# MUGWORT

## *Artemisia vulgaris* L.

### *Family*

Asteraceae (daisy family), consisting of more than 500 species that are globally distributed.[1]

### *Parts Used*

Herb.

### *Description*

Mugwort is an erect, perennial weed growing wild and abundantly in temperate and cold-temperature zones of the world. It is native throughout Europe, Northern Africa and Central Asia and is naturalised in other parts of the world, including parts of North America and Australia. This shrubby plant grows in woodlands, roadsides and cleared grounds reaching up to two metres tall. Mugwort leaves are pinnately dissected (arranged on either side of a common stem) with a feathery appearance. They are dark green above and markedly silver below. It has small yellowish or reddish-brown flower heads that are borne in terminal clusters in summer and early autumn. The leaves have a distinctive smell when crushed, similar to wormwood *(Artemisia absinthium)*, owing to its essential oil content.[2]

### *Traditional Use*

The scientific name Artemisia is derived from Artemis, the Greek Goddess of the hunt, wild animals, wilderness, childbirth and virginity, while *vulgaris* is Latin for common. Artemis, the moon goddess and twin sister of Apollo, the sun god, were said to be capable of bringing or relieving disease in women. The moon was held to influence

fertility and to be the source of women's power to bear children. Herbs named after Artemis, used for centuries, are still in use today to aid childbirth and for the treatment of a variety of women's ailments. Mugwort, along with southernwood *(Artemisia abrotanum)* and wormwood facilitate childbirth. They regulate and strengthen contractions and help bring away the afterbirth.[3] The common name mugwort was said to have been derived from having been used to flavour drinks. It was used to a great extent for flavouring beer before the introduction of hops. It has also been suggested that the name mugwort may not have derived from 'mug', the drinking vessel, but from *moughte* (a moth or maggot) because, from the days of Dioscorides, the plant has been regarded as useful in keeping off the attacks of moths. Many English common names end in 'wort' and this comes from the Old English 'wyrt' and means a plant or herb used for food or medicine.[4,5,6]

Mugwort has a long history of folk tradition and use. Anglo-Saxon tribes believed that the aromatic mugwort was one of the nine sacred herbs given to the world by the god Woden. English herbalist Nicholas Culpeper (1600s) said 'three drams (approximately 4g) of the powder of the dried leaves taken in wine is a speedy and the best certain help for sciatica.' He also said 'it breaks the stone and opens up the urinary passages when they are stopped...the herb itself being fresh, or the juice thereof taken, is a special remedy upon the overmuch taking of opium...a very slight infusion is excellent for all disorders of the stomach, prevents sickness after meals and creates an appetite but if made too strong disgusts the taste. The tops with the flowers on them, dried and powdered, are good against agues and have the same virtues with wormseed in killing worms. Mugwort was mentioned in the classic book A Modern Herbal (1931), the first comprehensive encyclopaedia of herbs to appear since the days of Culpeper. The author Maude Grieve says the dried leaves were used by the working classes in Cornwall as one of the substitutes for tea when tea was expensive. It was also occasionally used in Europe as an aromatic culinary herb, being one of the green herbs used to stuff geese before roasting. The herb is often favoured by sheep and was historically used as a fattening agent. Grieve said there were many superstitions connected with mugwort. St. John the Baptist was said to have worn a girdle of mugwort when he set out into the wilderness. It was believed to preserve the wayfarer from fatigue, sunstroke, wild beasts and evil spirits generally, and a crown made from its sprays was worn on St. Johns eve to gain security from evil possession. The Romans planted mugwort by roadsides, where it would be available to passersby to put in their shoes to relieve aching feet. Some of the "magic" in mugwort is in its reputed ability to induce prophetic and vivid dreams when the herb is placed near the bed or under the sleeper's pillow. Greive said mugwort's chief employment was as an emmenagogue but it is also useful as a diaphoretic at the beginning of a cold. It was also used as a nervine in palsy, fits and epilepsy.[7,8,9]

In Traditional Chinese Medicine (TCM) mugwort has been used as an analgesic agent and, in conjunction with acupuncture therapy, to treat neonatal jaundice, gastric ulcers, hepatitis and convulsive crisis. In TCM the downy underside of mugwort is used in moxibustion therapy for different conditions including hypertension and breech pregnancy.[10]

## *Constituents*

Volatile oil (up to 0.3%) with camphor, borneol, alpha-thujone, germacrene, camphene, 1,8-cineole, linalool and beta-caryophyllene, and numerous other monoterpenes and sesquiterpenes (depending on the source). Phytochemical studies have identified more than 20 flavonoids in mugwort extracts. The most abundant compounds are eriodicyol and luteolin.

Also present are sesquiterpene lactones (including vulgarin and psilostachyin), alkaloids, saponins, sterols (stigmasterol and sitosterol), tannins, terpenes, acetylenes, flavonal glycosides and coumarins, phytyl fatty acid esters and squalene.[11,12,13,14,15,16]

## *Actions*

Emmenagogue, anthelmintic, bitter digestive stimulant, cholagogue, antispasmodic, antioxidant

## *Pharmacological Activity*

### Gynaecological Activity

Mugwort is used largely as a uterine stimulant to improve congestive dysmenorrhoea and to bring on a delayed period, due to the presence of triterpenes and in particular β-sitosterol. It is discussed extensively in early writings as an abortifacient and a poem known as the *Salernitan Regimen of Health* names mugwort as an abortifacient.[17]

### Antibacterial, Antiviral and Antiparasitic Activity

A 2014 study has found that a crude ethanolic leaf extract of mugwort showed potent antimalarial properties in terms of anti-disease activities; antipyretic activity, peripheral and central antinociception (reduced sensitivity to pain), increased survival, averted end-stage disease and reversed thrombocytopenia/thrombocytosis. Thus, the antidisease properties of mugwort crude plant extract collectively with established antiparasitic properties, further corroborate the potential of this plant to be developed into an effective antimalarial. The researchers had previously reported that the ethanolic leaf extract of mugwort possesses both potent and safe antimalarial activity (in terms of antiparasitic properties) in a *Plasmodium berghei* murine malaria model. Artemisinin isolated from *Artemisia annua* (sweet wormwood) is the most potent antimalarial against chloroquine resistant *Plasmodium falciparum* malaria. This prototype study investigated the antidisease activities of mugwort in a *Plasmodium berghei* ANKA murine malaria model that elicit pathogenesis similar to falciparum malaria.[18]

A 2012 study screened the antimicrobial activity of different extracts of mugwort leaves. To detect the *in vitro* antibacterial activity of 10 bacterial strains, including *Staphylococcus aureus, Salmonella typhi, Pseudomonas aerogenosa* and *Escherichia coli*, were selected. These bacteria are both gram positive and gram negative. Antifungal activity of mugwort on several fungal species were selected for the study including *Aspergillus fumigates* and *Candida albicans*. Leaves were extracted with a petroleum ether, chloroform, ethyl acetate, ethanol and aqueous. The results of antimicrobial activity revealed that the extracts exhibited activity against both gram positive and gram negative and fungal organisms. The researchers suggested the antibacterial and antifungal activity of aqueous, chloroform and ethanolic extracts may be due to the presence of flavonoids but requires further study.[19]

The antimicrobial activities of ethanol, methanol and hexane extracts from wormwood, sweet wormwood and mugwort were studied. Plant extracts were tested against five Gram-positive bacteria, two Gram-negative bacteria and one fungal strain. The results indicated that sweet wormwood alcoholic extracts are more effective against tested microorganisms. However, all plants extracts have moderate or no activity against Gram-negative bacteria. The researchers said the results confirm the justification of extracts of Artemisia species use in traditional medicine as treatment for microbial infections.[20]

The inhibitory effect of essential oils of *Lippia alba, Lippia origanoides* (both from the verbena family), *Oreganum vulgare* (oregano) and mugwort on yellow fever virus (YFV) replication was investigated in response to a need for an effective antiviral drug. All the essential oils studied were found to be effective antiviral agents, with oregano being the most potent oil at the lowest dose. Mugwort essential oil in the culture medium was an effective antiviral at 100mcg/mL dose. The mode of action of the essential oil seems to be direct virus inactivation.[21]

Trichinellosis, often causing diarrhoea and more rarely fever, periorbital oedema and myositis in human, is commonly treated with benzimidazole derivatives. The Artemisia genus has been found to be effective against a variety of parasites. The efficacy against trichinellosis *(Trichinella spiralis)* of mugwort and wormwood was examined in rats. The results of trichinoscopy and artificial digestion, during the adult phase of the illness showed that 300mg/kg doses of methanol extracts of mugwort reduced the larval rate in various tissue sites by between 53.4% to 75.6%. Analysis of antibody levels also showed that mugwort significantly reduced the antibody response and the overall conclusion was that mugwort could be an alternative drug against trichinellosis.[22]

A study examined the essential oils of mugwort and wormwood and found them to exhibit broad spectrum antimicrobial activity against a range of common human pathogens.[23]

Mugwort is also used against fleas and flies in holistic veterinary practice, and also as an anthelmintic – however it was not shown to be effective against worms in pigs in one study.[24,25,26]

Insect repellent and fumigant activity has been found in essential oils from mugwort.[27]

**Gastrointestinal and Glycaemic Activity**

A study evaluated mugwort for antagonistic activity on smooth muscle tissue of the airways and gastrointestinal tract in order to explain its traditional use in asthma and hyperactive gut. Different biogenic amine receptors were studied for their interaction with extracts of mugwort. A specific, competitive histamine receptor antagonist and smooth muscle relaxant activity was found on smooth muscle in both the ileum and the trachea explaining the herb's traditional use in the treatment of asthma and hyperactive gut.[28]

A range of herbs were evaluated for possible anti-diabetic agents using the oral glucose tolerance test in mice. While some herbs, including Syzygium (a genus of flowering plants that belongs to the myrtle family) exhibited antihyperglycaemic activities when fed simultaneously with glucose an increase in blood glucose levels was noted for *Nopalea cochinellifera* (cochineal cactus) and mugwort.[29]

The effect of an extract of the aerial parts of mugwort was investigated against D-galactosamine and lipopolysaccharide induced hepatitis in mice. The raised plasma levels of the liver enzymes, alanine aminotransferase (ALT) and aspartate aminotransferase (AST), were significantly reduced by pre-treatment of mice with different doses of mugwort. The hepatoprotective effect was further verified by histopathology of the liver, which showed improved architecture, absence of parenchyma congestion, decreased cellular swelling and apoptotic cells, compared with the findings in the toxin group of animals. These findings scientifically validated the traditional use of mugwort for various liver disorders.[30]

**Antispasmodic and Nociceptive Activity**

A recent study describes antispasmodic, antidiarrheal, bronchodilatory and tracheo-relaxant activities of mugwort to rationalise some of its traditional uses. Extracts of mugwort were studied in the isolated tissue of rabbit jejunum and guinea-pig trachea, as well as in the *in vivo* castor oil-induced diarrhea and bronchodilatory techniques. Mugwort was shown to relax spontaneous contractions in the jejunum, and it exhibited protective effect against castor oil-induced diarrhea and bronchoconstriction in rodents. In the trachea, the herb relaxed the experimentally induced contractions. Overall mugwort exhibited a combination of anticholinergic and calcium ion antagonist mechanisms, providing pharmacological basis for its folkloric use in the hyperactive gut and airways disorders, such as abdominal colic, diarrhoea and asthma.[31]

Extracts of *Achillea millefolium* (yarrow) and mugwort were evaluated by the hot plate, writhing, formalin and intestinal transit tests in an attempt to confirm their folk use as analgesic, anti-inflammatory and antispasmodic agents. Both extracts significantly inhibited abdominal contortions but did not change intestinal transit in mice or response response time in the hot plate or formalin test. The flavonoid glycoside, rutin, was found to be the principal active constituent responsible for the effects.[32]

**Antioxidant Activity**

An Egyptian study evaluated the *in vitro* and *in vivo* antioxidant activities of aqueous extract of mugwort. The plant extract was tested for radical scavenging, nitric oxide radical scavenging, reducing power assays, total phenol, flavonoid and flavonol content. Serum ascorbic acid level, blood glutathione level and superoxide dismutase activity in rats treated with mugwort extract was also measured. The extract exhibited scavenging potential similar to standard rutin and also nitric oxide scavenging activity. The reducing power of the extract depends on the amount of extract. The treatment of rats with aqueous extract of mugwort resulted in a significant increase in blood glutathione level, superoxide dismutase activity and serum ascorbic acid level as compared to their corresponding controls. The results obtained indicated that aqueous extract of mugwort is a potential source of natural antioxidants.[33]

The extracts of various Japanese herbs were examined for antioxidant potential. Mugwort (Yomogi) showed remarkable radical scavenging activity, especially the volatile oil.[34] While another

study into Vietnamese medicines for gout and related inflammatory symptoms, found that mugwort was one of the herbs that exhibited strong xanthine oxidase inhibitory activity.[35]

**Anticancer Activity**

Recently there has been increasing interest in the use of essential oils as medicinal agents because they have been found to have anticancer potentials through induction of apoptosis in various cancer cell lines of haematological and solid tumor origins. There is considerable evidence showing that the active compounds in the essential oils of different *Artemisia* species are responsible for their antiproliferative effect on cancer cells. Although there is no available scientific data on the cytotoxic and apoptosis inducing effects of mugwort essential oil, recently the methanolic extract from mugwort has been shown to substantially reduce the viability of the hepatocellular carcinoma cell line HepG2. The cytotoxic effect of this extract is suggested to be mediated by apoptosis.[36] Aqueous extracts from mugwort have been also reported to induce apoptosis in prostate, breast and colon cancer cell lines.[37] In addition, extracts from mugwort have been shown to sensitize MDA-MB-231 and MDA-MB-468 breast cancer cells to TRAIL.[38] However neither the composition of active ingredients, nor the detailed apoptotic mechanisms induced by the different extracts, have been determined. A recent study isolated the essential oils from mugwort aerial parts (leaves and buds) and identified its chemical composition using gas chromatography (GC)/mass spectrometry (MS) analyses. Major components of the oil such as caryophyllene, alpha-zingiberene, borneol and ar-curcumene have all been reported to induce apoptosis in different human cancer cell lines, as purified compounds or as part of essential oil isolated from other plants. A 2014 study examined whether or not the essential oil isolated from the aerial parts of mugwort induces apoptosis in the human acute myelogenous leukemia cell line HL-60. The report also investigated the possible mechanism(s) of apoptosis triggered by the essential oil. The results demonstrate, for the first time, that low doses of essential oil from mugwort induce apoptosis in the HL-60 cells through a mitochondria and caspase dependent mechanisms. In addition to the effect on HL-60, low concentrations of the essential oils from leaves and buds were able to induce apoptosis in various other human cancer cell lines (Jurkat, K562, MCF-7, HepG2, PC-3 and HeLa) but lack substantial cytotoxicity for normal nonmalignant cells such as BJ and HEK-293 V79-4 cells at the same doses. This feature implies a promising potential for mugwort oil compounds as chemotherapeutic for cancer treatment with a low risk of side effects, usually related to the unspecific cytotoxicity of many conventional cancer therapeutics.[39]

Antitumoral activity has been reported to artemisic acid and artemisinin B extracted from mugwort.[40]

A 2011 study sought to identify the antiproliferative effects of different *Artemisia* species on cultured human cancer cells. A range of extracts including methanol, ethyl acetate, dichloromethane and n-hexane extracts were obtained from aerial parts of seven species of *Artemisia*. The antiproliferative effects of each herb was examined on four cancers (AGS, HeLa, HT-29 and MCF-7). Mugwort was shown to inhibit MCF-7 breast cancer cells.[41]

The anti-mutagenicity of the functional components of several typical traditional herbs used in Japan was examined. The traditional herbs included Gennoshoko *(Geranium nepalense var. thunbergii)*, Yomogi *(Artemisia vulgaris var. indica)* and Kanzo *(Glycyrrhiza uralensis)* and they were examined by Ames mutagenesis assay test against various mutagens. The water-soluble components or volatile oil of the herbs were extracted in boiling water. Yomogi was shown to have good antimutagenicity against multiple mutagens. In addition, the volatile oil of yomogi also had remarkable antimutagenic effects against key mutagens.[42]

## *Indications*

- Delayed or irregular menstruation, amenorrhoea, dysmenorrhoea, to hasten labour and help expulsion of the placenta
- Poor appetite, weak digestion, nervous dyspepsia
- Intestinal parasites
- Oxidative stress and infection

## *Energetics*

Cool and dry.[43]

## *Use in Pregnancy*

Due to the emmenagogic action mugwort is not recommended during most stages of pregnancy – except in the last weeks to aid delivery. It should be avoided during breastfeeding because it tends to dry up secretions.[44]

## *Contraindications*

Allergic reactions to mugwort pollen have been commonly reported, including cross reactivity to other daisy family species.[45] One study found that using oral doses of the herb medicinally (in immunotherapy) could reduce allergic responses to the airborne pollens in the skin.[46]

## *Drug Interactions*

None known.

## *Administration and Dosage*

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| Liquid Extract: | 1:1 |
| Alcohol: | 30% |
| Weekly Dosage:[47] | 10 to 40mL |

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