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Review Article

An Overview on Traditional Uses, Phytochemical and Pharmacological Studies of *Artemisia absinthium* Linn (Afsanteen)

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A B S T R A C T

Artemisia, being the largest and widely distributed genus of the plant family Asteraceae comprises more than 400 species. Some popular species are reported to possess several medicinal properties owing to the rich phytochemical diversity. Among them, *Artemisia absinthium* (Afsanteen) is commonly known as wormwood. It is mentioned in Unani literatures and almost all the herbal medicinal books of the Western world. It is reported to possess several therapeutic benefits in chronic fevers, inflammation of viscera, hepatitis, splenomegaly, indigestion, anorexia, worm infestation, jaundice, ascites, amenorrhoea, dysmenorrhoea, epilepsy, gastric problems and urinary disorders. It is a rich source of chemically novel compounds and needs elaborate screening strategies to dwell into the pharmacological effects of its phytoconstituents. A lot of research work had been done on different species of Artemisia, because of its therapeutic potential in many indigenous traditional cultures. The present review is aimed to gather the comprehensive information of traditional uses, phytochemistry and pharmacology of *Artemisia absinthium* so as to generate optimum data for future reference.

Keywords: *Artemisia absinthium*, Traditional uses, Phytochemistry, Pharmacology

Introduction

Artemisia is a large, diverse genus of plants with more than 400 species belonging to the family Asteraceae. It comprises herbs and shrubs known for their volatile oils. They grow in temperate climates of Northern and Southern Hemisphere, usually in dry or semi-dry habitats. *Artemisia absinthium* is a very important member of this genus, commonly known as wormwood.[1] In Unani system of Medicine, it is recognized as "Afsanteen" and used as an astringent, demulcent, deobstruent, anthelmintic, antiseptic, cholagogue, antipyretic, stomachic, resolvent, diuretic and emmenagogue for the treatment of chronic fevers, inflammation of viscera, hepatitis, splenomegaly, indigestion, anorexia, worm infestation, jaundice, ascites, amenorrhoea and dysmenorrhoea.[2,3,4,5,6,7,8] *Artemisia absinthium* contains volatile oil (1%) and a crystalline bitter glucoside, anabsithin (absinthin). The dry leaves and flowering tops collected from Gulmarg in kashmir yielded a pleasant smelling essential oil (0.2%). The oil contains mostly the esters of thujyl alcohol, thujane, thujone, cadinene and S-guaiazulene. Aqueous and alcoholic

extract of *Artemisia absinthium* has anti-inflammatory, hepatoprotective, anthelmintic and antimalarial activity. Its essential oil has antimicrobial activity.

Artemisia absinthium

Vernacular Names

Afsanteen is known by different names in different regions viz.

Arabic- Khatraque, **Persian**-Afsantin/ Brinjasif kohi/ Sataroo, Marwah Afsanteen Rumi, Marw, **Bengali**-Mastaru, **English**-Absinth, Worm wood, Medder wort, Ming wort, **French**- Absin menu, Absinthe, **Gujarati**-Mastaru, **Hindi**- Vialayati Afsanteen, Nagdoun, **Kannada**-Varuvalu, Urigattige, **Kashmiri**-Tethwan, **Malayalam**-Nipampala, Tiru-nitripachcha, **Tamil**-Machipattri, **Telugu**-Tartiha, **Sanskrit**- Indhana, Damar, **Unani**-Afsanteen, **Urdu**-Afsanteen[2,3,4,5,6,8,9,10]

Geographical Distribution

Artemisia absinthium is an aromatic and bitter shrub found in Kashmir at an altitude of 5000-7000 ft., North Asia, Afghanistan, and West wards to the Atlantic, Waste places on chalky soils, Nepal, China, and Japan. It is indigenous in Europe, Asia, and mountainous districts of India and cultivated in the United States too.[6,8,10]

Morphology

Artemisia absinthium is a perennial, hoary, silky, pubescent, herbaceous, aromatic plant. Stem is erect, angular, ribbed, 0.3-0.9 m long. The leaves are ovate or obovate, 2.5-5 cm, unequally 2-3 pinnatefidly cut into spreading linear, lenceolate, obtuse segments, hoary on both the surfaces; radical and lower cauline narrowed into winged petioles. The heads are 6-8 mm in diameters, numerous, but hardly crowded, pedicelled, hemispheric in drooping, second recemes terminating the branches. Flowers yellow, heterogamous, ray flowers females and dilated below and disc flowers hermaphrodite. The receptacle is covered with long hair. Anthers acuminate not aristate. Achenes elliptic, oblong or somewhat obovoid 1mm long.[6]

Description of Plant in Unani Literatures

Afsanteen (*Artemisia absinthium* Linn) has been described in details by many Unani physicians. The shrub is short and soft, highly branched; leaves are whitish closely resemble to the leaves of Ushna (*Usnea longissima*), mottled in colour, flowers are small, white, resemble to the flower of Babuna (*Matricaria chamomilla*) and yellowish in the centre. Small bulb appears after falling the flowers containing seeds inside.[3,4] The shrub looks like the Aqhwan (Chrysanthemum). Stem is long, straight and branched, leaves are mottled in colour, and hairy similar to the leaves of Sa'atar (*Zataria multiflora*). The taste is bitter, astringent and pungent. Ibn Sina states that; according to Hunain bin Ishaq, Afsanteen is of various types. First Khurasani, second Mashriqi, third is derived from Koh e Bakam, fourth Soosi and fifth Tarsoosi.[4,5]

Hes'as Mustamala (Parts Used)

Dried leaves and flowering tops of the plant are mainly used for medicinal purposes.[3,4,8,10,11].

Mizaj (Temperament)

Different physicians described its temperament according to their reasoning.

Hot (1) Dry (3), Hot (1) Dry (2), Hot (2) Dry (2).[2,3,5,7,11,12,13]

Aa'fal (Pharmacological Actions)

Afsanteen produces many types of effect after administration into the body. The functions reported by various authors are mentioned as follows:

Qabis (Astringent), Mukhaddir (Anaesthetic), Muharrik (Stimulant), Mosakkhin (Calorific), Mohallil (Resolvent), Mojaffif (Siccative), Mulattif (Demulcent), Jali (Detergent), Mufatteh (Deobstruent), Musakkin (Sedative), Dafa' e Ta'ffun (Antiseptic), Muqawwi e Meda (Stomachic), Qatil e Deedan e Ama (Anthelmintic), Mudirr e Baul (Diuretic), Mudirr e Haiz (Emmenagogue), Mushil e Safra (Cholagogue), Daf'a e Humma (Antipyretic), Moarriq (Diaphoretic), Kasir e Riyah (Carminative), Moqawwi e Jigar (liver tonic), Muqawwi

e Dimagh (Brain tonic), Mushtahi e Ta'am (Appetizer), Mullayyin (Laxative).[2,3,4,5,6,7,8,10,11,12,13]

Mahell e Istemal (Therapeutic Uses)

Based on the aforementioned pharmacological action of Afsanteen, it is used effectively into many diseases in various dosage forms:

Sara (Epilepsy), Ikhtanaqur Reham (Hysteria), Sakta (Apoplexy), Kaboos (Nightmare), Laqwa (Facial paralysis), Falij (Hemiplagia), Istirkha (Flaccidity), Falij umoomi (Generalized paralysis), Suda'a (Headache), Rasha (Parkinsonism), Sadar wa dowwar (Giddiness and Vertigo), Malekholia (Melancholia), Sahar (Insomnia), Wajaul mafasil (Arthralgia), Warm e kabid (Hepatitis), Warm e Tihal (Splenitis/Splenomegaly), Yarqan (Jaundice), Istisqa (Ascites), Zo'f e M eda (Weakness of Stomach), Zo'f e Hazm (Indigestion), Nafakh (Flatulence), Tahabbuj (Edema), Su al Qinya (Anaemia with hypoproteineamia), Shaqaq e Miqa'd / Kharash e miqad (Anal Fissure), Bawasir (Piles), Kuzaz (Tetanus), Humma (Fever), Wadaqa, Ashob e Chash (Phlectanular Conjuctivitis), Da'alTha'lab (Alopecia areata), Da' al Hayya (Alopecia furfuracea), Nuzul al Ma' (Cataract), Tarfa (Ecchymosis of the eyelids), Khunaq (Diphtheria).[2,3,4,5,7,8,10,11,12,13,14]

Miqda'r e Khurak (Doses)

The drug is given in varying doses as mentioned below:

2-5 gm, 3-5 gm, 4.5-7 gm, 4.5-9 gm, 7-9 gm , 7 gm , 17.5-24.5 ml, 4.5-6.75 gm.[2,3,5,7,9,13,14]

Mazarrat (Adverse Effects)

Despite having usefulness in many diseases, the drug sometimes may produce side effects like headache and weakness in stomach.[2,5,7,9,10,12]

Musleh (Corrective)

For cold temperament persons, Anisoon (*Pimpinella anisum*), Mastagi (*Pistasia lentiscum*), Muqil (*Commiphora mukul*) could be added with the drug to reduce its toxicity.[2,5,7,9,10,11,13]

For hot temperament persons Neelofer (*Nymphaea alba*), Samagh Arbi (*Acacia arabica*), Kateera (*Astragallus gummifer*), Sharbat Anar, Gulab (*Rosa damascena*), Sikanjbeen are advised to protect from harmful effect of the drug.[5,7,9,10,11,13]

Badal (Substitute)

When the availability of the drug happens to be very difficult or the patient is unable to get it easily, the following drugs could be used in place of Afsanteen.

Asaroon (*Asarum europeum*), Osara e Ghafis (*Agrimonia eupatona*), Kasoos (*Cuscuta reflexa*), Sheeh Armani (*Artemisia persica*), Post Halela Zard (*Terminalia chebula*).[2,5,7,9,10,11,13]

Murakkabat (Compound Unani Formulations)

The following preparations are available in the market which has the Afsanteen as one of the ingredients.

Itrifal Deedan, Arq-e-Afsanteen, Zimad e Kabid, Roghan Afsanteen, Roghan Kalan, Joshanda Afsanteen.[11,14]

Phytochemical Studies

Wormwood contains volatile oil (1%) and a crystalline bitter glucoside, anabsithin (absinthin).[15] The dry leaves and flowering tops collected from Gulmarg in kashmir yielded a pleasant smelling essential oil (0.2%). The oil contains mostly the esters of thujyl alcohol, thujane, thujone, cadinene and S-guaiazulene. The essential oil from the shade dried leaves was found to contain α-thujene, α-pinine, camphene, *p*-cymene, 1,8-cineol, methylheptenone, β-phellendrene, caryophyllene oxide, α-terpineol, thujyl alcohol, geraniol, thujyl acetate, caryophyllene, α-himachalene, α-cadinene and elemol besides certain unidentified compounds.[16] Myrcene, α-pinine, thujyl alcohol, nerol and thujyl acetate isolated from volatile oil; two fulvene hydrocarbons isolated and identified as 3,6-dihydrochamazulene and 5, 6-dihydrochamazulene; a carbohydrate and 3, 4, 5-trimethoxybenzoic acid.[17] A new sesquiterpene lactone- artabin- isolated from aerial parts; a new lactone- arabsin, m.p. 188, isolated; isolation of cis- and trans-epoxyocimenes from essential oil of Italian plant; cis- 12, 13-epoxy-cis-9-octadecenoic acid (1.48), cis- 9,10-epoxy-cis-12- octadecenoic acid (5.94%) and traces of 9,10-epoxyoctadecenoic acid from seed oil; two stereoisomeric 3,7- dioxabicyclo [3,3,0]- octaners (I, II) and germacra-1 (10)-en—oxo-6,12-olide (III) (Ketopelenolide) along with a new guainolide, mp. 215°, obtained from Yugoslavian species.[18] Palmitic (33.39), arachidic (26.2), linoleic (27.5%), lauric, myristic, steric and oleic acid identified in lipid fraction; detection of α- and β- pinenes, p-cymene, β-phellandrene, azulenre, cineole, thujone, nerol, neryl acetate and cadinene in volatile oil of leaf (0.22%), flower (0.35%), stem (tr), and herb (0.3%) by TLC; anabsin isolated; detection of α- thujene, α-pinene, camphene, p- cymene, 1,8- cineole, methylheptenone, β-phellandrene, caryophylene oxide, α-terpineol, thujyl alcohol, thujyl acetate, geraniol, caryophyllene, α-himachalene, α-cadinene and elemol in essential oil by GLC; artemoline isolated from leaves and flowers; a homologous series of oligosaccharides isolated from roots in which fructofuranose unit joined by β(2→1') linkages to fructose unit of sucrose; seed oil contained about 5% low molecular weight triacylglycerides; nonglyceride lipids of seed hulls consisted of homologous hydrocarbons C23-32, fatty acid esters and terpenoides; a C29 sterol (I) isolated; (-) methyl jasmonate isolated; detection of chamazulene, β- caryophyllene, α-bisabolol and β-thujone in essential oil by GC- ms; artabsinolides A, B, C and D isolated; a new guainolide dimer - absintholide - isolated.[19]

Two new guainolides - artanolide and deacetylglobicin - isolated from aerial parts; scopoletin, umbelliferone, caffeoylquinic acid and chlorogenic acid isolated from infusion of plant; isolation of a new sesquiterpene lactone - aertenolide - from foliage; parishin B and parishin C isolated from aerial parts.[20]

Pharmacological Studies

Anti-inflammatory Activity

The anti-inflammatory activity of methanolic extract of aerial part of *Artemisia absinthium* was evaluated in rats using plethysmometer. The test drug was administered in the doses of 300, 500 and 1000 mg/kg, p.o., Acetyl salicylic acid in the dose of 300 mg/kg was given as standard drug, whereas the control group received 0.9% NaCl (saline) solution. The mean increase in hind paw volume of rat was measured volumetrically. The study revealed that *A. absinthium* produced significant anti-inflammatory effect.[21]

Anti-tumour Activity

Various anti-tumour substances such as flavonoids, sesquiterpene, lactones and terpenoids were extracted from *Artemisia* species. A derivative of artemisinin, artesunate, showed both in vivo and in vitro anti-tumour effects.[22]

Hepatoprotective Activity

The aqueous and methanolic extracts of wormwood were studied in acetaminophen and carbon tetra chloride induced hepatic damage. Pre-treatment of rats with plant extract significantly prevented rise in serum level of transaminases like GOT and GPT. Post-treatment of rats with plant extract restricted the hepatic damage. These results indicated that the crude extract of *A. absinthium* exhibited hepatoprotective action.[23]

Anthelmintic Activity

Thujone which has been reported from *Artemisia absinthium* showed anthelmintic activity. In comparison to albendazole, anthelmintic activity of ethanolic extracts and aqueous extract of aerial parts of *A. absinthium* against the gastrointestinal nematodes revealed that both the extracts have significant anthelmintic effects on live *Haemonchus contortus* worms. *A. absinthium* is considered to be an effective natural alternative remedy for parasite control both in humans as well as in animals.[24]

Antipyretic Activity

An antipyretic activity of diverse fraction of wormwood was investigated in rabbits. The fever was induced through yeast injection with the help of esophageal probe. The study revealed that water soluble, hexane and chloroform extract of *A. absinthium* exhibited antipyretic activity. The plant extract of worm wood upto 1.6 g/kg documented no side effect.[25]

Antidepressant Activity

The investigation showed the antidepressant activity in tail suspension test and forced swimming test by using *A. absinthium* at flowering stage and it considerably reduced the immobility period both in tail suspension test as well as in forced swimming test.[26]

Antiulcer Activity

The investigation showed that various solvent extracts such as carbon tetrachloride, chloroform, methanol, ethanol and hexane of *Artemisia absinthium* had shown antiulcer effects in rats. The acetyl-salicylic acid was responsible for inducing ulcer in rats. The study showed reduction in ulcer index, increase in level of mucin, reduction in peptic activity and decrease in gastric juice volume.[27]

Antiprotozoal Activity

Due to the presence of artemisin, ethanolic and aqueous extract of *A. absinthium* showed growth inhibitory effects against *Naegleria fowleri*. *Artemisia absinthium* also contained oxygenated monoterpene camphor, which showed anti-leishmanial activity against axenic amastigote and promastigote forms of *Leishmania donovani* and *Leishmania aethiopica*. Wormwood also exhibited antiprotozoal activity against *Leishmania donovani*, *Leishmania infantum*, *Plasmodium falciparum* and *Trypanosoma cruzi*.[28]

Antioxidant Activity

Wormwood containing various flavonoids such as rutin and quercetin, phenolic compounds (vanillic acid, chlorogenic salicylic acid, coumaric and syringic) are possibly involved in the mechanism of free radical scavenging activity. These phytoconstituents are known to possess potent antioxidant and free radical scavenging activities. The 2, 2-diphenyl-1-picrylhydrazyl-free radical scavenging activity in *A. absinthium* was found to be independent on biomass accumulation in callus culture but it is dependent on secondary metabolites production. Maximum accumulation of total flavonoids (0.48 mg quercetin equivalent/g dry weight), total phenolics (1.48 mg gallic acid equivalent/g dry weight) and the highest antioxidant activity (63.3%) was observed from 35-day-old callus culture.[29]

Antibacterial Activity

The essential oil from the air-dried leaves was tested for its antibacterial activity against *Staphylococcus aureus* (sensitive and resistant strains), *Salmonella typhi, E. coli, Proteus vulgaris, Klebsiella pneumoniae,* and *Pseudomonas aeruginosa* and for antifungal activity against *Candida albicans, C. utilis* and *Aspergillus niger* by the serial dilution method. The essential oil at 1:1000 dilutions was found to be active against both sensitive and resistant strains of *S. aureus, K. pneumonia* and *P. aeruginosa*.[30] An investigation

showed that ethanolic extracts of *Artemisia absinthium* inhibit *Staphylococcus aureus* with inhibition zones 1015 mm in diameter, however, did not show antibacterial potential against *Candida albicans, E. coli, Streptococcus faecalis* and *Bacillus subtilis*.[31]

Antimalarial Activity

The aqueous and alcoholic extracts of wormwood were administered p.o., s.c. and i.p. in a chloroquine-sensitive strain of *Plasmodium berghei* in mice for four days to see the shizonticidal activity. The highest suppression of parasitaemia was observed with the alcoholic extract given orally at the 74 mg/kg dose level. The aqueous extract was less active.[32] The sesquiterpene lactone fraction and aqueous extract of *Artemisia absinthium* inhibits *Plasmodium falciparum*. The aqueous extract of *Artemisia absinthium* at the dilution of 1:35 showed maximum inhibition percentage (89.9%). The LD50 value was 31.4 µg/ml of sesquiterpene lactone fraction.[33]

Conclusion

Phytochemical study of the Afsanteen shows that *Artemisia absinthium* contains absinthin, artabsin, essential oil, anabsinthin, anabsin, matricin, organic acids, lactones and resins which are responsible for many actions. Pharmacological studies have demonstrated its antitumor, hepatoprotective, antimalarial, anthelmintic, antipyretic, antidepressant, antiulcer, antibacterial, antiprotozoal and antioxidant activities. Phytochemical and pharmacological studies done so far on the *Artemisia absinthium* confirm the claims of traditional use of this plant in different diseases. The information collected in this review will help researchers and clinicians to investigate the potential of this plant and utilize it for the benefit of the society.

Conflicts of Interest: None

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