

Exploring the Botanical and Pharmacological Significance of *Aristolochia rotunda* Linn (Zarawand Mudahraj): Traditional Uses, Habitat, and Bioactive Potential.

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ABSTRACT

The plant *Aristolochia rotunda* Linn (Zarawand Mudahraj) is a member of the Aristolochiaceae family. Its rhizomes are the most valuable portion utilised in the pharmaceutical industry, mostly because of their abundance in bioactive compounds. The medicinal plant *Aristolochia rotunda* Linn exhibits a spectrum of pharmacological activities essential for combating hyper-uricaemia-induced inflammation. Its anti-inflammatory effects are mediated by inhibiting TNF- α , IL-1 β , IL-8, and NF- κ B p65 protein expression, crucial in synovial tissue. These actions are attributed to compounds like Aristolochic Acid, Aristolactam IIIa, and flavonoids present in the plant. Moreover, *Aristolochia rotunda* Linn acts as a xanthine oxidase inhibitor, reducing uric acid synthesis, thereby mitigating gout symptoms. It also demonstrates antioxidative properties through its phenolic components, including flavonoids, which scavenge free radicals and protect against oxidative damage. Beyond these, the plant exhibits antiviral, antiallergic, antiplatelet, and potential antitumor activities attributed to its flavonoid content. Additionally, it offers neuroprotective effects attributed to specific ligands present. The multifaceted pharmacological profile of *Aristolochia rotunda* Linn underscores its potential as a therapeutic agent for conditions. *Aristolochia rotunda* Linn is yet unexplored, though. In order to uncover other biological activities of *Aristolochia rotunda* Linn and those of other species in the same genus, as well as to identify the chemicals responsible for these activities, further research should be carried out. The majority of the works studied were Kitabul Umda Fil Jarahat, Bustanul Mufradat, Khazanul Advia, Colleget (Kitabbul Kulliyat), Muheet e Azam, and The Complete Book of the Medical Art (Kamil Sana).

Keywords: *Aristolochia rotunda* Linn, Traditional Medicine

INTRODUCTION

Zarawand mudahraj (*Aristolochia rotunda* Linn) belongs to the genus *Aristolochia* and family Aristolochiaceae [1]. *Zarawand* is a perineal herb. *Zarawand* a Persian word meaning “Golden Utensils” [2] *Geelani* also meant by the *zarawand* as *Zarf-tila* meaning Golden utensils [3] *Zarawand* in hindi is called “*Alaisar Mool Bakr*”. and in Sanskrit as

“Ark Moola”[3] In Spain it is known as *Masmaqoorah*, *Masmaqaraan*, *Masmaqaar* or *shajr-e-musaddad*. [2] African and people of west call it *Shajr-e- Rustum*. [4] Its botanical name is *Aristolochia* which is a Greek word *Aristolochia* [5], *Aristo* meaning *Nafaas* [4]/*nafsa* [3] and *Lochia*[2]/*lokia*[2]/*lokhus*[4] meaning “*Fazil*” better. Thus, *Aristolochia* meaning “Substances better for portpartum women”[3-5] In Greece it is also called as *Waq拉斯atees*. There are two major Variants of *Zarawand* as Described by Arab physicians[5] *Dasqareedoos* [6] *Zarawand Taweel*(*Aristolochia longa* Linn) which is male variant having, long roots also called as *zakar* or *Qaleetas* in Greek and *Zarawad Mudahraj*(*Aristolochia rotunda* Linn) a female variant with round root known as *Ansi* in Greek. The fresh and reddish colored *Zarawand* is considered best for use.[5] *Zarawand Mudahraj* is superior to *Zarawand Taweel*. [7] *Qaleemateetas* also called as *zarjoni* is third variant described by Greek which is considered to be subtype of *Zarawand taweel*. [6] According to Medical books there are nine variants of *Aristolochia* in which *Aristolochia serpentinia* (*zarawand daf-e-zehar maar*) and *Aristolochia indica* (*zarawand hindi*) are mentioned in Bristish pharmacopeia[3]

Habitat:

There is a vast variety of species in the genus *Aristolochia* ranging from 250-500.[8,9] *Aristolochia* is found almost everywhere, ranging from temperate to tropical environments. It is most frequently found in Asia, Africa, North and South America, and Australia, although it is widely dispersed throughout tropical Asia. [10] *Aristolochia rotunda* is distributed in an area ranging across northern Morocco, Spain, throughout the northern Mediterranean, and Balkans to Turkey and colonizes damp grassy areas and boulders. [11] Southern Europe is home to this indigestible plant. [12] The meadows, hills, woodlands, ditch and field borders, canal banks and roadside areas are all inhabited by *Zarawand Mudahraj* (Figure 1 & Figure 2). Moist, shady areas 0-800 meters above sea level and chalky soil is preferred. [13]

Botanical classification

Botanical name: *Aristolochia rotunda* Linn)[14,15]

Kingdom : Plantae

Sub- Kingdom : Tracheophyton (Vascular plants)

Phylum : Angiosperms (Flowering plants)

Superorder : Magnoliiflorae [10]

Order : Aristolochiales

Family : Aristolochiaceae

Sub family : Aristolochioideae

Genus : *Aristolochia*

Species : *A. rotunda*

Part used : Root [3-5]



Figure 1: Zarawand mudharaj whole plant



Figure 2: Zarawand mudharaj root

Vernaculars [2-5,15,16]

Arabic	:	Zarawand Mudahraj [16]
Greek	:	Unsa
Persian	:	Zarawand-i-gird
English	:	European Birthwort, Round Aristolochia, Smeatwort, Round leaved birthwort
Iran	:	Nukhud -i- alwandi, Nukhud maryam
Hindi	:	Kjoor

Ethnobotanical Description:

Zarawand mudahraj is small perennial plant with slender stem and sub globose tuberous stock. The sessile stem has obtusely cordiform leaves attached with short or absent petiole. The solitary blooms have a yellow perianth and a brownish limb within, and they are found in

the leaf axils. The whole plant is acrid, aromatic and bitter [1,6]The root is tuberous, hard and heavy when dry and is placentiform, more or less mamillated on the undersurface. The surface bears thin light stripes all around with centrally situated pit both on upper and lower surfaces. The central pit on upper surface bears the remains of several stems and lower surface bear pits where rootlets are attached. Sometimes dried roots have hairy rootlets intact. It is smooth yellowish brown to light brown in colour with slight spicy odour.[1]

Procedure and time of collection: After flowering period is over roots are dug over.[1]

Mahiyat:

Zarawand mudahraj is a root which is round more or less similar to *fundaq*. The root is yellowish pale in color outside and reddish inside. The perennial plant bears many stems which arise directly from the root and has round soft aromatic leaves similar to the leaves of *qusoo*^{JA} and are slightly bitter in taste. The Plant bears white cap shaped flowers which are reddish inside and have acrid odour.[3,14,17] mentioned in baad-e- awar. Zarawand Mudahraj has few variants as Shaami,Rumi and magribi.[3]

Mizaj:

Hot2 Dry2 [3,4]	Hot3 Dry3[18]	Hot2 Dry3[2]
Hot3 Dry2[19]	Hot Dry[16]	

Dosage (Miqdar khoodak):

3-5gms[18]	4.5 to 7gms[2]	7gms[17]
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Shelf life: 2 years [20]

Taste: Bitter with luab daar [20]

Nisbat sitara: Neer azam shams sae^l[20]

Nafah Khaas

Mushil Balgham(Purgative of Phelgm) [18]

Antidote to poisons and Brain tonic [20]

Af'aal (Actions):

- Mudirr-i- haiz (emmenagogue) [6,18]
- Mulattif (Demulscient) [20]
- Mushil Balgham(Purgative of phelgm) [3]
- Muqawwi bah (aphrodisiac) [3,18]
- Musakkin alam (Analgesic) [18,21]
- Anthelminthic (*Qatil-e-deedan*) [19]
- *Muqawwi Sama*⁷Antidote (*Dafe zaher in scorpion poisoning*) [20,21]
- Muqawwi Meda (stomach) [16]
- Muqawwi Dimagh (brain tonic) [18]
- Munbit Balgham/Muqata wa Mukhrij Balgham [17]
- Muhallil (resolvent) [6,21]
- Mufattih (Deobstruent) [18]

- Muqawwi bah (aphrodisiac) [3,18]
- Mudir-i-boul (diuretic) [18]
- Abortefecant(Mukhrij janeen) [6,19]
- Wound Healing(jarah wa qaroooh mai mufeed)[6,20]
- Detergent (Jali) [6,20]
- Absorbent [6,21]
- Mushil Safra [7]

Muzir (Adverse Effect):

- Toxic to spleen by producing dryness in it [20]
- Nerves(Coolness to it and produce dryness) [18]
- Liver[7]

Musleh (Corrective):

Rogan-e- kadu [18-20]	Honey[20]/ Berberis [7]	Rogan-e Banafshah[3,20]
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Badal (Substitute)

Zarawand Taweel and Rewand cheeni[17]	Zarawand Taweel and ½ part Rewand cheeni [2,20]
Zarawand Taweel [17]	Bisbasa [2]
Qust[7]	Zaranbaad and Qust [7]

Compound Drugs

Tiryaaq Arbah, Majoon Falasfa, Dabeedul ward, Marham-e-Qoobap [18]

Medicinal USES

- Chronic Cough,Asthma (Mukhrij Balgham)[6,18,20]
- Chronic Ulcers [18]
- Pleurisy[18]
- Chronic joint pain, sciatica and Gout[7]
- Hepatitis and sclerotic changes of liver and spleen [18]
- Epilepsy[20]
- Baldness,Seborrhea/Malaema/Favus [7]
- *Hiccups*[27]
- *Jaundice*(Yarqaan) [20]

Chemical Constituents

Organic

Phenolic Tannins, Starch, and Terpenoids[1]

Aristolochic acid and esters, Aristolactams, Flavonoids, Ligands, Terpenoids like mono-, sesqui-, di-, tri- and tetraterpenoids, Benzenoids (Phenylmethanoids and phenylpropanoids), Steroids mostly β-sitosterol and β-sitosterol glucoside, Glycerol, proto-quercitol [1,22] Alkaloid Aristolochine. Phenolic diterpenes and acids, and flavonoids, Aristolochic acid [23]

Inorganic

Bismuth, Calcium, Iron, Magnesium, Potassium and Zinc[1]

Mode to Action

Anti inflammatory: [24]

Zarawand Mudahraj (*Aristolochia rotunda* linn) is having potent anti-inflammatory, analgesic, antipyretic, antiarthritic activity, anti-mutagenic/anti-carcinogenic, hepatoprotective, antiviral, antioxidant properties which are constitutive qualities for any drug to act against hyper-uricaemia induced inflammation. These actions are mediated by inhibiting TNF- α , IL-1 β , IL-8, and NF- κ B p65 protein expression in synovial fluid and synovial tissue. Suppression of NF- κ B may be responsible for the decrease in levels of IL-6, IL-8, and TNF- α in synovial tissue. The anti-inflammatory action of *Aristolochia rotunda* linn is also due to the presence of Aristolochic Acid, Aristolactam IIIa, Aristolamide II Chemical Constituents/ and Flavinoids[25]

Xanthine oxidase inhibition

Neutrophil influx into the joint fluid is the most sensitive and dramatic indicator of gout. Both the synovial membrane and the joint fluid have an increase of neutrophils, which phagocytose monosodium urate crystals (MSU) and release mediators that intensify the inflammatory response. A key process in gout is the oxidation of hypoxanthine to xanthine and subsequently to uric acid, which is catalysed by the enzyme Xanthine Oxidase (XO). XO is a major generator of free radicals created from oxygen and a key player in the oxidative damage process in a number of illnesses, including diabetes, gout, ischemia, renal damage, hypertension, and others. Medicinal plants which possess phytochemical constituents are alternative to allopurinol. Phytochemical extracts revealed the presence of flavonoids, phenolics, and saponins accounting for its antioxidant property. A class of polyphenolic chemicals known as flavonoids has a variety of biological effects, including anti-inflammatory, anti-hepatotoxic, and anti-ulcer properties [26] Polyphenols, also known as phenols, possess antitumor, antimutagenic, and antioxidant properties. [27] Flavonoids and certain other phenols, polyphenols and tannins as well, plant growth regulators and folic compounds have potent XO inhibitor activity. Flavonoids like kaempferol and quercetin had 85% and 90% XO inhibitory activity respectively. Tannins and related polyphenols which are astringent are the active principles of several herbal remedies. Plants high in tannins have been widely employed as treatments for conditions including inflammation liver injury, kidney problems, arteriosclerosis, hypertension, stomach disorders, nervous and hormonal problems because of their antimutagenic, radioprotective, antioxidant, antitumor, and astringent properties. [28] Thus, kaempferol, quercetin, 5, 7-dimethoxycoumarin, alkaloids, and other biologically active substances impart xanthine oxidase activity. Since these bioactive substances also have strong physiological effects like antioxidant, antimutagenic, and antitumor properties, any of these bioactive substances may also contribute to XO inhibitory activity[29]. It is well known that plant anthocyanosidic and polyphenolic extracts act as free radical scavengers and as antiliperoxidants and are helpful in protecting collagen from degradation caused by superoxide anion radicals, diminish capillary fragility and permeability and exert a powerful antiphlogistic effect[30]. Further, phenols are essential components of plants because of their hydroxyl groups, which enable them to scavenge oxygen from free radicals. Consequently, the phenols directly contribute by acting as antioxidants. [31]

Hypouricemic action

Polyphenols, flavonoids, coumarins, ellagic acid, valoneic acid dilactone (VAD) quercetin, morin, myricetin, kaempferol, apigenin and puerarin possess xanthine oxidase inhibition action thus lowering uric acid synthesis and confirmed to have strong hypouricemic actions. [25]

Anti-oxidative: [24]

Phenolic components like phenolic diterpenes, acids and flavonoids impart antioxidative property also [24, 32] Flavonoids have significant antioxidant and chelating properties. The

structure and hydroxyl group substitution pattern of flavonoids determine their antioxidant action. [33]

Antiviral, Antiallergic, Antiplatelet, Anti tumor[32]

Flavonoids impart these properties in *Aristolochia rotunda* Linn. *Aristolochia rotunda* Linn. also has Stimulant and tonic properties. [34]

Neuroprotective: *Aristolochia rotunda* Linn is imbibed with ligands which impart neuroprotective action. [22]

Conclusions

This thorough analysis emphasises the pharmacological importance, phytochemicals, and traditional knowledge of *Aristolochia rotunda* Linn. *Aristolochia rotunda* Linn's use in pharmaceutical dosage forms was reviewed, along with safety information. Despite its long tradition of use in medicine, more research is still required to fully comprehend the molecular mechanisms, the relationship between structure and activity, the possible antagonistic and synergistic effects of its phytochemicals, the administration of drugs, interactions between drugs, and toxicological effects.

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