Aetheroleum Lavandulae

Definition

Aetheroleum Lavandulae consists of the essential oil obtained by steam distillation from the fresh flowering tops of *Lavandula angustifolia* Mill. or of *L. intermedia* Loisel (Lamiaceae) (*1–4*).

Synonyms

Lavandula officinalis Chaix, *L. spica* Loisel., *L. vera* DC., *L. vulgaris* Lam. (*5–8*). Lamiaceae are also known as Labiatae. In most formularies and older reference books, *Lavandula officinalis* Chaix is regarded as the correct species name. However, according to the International Rules of Botanical Nomenclature, *Lavendula angustifolia* Mill. is the legitimate name for the species (*8, 9*).

Selected vernacular names

Al birri, alhucema, arva neh, aspic, broad-leaved lavenda, common lavender, Echter Lavendel, English lavender, espi, espic, espliego común, firigla, frigous, garden lavendar, grando, hanan, hanene, hzama, khazama, khirii, khouzamaa, khouzami, khuzama, khuzama fassiya, khuzama zerqua, Kleiner Speik, Lavanda, lavande, lavande femelle, lavande véritable, lavando, lavandula vraie, Lavendel, lavender, lawanda, lófinda, ostoghodous, postokhodous, spigandos, true lavender (*6, 8–14*).

Geographical distribution

Indigenous to the northern Mediterranean region. Cultivated in southern Europe, and in Bulgaria, Russian Federation, United States of America, and the former Yugoslavia (*8, 15*).

Description

An aromatic shrub, 1–2 m high. Branches grey-brown to dark brown with long flowering and short leafy shoots, bark longitudinally peeling. Leaves clustered on leafy shoots, widely spaced on flowering shoots; petiole very short; blade linear-lanceolate to linear, 17 mm long, 2 mm wide

on leafy shoots, 2–6 cm long, 3–6 mm wide on flowering shoots; grey stellate tomentose, base attenuate, margin entire, revolute, apex obtuse. Inflorescence a crowded, interrupted or nearly continuous spike, 2–8 cm long; verticillasters numerous, with 6–10 flowers, upper ones densely crowded; peduncle about three times longer than the spike; bracts papery, rhombic-ovate, 3–8 mm long, rust coloured when dry; bracteoles absent or up to 2.5 mm long, pedicel 1.0–1.5 mm long; calyx 4–7 mm long, densely grey stellate tomentose outside, with 13 longitudinal ribs, upper lip entire, appendage obcordate, lower lip four-toothed; corolla 10–12 mm long, blue, base subglabrous, throat and limb glandular hairy, upper lips straight, lower lips spreading. Nutlets narrowly cylindrical (*8*).

Plant material of interest: essential oil

General appearance

A clear colourless or pale yellow liquid, miscible with 90% alcohol, ether and fatty oils (*1–4*).

Organoleptic properties

Odour: characteristic, fragrant, aromatic; taste: aromatic, slightly bitter (*1, 3*).

Microscopic characteristics

Not applicable.

Powdered plant material

Not applicable.

General identity tests

Macroscopic examinations (*1, 3, 4*); refractive index, specific gravity and optical rotation measurements (*2*); thin-layer chromatography for the presence of linalyl acetate and linalool (*4*), and gas chromatography (*4*).

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 (*16*).

Chemical

Relative density 0.878–0.892 (*4*). Refractive index 1.455–1.466 (*4*). Optical rotation -12.5–7° (*4*). Acid value not more than 1.0 (*4*).

Pesticide residues

The recommended maximum limit of aldrin and dieldrin is not more than 0.05 mg/kg (*17*). For other pesticides, see the *European pharmacopoeia* (*17*), and the WHO guidelines on quality control methods for medicinal plants (*16*) and pesticide residues (*18*).

Heavy metals

For maximum limits and analysis of heavy metals, consult the WHO guidelines on quality control methods for medicinal plants (*16*).

Radioactive residues

Where applicable, consult the WHO guidelines on quality control methods for medicinal plants (*16*) for the analysis of radioactive isotopes.

Other purity tests

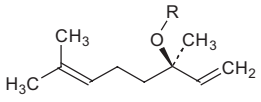
Tests for foreign organic matter, total ash and acid-insoluble ash not applicable. Tests for water-soluble extractive and acid-soluble extractive to be established in accordance with national requirements.

Chemical assays

Official analysis by gas chromatography shows the following composition: limonene, cineole, 3-octanone, camphor, linalool, linalyl acetate, terpinen-4-ol, lavandulyl acetate, lavandulol, α-terpineol (*4*).

Major chemical constituents

Contains: linalyl acetate (25–46%), linalool (20–45%), terpinen-4-ol (1.2–6.0%), lavendulyl acetate (> 1.0%), 1,8-cineole (1,8-cineol, cineol, cineole, eucalyptol) (< 2.5%), 3-octanone (< 2.5%), camphor (< 1.2%), limonene (< 1.0%), and α-terpineol (< 2.0%) (*4*). The structures of linalyl acetate and linalool are presented below.



and enantiomer

linalool R = H

linalyl acetate R = CO-CH_3

Medicinal uses

Uses supported by clinical data

Inhalation therapy for symptomatic treatment of anxiety, restlessness and to induce relaxation (*19–22*). Externally in balneotherapy for the treatment of circulation disorders (*23*).

Uses described in pharmacopoeias and well established documents

Symptomatic treatment of insomnia, and as a carminative for the treatment of gastrointestinal disorders of nervous origin (*15, 24*).

Uses described in traditional medicine

Orally as a cholagogue, diuretic and emmenagogue; externally for the treatment of burns, diarrhoea, headaches, sore throats and wounds (*15*).

Pharmacology

Experimental pharmacology

Anaesthetic activity

In vitro, the essential oil, linalyl acetate and linalool, 0.01–10.0 µg/ml in the bath medium, reduced electrically-evoked contractions of a rat phrenic-hemidiaphragm (*25*). In the rabbit conjunctiva test in vivo, administration of an aqueous solution of the essential oil, linalyl acetate or linalool, 30.0–2500.0 µg/ml, into the conjunctival sac increased the number of stimuli needed to provoke the reflex (*25*).

Anticonvulsant and sedative activities

Intraperitoneal administration of 2.5 g/kg body weight (bw) of linalool to rodents protected against convulsions induced by pentylenetetrazole, picrotoxin and electroshock (*26, 27*). In mice, intraperitoneal administration of 2.5 g/kg bw of linalool interfered with glutamate function and delayed *N*-methyl-D-aspartate-induced convulsions (*28*). Linalool acts as a competitive antagonist of [^{3}H]-glutamate binding and as a non-competitive antagonist of [^{3}H]-dizocilpine binding in mouse cortical membranes, suggesting interference of glutamatergic transmission. The effects of linalool on [^{3}H]-glutamate uptake and release in mouse cortical synaptosomes were investigated. Linalool reduced potassium-stimulated glutamate release (*29*). These data suggest that linalool interferes with elements of the excitatory glutamatergic transmission system.

Anti-inflammatory activity

The effect of Aetheroleum Lavandulae on immediate-type allergic reactions was investigated in vitro and in vivo. External and intradermal administration of aqueous dilutions of the essential oil, 1:500, 1:100, 1:10, 1:1 and 1:0, to mice inhibited mast cell-dependent ear oedema induced by compound 48/80 (*30*). Administration of the essential oil (same dose range) to rats inhibited passive cutaneous anaphylaxis induced by anti-dinitrophenyl (DNP) IgE, compound 48/80-induced histamine release and anti-DNP IgE-induced tumour necrosis factor-α secretion from peritoneal mast cells (*30*). Inhalation of 0.3 ml of the essential oil inhibited

thromboxane B_2 release induced by arachidonic acid in mice, suggesting an anti-inflammatory effect (*31*).

Antimicrobial and acaricidal activities
The undiluted essential oil inhibited the growth of *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa, Staphylococcus aureus* and *Streptococcus pneumoniae* in vitro (*32, 33*). The undiluted essential oil, 10.0 µl/disc, inhibited the growth of *Mycobacterium chelonae, M. fortuitum*, *M. kansasii*, *M. marinum* and *M. scrofulaceum* (*34*). The undiluted essential oil inhibited the growth of filamentous fungi in vitro (*35*). The essential oil, linalool, linalyl acetate and camphor had miticidal activity against *Psoroptes cuniculi* in rabbits (*36*).

Antispasmodic activity
Addition of the essential oil to the bath medium, 0.02 mg/ml and 0.2 mg/ml, reduced the twitching response and relaxed the muscle tone of rat phrenic nerve diaphragm preparations in vitro (*37*). The antispasmodic activity of the essential oil and linalool was mediated through the cyclic adenosine monophosphate signal transduction system, determined using a guinea-pig ileum smooth muscle preparation (*38*).

Central nervous system depressant effects
Inhalation of the essential oil (dose not specified) by mice reduced caffeine-induced hyperactivity, which was correlated with linalool serum levels (*39*). Intragastric administration of the essential oil (dose not specified) to rats produced anxiolytic effects and prolonged pentobarbital sleeping time (*40*).

Intragastric administration of 1.6 g/kg bw of the essential oil increased the lever-pressing response rate during the alarm phase of the Geller-type conflict test in animals, suggesting that the oil had an anticonflict effect similar to that of diazepam (*41*). Intragastric administration of 25.0 ml/kg bw of the essential oil, diluted 60 times in olive oil, prolonged pentobarbital sleeping times in mice (*42*). Inhalation of 0.3 ml of the essential oil inhibited strychnine-induced convulsions in mice (*31*).

Clinical pharmacology

Anxiolytic activity
In a comparison clinical trial without placebo, 40 healthy volunteers received aromatherapy (inhalation) with Aetheroleum Lavandulae or essential oil of rosemary (*Rosmarinus officinalis*) and were then asked to perform some simple mathematical computations. In the group treated with Aetheroleum Lavandulae, the electroencephalogram showed an increase in beta power, suggesting increased drowsiness. The subjects treated with this

oil also reported feeling less depressed and more relaxed, and performed the mathematical computation more accurately after the therapy (*20*).

In an uncontrolled trial in 13 healthy volunteers, inhalation of Aetheroleum Lavandulae significantly ($P < 0.001$) decreased alpha-1 frequencies (8–10 Hertz) shortly after inhalation, and the subjects reported feeling "comfortable" in a subjective evaluation of the treatment (*22*).

In a randomized study involving 122 patients admitted to a general intensive care unit, patients received either massage, aromatherapy with the oil (1% essential oil in grapeseed oil; 1–3 treatments over a 5-day period) or a period of rest to assess the efficacy of these factors on the stress response and anxiety. No difference between the three therapies was observed for the stress response. However, patients treated with the oil aromatherapy reported improvements in mood and a reduction of anxiety (*19*).

In 14 patients on chronic haemodialysis, inhalation of the essential oil over a one-week period decreased the mean score in the Hamilton anxiety rating scale compared with controls undergoing inhalation of odourless substances (*21*).

Analgesic activity

In a preliminary clinical trial without controls, addition of six drops of the essential oil to bath water daily for 10 days following childbirth did not reduce the incidence of perineal discomfort except for the period between days 3 and 5 postpartum (*43*). In a single-blind randomized clinical trial in 635 postpartum women, subjects were given pure Aetheroleum Lavandulae, synthetic lavender oil or an inert oil to use as a bath additive for 10 days postpartum. No difference between the therapies in the reduction of perineal discomfort was observed (*44*).

Cardiovascular effects

In a randomized crossover controlled study, healthy volunteers (number not specified) sat with their feet soaking in hot water for 10 minutes with or without the addition of the oil. Electrocardiogram, fingertip blood flow and respiration rate measurements indicated that treatment with the oil increased parasympathetic nerve activity and increased blood flow but had no effects on heart or respiratory rates (*23*).

Adverse reactions

Allergic contact dermatitis has been reported in patients previously exposed to the essential oil (*45–49*).

Contraindications

Aetheroleum Lavandulae is contraindicated in cases of known allergy to the plant material. Owing to its traditional use as an emmenagogue and abortifacient, the essential oil should not be used internally during pregnancy (*50–52*).

Warnings

Essential oils should be used with caution in children. Keep out of the reach of children.

Precautions

Pregnancy: non-teratogenic effects

See Contraindications.

Nursing mothers

Owing to a lack of safety data, the essential oil should be administered internally only under the supervision of a health-care provider.

Paediatric use

Owing to a lack of safety data, the essential oil should be administered internally only under the supervision of a health-care provider.

Other precautions

No information available on general precautions or on precautions concerning drug interactions; drug and laboratory test interactions; carcinogenesis, mutagenesis, impairment of fertility; or teratogenic effects during pregnancy.

Dosage forms

Essential oil (*15*). Store in a well-closed container, in a cool, dry place, protected from light (*4*).

Posology

(Unless otherwise indicated)

Essential oil by inhalation, 0.06–0.2 ml three times per day (*7*); internally, 1–4 drops (approximately 20–80.0 mg) on a sugar cube per day (*24*).

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