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A review of therapeutic and pharmacological effects of thymol

Pouya Parsaei¹, Mahmoud Bahmani², Nasrollah Naghdi³, Majid Asadi-Samani^{4*}
and Mahmoud Rafieian-Kopaei⁵

¹Young Researchers and Elite Club, Shahrekord Branch, Islamic Azad University, Shahrekord, Iran

²Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran

³Clinical Microbiology Research Center, Ilam University of Medical Sciences, Ilam, Iran

⁴Student Research Committee, Shahrekord University of Medical Sciences, Shahrekord, Iran

⁵Medical Plants Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran

ABSTRACT

Thymol ($C_{10}H_{14}O$) is a monoterpene which is considered a phenolic component and is present in many vegetable oils. Thymol is an aromatic essence which is known as disinfectant in traditional medicine. Thymol is found in plants and has properties such as antibacterial, antipyretic, antispasmodic, antifungal, antioxidant, and hepatoprotective, anti worm, antispasmodic for rats tracheal smooth muscles, gastroprotective, antihyperglycemic, antihyperlipidemic, analgesic, acaricide, and antiepileptic. Thymol is a medicinal, plant-based component with pleasant taste and smell and is found in many medicinal plants including *Thymus vulgaris*, and *Carum copticum*. Because it is inexpensive and exerts pharmaceutically peerless effects, it could be used to heal many of the diseases and may be commercially available in different countries in the future.

Key words: Medicinal plants, Thymol, Therapeutic effects

INTRODUCTION

Nowadays, different diseases are highly increasing in prevalence and spreading because of living conditions and environment, diet, weather, stress, bad food habits, mechanical life, etc [1-5]. These diseases bring many costs for individuals and community [6-11] and many diseases are reason for mortality in children and adults [12-17]. These diseases are classified into infectious and non-infectious [18-,23]. Finding a way to control and treat infectious and noninfectious diseases is particularly important [24-26]. In recent years, because of increased interest in use of nature-based substances and prevalence of gastrointestinal and respiratory diseases and various cancers, use of these substances has been widely investigated [27-33]. Medicinal herbs are available, inexpensive, and effective [34-41]. Many of the medicinal plants contain antioxidant and pharmaceutical components which are effective on various diseases [42-48]. An effective plant-based substance is thymol which is reviewed in this paper.

Firstly the key words thymol and medicinal plant were searched for in the databases such as Scientific Information Database, Scopus, PubMed, Magiran, and Google Scholar and the related articles were retrieved and analyzed.

Thymol description

Thymol is a natural monoterpene phenol compound which is known as 2-isopropyl-5-methylphenol (IPMP). It is a white crystalline substance of a pleasant aromatic odor and derivative of cymene which is mostly found in oil of thyme. Thymol has a strong antiseptic property with distinctive, strong flavor of the culinary herb thyme. It is mostly extracted from the plant *Thymus vulgaris* (common thyme) and some other plants. Thymol ($C_{10}H_{14}O$) is a monoterpene which is found in many vegetable oils [49]. Thymol is a phenolic chemical compound [50] (Figure 1).

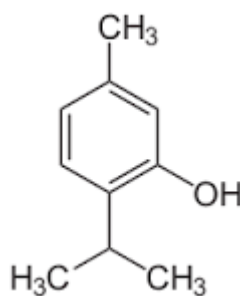


Figure 1. Chemical structure of thymol

Therapeutic and pharmacological effects of thymol

Thymol is an aromatic essence which is known as disinfectant in traditional medicine. Many of the plants contain thymol [51]. Thymol is found in plants and has antibacterial effects [50]. In the conducted studies, its antipyretic and antispasmodic properties have been also explained [52]. Thymol has also antimicrobial [53] and antifungal [54] properties, and exerts antimicrobial effects through making the pathogens cell membrane permeable [53,54].

Thymol is a strong antimicrobial agent and has been used in alcohol solutions for the treatment of hookworm, tinea or ringworm, varroa mites and prevent fermentation and the growth of mold in bee colonies infections. Thymol is used as an antiseptic ingredient in some mouthwashes toothpastes. In combination with chlorhexidine, it is used to reduce plaque and gingivitis. It is also used halothane, an anaesthetic, as an antiseptic. It has been suggested that Thyme extract and thymol have relaxing effects on uterus and trachea which possess β 2-receptors [76].

Another important property of thymol is its antioxidant effect [55]. Thymol is also used as a stimulant to promote food health and safety in food industry [56]. Thymol is the most commonly plant-based mouthwash. Its effect mechanism is based on destruction of pathogens' cytoplasmic membrane [57]. Thymol exerts antimutagenic and hepatoprotective properties, as well [58-61]. Anti worm activity is another property of this important pharmaceutical component [62]. Thymol has exerted antispasmodic effects on tracheal smooth muscles through Beta-2 adrenergic receptors and increasing potassium conductance [64]. Thymol exerts its effect through changes in myosin ATPase activity and reduces isometric contractions [63]. Other therapeutic effects of thymol include gastroprotective [65], regenerative [66], hyperglycemic and antihyperlipidemic [67], analgesic [68], acaricide [69], and antiepileptic [70] properties.

DISCUSSION

Thymol is a medicinal, plant-based component with pleasant taste and smell and is found in many medicinal plants including *Thymus vulgaris*, and *Carum copticum*. Thymol has a strong antimicrobial activity due to its phenolic structure. Phenolic compounds including flavonoids and flavonols have been shown to possess antimicrobial activity [71]. It should be noted that there are a lot of other plants which have phenolic compounds [72-78]. Phenolic compounds also have antioxidant activities which counteract a wide variety of diseases [79-99]. However, Thymol has shown strong antibacterial activity especially against bacterial strains including *Aeromonas hydrophila* and *Staphylococcus aureus*. Furthermore, thymol has a strong post antibacterial effects, too, due to inhibiting lactate production, and decreasing cellular glucose uptake [100-108]. Because it is inexpensive and exerts pharmaceutically peerless effects, it could be used to heal many of the diseases and may be commercially available in different countries in the future.

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