



***DIDYMOCARPUS PEDICELLATA* R. BR.: A VALUABLE HERB FOR RENAL STONES**

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ABSTRACT

Ayurveda is an ancient science which has survived for more than 5000 years. It has time and again proved its effectiveness in treating chronic diseases as well as some acute conditions to which modern science has no cure. In addition to this, Ayurvedic drugs and herbs have the potential to make therapeutic intervention in some diseases easy as well as cost-effective. One such herb is *Didymocarpus pedicellata* R.Br. It is a plant with an ethnomedicinal use for treating renal stones. Many Ayurvedic texts describe its morphology, habitat, *ras panchak* and its therapeutic uses. However, the identification of the plant as *Pashanbhed* is slightly contentious because of another plant, *Bergenia ciliata*, having similar characteristics. Both these plants are used to treat similar conditions. Research data is also limited on this plant for the above mentioned reason. The main objective of this article is to describe the various unexplored and scientifically explored aspects of *Didymocarpus pedicellata* R.Br. as this plant has not been reviewed adequately enough and the non-availability of compiled data is a major hurdle in further research work. Additionally, there is a need to find more herbal drugs for renal stones as it is the third most common disease in the world.

KEYWORDS: *Pashanbhed*, Renal Stones, *Ras Panchak*.

INTRODUCTION

Ashmari is one of the dreaded entities among many critical diseases known to mankind since the *Vedic* period. It finds mention in most of the Ayurvedic classics but a profound description was provided by *Acharya Sushrut*, the father of surgery, in his treatise "*Sushrut Samhita*". His description includes the etiopathogenesis, complications and management of the condition. Both conservative and surgical procedures of management are mentioned, depending upon the severity of the disease.

Ashmari, as described in ayurveda, is similar to urolithiasis, which is the third most common disease of the urinary tract. Renal stones are a common problem worldwide with substantial morbidities and economic costs.^[1] In India approximately 5-7 million patients suffer from stone disease. At least 1/1000 of Indian population needs hospitalisation due to Kidney stone disease.^[2]

In the treatment of urolithiasis, there is no satisfactory drug used in clinical therapy. Endoscopic stone removal and ESWL are very costly and recurrence is quite common with these procedures.^[3] Thus a drug for

prevention of this disease or its recurrence would be of great interest.

There are many drugs which have wonderful therapeutic properties but are still not known, the reason being that they are not documented in the books. There are many drugs which are not mentioned in texts but their extensive use is seen in certain tribes with marvellous effects. So, finding more ethnomedicinally used drugs will expand their availability for the whole population.

Multiple formulations are generally used in treatment regimens. But if better therapeutic effect can be reached with single preparation then there is a case for using it over multiple formulations. For this, a certain dose of the single herbal preparation would be needed to achieve desirable pharmacological action, thus reducing the risk of deleterious side-effects. Additionally, this also indirectly leads to better compliance and therapeutic effect.

Didymocarpus pedicellata R.Br. is one such drug that can be explored for potential single drug formulations, especially in the treatment of Kidney/Urinary stone

disease. Renal stones occur when urinary chemistry results in increased concentrations of stone salts that leads to super-saturation and exceeds the limit of metastability for that salt in solution. Increased urine volume decreases the saturation of the salts and prevents the precipitation of the crystal at physiological pH. Pashanbhed is used in renal stones because of its lithotriptic action as well as its diuretic action which helps in alkalinising the urine.

Taxonomic Position^[4]

Kingdom: Plantae.
Subkingdom: Iridiplantae.
Infrakingdom: Streptophyta.
Division: Tracheophyta.
Subdivision: Spermatophytina.
Class: Magnoliopsida.
Super order: Asteranae.
Order: Lamiales.
Family: Gesneriaceae.
Subfamily: Cyrtandroideae.
Tribus: Disymocarpeae.
Genus: *Didymocarpus*.
Species: *Pedicellata* R.Br.

Vernacular Names of *Didymocarpus Pedicellata*

English: Black stone flower, Stone flower^[5]
Sanskrit: Shilapushpa^[6,7], Shantapushpi, Pathar Chatta.^[8,9]
Tamil: Kalpasi.^[10]
Hindi: Charela, Patharphori^[10], Pashanphori^[11]
Nepali: Kumkum, Kum.^[8]

CHEMICAL CONSTITUENTS

The leaves contain a number of chalcones, quinochalcones and flavanones. Pediflavone has also been isolated from young leaves.^[12] The main constituents isolated from leaves are Pedicellic acid^[13,14], 2'-hydroxy-4',5',6'-trimethoxychalcone^[15], 5,8-dihydroxy-7-methoxyflavon and Didymocarpin.^[16] Some other major constituents are Pedicin^[17,18], Pedicinin^[13,17,19], Pedicellin^[15,17,19,20], Pedicidin.^[21] *D. pedicellata* also contain 2-Hydroxy-3,4,6-trimethoxychalcone^[18], 5,6,7,8-tetramethoxyflavanone^[15], 8-hydroxy-5,6,7-trimethoxyflavanone^[15], Didymocarpene^[22], (7-hydroxy-5,6,8-trimethoxyflavanone), Didymocarpin-A^[23,24], Didymocarpol, didymocarpenol^[22], Isodidymocarpin^[25], Isopedicin^[17], Methylpedicin^[15,18,26], Methylpedicinin^[27], Pashanone^[26,28], Pediflavone^[29], Pseudoisopedicin^[30], β -sitosterol, Behenic acid, lignoceric acid, palmitic acid, stearic acid.^[22]

Ethnobotanical Uses

Didymocarpus pedicellata R.Br. has various ethnomedicinal and ethnobotanical uses. Its leaves are considered to be a good remedy for stones in the kidney and bladder. It is a major constituent (32.6% w/w) of Cystone (Himalaya Drug Company), a formulation used to cure renal ailments such as urolithiasis^[31], neuro-

ureterolithiasis^[32], burning micturition^[33] and several other renal disorders^[34], used as antibacterial; and in urinary tract infection.

Morphology^[35]

- Leaf: Leaves are simple, petiolated (5.0 to 8.0 cm), ovate or cordate having unequal base and serrate margin. Mature leaves are about 8.0 to 10.0 cm in length and 5.0 to 8.0 cm in width. The upper surface is green and glabrous while the lower surface is rough and whitish with small orange coloured dots and prominent veins.
- Rhizomes: These are short (0.5 to 3.0 cm in length and 0.3 to 0.8 cm in diameter), tortuous, cylindrical and horizontally creeping. The lower and lateral sides of rhizomes are covered with 0.1 to 0.3 mm thick roots which are slender and wiry. The upper surface of the rhizome has an aerial stem (about 0.5 to 1.5 cm long and 0.5 to 0.8 cm thick). Adjacent to the vertically grown aerial stem, at the upper surface of rhizome, there are small (1.5 to 3.0 cm long) young leaves which are somewhat triangular in shape, curly and orange in colour. The top of the rhizome, from where the aerial stem grows, is encircled by leaf scar.
- Fruits: The fruits are pedicellate, filiform capsule with persistent calyx. These are longitudinally dehiscent having minute ellipsoids.
- Flowers: Flowers are short connate, pedicellate having ovate bracts, funnel shaped calyx which is dividing nearly 1/3rd way down with rounded lobes and purple corolla. Peduncle is slender, oval, trichotomously branched, 5.0 to 10.0 cm long and 0.5 to 1.0 mm thick.

Distribution

It is found in the subtropical and western Himalayan region from Chamba to Kumaon at altitudes between 2500 and 5500 ft. above sea level.^[36]

Didymocarpus Pedicellata in Modern Literature Indian Medicinal Plants^[37]

In this book written by Kirtikar and Basu, *Didymocarpus pedicellata* R.Br. is described as *Kshudra Pashanbhed* with synonyms like *Shila-Valkaa*, *Shilapushpa*. The leaf has antilithiatic action. It contains a number of chalcones, quinochalcones and flavanones. Pediflavone has also been isolated from young leaves.

Indian Medicinal Plants^[38]

In this book written by C.P. Khare, he has mentioned *D. Macrophylla* auct. non-Wall. Ex D.Don. as synonyms of *Didymocarpus pedicellata* R.Br. Synonyms like *kshudra pashanabheda*, *shila-valkaa*, *shilapushpa* are mentioned. Actions like antilithiatic which are used for kidney and bladder stones are mentioned. The plant is said to have constituents like chalcones, quinochalcones and flavanones. Pediflavone has been isolated from young leaves.

Agro's Dictionary of Medicinal Plants^[39]

This book is written by Narayan Das Prajapati and Dr. U. Kumar. In this book vernacular names of the plants *shila Pushpa* and *pathar phori* are mentioned. Uses of the plants like Vasorelaxant, plaque formation suppressant effects are mentioned. The plant is used in carbuncles and rashes.

Medicinal Flora of Garhwal Himalayas^[40]

This book was written by Vaidya Mayaram Uniyal. In this book he has mentioned *Didymocarpus pedicellata* R.Br. as *pathar phori* which is a small stemless herb with leaves radical, roundly ovate.

Flowers are purple in colour. The plant is distributed sporadically in the tropical region of the area upto 1800m altitude. The leaves are used as a cure for kidney and bladder stones.

Flora of District Garhwal North West Himalaya^[41]

This book is written by RD Gaur, he has described the characteristics of the family Gesneriaceae. The plants belonging to this family are usually herbs or shrubs, sometimes epiphytes; leaves are radical to opposite, equal or alternately large and small; simple, entire or toothed, stipulate, flowers usually in cymose, bisexual, irregular, often large and showy calyx tubular, free or adnate to the ovary; lobes valvate. Corolla with an oblique limb, more or less 2 lipped; lobes imbricate, Stamens 4 or 2, often with staminode; anthers connate or connivent in pairs; pollen 3-4 colpoidate or colpate, subprolate to prolate, surface various. Disc present, annular or 1- sided. Ovary superior to inferior, 1- locular, with 2-parietal placentas; ovules numerous. Fruit is a capsule or berry. About 120 genera and over 2000 species are found in tropics and subtropics; there are about 20 genera and 112 species in India.

Didymocarpus Pedicellata in Ayurvedic Literature

“पाषाणभेदकोऽश्मघ्नो गिरिभिर्दिग्न्नयोजिनी।

अश्मभेदो हिमरितक्तकः कषायो वरितशोधनः॥

भेदनोहृतिदोषाशौगुल्मकृच्छ्राश्महृजः।

योनिरोगान्प्रमेहाश्चत्वीहाशूलरूपाणि च॥” (भा.प्र.०/184-5)^[42]

In *BhavPrakash Samhita* (written by Acharya Bhavmishra, 16th century), *Pashanbhed* has been described as a lithotriptic plant (*giribhit*, *ashmabhed*). In addition to this, it has been described as *hima*, *tikta*, *kashaya ras*, and *basti shodhana* (cleansing the urinary bladder).

Ayurvedic Properties (Ras Panchak) of Pashanbhed^[42]

Ras: Tikta.

Guna: Tikshna, usna.

Veerya: Sheeta.

Vipaka: Katu.

Prabhava: Ashma Bhedana.

Doshagnata: Tridosha Shamak.

Roga: Ashmari, Jwara, Raktapitta, Atisara, Pravahika, Gulma, Arsha, Hridroga, Kasa, Yonivyapada, Mootrakrichchhra.

Karma: Shothahara, Vranaropana, Stambhana, Rakta Pittashamaka, Hridya, Kaphanissaraka, Ashmari Bhedan, Mootrala, Jwaraghna, Vishaghna.

Activities of Didymocarpus Pedicellata**Antiuro lithiatic Activity**

The hydro-alcoholic extract of the whole plant of *Didymocarpus pedicellata* R.Br. (100 and 200 mg/kg) showed antiuro lithiatic potential against calcium oxalate stones when tested against ethylene glycol induced urolithiasis in rats.^[43]

Nephro-Protective Activity^[44]

Ethanol extract of aerial parts of *Didymocarpus pedicellata* R.Br. showed significant nephroprotective activity when tested against ferric nitrilotriacetate (Fe-NTA) mediated renal oxidative stress and nephrotoxicity in mice. The extract was found to possess high contents of total polyphenolics, exhibit potent reducing power and significantly scavenge free radicals including several reactive oxygen species and reactive nitrogen species.

Spasmolytic Activity^[45]

Aqueous extract of *Didymocarpus pedicellata* R.Br. and isolated pedicellin from it showed papaverine-like spasmolytic activity on isolated ileum and uterus of guinea pig and ascending colon of rabbit. The extract also inhibited the carbamylcholine induced intestinal hypermotility in cats and prostigmine induced intestinal hypermotility in rats.

Antimicrobial Activity

Flavones (didymocarpin, didymocarpin-A), chalcones (isodidymocarpin, pedicellin), quinochalcones (pedicinin, methylpedicinin) and their derivatives isolated from *Didymocarpus pedicellata* R.Br. showed some deleterious effects against plant pathogenic fungi and bacteria.^[46] Essential oil from this plant also showed antibacterial and antifungal potential.^[47]

CONCLUSION

A thorough review of available literature and interaction with rural folk living in and around the area of its natural occurrence revealed that *Didymocarpus pedicellata* R.Br. is a very popular remedy for renal disorders. It is also a major constituent of some popular herbal formulations used for kidney stones.

Ayurvedic texts describe *Didymocarpus pedicellata* R.Br. as having *Tikta ras*, *Sheeta veerya*, and *Katu vipaka*. Due to these properties, it is *tridosha shamak*. Its *prabhava* is *ashmarighna*, which enables it to be an efficient lithotriptic drug.

However, there is a lack of exhaustive studies on this plant. It is recommended that further studies should be

carried out on *Didymocarpus pedicellata* R.Br. regarding its various pharmacological and therapeutic properties, and the chemical constituents responsible for the same. This article can serve as a good base to build on for further such studies on this plant in the future.

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