Folium Menthae Piperitae

Definition

Folium Menthae Piperitae consists of the dried leaves of *Mentha* × *piperita* L. (Lamiaceae) (*1–3*).

Synonyms

Mentha piperita (L.) Huds., *M. piperita* Stokes, *M. balsamea* Willd. (*1*, *4*).

Selected vernacular names

Amentha, american mint, balm mint, brandy mint, cabra-caa, curled mint, doun menta piperita, hierbabuena, hortela pimenta, Katzenkraut, lamb mint, la menta, lamint, menta piemonte, mentea peperina, mentha pepe, menthe, menthe anglaise, menthe poivrée, moto yuyo, nána, ni naa, ni'na el fulfully, pepermin, pepper mint, peppermint, Pfefferminze, Pfefferminzblätter, piperita, pudeena, pum hub, yerba mota (*1*, *4*, *5*).

Geographical distribution

Commercially cultivated in eastern and northern Europe and the United States of America, and is found in Africa (*1*, *3*, *6*, *7*).

Description

A perennial herb, 30–90 cm high. Stems square erect or ascending, branched, the upper portion always quadrangular. Leaves opposite, petiolate, ovate-oblong to oblong-lanceolate, serrate, pointed; dark green on the upper surface. Flowers purplish, occur in thick, terminal, spicoid racemes of verticillasters; each flower shows a tubular calyx with 5 sharp, hairy teeth, a purplish, irregular, 4-cleft corolla, 4 short stamens, a 4-celled ovary and a projecting style ending in a bifid stigma. Fruit consists of 4 ellipsoidal nutlets (*1*, *7*, *8*).

Plant material of interest: dried leaves

General appearance

Green to greenish-brown. Leaves whole, broken or cut; thin, fragile; whole leaf 3–9 cm long and 1–3 cm wide, often crumpled. Lamina oval or lanceolate; apex acuminate; margin sharply dentate; base asymmetrical. Venation pinnate,

prominent on the lower surface, with lateral veins leaving the midrib at an angle of about 45°. Lower surface slightly pubescent and secretory trichomes visible under a hand lens as bright yellowish points. Petiole grooved, usually up to 1 mm in diameter and up to 1 cm long (*2*).

Organoleptic properties

Odour: characteristic, penetrating; taste: characteristic, aromatic (*2*).

Microscopic characteristics

Upper epidermis composed of large, clear epidermal cells with sinuous, vertical walls and possessing few or no stomata, few glandular trichomes present; palisade parenchyma, comprising a layer of columnar cells rich in chloroplasts; spongy parenchyma, of 4–6 layers of irregularly shaped chloroplastid-containing cells and intercellular air-spaces. Lower epidermis of small epidermal cells with sinuous, vertical walls and numerous diacytic stomata; in the region of veins and midrib, exhibits non-glandular and glandular trichomes as outgrowths; non-glandular trichomes uniseriate, papillose, 1–8-celled; glandular trichomes have 1–2-celled stalk and 1–8-celled glandular head containing the essential oil. Calcium oxalate crystals absent; pollen grains spheroidal and smooth (*1*, *4*, *7*, *8*).

Powdered plant material

Brownish-green. Fragments of leaf tissue with cells of epidermis having sinuous walls, cuticle striated over the veins, diacytic stomata present predominantly on the lower epidermis; epidermis fragments from near leaf margin with isodiametric cells showing distinct beading and pitting in anticlinal walls; covering trichomes short, conical, unicellular, bicellular or elongated, uniseriate multicellular (3–8 cells) with striated cuticle. Glandular trichomes of 2 types: either with unicellular base with small, rounded, unicellular head 15–25 µm in diameter; or with unicellular base with enlarged, oval multicellular head 55–70 µm in diameter composed of 8 radiating cells; dorsoventral mesophyll fragments with a single palisade layer and 4–6 layers of spongy parenchyma; yellowish crystals of menthol under the cuticle of secretory cells. Calcium oxalate crystals absent (*1*, *2*).

General identity tests

Macroscopic and microscopic examinations, and thin-layer chromatography (*1*, *2*). Gas chromatography of the steam-distilled essential oil (*9*).

Purity tests

Microbiological

Tests for specific microorganisms and microbial contamination limits are as described in the WHO guidelines on quality control methods for medicinal plants (*10*).

Foreign organic matter

Not more than 5% stems, the diameter of which must be not more than 1.5 mm; not more than 8% leaves showing brown stains due to *Puccinia menthae* (*2*); not more than 2% other foreign matter (*2*).

Total ash

Not more than 15% according to the *European pharmacopoeia* (*2*); not more than 12% according to the *African pharmacopoeia* (*1*).

Acid-insoluble ash

Not more than 1.5% (*2*).

Pesticide residues

The recommended maximum limit of aldrin and dieldrin is not more than 0.05 mg/kg (*2*). For other pesticides, see the *European pharmacopoeia* (*2*), and the WHO guidelines on quality control methods for medicinal plants (*10*) and pesticide residues (*11*).

Heavy metals

For maximum limits and analysis of heavy metals, consult the WHO guidelines on quality control methods for medicinal plants (*10*).

Radioactive residues

Where applicable, consult the WHO guidelines on quality control methods for medicinal plants (*10*) for the analysis of radioactive isotopes.

Other purity tests

Sulfated ash, water-soluble extractive, alcohol-soluble extractive, and loss on drying tests to be established in accordance with national requirements.

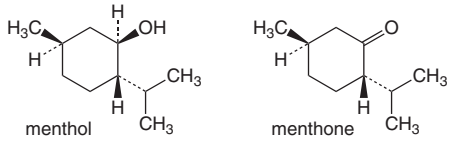
Chemical assays

Whole and cut leaves contain not less than 1.2% and 0.9% (v/w) essential oil, respectively, determined as described in the *European pharmacopoeia* (*2*).

Major chemical constituents

The major constituent of the leaves is the essential oil (0.5–4%), which contains menthol (30–55%) and menthone (14–32%). Menthol occurs mostly in the free alcohol form, with small quantities as the acetate (3–5%) and valerate esters. Other monoterpenes present include isomenthone (2–10%), 1,8-cineole (6–14%), α-pinene (1.0–1.5%), β-pinene (1–2%), limonene (1–5%), neomenthol (2.5–3.5%) and menthofuran (1–9%) (*2*, *4*, *6*, *12*, *13*).

The structures of the major monoterpenes, menthol and menthone, are presented below.



Medicinal uses

Uses supported by clinical data

None.

Uses described in pharmacopoeias and in traditional systems of medicine

Symptomatic treatment of dyspepsia, flatulence and intestinal colic (*1*, *3*, *14*, *15*).

Uses described in folk medicine, not supported by experimental or clinical data

As an emmenagogue, vermifuge, lactation enhancer and sedative. Also used to treat bronchitis, bacillary dysentery, diabetes, diarrhoea, dysmenorrhoea, fevers, hypertension, jaundice, nausea, pain, and respiratory and urinary tract infections (*5*).

Pharmacology

Experimental pharmacology

Antimicrobial activity

Extracts of Folium Menthae Piperitae have antibacterial and antiviral activity in vitro. Addition of ground leaves to the agar medium inhibited the growth of *Salmonella typhimurium*, *Staphylococcus aureus* and *Vibrio parahaemolyticus* at concentrations of 0.1–2.0% (w/v) (*16*). Aqueous and ethanol extracts of the leaves reduced the number of plaques of the rinderpest virus at concentrations of 4–8 mg/ml (*17*). Aqueous extracts of the leaves demonstrated activity against the following viruses in egg and cell culture: Newcastle disease, herpes simplex, vaccinia, Semliki Forest and West Nile (*18*).

Smooth muscle contraction

A 31% ethanol extract of the leaves inhibited both acetylcholine- and histamine-induced smooth muscle contractions in guinea-pig ileum in vitro at a concentration of 10 ml/l (*19*, *20*). The results were similar to those obtained with 0.13 mg atropine (*19*). An aqueous flavonoid fraction isolated from a leaf

extract inhibited barium chloride-induced muscle contractions of guinea-pig ileum in vitro at a concentration corresponding to 0.5 g leaves/ml (*21*).

Choleretic activity

Injection of a leaf infusion (0.5 ml) or a flavonoid fraction (equivalent to 3.3 g leaves/kg body weight) increased the amount of bile acids in cannulated rats and dogs (dose 0.4 mg/kg body weight) (*21*, *22*). A mixture of flavonoids, isolated from the leaves, had choleretic activity in dogs (2 mg/kg body weight) (*23*). Flavomentin, a flavonoid isolated from the leaves, stimulated bile secretion and the synthesis of bile acids in dogs (2 mg/kg body weight) (*24*). Intragastric administration of a 30% ethanol extract of the leaves to rats (1 ml/kg body weight) increased bile flow by 43%. The extract did not induce sedation in mice at doses up to 10 ml/kg body weight (*20*).

Anti-oedema activity

Topical application of a methanol leaf extract to mice (2.0 mg/ear) inhibited ear oedema induced by 12-*O*-tetradecanoylphorbol-13-acetate (*25*).

Analgesic activity

Intragastric administration of a 30% ethanol extract of the leaves inhibited phenylbenzoquinone-induced writhing in mice (ED_{50} 2.1 ml/kg body weight) (*20*).

Toxicology

Intragastric administration of a leaf extract (50 g leaves infused with 500 ml hot water for 10 minutes, then spray-dried) to 12 mice (4 g/kg body weight as a single dose) did not result in central nervous system depression, toxic effects or mortality (*26*).

Clinical pharmacology

None.

Contraindications

No information available.

Warnings

No information available.

Precautions

General

Patients with gallstones should not use Folium Menthae Piperitae unless under medical supervision (*15*).

Other precautions

No information available on precautions concerning drug interactions; drug and laboratory test interactions; carcinogenesis, mutagenesis, impairment of fertility; teratogenic and non-teratogenic effects in pregnancy; nursing mothers; or paediatric use. Therefore, Folium Menthae Piperitae should not be administered during pregnancy or lactation or to children without medical supervision.

Adverse reactions

No information available.

Dosage forms

Dried leaves (*2*, *3*). Tincture and infusions (*6*). Store in a well-closed container, protected from light (*2*).

Posology

(Unless otherwise indicated)
Daily dosage: 1–3 g crude drug three times daily (*14*, *27*). Infusion: pour 150 ml hot water over 1.5–3.0 g (one tablespoon) dried leaves, steep for 10 minutes, strain and drink three times daily between meals (*6*, *15*, *28*). Tincture: 2–3 ml (1:5, 45% ethanol) three times daily (*14*).

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