

Pharmacological Properties of *Mentha* Species

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Abstract

People have been using plants in treating various diseases and obtaining successful results since old ages. Most of these plants have become natural medicines as a result of coincidences or curious practices. Different treatments by using different plants have been carried out and proven to be healing and plants have become significant and popular among people in a short period. *Mentha* species, which have a significant place in alternative medicine, has pharmacological effect. In this research, based on previous study results, the effects of *Mentha* species, which has been used for various purposes including medical, nourishing aims and as spice, are analyzed and presented.

Keywords: *Mentha*; Pharmacology; Alternative medicine; Medicine; Plant

Introduction

It is assumed that there are approximately 1 million different plant species on earth while almost 500 thousand have been determined until today. On the other hand, the number of species that could be determined has been increasing every day. According to the report of World Health Organization (WHO), based on various publishing about codex of 91 countries (pharmacopeia) and medicinal plants, the number of plants used in medicine is around 20 thousand [1].

Phytotherapy has become a discipline after plants that have been used in traditional folk medicine is filtered scientifically and re-evaluated; the word itself means treatment through plants. The discipline has been developing and gaining importance every day. According to the data presented by World Health Organization (WHO), 80% of people in developing countries have been using phytotherapy methods and 3.3 billion people have been using medicinal plants for medicinal purposes [2].

25% of active substances in medicines that are produced pharmacologically in modern respect are obtained from plants. On the other hand, active substances of most of the artificially produced medicines are structurally similar to the chemicals which were firstly isolated from plants. Demand for plants with which medicines are produced have been increasing in both developing and developed countries as they are affordable, they don't have any side effects, they have low toxic effect and they are produced naturally [3].

Experimental

Properties of *Mentha* (L.)

An important part of the useful plants that have been known since the past and have never lost their significance to date are the plants found in the Lamiaceae family. In this study, *Mentha* species were selected as a subject from the Lamiaceae family (Figure 1). *Mentha* is a perennial plant growing in humid environment while there are some exceptional annual *Mentha* plants. They have creeping rhizomes. They have simple, characteristic leaves with beautiful scent. Flowers of the plant are either hermaphrodite or they are on the pistil or on a different plant. Calyx is actinomorphic or sub-bilabial, tubular or campanulate; the plant is 10-13 vascular, 5 sub-equal or unequal teeth. Corolla weakly 2-lipped, sub-equal lobe, upper lobe is wider, generally emarginated and shorter than tubecalyx. It has 4 stamens and rises from below the labium outwardly. Fruits are small, smooth, nutlets smooth, foveolate or reticulate [4].



Figure 1: *Mentha* sp.

Bioactive compounds

Many plants contain a wide variety of chemical substances that have significant biological effects on humans. Whether used for what purpose, plants give the nature struggle for survival a number of things that they already produce in their own structures. Plants also have living spaces that grow and develop, feed and build up the next generation like other creatures. In these areas they are subjected to many biotic or abiotic processes while living their lives. The plants protect themselves from these factors in other ways because they have no chance of getting away or escaping. In order to protect themselves, plants produce a number of substances under the name of secondary minerals during photosynthesis. These secondary products are very important ingredients for plants in terms of maintaining harmony, protection, defence and continuing their generations [5-8].

In essential oils of *Mentha* species, there are basic components such as menthol (33-60%), menthone (15-32%), isomenthone (2-8%), 1,8 sineol (eucalyptols) (5-13%), menthyl acetate (2-11%) menthofuran (1-

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Mentha plants	Pharmacological effect	Extraction
<i>Mentha spicata</i>	Analgesic [14,18], Anti-inflammatory [18,28], Antipyretic [18], DNA damage protecting activity [25,27], Antioxidant [21,59], Anti-androgenic [22], Antimicrobial [42,47,74], Cytotoxic [42,52], Antiviral [47], Anticancer [49], Antiemetic [56]	Essential oils, Methanol, Diethyl ether, Ethyl acetate, n-butanol, Ethanol, Hexane, Chloroform, Aqueous, Water
<i>M. spicata</i> var. <i>crispa</i>	Antibacterial [22], Anti-allergic [36], Antioxidant [45]	Essential oils, Methanol, Water-soluble
<i>Mentha × piperita</i>	Analgesic [15,19,24,43], Antimicrobial [20,37,42,47,74], Antioxidant [20,45,53,57], Antibacterial [22,53], Antiparasitic [24], Sedative [24], Antichlamydia [33], Cytotoxic [42,54,57], Anti-inflammatory [43,57], Antiviral [47], Anticancer [51,54], Antiemetic [56], Radioprotection [58]	Essential oils, Aqueous extracts, Ethanol, Hexane, Chloroform, Methanol, Water-soluble, Petroleum ether, Benzene, Ethyl acetate
<i>M. arvensis</i>	Analgesic [16], Antimicrobial [16,42], Antioxidant [16], Antibacterial [22], Sedative [38], Anti-inflammatory [38,75] Cytotoxic [42], Anticancer [49], Hepatoprotective [59], Anti-allergic [75]	Ethanol, Essential oils, Methanol, Aqueous, Chloroform
<i>M. arvensis</i> var. <i>japanensis</i>	Antioxidant [45]	Water-soluble
<i>M. cordifolia</i>	Analgesic [17], Antioxidant [75]	Ethanol, Aqueous
<i>M. aquatica</i>	Antimicrobial [20], Antioxidant [21,44,45], Anticholinesterase [21], Anti-inflammatory [44]	Essential oils, Ether, Chloroform, Ethyl acetate and n-BuOH, hydroalcoholic
<i>M. longifolia</i>	Antimicrobial [20,32,42,66,69,78], Antioxidant [20,32,63,66,67,68,78], Cytotoxic [32,42,50], Anticancer [49], Hepatoprotective [60], Antispasmodic [62], Antibacterial [67,70], Acute Toxicity Effect [70], Antiviral [73]	Essential oils, Methanol, Aqueous, Ethanol, Hydroalcoholic
<i>M. longifolia</i> subsp. <i>longifolia</i>	Antimutagenic [64], Antioxidant [65,71], Antimicrobial [65,71],	Ethanol, Methanol
<i>M. mozaffarianii</i>	Analgesic [23], Antimicrobial [77]	Essential oils
<i>M. pulegium</i>	Antiparasitic [24], Antimicrobial [29,39,40], Antioxidant [40,81], Antispasmodic [61], Antimutagenic [81]	Essential oils, Hot water, Cold water, Ethanol, Hexane, Methanol, Dichloromethanol
<i>M. viridis</i>	Analgesic [24], Antiparasitic [24], Anticancer [49], Antioxidant [78], Antimicrobial [78]	Methanol, Aqueous
<i>M. suaveolens</i>	Cardiovascular Effects [30], Antibacterial [31], Analgesic [35], Anti-inflammatory [35], Antiviral [46]	Methanol, Dichloromethanol, Ethanol, Hexane, Essential oils
<i>M. australis</i>	Antioxidant [34]	Methanol
<i>M. rotundifolia</i>	Antibacterial [41], Antioxidant [79], Antimicrobial [79]	Essential oils
<i>M. haplocalyx</i>	Antioxidant [45], Anti-inflammatory [80], Anti-allergic [80]	Water-soluble, Ethanol
<i>Mentha × dalmatica</i>	Antioxidant [45]	Water-soluble
<i>Mentha × verticillata</i>	Antioxidant [45]	Water-soluble
<i>Mentha × villosa</i>	Cytotoxic [48], Antitumour [48]	Essential oils
<i>M. canadensis</i>	Antioxidant [55]	Methanol
<i>M. dumetorum</i>	Antimicrobial [74]	Essential oils

Table 1: Pharmacological effects of *Mentha* species.

7%), limonene (1-7%), β -myrcene (0.1-1.7%), β -caryophyllene (2-4%), pulegone (0.5-1.6%) carvone (1%) [9, 10]. On the other hand, it is stated that there are some compounds in *Mentha* species such as neomenthol, carvomenthone, p-cymene, aromadendrene, phellandrene, pipertone, pinene, carvacrol, α -pinene, α -phellandrene and thujone [11-13].

Results and Discussion

Pharmacologic effects

In studies on *Mentha* species, different methods are practiced, different solvent and essential oils of plants are used and various pharmacologic effects are determined. In the related studies on species, it is found that *Mentha* species have significant effects such as analgesic, anti-inflammatory, antipyretic, DNA damage protecting activity, antioxidant, anti-androgenic, antimicrobial, cytotoxic, antiviral, anticancer, antiemetic, antibacterial, antiallergic, antiparasitic, sedative, anti-chlamydia, radioprotection, anti-cholinesterase, hepatoprotective, antispasmodic, acute toxicity effect, anti-mutagenic, cardiovascular effects and anti-tumour effects (Table 1) [14-82].

Conclusion

Plants have been used by people in alternative medicine for different purposes since old ages. Nutraceutical and functional foods help protect against a chronic illness, reducing illness effects (82). It has been reported that various pharmacological effects of *Mentha* species,

one of the nutraceutical and functional foods, are reported. In this study, effects of *Mentha* species are stated. In this context, it is believed that *Mentha* species can be used in the treatment of many different diseases. After determining phytochemical content of *Mentha* species, they can be isolated and used in designing modern medicines. On the other hand, side effects of medicines that have been used currently can be eliminated. As a result, besides the fact that the use of *Mentha* species is quite significant, it is thought that the plant has an important place in the production of pharmaceutical products.

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