after completing studies can be suitable alternatives for chemical drugs for the treatment of candidal infections, especially mucosal candidiasis (21). Evaluation of antioxidant properties of hydroalcoholic extract of Shiitami thyme and their antimicrobial effect on *Staphylococcus aureus* in hamburger showed the effect of different concentrations of extract on *Staphylococcus aureus* growth during certain storage period. The extract of Shiraz's vetiver, in glacial conditions, inhibited the growth of *Staphylococcus aureus* bacteria in hamburger. Peppermint extract has antibacterial effect and can be recommended as an antibacterial preservative in burgers and other meat products (22). Analysis of antibacterial properties of chlorhexidine essential oil of thyme and mouth on streptococcus mutans elastic orthodontic rings in external conditions showed a statistically significant difference between the mean number of live bacteria isolated from contaminated rings before and after disinfection with thyme solution and Chlorhexidine 0.2 is present. This decline was not significant for distilled water. There was no statistically significant difference between the two mouthwashes of thyme and chlorhexidine in microbial plaque control. Antibacterial properties of zein film containing essential oil of Shirazi thyme and Monolourin in comparison with *Listeria monocytogenes* and *E-coli* in vitro showed that zein films containing essential oil and monolourin significantly increase the antibacterial activity compared to the control group. All films, except the blank film, showed anti-Bacterium effects against *Listeria monocytogenes*, while only films containing essential oil showed antibacterial effects against *E. coli*. In terms of effectiveness, the zein film containing 3% essential oil had the best antibacterial effect against both bacteria. Also, in all of the films studied, there was no bacterial colony in the film and agar contact area. The antibacterial effect of food coating, which included the combination of Baxi-methyl cellulose containing essential oil of Shirazi thyme and grape seed extract, showed that the coating containing essential oil of Shirjani and grape seed extract properly reduced the growth of microorganisms causing corruption and also increased durability. Antimicrobial and physical activity of oral film based on chickpea protein isolate containing Thyme essential oil by response surface method showed that chickpea protein has the ability to form a film. Also, optimization of the final formulation showed that for maximum antimicrobial activity of the oral film, minimum penetration of water vapor and maximum solubility should be used from 4 grams of chickpea protein, 44.4% glycerol and 1% essential oil. The use of different levels of thyme extract or nitrate did not affect the level

of glucose, cholesterol and triglyceride and also the level of aspartate aminotransferase enzymes in broiler chicks. Nitrate consumption significantly increased HDL levels compared to control treatment. Consumption is also used in independent comparisons

## Conclusion

The use of thyme in the treatment of indigestion, digestive diseases, acute and dry cough, pain and inflammation and relaxation, has had equal or better efficacy with less complications than chemical drugs. Antimicrobial, antimicrobial and anti-fungal effects include effects on *Giardia Staphylococcus aureus* cyst, *Streptococcus mutans*, *Listeria* and *E coli*, *Enterococcus faecalis* *Candida albicans*, and Aflatoxin. The effects of its anti-cancer cells have been positive only in the laboratory study. It is suggested that more trials be conducted on the therapeutic topics discussed.

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