



A SYSTEMIC REVIEW ON MENTHA AND THEIR PHARMACOLOGICAL ACTIVITY

ARPIT KUMAR¹, ADITYA GUPTA² AND DR. JAYANT KUMAR MAURYA³

1. Research Scholar, Ashok Singh Pharmacy College, Maharoopur Jaunpur U.P. 222180

2. Assistant Professor, Department of Pharmacology, Ashok Singh Pharmacy College, Maharoopur Jaunpur U.P. 222180

3. Academic Head, Ashok Singh Pharmacy College, Maharoopur Jaunpur U.P. 222180

Corresponding Author: **Arpit Kumar**

Abstract

Plants are a great source of phytochemical substances, which are used as dietary supplements to cure a wide range of illnesses and issues. Because of its high efficacy, low toxicity, and antioxidant potential, mint (*Mentha* species) is one of the medicinal plants with a wide range of health benefits, including anti-obesity, antimicrobial, anti-inflammatory, anti-diabetic, and cardioprotective effects. It also shows promise in preventing the development of cancer. It has also been discovered that mint essential oils contain antimicrobial properties. A person can add taste while consuming less sodium and sugar by cooking with fresh mint and other herbs and spices.

Keywords: food preservation, antimicrobial, swelling, phytochemicals, mint, and *Mentha*

INTRODUCTION

One of the most popular aromatic therapeutic plants in the world is Mint (*Mentha* sp.). These plants are commonly cultivated worldwide for their unique herbal features such as antioxidant and antibacterial effects (Kadam et al., 2011; Nayak et al., 2011). These belong in a large group of perennial-herbaceous plants. The plant consists of stems that spread out uniformly and produce coarse, oval-shaped leaves which have serrated edges. Approximately 25–30 species constitute the genus *Mentha* under the Lamiaceae family (Hawryl et al., 2016) [1]. The *Mentha* belongs to Europe by birth, although, it occurs naturally in the north side of US The product has been exported around the world (Hocking & Edwards, 1955; Kavrayan & Aydemir, 2001). That forms an important part of the vegetation and it mainly develops in the Mediterranean region.[2]

The southern Himalayan regions of India, which include Himachal Pradesh, Haryana, Punjab, Uttar Pradesh, and Bihar, are the main producers of mint in the nation, according to Kripanand et al. (2015). While this genus can be produced in many different environments, humid environments and moist soils are the best for growing it. Due to its broad range of tolerance qualities, it can also be grown in the open (Maffei, 1999). The mint plant is between 10 and 120 cm tall and can spread across an indiscriminate region. Because of their propensity to proliferate, several mints are categorized as invasive (Park et al., 2002). Most mint species, which are economically seed sterile, are supported by underground stolons of mature plants, also called runners or rootstock (Douhan and Johnson, 2001).[3]



Fig: Plant of Mentha

According to Kripanand et al (2015), the southern Himalayan regions of India including Himachal Pradesh, Haryana, Punjab, Uttar Pradesh and Bihar constitutes the primary producing states of mint in the country. It is true that it can be grown in multiple environments yet humid locations and wet soil provide optimal condition. It is one of the most tolerant plants and therefore it can be cultivated in the open (Winkie et al., 2006). It grows from 10 to 3 feet of height, spreading widely on a random ground area. # Several mint species are declared ‘invasive’ because of their tendency to thrive. Underground stolons of mature plants, also called runners or rootstock, are able to support most of the mint species, which are economically seed sterile (Douhan and Johnson, 2001.[3]).

This is because stolons take a lot of water hence, they dry out quickly and cannot stay for longer. Based on the opinions of Alankar (2009) as well as Rohloff (1999), the highest plenteous active substances identified in the *Mentha* spp include limonene, as well as cineole, menthone, Menth Other compounds from the aerials part of the mint are namely: luteolin-diglucuronic acid and eriondyctiitol glucosides.[4]

Multiple authors Park et al., 2002; Thompson, 2003; Columbia Electronic Encyclopaedia, 2005; Commonwealth of India, 1962) [98, 129]. They can also be eaten raw or green when identified by their specific qualities. [5] These include being diaphoretic, stomachic, anti-spasmodic, antimicrobial, and refreshing. Saeidnia, et al. (2005); Colak et al. (2008);, Keifer et al. (2008);, Teertha and Zhou (2009);, Ak Pinar (2010 [6]

HISTORICAL BACKGROUND

John Gerard’s Herbal (1597) advocated for closing watery eyes and all cases of putrid outflows in the first instance and in the second one they should be soored. Using mint leaves with salt water helps one to kill stinging bees and wasps, while it is useful while bathing in places for normal dogs. “Mentha,” or mint, is a unique product that dates back several centuries. The genus *mentha* contains many species having aromatic values. It is used in aromatic, culinary and medication purposes.[7]

Mint was considered a good herb in ancient Greece, Rome and Egypt because it had medicinal value. This meant welcoming visitors and offered relief for stomach pains and upset stomach. It is named after a mythical Greek nymph, Menthe. The fame of mint spread through Europe and Asia especially during the Middle Ages. Mint was another medicinal plant that was cultivated and preserved mainly in monasteries. They also added it to food and used it as a breath freshener.[8]

BOTANICAL DESCRIPTION

It consists of small broken down branches. The leaves are usually opposite, decussate, shortly petiolate, and 2 mm long while the adult’s leaves range from 2.5 to 3.5 cm long and 1.5 to 2.0 cm broad.

Table: Scientific Classification of Mint

S. NO.	Kingdom	Plantae
1.	Phylum	Angiospermophyta
2.	Class	Magnoliopsida
3.	Order	Lamiales
4.	Family	Lamiaceae
5.	Genus	Mentha
6.	Species	25

Morphology

Botany and morphology of wild mint come together. Wild mints in terms of their appearance vary depending on which place they come from. Wild mints have many small roots while their root systems are shallow. Despite multiple stresses, a strong root system allows for chronic preservation (Londonkar et al., 2009). Wild mint's flavors with an intensity ranking from weakest to strongest is the flowers > the roots, stem, and leaves. Wild mint has square-branched leaves laden with water drops bearing a delicate mint perfume. Most mint leaves have oblong-ovate shapes. The best time when wild mint flowers is in September and October.



Fig: Harvesting of Mentha Plant

PHYTOCHEMICAL COMPOSITION OF MENTHA

Polyphenols and oleanolic acid, caffeic acid, metabolites of caffeic acid, cinnamic acid, caftaric acid are rich in Mentha species. Researchers have also established that these plants consist of flavonoids that form between 10 and 70 percent of all phenolic substances. Luteolin and its derivatives such as acacetin, apigenin, diosmin, salvigenin, and thymosin are the major flavonoids involved in this process. These other flavonols, such as epicatechin, catechin, and coumarins, including esculetin and scopoletin. However, aroma compositions of mint mainly revolve around the essential oils. Major constituents in Mentha species include oxides, ethers, ketones, esthers, and alcoholics. Their appearance can range from greenish yellow, through colorless, to pale yellow footnote:[13]

There is a lot of chemical evidence that various chemical compounds found in high quantity in Mentha species are considered responsible for their pharmacologic activities. Consumption of essential oils has been common food, beverages, confectionaries, and cosmetic industries. It is believed that the mentha species are able to cool the body, can help to strengthen the stomach and digestive problems, the respiratory tract disease and hemeorrhoids. [14]

HEALTH BENEFITS OF MINT LEAVES

A few potential health benefits of mint. There is a potential for Mint usage as medical herb for complex diseases; in addition to common culinary and domestic medication benefits.

It is rich in nutrients and also contains an active ingredient composition, thus mint has many health advantages.

- 1. Digestive Aid:** Digestive issues such as gas, indigestion and bloating are eased with mint. It relieves tummy ache by allowing these muscle parts in one's digestive tract to relax hence maintaining a healthy digestive system.
- 2. Nausea:** Research shows that the smell of mint reduces motion sickness and nausea. As pain relief, it is often employed in many forms such as essential oils and tea.
- 3. Better Oral Health:** Mint's antibacterial properties aid it to reduce the breath odor-causing germs as well as protect teeth from infections.
- 4. Benefits for the Respiratory System:** Mint has an ingredient known as menthol, a natural decongestant. It relieves the symptoms related to these respiratory conditions such as sinusitis, blockage, or cough.

5. Antioxidant Properties: Mint has numerous antioxidant properties that support one's overall health by reducing chances of chronic diseases and oxidative stress.

6. Stress and Headache Relief: The tranquil properties of mint may help reduce tension and anxiety. Migraine and headache can easily be relieved using mint oil on the temples.

7. Skin Health: The mint, which has bactericidal and inflammatory properties, is particularly beneficial for skin conditions including acne, inflammation, irritations and rashes. It is commonly used for skincare because of its calming effects.

NUTRITIONAL COMPOSITION AND PROPERTIES

According to the Office of Dietary Supplements (ODS), peppermint oil may irritate and produce redness on the skin. Trusted Source. It is advised against applying the ointment directly to a child's face or chest by parents or caregivers due to the potential for major adverse effects from direct inhalation.[17]

Table: Nutritional composition

S. NO.	Nutrients	Chemical value (100g)
1.	wet	83.63%
2.	polypeptides	5.1g
3.	Hydrate of Carbon	6.76g
4.	Calcium ion	268mg
5.	Phosphorus	71mg
6.	Iron	16.4%
7.	Zinc	0.32mg
8.	Vitamin C	36mg
9.	Ash	2.6g

PHARMACOLOGICAL PROPERTIES

1. Antimicrobial Actions

The investigation focused on the impact of essential oils on the growth of methicillin-resistant *Staphylococcus aureus*, methicillin-sensitive *S. aureus*, *Salmonella enteritidis*, *Escherichia coli* O157: H7, and *Helicobacter pylori*. The essential oils inhibited growth in a dose-dependent manner in each strain's liquid culture. In addition, these authors proved the bacteria cidal activity in the phosphate buffered saline.[18] The bacteria cidal activity towards the *Helicobacter pylori* and *Staphylococcus aureus* strains, both sensitive as well as resistant to antibiotics. An essential oil sample taken from *MA var. piperacens* produced in Thailand were tested by disc-diffusion assays against important zoonotic pathogens relevant to export of broiler meat products like Enterotoxigenic/pathogenic strains of ESBL-positive ESBL-producing *Salmonella*.

2. Antioxidant Activities

Cineole, one of the most crucial constituents in mint extract, has been reported to decrease the effect of ethanol on rat stomach mucosa. The activity has been linked with the ability of the test chemical to scavenge the pro-oxidants, its non-competitive lipoxygenase inhibition potency and the reversion of reduced level non-protein sulphhydryl. According to the literature, thymol, cineole, eugenol (which are all present in mint) have been reputed as strong antioxidants that inhibit peroxidations of lipids. Research shows that the flavonoids found in mint, especially quercetin, can inhibit lipid peroxidation and at the same time scavenge free radicals such as superoxide and OH. Mint extract contains xenobiotic modulatory compounds which are very good for phase 2 enzymes like glutathione and glutathione-S-transferase as well as antioxidant flavonoids terpenes and eugenol. [20]

3. Antifertility Activities

The antifertility effect of the petroleum extract of *MA* leaf has been evaluated in adult male albino mice. An analysis was conducted whereby oral doses of 10 and 20 mg/day/mouse were administered to male albino mice for 20, 40 and 60 days. Negative fertility observed after two months of therapy in all dose schedules. There are

no alterations in the body weight and libido of the treated animals. Though, the weight of the testis, epididymis, cauda epididymal total sperm count, motility, vitality and morphology was also significantly decreased. This study assessed the effectiveness of MA leaf methanol extract as a reversible contraceptive in male Albin mice. Twenty, forty, and sixty days of oral treatments with male mice with documented fertility using an extract aqueous solution at 10 mg per mouse led to partial suppression of fertility without affecting typical sexual activity. Therefore, there was a proportional decrease in the average weights of the testes and other reproductive accessory organs as the treatment became prolonged.

4. Effect on Anaphylactic Reactions and Tumour Necrosis Factor (TNF)-alpha Production

The effects of an aqueous extract of MA L. var. piperocaines Malinv. (MAAE) were investigated in connection to anaphylactic reactions generated by immunologic and non-immunologic stimulation. In a dose-dependent way, MAAE (0.001–1 g/kg) given intraperitoneally, intravenously, or orally decreased passive cutaneous anaphylaxis. MAAE (0.001–1 mg/ml) dose-dependently inhibited the release of histamine from rat peritoneal mast cells (RPMC) triggered by compound 48/80 or anti-DNP immunoglobulin E (IgE). Furthermore, MAAE (0.1 mg/ml) markedly reduced the production of TNF-alpha mediated by anti-DNP IgE. These results imply that MAAE inhibits both immunologic and non-immunologic stimulation-mediated anaphylactic reactions, as well as the production of TNF-alpha from RPMC.[22]

5. Radioprotective Activity

The radioprotective effects of various doses (0, 2.5, 5, 10, 20, 40, and 80 mg/kg body weight) of mint extract (MA) in chloroform were tested on mice exposed to 10 Gy gamma radiation. After receiving 10 mg/kg body weight of mint extract or oil, the mice were subjected to 6, 7, 8, 9, and 10 Gy of gamma radiation. The induction of radiation sickness and mortality were observed for a period of 30 days following the radiation treatment. The highest number of survivors in this group 30 days after radiation suggests that this dosage offered the best protection.[23]

6. Cardiovascular Disease

We looked at how the metabolism of arachidonic acid was affected by three polarity-based fractions from the MA crude extract. This raw extract inhibited the production of thromboxane B2-a stable analogue of thromboxane-A₂, 12-hydroxyeicosatetraenoic acid via the lipoxygenase pathway, and lipoxygenase product 1 by the cyclooxygenase pathway. Since thromboxane-B₂ is a major factor in platelet aggregation, MA might have antiplatelet effects. It was found that whereas MA had no effect on platelet activating factor, it inhibited the aggregation of human platelets caused by both arachidonic acid and adenosine diphosphate. It implies that the herb's beneficial effects on those with ischemic heart disease might be partially explained by its ability to inhibit platelet aggregation. Additionally, it was successful in increasing glutathione peroxidase activity.[24]

7. Anti-allergic and Anti-inflammatory Activity

Ethanollic and aqueous extracts (leaves, stem, and roots) of MA were evaluated for their anti-inflammatory and anti-allergic qualities using mice paw edema produced by histamine and the histamine release inhibition test. The secondary phytoconstituents found in MA, and especially in its leaves, provide MA its anti-inflammatory and allergy-promoting qualities. Based on the percentage inhibition of 53% and 57%, respectively, the anti-allergic results demonstrated the considerable inhibitory efficacy of the ethanollic extracts of the root and leaf. The percentage inhibitory potential of ethanollic extracts of plant components is leaf = 68.30 > root = 48.80 > stem = 10.70%, in contrast to the usual drug diclofenac sodium, which generated 77.87% edema inhibition.[25]

8. Anti-headache properties of peppermint

In the past, headache conditions have been treated with the plant utilized in herbal treatments (Levin, 2012). Headache relief is guaranteed when peppermint oil and its derivatives are consumed. A study found that patients' headache discomfort was significantly reduced when eucalyptus and peppermint oil were combined (Gobel et al., 1994).[26]

9. Common cold

Menthol is found in mint. This decongestant, which is fragrant, may aid in breaking up mucus and phlegm, making it simpler to expel. For kids with a typical cold, using menthol vapor rubs or ointments may be a secure and efficient treatment Trusted Source. The American Lung Association (ALA) cautions against using menthol to treat cold symptoms, citing a lack of evidence from scientific research. Despite this, some people may discover that using a menthol vapor rub relieves their cold symptoms.[27]

10. Diet

Mint is a simple addition to smoothies, sweets, drinks, and green salads. Eating mint leaves with food did not confer any health benefits. Rather, mint was ingested as a pill, applied topically, or inhaled through aromatherapy. Some of the research that was previously addressed can be summed up using the list below. consuming dried or fresh leaves as a breath freshener. Essential oil inhalation may lessen cold symptoms and cognitive performance. putting it on the skin to lessen nursing-related nipple soreness. Indigestion and IBS may be treated with taking capsules with food.[28]

11. Skin Health

Because of its anti-inflammatory and antibacterial qualities, mint helps treat skin acne and pimples. Because mint leaves have a high salicylic acid content, they have anti-acne properties. It is also a powerful skin cleaner. Because of its antioxidant qualities, mint helps your skin look clear and young by eliminating free radicals from your body. In addition to removing debris and dead skin cells from pores, mint helps your skin look toned and beautiful. It also helps your skin maintain moisture. Rosmarinus acid is an anti-inflammatory and antioxidant found in mint plants. Comparing the rosmarinus acid-treated group to the non-supplemented control group revealed a reduction in asthma symptoms. Many plant components with anti-allergenic properties are found in the mint plant family. But, compared to dietary mint, the amount of mint extract in oils and ointments can be much higher. The impact of dietary mint on allergy symptoms has not been thoroughly studied.[29]

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