Review Article

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A PHARMACOGNOSTIC REVIEW ON CHARAKOKTA MUTRAVIRECHANIYA MAHAKASHAYA

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ABSTRACT

The prevalence of renal disorders is growing most rapidly in people now-a-days. It is estimated that over a five year period, approximately 10% of men over the age of 70 will develop acute urinary retention. According to a survey (NHANES) conducted in U.S., the prevalence of Chronic kidney disease in people ages 60 and older jumped from 18.8 to 24.5%. In their treatment diuretics plays a major role. Under the 50 Mahakashaya i.e. great extractives, there is a description of a group of 10 herbs named 'mutravirechaniya mahakashaya' (great extractives of diuretics) by Acharya Charaka. They effectively cure urinary disorders like frequency of the urine, acute or chronic urinary infections and calculi in the urinary tract. Some herbs deal with renal function and help to preserve them. Before preparing and indicating such formulations in urinary disorders, authentication of mentioned drugs by their pharmacognostical details is of great need. Some are controversial like Pashanbheda, while some are rarely seen like Gundra and Itkatmula. These 10 drugs are reviewed here for their taxonomy, synonyms, vernacular names, habitat, morphology, phytochemistry and respective images. This review article may help to some extent in authenticating and focusing the future research on these diuretic herbs.

Keywords: Mutravirechaniya mahakashaya, diuretics, authentication, pharmacognosy.

INTRODUCTION

The prevalence of renal disorders is growing most rapidly in people now-a-days. It is estimated that over a five year period, approximately 10% of men over the age of 70 and almost 1/3rd of men in their 80s will develop acute urinary retention.[1, 2] Between the 1988-1994 National health and nutrition examination survey (NHANES) study and the 2003-2006 NHANES study, the prevalence of Chronic kidney disease in people ages 60 and older jumped from 18.8 to 24.5%.[3]

In their treatment diuretics plays a major role. They are the drugs which increase the process of urine formation. Some drugs like digitalis will also increases the urine out flow by mobilizing the edema fluid when given to patients with congestive heart failure. But the term diuretic is generally restricted to the agent which acts directly on kidney[4]. Modern therapeutics has a broad spectrum for diuretics. These drugs are not only very effective but also have side-effects[5]. The Mutrala (diuretic) drugs of Ayurveda in addition to the diuretic effect, are supposed to have beneficial systemic actions.

Under the 50 Mahakashaya (great extractives), all classes of great extractives are mentioned that cures various diseases or help contribute to positive health. Likewise there is a prescription of a group of herbs named 'mutravirechaniya mahakashaya' (diuretics) [6]. There is a group of 10 drugs which have been quoted under the Mutravirechaneeya Dashemani or Mutravirechana Mahakashaya by Acharya Charaka and Vruddha Vagbhata. 5 are the contents of trunapanchmoola (group of 5 grass roots), a frequently used combination for treating scanty urination and burning micturition, etc. Sensing the need for their identification, in the present study their pharmacognostical details are revealed.

To review the Ayurvedic diuretics group and its content, 4th chapter of Charaka samhita Purvardha was referred. Amongst total 50, mutravirechaniya (diuretic) is 35th Mahakashaya (great extractive) as follows:

'Vrukshadani Shvadanshtra Vasuka Vashira
Pashanabheda darbha Kusha Kasha Gundrotkatamulanitee
dashemani mutravirechaniyani bhavanti|'[7]

This Mutravirechaniya group contains 10 herbs as follows and their respective properties according to Ayurveda point of view are also mentioned:

No.	Dravya	No.	Dravya
1.	Vrukshadani	6.	Darbha
2.	Shvadanshtra	7.	Kusha
3.	Vasuka	8.	Kasha
4.	Vashira	9.	Gundra
5.	Pashanabheda	10.	Itkatamula

Vrukshadani

Loranthus falcatus Linn. f., Syn. *Dendrophthoe falcata* Linn. F. from Loranthaceae family is also called as Bandaka, Sanharsha.

External morphology- It is a large branched, 1-3 m long parasitic shrub. Branches are swollen from the base and the bark is dark gray. Oppositely arranged leaves are 7-15 cm

long, variable in shape. Leaf stalks are 1 cm long and the midriff is red. Flowers occur in stout racemes in leaf axils. The flower buds look like long red tubes. Flower tube is 3-5 cm long, red, five narrow petals or lobes of the flower tube are greenish or yellowish upturned. Stamens, 4-6 protrude out of the flower. The green style is slender and is longer than the stamens.

It is recommended in Artava vikara (menstrual disorders), Shwasa (bronchial asthma), Unmada (insanity) and Rakta vikara (hematological disorders) [8]. (Figure 1)

Shwadanshtra- Gokshura

Tribulus terrestris from Zygophyllaceae family is found throughout India up to 5400 m. Its names & synonyms are not found in the Vedic literature. In Samhita period, Acharya Charaka identified it as the best drug for mutrakrichra (dysuria) and vata roga (diseases caused by vitiation of vata). It is one of the herb which is mutral (diuretic) as well as sothahara (anti-inflammatory). The root is used in Dashamoola while the fruit is vrushya (aphrodisiac). Bapalalji Vaidya is of the view that both roots & fruits are to be used along with whole plant in Ashmari (urolithiosis).[9]

Classical categorization: Charaka- Dashamoola, Shothahara (roots that relieve inflammation), Mutravirechaniya (cleanse, detoxify urinary system), Krimighna (herbs that treat intestinal worms.)

Sushruta- Vidarigandhadi, Viratarvadi, Laghu Panchamoola.

Controversial studies: Quoting the great teacher late Amrutalal P. pattani, vaidya Bapalal stated that "Trikantaka" should possess three spines or spar but not six or four as the case with *Tribulus* or *pedalium*. While commenting on Chakradatta, Shiva Das Sen considered that bigger variety of Goksura is the best one [10].

Chemical composition- Fruits: traces of an alkaloid, a fixed oil, a small quantity of essential oil, resins & nitrates, chlorogenin, diosgenin, gitogenin, rutin, rhamnose .

Roots: Campesterol, B-sitosterol & stigmasterol, neotigogenin.

Aerial parts: Astragalin, dioscin, diosgenin, hecogenin, ruscogenin, trillin, furostanol, glycoside, spirosterol, saponin, terrestrosides A – F saponins C& G etc.[11] Other- Sapogenins, diosgenin, gitogenin, chlorogenin, ruscogenin. (Figure 2)

Vasuka- *Osmanthus fragrans* from family Oleaceae.

Bruhat Bakula or buka is considered in place of Vasuka. In Hindi, it is called as Baghula or Badi Moulasiri.[12] According to Charaka commentators, Vasuka is a drug having synonyms Vakapushpa and Punarnava. In many Ayurvedic lexicons Vasuka is mentioned as Vasu, Shaiva, Shivamallika, Pashupat, Shiv, Sureshta, Shivshekhar etc.[13] Acharya K. C. Chunekar mentioned species *Trianthema portulacastrum* from Ficoidaceae family as Vasuka. [14] (Figure 3, 4)

Vashira

According to Kaiyadeva nighantu, rakta apamarga (*Achyranthes aspera*) is vashira (FIGURE-5). He mentioned 3 types of Apamarg as Apamarga- white, vashira-red and ramatha- blue.[15, 16]

Morphology-

Macroscopic- It has yellowish-brown colored cylindrical tap root, slightly ribbed, 0.1-1.0 cm thick and rough due to presence of some root scars. Stem is yellowish-brown, erect, branched, cylindrical and hairy. Leaf is simple, exstipulate, opposite, decussate, with wavy margin, slightly acuminate and pubescent due to the presence of thick coat of long simple hairs. Greenish-white flowers are arranged in inflorescence of long spikes, numerous, sessile, bracteate with two bracteoles, bisexual, actinomorphic, hypogynous; stamens 5, anther is two celled, dorsifixed. Gynoecium is bicarpellary, syncarpous. Ovary is superior, unilocular with single ovule. An indehiscent dry utricle fruit enclosed within persistent perianth and bracteoles. Brown seed is sub-cylindric, truncate at the apex, round at the base and endospermic.

Microscopic- Mature root shows 3-8 layered rectangular tangentially elongated cork cells. Secondary cortex is 6-9 layered, oval to rectangular, thin-walled, parenchymatous having a few scattered stone cells. It is followed by 4-6 discontinuous rings of vascular tissues; small patches of sieve tubes, demarcating the xylem rings. Vessels are simple pitted; medullary rays 1-3 cells wide; small prismatic crystals of calcium oxalate present in cortical region.[17]

Some considers *Dactyloctenium aegyptium* (L.) Willd. from Poaceae family as Vashira. (Figure 6) It is also called as Egyptian crowfoot grass or Egyptian finger grass in English and makada in hindi.[18] Besides this there is not valid reference from Ayurvedic lexicons or texts.

Taxonomy- Kingdom- Plantae, Division- Angiosperms, Class- Monocots, Subclass- Commelinids,

Order- Poales, Family- Poaceae, Subfamily- Chloridoideae, Genus- Dactyloctenium, Species- aegyptium

Pashanabheda

Synonyms- Ashmaghna, Giribhid, Bhinnayojini[19]; Pakhanabheda, Silphara, Patharcua, Pakhanabhed, Silpbheda, silparo, Dakachru, Pashanbheda[20].

Pashanabheda is a controversial species and therefore various plant species are considered in its place at various regions by many botanists. Hereby I have tried to state some of them as follows[21]:

***Saxifraga ligulata* Wall. Saxifragaceae**

Synonym- Vatapatribheda. This species is found in Kashmira, Nepala and mid Himalayan region of India up to an altitude 1500 m. Its roots are sold in the market of Uttar-Pradesh as Pashanabheda. They have mutrajanana (diuretic) and ashmarighna (lithotriptic) properties and therefore used in mutrakrichha (dysurea), mutraghat (anurea), ashmari (calculus), vrukkashula (renal colic) and bastiroga (disorders of urinary bladder) in 0.5-1 gram quantity.[22] (Figure 7)

***Aerva lanata* Juss.- Amaranthaceae**

It has synonym Aadanapaki and called as Gorakhganja, Gorakhbuti, Kapurijadi in Hindi. It is mostly found in Rajasthan and south India. In South Indian region, *Aerva javanica* Juss. Ex. Schult. species from Amaranthaceae family is taken as Pashanabheda which is called as Khula and Dhaulafuli.[23] It is Snehan (oleation), mutrajanana (diuretic) and ashmarihara (lithotriptic)[24]. In ashmari

(urinary calculi) and mutrakruchha (dysurea) decoction of its flowers is given [25].

Taxonomy- Kingdom: Plantae, Sub-kingdom: Tracheobionta, Division: Magnoliophyta, Class: Magnoliopsida, Subclass: Caryophyllidae, Order: Caryophyllales, Family: Amaranthaceae, Genus: Aerva, Species: *Aerva lanata* (L.) A. L. Juss. ex Schultes[26]

Morphology- It is an erect or prostrate herb with a long tap-root, branched from near the base; branches are many, pubescent or woolly-tomentose, striate. Leaves are alternate, 2-10 × 1-6 cm, elliptic or obovate, entire, pubescent above, more or less white with cottony hairs beneath; petioles 3-6 mm long, often obscure. Flowers are greenish white, very small, sessile, often bisexual, in small dense sub-sessile axillary heads or spikes 6-13 mm long, forming globose clusters. Bracteoles are 1.25 mm, long, membranous, broadly ovate, concave. Perianth 1.5-1.25 mm long; sepals oblong, obtuse, sometimes apiculate, silky-hairy on the back; stigmas two, seed 0.85 mm in diameter, smooth and polished, black.[27]

Chemical composition: Flavonoids, Alkaloids, Steroids, Polysaccharides, Tannin, Saponins, carbohydrates, glycosides, terpenoids, proteins.[28] Whole plant consists of 27 different types of terpenoids in which 5 are only present in roots.[29] The presence of 6 types of saponins also evidentiary.[30] Flavanoids like kaempferol, quercetin, isorhamnetin, isorhamnetin, galactoside, flavanone glucoside persinol, persinosides A etc. are present[31]. (Figure 8)

***Kalanchoe pinnata* Pers.** From Crassulaceae family

It is taken as Pashanabheda in Bengal region. It is called Parnabeeja in Sanskrit and Jakhma-e-hayat, Patharachura in Hindi. Its leaves are used in ashmari (renal calculi).

Chemical constituents- Calcium sulphate, Acid tatrate of Potassium, Calcium oxalate. (Figure 9)

***Coleus aromaticus* Benth.** Species- Labiateae, Syn. Lamiaceae

It is also taken as Pashanabheda mostly in Bengal region. Its names are Pashanabhedi (Sanskrit), Patta ajavain, Pattharachura (Hindi) and Country borage (English). It is Ashmarighna (lithotriptic) in nature and therefore used in urinary system disorders[32]. (Figure 10)

***Homonoia riparia* Lour**. Euphorbiaceae

It is taken as Pashanabheda in Mysore, Bangalore & called as Chhota Pashanabheda (Hindi). It is mutrala (diuretic) and used in Mutrashmari (renal calculi).[33] (Figure 11)

***Rotula aquatica* Lour.** Species Boraginaceae

Its names are Pashanabheda (Sanskrit) and Sherani (Marathi) and found in Karnataka. It is widely distributed in India from Kumaun to Assam and western to southern india.[34, 35]

Taxonomy: Kingdom- Plantae, Angiosperms, Eudicots, Asterids, Family- Boraginaceae, Subfamily- Ehretioideae, Genus- *Rotula,* Species- *R. aquatica* [36]

Its roots are used in Arsha (piles), Firanga (syphilis) [37] *and* Calculus of urinary bladder[38]. Decoction of its root tuber is used as diuretic[39].

Phytochemistry- Baunerol, steroid ,alkaloid, rhabdiol .The medicinal values of plant lie in their component phytochemicals such as alkaloids, flavonoids, phenolic compounds and other nutrients like amino acid, proteins, which produce a definite physiological action on the human body[40,41]. (Figure 12)

***Ammania baccifera* Linn.- Lythraceae**

It is called as Agnidarbha, Kshetravashini, Kurandika, Kshetrabhusha, Pasanabheda, Brahmasoma, Agnipatri in Sanskrit, Dadamari, Aginbuti, Jangli mehendi, Banmirich in Hindi and Dadmari, Aginbuti, Bharajambhula in Marathi[42]. It is commonly known as Red Stems, Acrid Weed and Blistering Ammannia.

Morphology- It is an erect or procumbent herb, grows up to 40 cm high. Branches are usually opposite. Young stem is quadrangular and green. The leaves are linear oblong, sessile, 3-4 cm long, 0.6- 0.8 cm wide, with odor specific. Type of leaf venation is pinnate. Flowers are reddish in dense axillary clusters, forming whorls, apetalous. Fruits are depressed globose capsules partially covered by calyx. Seeds are numerous, semi-ovoid to obovoid, 0.3-1.0x 0.2mm and dark brown color. Fruiting and flowering during September to March.[43] It is mutrala (diuretic), sphotajanaka (blister forming) and recommended in high blood pressure[44]. It is used as traditional diuretic[45]. (Figure 13)

***Bergenia ligulata* Engl**.- Syn.- B. ciliate Sternb.- Saxifragaceae

This plant is main botanical source of Pashanbheda which is used in indigenous system of medicine[46,47,48,49,50].

Taxonomy- Kingdom: Plantae, Division: Magnoliophyta, Class: Magnoliopsida, Order: Saxifragales, Family: Saxifragaceae, Genus: *Bergenia,* Species: *ligulata*[51]

It is a perennial herb that grows wild in India at high altitudes between 1800-5100 meters in Himalayas usually in rocky areas and cliffs[52].

Phytochemistry- root contains alkaloids, steroids, flavonoids, terpenoids, tannins, glycosides, carbohydrates and saponins. β-Sitosterol, Stigmesterol, Tannic acid and Gallic acid were isolated by using thin layer and column chromatography[53]. Its rhizomes are the major source of Bergenin and Afzelechin[54]. It is shita (cooling), brihana (bulk-increasing) and recommended in mutrashmari (urinary calculi), prameha (diabetes), yonirog (vaginal disorders), shula (colic) [55].

***Nothosaerva brachiata* Wight** from Amaranthaceae is also taken as Pashanabheda which is called as Ghoulafindauri in Rajasthana[56]. (Figure 14, 15)

Darbha- *Imperata cylindrica* Beau. Syn. *I. arundinaceae* Graminae

(Poaceae) as It is commonly known as Dabha, Ulu[57],Cogon Grass and used in Ayurveda for the treatment of various urinary disorders.

Morphology- It is a tufted, perennial grass with hard, creeping roots and it reaches a height of 0.6–1.5 m. It is found in all continents, in hotter parts of India, both in plains and hills.[58]

Chemical constituents- The drug contains five triterpenoids viz. cylindrin, arundorin, ferneon, isoburneol

and simiarenol.[58] It is a reputed drug of Ayurveda, used extensively for the treatment of various ailments viz. urinary calculi, retention of urine, diabetes, cardiac disorder, gout, common cough and cold, inflammation, anemia, etc. It also acts as aphrodisiac and rejuvenator.[58] (Figure 16)

Kusha- *Desmostachya bipinnata* stapf Syn.- *Eragrotis cynosuroides* Beauv. Graminae (Poaceae).
Taxonomy- Kingdom- Plantae, Division- Angiosperms, Class- Monocots, Subclass- Commelinids,
Order- Poeles, Family- Poaceae, Genus- Desmostachya, Species- D. bipinnata
It is native to northeast-west tropical, northern Africa, countries in the Middle East and temperate and tropical Asia.[59] It is shita (cooling), mutravirechana (diuretic), stanyajanana (galactogogue), pipasahara (anti-dypsic) and can be used in pradara (leucorrhoea), raktarsha (bleeding piles) and ashmari (calculus).[60] (Figure 17)
Phytochemistry- coumarins, amino acids, carbohydrates, flavonoids, sterols, terpenes and triterpenoids.[61]

Kasha- *Saccharum spontaneum* Linn.- Graminae (Poeceae)[62].
It is a perennial grass, growing up to 3 meters in height, with spreading rhizomatous roots. It is used in mutrakrichha (dysuria) and ashmari (calculus).[62]
Taxonomy- Kingdom- Plantae, Division- Angiosperms, Class- Monocots, Subclass- Commelinids,
Order- Poales, Family- Poaceae, Genus- Saccharum, Species- *S. spontaneum* (Figure 18)

Gundra- *Typha elephantina* Roxb., non Grah., Syn. *T. angustifolia* Watt, non Linn.
It is a plant from Typhaceae family having synonyms Potgal and Eraka.[63]
Taxonomy- Kingdom- Plantae, Division- Angiosperms, Class- Monocots, Subclass- Commelinids,
Order- Poales, Family- Typhaceae, Genus- Typha, Species-*T. elephantiana* Roxb.
It grows in extensive colonies near freshwater marshes and on the banks of lakes and streams[64]. It is a plant species widespread across northern Africa and southern Asia. It is said to be shita (cooling), mutrala (diuretic) as well as pittaghna (alleviates pitta) [65] in nature.
Morphology- It is herbaceous, colonial, rhizomatous and perennial plant, growing up to 3 m (9ft) with long, slender, green stalks topped with brown, fluffy, sausage-shaped flowering heads. [66]
Chemical constituents- Preliminary phytochemical screening of the aerial part of the *T. angustifolia* reveals the presence of different secondary metabolites.[67] (Figure 19)

Itkatmula (Jayanti bheda)- *Sesbania cannabina* (Retz.) Pers. Syn. *S. aculeate* Pappilionaceae (fabaceae),
Common name- Yellow Pea Bush, Sesbania Pea
Taxonomy- Kingdom- Plantae, Subkingdom- Tracheobionta, Superdivision- Spermatophyta, Division- Magnoliophyta, Class- Magnoliopsida, Subclass- Rosidae, Order- Fabales, Family- Leguminosae, Subfamily- fabaceae, Genus- Sesbania Scop., Species- *S. cannabina* Poir.[68]
Morphology- Leaves are alternate, compound with up to 35 pairs of leaflets. Flowers are pea-shaped, yellow, calyx 3-5.5 mm long, standard 6-10 mm tall, yellow with purple flecks on the back, wings yellow but not streaked with purple. Pods 12-20 cm long, 2-3 mm wide, pale brown to yellowish brown. It is shita (cooling) and mutrala (diuretic) in nature and therefore used in ashmari (urolithiasis).[69] (Figure 20)

Figure 1: ***Loranthus falcatus*** **Linn. f.**

Figure 2: ***Tribulus terrestris***

Figure 3: ***Osmanthus fragrans***

Figure 4: ***Trianthema portulacastrum***

Figure 5: ***Achyranthes aspera***

Figure 6: ***Dactyloctenium aegyptium*** **(L.)Willd**

Figure 7: ***Saxifraga ligulata*** **Wall.**

Figure 8: ***Aerva lanata*** **Juss.**

Figure 9: ***Kalanchoe pinnata*** **Pers.**

Figure 10: ***Coleus aromaticus*** **Benth.**

Figure 11: ***Homonoia riparia*** **Lour.**

Figure 12: ***Rotula aquatica*** **Lour.**

Figure 13: ***Ammania baccifera*** **Linn.**

Figure 14: ***Bergenia ligulata*** **Engl.**

Figure 15: ***Nothosaerva brachiata*** **Wight**

Figure 16: ***Imperata cylindrica*** **Beau.**

Figure 17: ***Desmostachya bipinnata*** **stapf.**

Figure 18: ***Saccharum spontaneum*** **Linn.**

Figure 19: ***Typha elephantina*** **Roxb.**

Figure 20: ***Sesbania cannabina*** **(Retz.)Pers.**

CONCLUSION

To eliminate the urinary disorders by Ayurvedic line of treatment, we have to confirm the identification of mentioned drug first. Mutravirechaniya mahakashaya from Charaka samhita have the medicinal values for Urinary disorders. They effectively cure the frequency of the urine, the acute or chronic urinary infections and the stones in the urinary tract. Some herbs deal with renal function and help to preserve them. Before preparing and indicating such formulations in urinary disorders, authentification of mentioned drugs is of great need. In mutra-virechaniya mahakashaya (great extractives of diuretics), some drugs are controversial like Pashanbhed, while some are rarely seen like Gundra and Itkatmula. So, for their identification purpose, they are reviewed here for their taxonomy, synonyms, vernacular names, habitat, morphology and phytochemistry with respective images. It will simplify the authentication of a drug for better medicinal results.

Current status and future prospects

The modern science has revealed a lot of pharmacological screening of most of these herbs but somehow diuretic aspect of research still needs to be focused. Some variance between the therapeutic effects in the individual monograph of the herbs and their diuretic action according to Ayurveda could be the reason for need of research. This review article may help to some extent in authenticating the mentioned drugs and focusing the future research on these diuretic herbs.

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