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A PHARMACOLOGICAL STUDY ON PASHANBHEDA (*Bergenia ligulata*) MEDICINAL PLANT IN THE TREATMENT OF MUTRAKRICHHA (UTI)

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ABSTRACT

Renal disorders are becoming more commonplace in today's culture at an alarming rate. It is anticipated that 10% of males over the age of 70 will develop Mutrakrichha in five years (UTI). An American survey found that the prevalence of Mutrakrichha (UTI) among those 60 and older increased from 18.8% to 24.5%. Diuretics are a key component of their treatment. Under the 50 Mahakashaya, or great extractives, Acharya Charaka speaks of a group of 10 plants known as mutravirechaniya mahakashaya (great extractives of diuretics). They effectively cure urinary issues include frequent urination, urinary tract infections (UTI), and calculi. Some herbs help to maintain renal function. Before producing and recommending such formulations in Mutrakrichha, it is imperative to verify the authenticity of specified medications using their Pharmacognostical data (UTI). This review article may, to some extent, help to validate and guide further study on these subjects.

KEYWORDS: Pashanabheda, Mutrakrichha, UTI, etc.

INTRODUCTION:

The frequency of Mutrakrichha (UTI) is alarmingly rising in today's culture. It is anticipated that within a five-year period, 14% of men over the age of 70 and roughly a third of men in their 80s may have Mutrakrichha (UTI). The frequency of Mutrakrichha (UTI) in those 60 and older increased from 18.8% to 26.5 percent. Diuretics are a key component of their treatment. They are medications that hasten the

generation of urine. Many medications, including digitalis, improve urine production when given to people with congestive heart failure by mobilizing edema fluid. However, a drug that directly affects the kidneys is referred to as a diuretic. Diuretics are accessible in a variety of contemporary therapy. These drugs not only work, but they also have unfavorable side effects. In addition to their diuretic effects, Ayurvedic mutrala (diuretic) medications are reported to have beneficial systemic benefits.[1]

The 50 Mahakashaya describes a wide range of fantastic extractives that help treat various diseases or help promote good health (great extractives). Similar to this, "mutravirechaniya mahakashaya"—a group of herbs used as diuretics—is recommended. The 10 medications that have been mentioned are listed below. The Mutravirechaneeya Dashemani or Mutravirechana Mahakashaya was written by Acharya Charaka and Vruddha Vagbhata. The Ayurvedic diuretics group and its content are evaluated using the fourth chapter of Charaka Samhita Purvardha. The diuretic mutravirechaniya is the 35th Mahakashaya (great extractive) out of a total of 50.[2]

METHOD AND MATERIALS

Pashanbheda (*Bergenia ligulata*) resources, authentic websites (PubMed, medicinal plants, etc.), authentic magazines, literature, manuscripts, a Sanskrit dictionary, the Shabdakosha, and other works have been assembled from a variety of periodicals and journals, as well as from Ayurvedic and contemporary writings.

Bergenia ligulata

The main botanical ingredient in the traditional Indian medication Pashanbheda is this plant.

Kingdom: Plantae,
Division: Magnoliophyta,
Class: Magnoliopsida,
Order: Saxifragales,
Family: Saxifragaceae,
Genus: Bergenia,
Species: ligulata

It is a perennial plant that naturally grows between 1800 and 5100 meters above sea level in India's Himalayas, primarily on rocky terrain and cliffs. Phytochemicals discovered in the root include alkaloids, steroids, flavonoids, terpenoids, tannins, glycosides, sugars, and saponins. It was possible to separate sitosterol, stigmesterol, tannic acid, and gallic acid using thin layer and column chromatography. Its rhizomes are mainly responsible for producing bergenin and afzelechin. It is indicated for mutrashmari (urinary calculi), prameha (diabetes), yonirog (vaginal disorders), and shula. It is shita (cooling) and brihana (bulk-increasing).[3]

VERNACULAR NAMES

Hindi: Dakachru, Pakhanabhed, PakhanabhedaPatharcua, Silparo, Silpbheda
Kannada: Alepgaya, Hittaga, Hittulaka, Pahanbhedi, Pasanberu
Assamese: Patharkuchi
Bengali: Himasagara, Patharchuri, Patrankur
Gujarati: Pakhanbheda, Pashanbheda
Marathi : Pashanbheda
Sanskrit : Ashmabheda,Nagbhita, Pashaanbheda, Silabheda
Tamil : Sirupilai

B. ligulata is a perennial succulent herb that may reach a height of 50 cm. It may be found in the temperate Himalaya between 1800 and 5100 meters (from Kashmir to Nepal), and it is extremely common in Pakistan, Central Asia, and East Asia.[3]

DESCRIPTION

B. The perennial plant ligulata has a robust rootstock and short, thick, meaty, and procumbent stems. The leaves are round or circular and 5–15 cm length throughout the flowering season (Flowering period March-May). Autumn leaves grow to be around 30 cm long and a bright red hue with short, stiff hairs. The top and bottom surfaces of the leaves are initially hairy, but as they become older, they almost completely lose their hair. Flowers are 3.2 cm in diameter and come in white, pink, or purple varieties. They develop a cymose panicle with styles and a flexible blossoming stem that is 10- to 25-cm tall.[4]

MACROSCOPIC FEATURES

The rhizomes are 1-2 cm broad and 1-3 cm long, solid, barrel-shaped, and cylindrical in shape. The exterior surface is brown in color and covered with tiny roots, ridges, furrows, wrinkles, and root scars. It tastes astringent and has a pleasant aroma. Characteristics on a tiny scale: In a transverse slice of the rhizome, cork is divided into the outer and inner zones. The inner zone is made up of multilayered thin walled, tangentially elongated, colorless cells, whereas the outer zone is made up of a few layers of slightly compressed, brown-colored cells. Two to three layers of secondary cortex and a single layer of cambium come after cork. A tiny zone of parenchymatous cells comprises a few simple starch grains, but the majority of cortical cells are covered with enormous rosette-shaped calcium oxalate (CaC2O4) crystals and starch grains. Although there is no pericycle or endodermis, there are vascular bundles arranged in a ring.[5]

The cambium is a continuous ring of two to three layers of cells with thin walls that are tangentially elongated. The xylem is made up of fibers, tracheids, vessels, and parenchyma. The core is a large pith made

up of rounded to oval parenchymatous cells that contain starch grains and CaC2O4 crystals identical to those seen in the cortical region. Perforation plates can be visible on one or both ends of vessels with simple pits, and the tracheid's, and have helical thickenings.[6]

ETHNOMEDICAL VALUE AND TRADITIONAL APPLICATION:

Various Indian languages, with regional variations, refer to the plant B. ligulata to imply that the plants grow between rocks, shattering them, or that they have lithotriptic qualities. The Ayurvedic therapy of vesicular calculi, urinary discharges, excessive uterine bleeding, bladder illnesses, dysentery, menorrhagia, splenic enlargement, and heart conditions uses the roots of B. ligulata, which have cooling, laxative, analgesic, abortifacient, and aphrodisiac effects. The treatment of dysentery uses it as an absorbent as well. In Sind (Pakistan), while children are teething, the root is massaged and fed to them with honey. In Indo-China, the leaves are crushed in a mortar and the juice is applied to the ears to relieve earaches.[7]

An oral hot water extract of the whole dried plant of B. ligulata has been utilized to treat Mutrakrichha (UTI). B. ligulata rhizome paste or juice combined with molasses was administered to human adults twice daily for three to four days in Nepal as an antihelmentic for the removal of roundworms and the treatment of colds. In India, dried roots of B. ligulata have been applied topically to cure wounds, boils, cuts, and burns. The plant's oral infusion has also been used to treat diarrhea. Adult humans have also utilized the plant's rootstock as a masticator. Fresh B. ligulata root decoction is used orally by adult humans to treat urogenital symptoms, urinary issues, and Mutrakrichha (UTI). Additionally, it is said that its hot water extract has been applied externally to cure boils and topically to treat ophthalmia.[8]

PHYTOCHEMISTRY:

Bergenin, a phenolic chemical, makes up the majority of its composition (nearly 0.9 percent), with minor quantities of the other phenolic compounds 24, 25, 26, 27, 28, and 29. Gallic acid, tannic acid, methyl gallate 30, (+)-afzelechin, leucocyanidin, (+)-catechin, (+)-catechin 11-O-galloyl bergenin, 7-O-ß-D-glucopyranoside, and Paashaanolactone31, a lactone. Furthermore, it contains sterols like ß-sitosterol, ß-sitosterol-D-glucoside, glucose (5.6%), tannins (14.2–16.3%), mucilage, and wax. Bergenin, 11-0-galloyl bergenin, 11-O-P-hydroxy-benzoyl bergenin, 4-0-galloyl bergenin, 11-O-brotocatechuoyl bergenin, 11-O-brotocatechuoyl bergenin, and 11-O-brotocatechuoyl bergenin are coumarins. (+) reynoutrin, eriodictyol-7-O-D-glucopyranoside, afzelechin, avicularin, and catechin; Flavonoids include (+) afzelechin, avicularin, catechin, eriodictyol-7-O-D-glucopyranoside, 6-O-P-hydroxybenzoyl arbutin, and 6-O- protocatechuoyl arbutin; benzenoids include arbutin, 6-O-P-hydroxybenzoyl arbutin, and 6-O- protocatechuoyl arbutin; and 3-(6'-O)

Anti-Benign Prostrate Hyperplasia activity.

Experimental studies support the traditional application of B. ligulata for renal issues. The Anti-Benign Prostrate Hyperplasia activity of an isolated component, bergenin, and a methanolic extract of B. ligulata rhizomes were evaluated in albino rats. In vitro, B. ligulata rhizomes reduced the development of BPH and cell aggregation while also acting as an antioxidant against lipid peroxidation and 1, 1-diphenyl-2-picrylhydrazyl free radicals.[9]

A modified animal model of the anti-benign prostatic hyperplasia action brought on by 0.75 percent ethylene glycol in drinking water (male wistar rats) showed that methanolic extract (5–10 mg/kg) of B. ligulata rhizomes decreased the Cell formation in the renal tubules. Additionally, B. ligulata extract decreased oxidative stress, polyuria, weight loss, impaired renal function, and renal function. A methanolic extract of B. ligulata combined with bergenin shown a considerable dissolving of Anti-Benign Prostrate Hyperplasia activity in both kidney and urine components. The anti-Benign Prostrate Hyperplasia activity of various extracts of B. ligulata and Dolichos biflorus alone and in combination was examined in vitro using the homogeneous precipitation method.[10]

Contrarily, B. ligulata had less activity, and the combination was less efficient than the individual extracts. The findings of this experiment suggest that the active components are non-protein, non-tannin molecules, which may function by preventing Anti-Benign Prostrate Hyperplasia activity. Larger dosages of 100 mg/kg of B. ligulata extract reduce urine output and urea diuresis in rats whereas low doses of 0.5 mg/kg alcoholic extract enhance diuresis. In a comparative study, B. ligulata's aqueous extracts reduced the growth of Anti-Benign Prostrate Hyperplasia activity more successfully than Tribulus terrestris.[11]

ANTIVIRAL PROPERTIES

In ethno-pharmacological screens, plants used in Nepalese traditional medicine and B. ligulata were evaluated for their antiviral potency. Methanolic and hydro methanolic extracts were tested using in-vitro viral systems such as influenza virus/MDCK cells and herpes simplex virus/cells, with ID5 extract displaying the greatest antiinfluenza-viral activity.[12]

Animals treated with an alcoholic extract of B. ligulata roots showed significantly lower levels of serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), alkaline phosphatase (ALP), and total bilirubin than did control animals, demonstrating the extract's hepatoprotective properties. Hepatoprotection's exact mechanism is yet uncertain, though.[13]

THE ACTION OF A DIURETIC

With the use of a pill of furosemide and the Lipschitz method, the diuretic activity of B. ligulata was established (Aventis Pharma Limited, GIDC estate). Roots of B. ligulata were demonstrated to be effective in increasing urine electrolyte concentrations of Na+, K+, and Cl-, indicating diuretic activity (mg/kg body weight). It has been established that the flavonoids and saponins, which are present in the active components of the alcoholic extract of B. ligulata roots, are what cause the diuretic effect.[14]

ANTIPYRETIC PROPERTIES

Using the Brewer's Yeast induced pyrexia procedure, 50 wistar rats were evaluated for their antipyretic efficacy. When compared to standard paracetamol at a dose of 20 mg/kg, the results revealed that the alcoholic extract of B. ligulata roots exhibited considerable antipyretic effect at a dose of 500 mg/kg body weight, with a significant reduction in body temperature lasting up to 4 hours after delivery.[15]

ANTITUMOR PROPERTIES

Another study examined the anticancer effectiveness of a B. ligulata hydroalcoholic extract administered intraperitoneally to rats. According to test results against Sarcoma- WM1256 IM, the hydroalcoholic extract of B. ligulata demonstrated cytotoxic effect with an ED50 on cell proliferation at a dose of 20 mcg/ml.[16]

CARDIOPROTECTIVE PROPERTIES

Several animal models were used to assess the hydroalcoholic extract of B. ligulata's hypotensive effects. An intravenous dose of 50 mg/kg in dogs had favorable hypotensive effects. The frog's heart responded well to the extract both chronotropically and inotropically. The extracts reduced coronary flow by having a detrimental inotropic and chronotropic effect on continuous cardiac perfusion in rabbits.[17]

In isolated guinea pig ileum, the alcoholic extract had little impact on 5-HT and acetylcholine responses, but it had a strong anti-bradykinin effect (both in vivo and in vitro). It improved the way that adrenaline affected the guinea pigs' ileum and tracheal chain.[18]

ACUTE TOXICITY RESEARCH

On healthy Swiss albino mice weighing 25–35 g, the alcoholic extract of B. ligulata was examined using the Up and Down or Stair case method. The maximum non-lethal dosage was found to be 5 g/kg for a 48 kg body weight. Functions of Bergenin.[19]

When bergenin was treated with 1.5 mM galactosamine for 14 hours in hepatocyte medium, it was discovered to have a hepatoprotective effect. By preventing the release of glutamic pyruvic transaminase and sorbitol dehydrogenase and increasing RNA synthesis, hepatoprotective effects against galactosamine-intoxicated rat hepatocytes may be achieved. The CCl4-induced cytotoxicity of bergenin was examined in primary cultured rat hepatocytes48. The activity of the enzymes glutamic pyruvic transaminase and sorbitol dehydrogenase generated by CCl4-intoxicated hepatocytes was decreased by bergenin.[20]

DOSAGE:

Powered rhizomes: 1-3 gm.

Decoction: 20-30 gm rhizomes

CONCLUSION

B. ligulata is a revered temperate medicinal herb, Known also as Pashanbheda. In many places of the world, numerous plants have the same name. Appropriate identification and standardization are necessary to provide the desired therapeutic effect while reducing adulteration. Regular use of these plants might lead to a rapid decline in their number. If they are over-exploited, they will go extinct in their natural environments. Strategic issues about legal usage and conservation, preservation efforts, and appropriate agrotechnologies are therefore crucial. Establishing protocols for in-vitro culture and micropropagation of this seriously endangered yet therapeutically promising candidate is urgently needed.

Standards, including accurate identification of plant species, are completely absent nowadays. Only modern scientific variables like taxonomic, pharmacokinetic, and phytochemical characteristics may be trusted. Such study would help develop proper drug standardization norms, which are now a crucial necessity, in addition to providing exact scientific information for detecting dangerous pharmaceuticals. Based on botanical, pharmacogenetic, phytochemical, and pharmacological data, the current review will help in the proper identification and authenticity of B. ligulata and will support future investigation of this potential therapeutic candidate.

Conflict of interest – None

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