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Exploring The Medicinal Potential And Pharmacological Profile Of Asaroon

(*Asarum europaeum*): A Comprehensive Review

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Abstract:

Asaroon (*Asarum europaeum*), a well-recognized herb in Unani system of medicine and a member of the Aristolochiaceae family, is native to regions of Eastern and Southern Europe. Traditionally, it has been used in Unani practice for managing a wide range of health conditions, including respiratory and gastrointestinal disorders, neurological conditions, liver-related ailments, genitourinary issues, snake bites, vector-borne diseases, and as a preventive measure during epidemics. This comprehensive review evaluates the pharmacological potential of *A. europaeum*, covering its classification, distribution, therapeutic uses, phytochemistry, pharmacology. Experimental investigations have demonstrated its antimicrobial activity, antitumor activity, antioxidant activity, Nephroprotective, anticancer properties, Antisecretory and antiulcer activities as well as neuroprotective activity.

Keywords: *Asarum europaeum*, Asaroon, pharmacological studies, phytochemical, Unani medicine, GTCH.

Introduction

According to recent estimates by the World Health Organization (WHO), around 80% of the global population (particularly about 90% of countries in the Eastern Mediterranean, South-East Asia, and Western Pacific regions) are used medicinal plants for primary healthcare and treatment purposes. [1] The Unani system of medicine, one of the core components of AYUSH, is an ancient healing practice that relies entirely on remedies made from natural sources namely plants, minerals, and animals. Unani drugs are classified based on their source of origin. The first category consists of plant-based remedies, including roots, stems, bark, leaves,

flowers, seeds, fruits, resins, extracts, and gums. The second category includes mineral-based substances such as metals, metal ores, and natural non-metals. The third category comprises animal-derived products, including animal glands, tissues, and certain animal toxins [2]. Historically, *A. europaeum* was widely cultivated and used for medicinal purposes in one of the royal gardens of Charles the Great during ancient times. Asaroon *(A. europaeum*) is one of the plant-based drugs entrenched in Unani pharmacotherapy that has been used for ages for preventive and therapeutic purposes. This medicinal plant holds importance due to its traditional medicinal applications. It is known to function as a health-enhancing tonic that supports brain and nerve function.[2] Asaroon (*Asarum europaeum*) is a polycarpic, perennial herbaceous plant. The name originates from Saraniyun, a word from the Siryani language [3]. In English, it is known by several names, including Asarabacca, Hazelwort, Wild Nard, and False Colt's Foot. In Arabic and Urdu, it is called Asaroon; in French, Asaret d'Europe and in the Unani system of medicine, it is referred to as Sumbul Barri and Nardin Barri.[4,5] In Hindi, it goes by names such as Taggar, Gathoona, Sikandarbala, Bandarkhur, and Mushkbala, while in Sanskrit, it is known as Upana.[6] Additionally, it has been used therapeutically to treat bronchial spasms and in cephalic snuffs. In the Unani system of medicine, it has been traditionally employed to treat disorders of the stomach, liver, spleen, and conditions affecting the nervous system and brain.

Taxonomical classification

kingdom	plantae
Phylum	Tracheophytes
Class	Angiosperms
Clade	Magnoliids
Order	Piperales
family	Aristolochiaceae
Genus	*Asarum*
species	*europaeum*

Habitat and Distribution:

The root is found in Europe and temperate mediterranean region [6]. It's a plant that typically grows in dense clusters and spreads widely in hilly regions, reaching heights of 5–6 feet [2].

Vernacular name:

Urdu- Asaroon

Bengali-Mushkbala

Arab- Asaroon

Hindi-Taggar

Sanskrit-Upana

English- Asarabacca, Hazelwort

Botanical description:

The plant is a perennial herb with a very short, fleshy stem. Its leaves are kidney-shaped, heart-shaped at the base, notched at the tip, dark green, glossy on top, and have a peppery taste and smell. 2-3stipules are present, arranged in two opposite rows on the stem. The flowers are solitary, terminal, nodding, greenish-purple, bisexual, and concealed by the petiole. The fruit is a capsule with three valves, and the root is irregularly shaped, knotty, sweet-smelling, bitter-tasting, and yellowish-brown in color. The root, used medicinally, is ash-colored, 2-3 lines thick, four-angled, twisted, rough, with a peppery odor and spicy, biting taste, yielding an ash-colored powder. Its properties are extracted by water or alcohol, but boiling dissipates them, and age diminishes their potency.[2]

***Fig**. Heres the depiction different parts of Asaroon (Asarum europaeum)*

Macroscopic description:

This plant typically grows in clusters and spreads widely across hilly regions, reaching heights of about 5 to 6 feet. It exhibits consistent floral and morphological traits, especially in comparison to other species. *A. europaeum* is a creeping terrestrial plant that features fully developed cataphylls, foliage leaves, and flowers. It undergoes a dormant phase during the winter months, resuming growth in the spring. Flowering usually takes place from late April to June, while fruiting occurs between May and August. The root consists of 5 to 15 annual shoots, measuring approximately 2-5 cm in width, 2-4 cm in length, and 0.7-1.5 cm in thickness. Externally, the root ranges in color from orange-yellow to dark brown and has a warty texture caused by leaf base scars.[5] The inflorescence, lateral branches, and outer surface are somewhat rough, dark in color, with a thin bark layer and a surrounding ring of vascular tissue. Najmul Ghani (1859 CE), a distinguished scholar of Unani medicine, identified five distinct types of roots. The first type is long, fibrous, irregular in shape, yellowish in color, and has a pungent smell. The second variety is hard and yellowish-brown. The third type is also hard but aromatic. The fourth has a bitter, unpleasant taste that causes irritation to the tongue when chewed. Lastly, the fifth type is soft, yellowish, and mildly aromatic.[3] The leaves are described as ovoid, pointed, and folded, with a soft hairy texture (pubescent). They are sessile (lacking a stalk), arranged in a distichous (two-rowed) pattern, and have a leathery, dark green surface. Their shape is rounded to kidney-like (reniform) with serrated edges. The average leaf size is approximately 4.7 cm in length and 6.5 cm in width. The flowers are hermaphroditic and actinomorphic (radially symmetrical), possessing a three-dimensional structure. They can appear in various colors including white, red, purple, green, or brown. The corolla is underdeveloped, and the sepals are thick, triangular-ovate in shape, measuring about 7–9 mm in length and 4–6 mm in width, ending in a lanceolate tip. The stamens are dithecal (having two anther lobes), and are attached dorsally-either adnate or semi-adnate. The stigmas are positioned at the tips of the styles and are covered with multicellular papillae. The ovary, which features six ribs, is lightly to densely covered with soft hairs (villous), though it tends to become nearly hairless (glabrescent) as it matures. The fruits are typically fleshy or leathery capsules that split open irregularly (irregular dehiscence) while retaining the floral structures such as sepals, stamens, and styles. The seeds are tear-shaped (lachrymiform), fleshy, and sticky (glutinous) when they begin to mature. [2,3,4,7]

Microscopic description:

The bark exhibits an uneven surface and is composed of several distinct tissues, including cork cambium, secondary cortex, xylem, and phloem. The cork layer measures between 150 and 180 micrometers in width and consists of 3 to 6 rows of tangentially elongated rectangular cells, which are densely packed and have thick, stratified walls. The endodermis forms a single layer of barrel-shaped cells, while the pericycle consists of 2 to 3 layers of isodiametric cells. Within the phloem, sieve tubes are accompanied by slender-walled parenchymatous companion cells. These phloem cells also contain stored tannins and oil globules. The xylem

is arranged in 12 to 20 small patches forming a ring, with xylem fibers ranging in length from 235 to 450 micrometers. The protoxylem exhibits spiral thickenings. [2,6]

Description of drug in Unani literature:

Asaroon *(Asarum europaeum*), an herbal medicine from the Aristolochiaceae family, is commonly referred to as European wild ginger, Asarabacca, Hazelwort, Wild Nard, or False Colt's Foot in English, and Asaroon in Arabic and Urdu In Unani Tibb, it's called Nadrinbari, and in Hindi, it's known as Taggar, Gathoona, Sikandrabala, Bandarkhur, or Mushkbala.[6] The name derives from the Siryani word saraniyun. This plant typically forms clumps and spreads extensively in hilly areas, growing to 5–6 feet in height. Flowers are found between the leaves near the roots. Its roots, the primary medicinal part, resemble fine-grained grass, are slightly moist, and are more potent than yellow wood.it has many thin roots in which small veins are found and thin and more fragrant. They are aromatic, pungent, and inflammatory, with a yellowish in color. Asaroon roots come in two main types: thick and thin, with medium-thickness roots considered high quality. These roots are described as aromatic, pungent, and causing tingling or inflammation when chewed.

There are four types of Asaroon (*Asarum europaeum*) roots:

1. Long, fibrous, and irregular – These roots have a pungent odor and a yellowish appearance.

2. Hard and yellowish-brown – Characterized by their firm texture and yellowish-brown color.

3. Hard and aromatic– Dense in structure with a strong, pleasant fragrance.

4. Bitter and unpleasant – Soft and slightly aromatic with a yellowish tone, but causes tongue irritation when tasted. [2,3,4,5,7,9]

Taste

bitter and unpleasant [2,3,4,7]

Bu (Odour):

Pungent [2,3,4,7]

Temperament (Mizaj)

Hot and dry in 2nd degree [3] Hot and dry in 3rd degree [7],Hot and dry[6] ,Hot 3 dry[8]

Miqdar-e-khurak (Dose)

3-5 gm [4,9], 3 gm [6], 3.5-12 gm [3]

Muzir (adverse effect)

Respiratory disorder [3,9,10]

Musleh (corrective)

Maweez munaqqa [3,9,10]

Af'al (action)

Muharrik- e-asab (nervine stimulant), Muqawwi-e- asab (nervine tonic), Munaqi-e-asab (nerve cleanser), Muqawwi-e-dimag (brain tonic), Munaqi-e-dimag (brain cleanser) Mudirr-e-baul (diuretic), Mudirr-e-Haiz (emmenagogue),Muqawwi-e-gurda (renal tonic) Muqawwi-e-meda (stomach tonic), Mufatteh sudad (deobstructant), Muhallil-e-awram (anti-inflammatory) ,Mulattif (demulcent), Musakhkhin (calorific), Musakkin (analgesic), Muwallid-e-mani (spermatogenic) ,Muqawwi-e-jigar (liver tonic), Mulayyin-e-shikam (laxative), Mukhrij-e-balgham (concoctive of phlegm), Mukhrij-e-sawda (evacuant of melanin), Mufattit-e-hasat (lithotriptic),Qabid (astringent).[3,4,5,6,7,8,9]

Istemalat (Therapeutical uses)

Epilepsy (Sar'a), Hemiplegia (Falij), Stomach disorders (Amraz-e-Meda), Liver disorders (Amraz-e-Jigar), Jaundice (Yarqan), Obstructive Jaundice (Yarqan-e-Suddi), Ascites (istisqa), Hepatitis (warm-e-jigar), Disorders of spleen i.e. chronic splenitis, Cerebral, Flaccidity (Istirkha), Numbness (Khadr), Sciatica (Irq al-Nas a), Chorea (Ra'sha) and Chronic lumbago (Waja' al Warik Muzmin) etc. It helps in the alleviation of the entire type of pains due to its musakkin -e- alam property, Muscle pain (Waja-ul-Azlaat), Lumbago (Waja-ul-Qutn) Arhritis (Waja'al-mafasil), Gout (Niqris), Coccydynia (Waja'al-Warik), Istarkha (Atony/Flaccidity), Tashannuj (Spasm), Falij (Hemiplegia), Sarah (epilepsy). [2,3,4,5,9]

Badal (Substitutes):

Zanjabeel (*Zingiber officinalis Rose*) [3,9,10]

Important compound

Jawarish Jalinoos, Majoon suranjan, Dawaul kurkum, dawaul kibrit. [6,9,10,12 ,13]

Chemical constituent:

Asarin, asarone, borly acetate, methyle eugenol, arusine, vasicine, vasicinine, resin. [2,6,9,10,12.14]

Phytochemical studies:

Asaroon species are chemically known for their high content of alkaloids and flavonoids which contribute to a broad range of pharmacological effects. The active compounds found in this medicinal plant include alkaloids, flavonoids, flavanol glycosides, diterpenoids and non-diterpenoids substance. The plant root has long been recognized as containing asarone as the main component. [2 ,9,10,12]

The root of Asaroon (*Asarum europaeum)* yield 0.7-4.1% essential oil, classified into four chemotypes containing key bioactive compounds. These include: (1) a chemotype with 70% trans isoasarone (α-asarone), 0.5% trans-isomethyleugenol, and 5% trans-isoelemecine; (2) a chemotype with 30% trans-isoasarone, 40% trans-isomethyleugenol, and 0.5% trans-isoelemecine; (3) a chemotype with 35% trans-isoasarone, 1% trans-isomethyleugenol, and 45% trans-isoelemecine; and (4) a chemotype with ~0.5% trans-isoasarone, trans-isomethyleugenol, trans-isoelemecine, and 40% eudesmol. The essential oil also comprises diasarone 1 (1-(2′,4′,5′-trimethoxyphenyl)-2-methyl-3-(2′,4′,5′-trimethoxyphenyl)-1E-pentene) and diasarone 2 (1-(2′,4′,5′-trimethoxyphenyl)-2-methyl-3-ethyl-1α,2β,3α(H)-4,6,7-trimethoxyindane). . The volatile oil (0.7–4%) includes ~50% asarone, 3% asaraldehyde, 15–20% methyleugenol, bornyl acetate, terpenes, and sesquiterpenes. The r also contains caffeic acid derivatives and flavonoids such as quercetin, isoquercetin (quercetin-3-O-glucoside), kaempferol-3-rutinoside, isorhamnetin, quercetin-3-O-β-D-glucopyranoside, cacticine (isorhamnetin-3-O-galactoside), isorhamnetin-3-O-rhamno(1-6) galactoside, kaempferol-3-O-β-D-galactopyranoside, hyperoside (quercetin-3-O-galactoside), and chalcone glucosides (2′,4′,6′,4-tetrahydroxychalcone-4′,6′-O-glucoside) . The leaves are rich in flavonoids, while the roots contain multiple chalcone diglycosides. The herb's nutritional profile is enhanced by elements like Ag, As, B, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Zn, and V illustrate the primary chemical constituents identified in Asaroon (*A. europaeum*). The active compounds (phenylpropanoids) in A. europaeum infusion demonstrated bronchodilator and anti-asthmatic effects. Asarone, a phenylpropanoid found in this plant, displays local anesthetic properties similar to benzocaine**.** [2,6]

Pharmacological studies: -

Antisecretory and antiulcer activities:

Aqueous and ethanol extracts of a mixture of Asaroon (*A. europaeum*) and antiulcer effect in vivo experiment on rats. This justifies the traditional use of this herb for the treatment of peptic ulcer disease. [15,16]

Antimicrobial activity:

Phenylpropanoids from Asaroon (*A. europaeum*) exhibit antimicrobial properties against gram-positive bacteria. In the study, the methanol extract showed the highest efficacy against Staphylococcus epidermidis, while the ethanol extract was most effective against Staphylococcus aurens. The four components of the extract of [(±) -car3-en-2,5-dione, ( )-azarinin, ( )-sesamine, methyleugenol] demonstrated a potent antimicrobial effect in vitro in L. monocytogenes strains. [2,15,18]

Neuroprotective study:

The anti-cholinesterase (ChE) activity of aqueous, hydroalcoholic extracts, and various fractions of *A. europaeum* root was evaluated using donepezil as a reference drug. Among these, the ethanol extract (A-ET)

displayed the most potent and selective inhibition of acetylcholinesterase (AChE), with an IC50 value of 99.69 µg/ml. Other extracts and fractions did not show any significant AChE inhibitory effects, nor did any demonstrate activity against butyrylcholinesterase (BChE). To better understand A-ET's mechanism of AChE inhibition, a kinetic analysis using a Lineweaver-Burk plot was conducted. Results indicated that A-ET acts as a competitive inhibitor, mimicking the substrate to bind at the enzyme's active site. The inhibition constant (Ki) was calculated to be 551.9 µg/mL through secondary replots of the slope versus different concentrations of A-ET. The neuroprotective potential of *A. europaeum* was also assessed in vitro using PC12 neuronal cells exposed to hydrogen peroxide (H_2O_2). cell viability was measured at A-ET concentrations of 1, 10, and 100 µg/mL, compared to a control group treated only with H_2O_2. Pre-treatment with A-ET at 100 µg/mL significantly protected the cells, resulting in 80.60% viability ($p < 0.001$). However, no significant neuroprotection was observed at the lower concentrations of 1 and 10 µg/ml. [2,17]

Antioxidant activity:

Aqueous and hydroalcoholic extract of Asaroon root in different fraction that is 1, 10, 100 micro gram/ml by using method DPPH radical scavenging activity shows an antioxidant activity with IC50 value of 45.65±0.72 comparing hydroxyanisole with IC50 value of 91.28±0.13 µg/ml.[2,17]

Antitumor activity:

The aqueous extract of Asaroon (*A. europaeum*) exhibited the highest antitumor activity, achieving 100% tumor inhibition. Additionally, Asaroon (*A. europaeum*) showed a moderate level of tumor inhibition ranging from 55.6% to 75% in other extracts. Notably, no tumor development was observed with its aqueous extract. The strong antitumor effect may be attributed to the presence of phenylpropanoid compounds in *A. europaeum*. [2,18]

Nephroprotective activity:

The ethanolic extract of Asaroon (*Asarum europaeum*) was found to contain alkaloids, tannins, flavonoids, steroids, and phlobatannins. When administered at doses of 200 mg/kg and 400 mg/kg, the extract significantly influenced elevated urinary parameters, including total protein, kidney weight, and pH. It also notably reversed the elevated levels of biochemical markers such as urea and creatinine in the treated groups. Furthermore, the extract exhibited a protective effect on kidney tissue by restoring the reduced levels of antioxidant enzymes like SOD and catalase, and by inhibiting lipid peroxidation. [2,19]

Anticancer activity:

The presence of trans Aconitic acid in leaf, stem and root of *Asarum europaeum* shows anti-cancer effect in vitro, and to inhibit respiration in the rat kidney cortex and in liver slices, which suggest the trans isomer to be an aconitase competitor in TCA cycle.[20]

Conclusion:

Asaroon *(Asarum europaeum*) has been widely used in the Unani system of medicine for centuries, both for treating and preventing various ailments. While its precise mechanism of action is still being explored, existing research has highlighted its physicochemical properties, ethnopharmacology, phytochemistry, traditional applications, and pharmacological effects underscoring the value of its historical use in Unani medicine. Its therapeutic potential is largely attributed to a range of bioactive compounds, including alkaloids such as asarin, asarone, bornyl acetate, methyl eugenol, arusine, vasicine, vasicinine, and resins. These constituents are known for their analgesic, anti-inflammatory, antimicrobial, immunomodulatory, diuretic, and antioxidant properties.

However, certain knowledge gaps remain. Firstly, the traditional pharmacological uses of *A. europaeum* require further validation through modern scientific studies to clarify its underlying mechanisms yet only limited contemporary research is available. Secondly, since the herb is often used in combination with other Unani remedies, potential drug interactions should be thoroughly investigated. Moving forward, well-designed clinical trials are recommended to confirm and support its therapeutic efficacy.

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