Review Article

An Update on the Herbal Plant *Mentha piperita*

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ABSTRACT

Mentha piperita L. (peppermint) is one of the most widely used medicinal herbs, and its distinct aroma and flavour have attracted the attention of the food and pharmaceutical industries. Mentha piperita is one of the most widely used herbs in the world, with a long history of safe use in medicinal formulations. Its leaf is used to treat anti-carcinogenic, Antispasmodic, Hepato-protective, Anti-edema, Anti-allergy, Antioxidant, Neuropsychiatric, Anti-inflammation, Analgesic as well as a cooling agent, Anti-TB, Antibacterial, anti-tumorigenic, anti-diabetic, Cutaneous Wound Healing, antiurolithic. Polyphenols, which are highly effective antioxidants and less toxic than synthetic ones, are found in this plant. The goal of this review is to show that a variety of chemical compounds and their pharmacological effects have been discovered in Mentha piperita in several studies. This plant has been found to contain a wide range of bioactive compounds, indicating that it is a rich source of phytochemicals that could be used to treat a variety of diseases. This plant shows a promising activity in several field of studies.

Keywords: Medicinal uses, *Mentha piperita*, Pharmacological actions.

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INTRODUCTION

Mentha piperita L., commonly known as peppermint, a medicinally important plant which belongs to the Family Lamiaceae (African pharmacopoeia, 1985; The Wealth of India, 1962). Mentha species are widely used for their flavouring and therapeutic benefits in many nations across the world. *Mentha piperita* is one of the most economically significant aromatic and therapeutic plants today.[1]

This perennial herbaceous has quadrangular stems and compound clusters of light purple petals. Peppermint contains a compound called menthol a significant amount of menthol (40.7 percent). particularly menthyl esters limonin, pulegone, caryophyllene, menthyl acetate as well as pinene. Flavonoids come in a variety of forms. Eriocitrin, hesaperidin, and other compounds found in this plant kaempferol[2]

The leaves of peppermint are beneficial to the intestines. coryza, inflammation, buccal mucosa inflammation Due to their antispasmodic properties, they might also cause respiratory difficulties. Peppermint oil applied topically is beneficial. Pains in the neuromuscular system are reduced. This oil's also have the uses as Antifungicidal, antibacterial, antiseptic, and antipyretic properties in addition to anti-aging properties. The topical *Mentha piperita* essence treat the affected wound healing, taking into account important factors like the number of fibroblasts, epithelial cells, inflammatory cells, and vasculature, and TGF- gene expression.[2]

The plant is farmed all throughout the world, but it also grows wild in damp environments, particularly in Europe, North America, and Asia. The United States of America, India, Japan, and the United Kingdom are the top producers and exporters of peppermint on the global market.[3]

Synonyms

Mentha piperita (L.) Huds., *Mentha piperita* Stokes, *M. balsamea* Willd.

Taxonomy

Kingdom: Plantae.

Family: Labiatae (Lamiaceae).

Division: Angiospermae.

Genus: Mentha.

Class: Dicotyledoneae.

Sub family: Stachydoideae.

Sub class: Sympetalae.

Tribe: Satureieae.

Order: Tubiflorae.

Species: *Mentha piperita* Linnaeus (Peppermint).

Sub order: Verbenineae.

Varieties: *Mentha piperita* var. officinalis Sole.

Vernicular Names for *Mentha piperita*

Arabic: Nana; Bogota: Yerba Buena; Brazil: Nortelapimento; Chinese: Po Ho; Danish: Pebermynte; Dutch: Pepermint; English: Brandy Mint, Pepper Mint; French: Menthe, Menthe anglaise; Kashmiri: Pudyanu Mexico: Menta piperita Hungarian: Borsus menta; Italian: Menta piperita; North America: Lamb Mint, Brandy Mint, Lam Mint, Peppermint; Norwegian: Peppermynte; Polish: Pepparmunta; Portuguese: Hortelanapi mentosa Spanish: Mentainglesa, Menta Piperita; Swedish: Pepparmynt; Turkish: Nana; Uruguay: Menta; Indian: Hindi, Bengali, Gujarati, Punjabi, Urdu, Marathi, Tamil and Telugu: Pudina;; Malayalam: Puthina. [7]

Medicinal uses

For respiratory congestion, peppermint oil vapour is used as an inhalant. Coughs, bronchitis, and inflammation of the oral mucosa and throat are all treated with peppermint tea. It's been used for centuries to treat colic in newborns, flatulence, diarrhoea, indigestion, nausea and vomiting, morning sickness, and anorexia, as well as as a spasmolytic to relieve gas and cramps. It's also used to treat toothaches, rheumatism, muscle discomfort, and menstrual cramps. Irritable bowel syndrome, Crohn's disease, ulcerative colitis, gallbladder and biliary tract diseases, and liver complaints are all treated with *Mentha piperita*.1 and this have shown a promising cure in wound healing on topical application 2 this *Mentha piperita* also have antiurolithiatic activity is thought to be mediated by a combination of crystal inhibitory, antioxidant, antiinflammatory, spasmolytic, and diuretic properties. *Mentha piperita* also improves urine and serum biochemistry, making it a safer and more cost-effective option for kidney stone prevention and treatment.[4]

Chemical composition

Basic components found in essential oils of Mentha species include menthol (33-60%), menthone (15-32%), isomenthone (2-8%), 1.8 sineol (eucalyptols) (5-13%), and menthyl acetate (2-11 percent) menthofuran (1–7%), limonene (1–7%), -myrcene (0.1–1.7%), -caryophyllene (2-4%), pulegone (0.5-1.6 percent) carvone carvone carvone carvone car (1 percent) On the other hand, neomenthol, carvomenthone, p-cymene, aromadendrene, phellandrene, pipertone, pinene, carvacrol, -pinene, -phellandrene, and thujone are said to be present in Mentha species.[5]

The composition of essential oil in *Mentha piperita* essential oil contains acetaldehyde, amyl alcohol, menthyl esters, limone, phellandrene, pinene, pugelone, and dimethyl sulphide, as well as alpha-pinene, sabinene, ocimene, gamma-terpinene, terpinolene, alpha- and beta-thujone, citronellol.

The properties of antioxidant in *mentha piperita*, here due to the existence of free radicals, a lack of antioxidants in the body promotes oxidative stress, which leads to a variety of pathological disorders. Antioxidants are of tremendous interest since they are a component of physiologically active compounds. A variety of physiologically active compounds that are generated by plants and have antioxidant action have been identified in the literature. Vitamin E, tannins, ascorbic acid (vitamin C), -carotene, a variety of protein compounds with enzymatic activity, flavonoids, polysaccharides, terpenoids, polyphenol compounds, and others are among them. Because to the presence of numerous bioactive compounds, Mentha pipertita has antioxidant capabilities.

The leaves of menthe piperita include Menthol, menthone caffeic acid, acetaldehyde, amyl alcohol, menthyl esters, limonene, pinene, cardial glycosides, phellandrene, cadinene, pugelone, and dimethyl sulphide are some of the substances found in the extract of the leaves of *Mentha piperita*. Alpha-pinene, sabinene, terpinolene, ocimene, diterpenes, gamma-terpinene, steroids, fenchene, alpha- and beta-thujone, coumarin, citronellol, carotenes, tocopherols, betaine, choline, saponin, tannins, and other constituents are among the constituents.[6]

Figure 1: *Mentha piperita* leaves

Pharmacological Actions

1. Effects that are anti-carcinogenic

Mentha piperita leaves extract revealed considerable anticarcinogenic effect in the treated animal dosage and time dependently by halting G1 cell cycle arrest and mitochondrial-mediated apoptosis, as well as perturbing oxidative equilibrium.[8]

2. Antispasmodic properties

Because of the presence of menthol and peppermint oil, the plant inhibited calcium channel function in guinea pig, papillary muscle, and atrial, rat, and their brain synaptsomes. The reduction in calcium influx also causes GIT smooth muscle relaxation.[9]

3. Hepato-protective effects

Mentha piperita leaves were found to have hepatic protective characteristics in mice, mitigating the effects of arsenic poisoning.[10]

4. Anti-edema properties

The 12-O-tetradecanoylphorbol13-acetate-induced ear edoema was reduced by topical treatment of a methanol leaf extract of *Mentha piperita* on mice (2.0 mg/ear).[11]

Table 1: Effect of *Mentha piperita* in different models[2,6]

Parts of plant	Compound	Effect
In humans, an herbal mixture including MP leaves	-	Activation of two epithelial chloride channels reduced anion secretion. The calciumactivated chlo-ride channels and the cAMP-dependent cystic fibrosis transmembrane conductance regulator were identified.
Leaves extract of MP in fish	Potassium, calcium, iron, manganese and magnesium. Vitamin A, C and E	Growth, immunological (in skin, mucus, and blood serum), and haematological parameters, as well as amylase activity and the amount of lactic acid bacteria, all increased in a dose-dependent manner.
The leaves' essential oil is found in minced beef	menthol (33.59%) and iso-menthone (33%)	Decrease in TBARS -Thiobarbituric acid reactive substances values.
Musca domestica and Anopheles stephensi essential oils	Menthol and menthone	Substantial larvicidal activity against housefly and Anopheles stephensi
Leaves in excision wound model	decarboxyrosemarinic acid galactoside	Reduce the levels of lipid peroxides and increase the antioxidant enzymes superoxide dismutase, catalase, and glutathione peroxidase at the wound site (healing activity); decrease the levels of lipid peroxides and increase the antioxidant enzymes superoxide dismutase, catalase, and glutathione peroxidase
The topical application of essence of MP in Cutaneous Wound Healing in rat model	pulegone, iso menthone, piperitone, carvone, and dehydrocarvone.	The *Mentha piperita* essence helps *with* wound healing acceleration in several ways. *Mentha piperita* essence increases expression of the Transforming growth factor-β (TGF-β) gene as an important factor in wound healing
Essential oil in the plant and in chocolate	In plant: peppermint: menthol (30.35 %), menthone (21.12 %), and others; in Chocolate mint: menthol (28.19 %) and menthone (15.53 %).	Peppermint has a greater antibacterial action than chocolate mint against E. coli, Streptococcus aureus, and Pseudomonas aeruginosa. Peppermint outperformed chocolate mint in the anti-oxidation test, while chocolate mint outperformed peppermint in the scavenging NO radical activity and as an anti-inflammatory.
Leaves calves and piglets	-	Therapeutic option for gastrointestinal and respiratory diseases in calves and piglets.

5. Anti-allergy properties

By reducing compound 48/80-induced histamine release from rat peritoneal mast cells in animals, *Mentha piperita* aqueous extract has exhibited dosedependent anti-allergic action.[12]

6. Antioxidant properties

Methanolic extracts of these plants demonstrated antioxidant activity, neurochemical characteristics, and protection against hydrogen-peroxide-induced toxicity in PC12 cells. The PC12 cells were significantly protected from oxidative stress by *Mentha piperita*.[13]

7. Neuropsychiatric effects

Peppermint has been suggested as a central nervous system stimulant in some studies. Based on possible changes in brain activity, studies on the effectiveness of aromas on cognitive performance, perceived physical workload, and pain responses have been conducted.[14]

8. Anti-inflammation properties

In a xylene-induced ear edoema test in mice and a cotton pellet granuloma test in rats, extract from these plants demonstrated anti-inflammatory effect.[15]

9. Analgesic as well as a cooling agent

Peppermint oil stimulates cold receptors on the skin, causing blood vessels to dilate, resulting in cooling and analgesic effects.[16]

10. Cardiovascular activity

Mentha piperita has been shown to have vasodilating qualities in some animals, as well as reducing systolic pressure and heart rate. Another benefit of peppermint oil is the relaxation of bronchial smooth muscles.[17]

11.Anti-TB properties

A patient who breathed peppermint essential oil demonstrated antituberculosis efficacy.[18]

12. Effects that are anti-tumorigenic

Mice were given *Mentha piperita* leaves, which have anti-tumor capabilities.[19]

13. Antibacterial properties

Peppermint oil and other leaf extracts have been shown to have antibacterial properties, inhibiting the development of both gramme positive and negative bacteria.[20]

14. Radio protective activity

In mice bone marrow, the leaf extract of these plants displayed radioprotective effects against radiation-induced chromosomal damage.[21]

15. Anti-diabetic properties.

Peppermint juice has been shown to lower glucose, cholesterol, low-density lipoprotein cholesterol (LDL-c), and triglyceride levels in treated rats.[22]

16. Antiurolithic effects.

The study proved *mentha piperita*'s preventative and therapeutic ability against urolithiasis, as well as providing scientific support for the folklore notion that it may prevent and cure kidney stones. *Mentha piperita*'s antiurolithiatic properties are thought to be mediated by a combination of crystal inhibitory, antioxidant, antiinflammatory, spasmolytic, and diuretic actions.[4]

17. Cutaneous Wound Healing properties.

Mentha piperita essence increases the expression of the Transforming Growth Component (TGF) gene, which is a key factor in wound healing. According to histologic measures, gene expression amount wound diameter and healing percentage topical use of *Mentha piperita* essence is effective in rats' cutaneous open wound healing. It shortens the inflammatory phase, deepens the granulated tissue, helps with angiogenesis, causes the proliferative phase to start sooner, and finally accelerates wound healing.[2]

CONCLUSION

Mentha piperita has been found to contain a wide range of bioactive compounds, indicating that it is a rich source of phytochemicals that could be used to treat a variety of diseases. Some of the beneficial biological effects suggest that this plant may have anti-oxidant, antinociceptive, antiinflammatory, antimicrobial, anti-carcinogenic, antiviral, anti-allergic, and antitumorigenic properties, wound healing property, antiurolithic effects indicating its potential for disease prevention and treatment.

REFERENCES

1. Shah PP, Mello PM. A review of medicinal uses and pharmacological effects of *Mentha piperita*. Indian Journal of Natural Products and Resources (IJNPR), 2014;3(4):214-221.
2. Amirzade-Iranaq MH, Tajik M, Amirmohammadi M, Yazdi FR, Takzaree N. Topical *Mentha piperita* Effects on Cutaneous Wound Healing: A Study on TGF-β Expression and Clinical Outcomes. WJPS 2022;11(1): 86-96.
3. Masłowski M, Aleksieiev A, Miedzianowska J, Strzelec K. Potential application of peppermint (*Mentha piperita* L.), german chamomile (Matricaria chamomilla L.) and yarrow (Achillea millefolium L.) as active fillers in natural rubber biocomposites. International Journal of Molecular Sciences. 2021 Jan;22(14):7530.
4. Jamshed A, Jabeen Q. Pharmacological Evaluation of *Mentha piperita* Against Urolithiasis: An In Vitro and In Vivo Study. Dose-Response. 2022 Jan 10;20(1):15593258211073087.
5. Sevindik M. Pharmacological properties of Mentha species. J Tradit Med Clin Natur. 2018 Jan;7(2):259.
6. Trevisan SC, Menezes AP, Barbalho SM, Guiguer ÉL. Properties of *mentha piperita*: a brief review. World J Pharm Med Res. 2017;3(1):309-13.
7. Fayed MA. *Mentha piperita* L.-A promising dental care herb mainly against cariogenic bacteria. Universal Journal of Pharmaceutical Research. 2019;4(3):33-8.
8. Jain D, Pathak N, Khan S, Raghuram GV, Bhargava A, Samarth R, et al. Evaluation of cytotoxicity and anticarcinogenic potential of Mentha leaf extracts. Int J Toxicol 2011;30(2):225-36.
9. Hills JM, Aaronson PI. The mechanism of action of peppermint oil on gastrointestinal smooth muscle: an analysis using patch clamp electrophysiology and isolated tissue pharmacology in rabbit and guinea pig. Gastroenterology 1991;101(1):55-65.
10. Sharma A, Sharma MK, Kumar M. Protective effect of *Mentha piperita* against arsenic-induced toxicity in liver of Swiss Albino mice. Basic Clin Pharmacol Toxicol 2007;100(4):249-57.
11. Yasukawa K, Yamaguchi A, Arita J, Sakurai S, Ikeda A, Takido M. Inhibitory effect of edible plant extracts on 12-O-tetradecanoylphorbol–13- acetate-induced ear oedema in mice. Phytother Res 1993;7(2):185-9
12. Sroka Z, Fecka I, Cisowski W. Antiradical and antiH2 O2 properties of polyphenolic compounds from an aqueous peppermint extract. Z Naturforsch C J Biosci 2005; 60(11-12):826-32
13. López V, Martín S, Gómez-Serranillos MP, Carretero ME, Jäger AK, Calvo MI. Neuroprotective and neurochemical properties of mint extracts. Phytother Res 2010; 24(6):869-74.
14. Balakrishnan A. Therapeutic Uses of Peppermint –A Review. J Pharm Sci Res 2015;7(7): 474-476.
15. Atta AH, Alkofahi A. Anti-nociceptive and antiinflammatory effects of some Jordanian medicinal plant extracts. J Ethnopharmacol 1998;60(2):117-24.
16. Balakrishnan A. Therapeutic uses of peppermint - A review. J Pharm Sci & Res 2015;7(7):474-76.
17. Khanna R, MacDonald JK, Levesque BG. Peppermint oil for the treatment of irritable bowel syndrome: a systematic review and meta-analysis. J Clin Gastroenterol 2014;48(6):505-12.

18. Shkurupiĭ VA, Odintsova OA, Kazarinova NV, Tkrachenko KG. Use of essential oil of peppermint (*Mentha piperita*) in the complex treatment of patients with infiltrative pulmonary tuberculosis. Probl Tuberk Bolezn Legk 2006;9:43-5.

19. Samarth RM, Panwar M, Kumar M, Kumar A. Protective effects of *Mentha piperita* Linn on benzo[a]pyrene-induced lung carcinogenicity and mutagenicity in Swiss albino mice. Mutagenesis. 2006;21(1):61-6.

20. Singh R, Shushni MAM, Belkheir A. Antibacterial and antioxidant activities of *Mentha piperita* L. Arab J Chem 2015;8(3):322-8.

21. Barbalho SM, Damasceno DC, Spanda APM, da Silva VS, Martuchi KA, Oshiiwa M, et al. Metabolic profile of offspring from diabetic Wistar rats treated with *Mentha piperita* (peppermint). Evid Based Complement Alternat Med; 2011:430237.

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