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REVIEW ARTICLE

Punarnava- A Review

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ABSTRACT

Herbs play an important role in our day to day life. They were the only source of medicine in olden days. Even today herbs are equally important to modern drugs as they have fewer side effects when compared to synthetic drugs. Among so many herbs, this review exposed the information on vernacular names, microscopic, macroscopic, chemical constituents, uses and pharmacological actions on punarnava.

Key words: Punarnava, Macroscopy, Microscopy, Traditional uses

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INTRODUCTION

In Ayurveda, Punarnava has many medicinal properties. It is called as Punarnava (Punar + nava). Punar means - once again, nava means - becoming new. This is also known as spiderlings as this plant grows low and spreads like spider [1].

Profile of punarnava [2-7]

Botanical Name: *Boerhaavia diffusa*
Family: *Nyctaginaceae*
Division: *Magnoliophyta*
Class: *Magnoliopsida*
Order: *Caryophyllales*
Genus: Boerhaavia
Species: diffusa, hirsuta

Vernacular names of punarnava in various languages

Boerhavia diffusa, Boerhaavia repens Linn(Latin); *Punarnava* (Sanskrit); *Lal Punarnava, Beshakapore*, Santh(Hindi); *Spreading Hogweed,* Shothagni, Red Hogweed, Rakta punarnava (English); *Thazhuthama(*Malayalam); *Punarnnava(*Bangali); Kommegida(Kanarese); Vakhakhaparo, Dholia-saturdo(Gujarati); Tambadivasu, Ghetuli(Marathi); *Chattarani(*Tamil); G*alijeru(*Telugu); Lalapuiruni, Nalipuruni (Oriya); ltcit (Ial), Khattan (Punjabi); Sanadika, Kommeberu, Komma (Kannada); Vanjula Punarnava(Kashmiri); Ranga Punarnabha(Assamese).

Common Names

Erva Tostão, Erva Toustao, Pega-pinto, Hog Weed, Pig Weed, Atikamaamidi, Biskhapra, Djambo, Etiponia, Fowl's Lice, Ganda'dar, Ghetuli, Katkatud, Mahenshi, Mamauri, Ndandalida, Oulouni Niabo, Paanbalibis, Patal-jarh, Pitasudu-pala, Punar-nava, Punerva, Punnarnava, Purnoi, Samdelma, San, Sant, Santh, Santi, Satadi Thikedi, Satodi, Spreading Hog Weed, Tellaaku, Thazhuthama, Thikri, Touri-touri, Tshrana, Yoegbe, Beshakapore, Raktpunarnava.

Distribution:

The herb is distributed throughout India.

Habitant:

This is found throughout India. It grows up to an altitude of 70 centimeters especially during the rainy season. It has a large root system and produces yellow and white flowers. It can be found in many tropical and warm-climate countries[8-12].

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Description:

Macroscopic characters of Punarnava [13-15]

Stem: Greenish purple, stiff, slender, cylindrical, swollen at nodes, minutely pubescent or nearly glabrous, prostrate divericately branched, branches from common stalk, often more than a metre long.

Root: Well developed, fairly long, somewhat tortuous, cylindrical, 0.2-1.5 cm in diameter, yellowish brown to brown coloured, surface soft to touch but rough due to minute longitudinal striations and root scars, fracture, short, no distinct odour, taste, slightly bitter, sweet, pungent .

Leaves: Opposite in unequal pairs, larger ones 25-37 mm long and smaller ones 12-18 mm long ovate-oblong or suborbicular, apex rounded or slightly pointed, base subcordate or rounded, green and glabrous above, whitish below, margin entire or subundulate, dorsal side pinkish in certain cases, thick in texture, petioles nearly as long as the blade, slender.

Flowers: Very small, pink coloured, nearly sessile or shortly stalked, 10-25 cm, in small umbells, arranged on slender long stalks, 4-10 corymb, axillary and in terminal panicles, bracteoles, small, acute, perianth tube constricted above the ovary, lower part greenish, ovoid, ribbed, upper part pink, funnel-shaped, 3 mm long, tube 5 lobed, stamen 2-3.

Fruit: One seeded nut, 6 mm long clavate, rounded, broadly and bluntly 5 ribbed, viscidly glandular.

Microscopic characters of punarnava:

Stem: Transverse section of stem shows epidermal layer containing multi cellular, uniseriate glandular trichomes consisting of 9-12 stalked cells and an ellipsoidal head, 150-220 µ long, cortex consists of 1-2 layers of parenchyma, endodermis indistinct, pericycle 1-2 layered, thick-walled often containing scattered isolated fibres, stele consisting of many small vascular

bundles often joined together in a ring and many big vascular bundles scattered in the ground tissue, intra fascicular cambium present.

Root: Transverse section of mature root shows a cork composed of thin-walled tangentially elongated cells with brown walls in the outer few layers, cork cambium of 1-2 layers of thin walled cells secondary cortex consists of 2-3 layers of parenchymatous cells followed by cortex composed of 5-12 layers of thin-walled, oval to polygonal cells, several concentric bands of xylem tissue alternating with wide zone of parenchymatous tissue present below cortical regions, number of bands vary according to thickness of root and composed of vessels, tracheids and fibres, vessels mostly found in groups of 2-8 in radial rows, having simple pits and reticulate thickening, tracheids, small, thick walled with simple pits, fibres aseptate, elongated, thick-walled, spindle shaped with pointed ends, phloem occurs as hemispherical or crescentic patches outside each group of xylem vessels and composed of sieve elements and parenchyma, broad zone of parenchymatous tissue, in between two successive rings of xylem elements composed of thin-walled more or less rectangular cells arranged in radial rows, central regions of root occupied by primary vascular bundles, numerous raphides of calcium oxalate, in single or in group present in cortical region and parenchymatous tissue in between xylem tissue, starch grains simple and compound having 2-4 components found in abundance in most of cells of cortex, xylem elements in parenchymatous tissue between xylem elements, simple starch grains mostly rounded in shape and measure 2.75-11 µ in diameter.

Leaves: Transverse section of leaf shows anomocytic stomata on both sides, numerous, a few short hairs, 3-4 celled, present on the margin and on veins, palisade one layered, spongy parenchyma 2-4 layered with small air spaces, idioblasts containing raphides, occasionally cluster crystal of calcium oxalate and orange-red resinous matter present in mesophyll. Palisade ratio 3.5-6.5, stomatal index 11-16, and Vein islet number 9-15.

Types:

In Ayurvedic tests, two varieties of punarnava white and red have been mentioned. The third blue variety is also cited in Raja Nighantu. The white punarnava is pungent, bitter and astringent in taste, pungent in the post digestive effect and has cold potency. The white variety alleviates all the three doshas. White variety is used as an edema, anemia, heart disease, cough, intestinal colic, kidney disorders; same uses as that of red.

The red one alleviates pitta dosha but aggravates vata dosha. Punarnava possesses light and dry attributes. Red variety is a nervous system, heart disease, hemorrhoids, skin diseases, kidney stones, edema, rat and snake bites; chronic alcoholism, wasting diseases, insomnia, rheumatism, eye diseases, asthma (moderate doses), induces vomiting in large doses, jaundice, ascites due to early liver and peritoneal concerns; urethritis. Leaf juice with honey, dropped into the eyes for chronic ophthalmia.

Phytochemicals present in punarnava [16]:

Generally whole plant consists the following phytochemical constitiutents, those are punarnavine (*Alkaloids)*, B-sitosterol (Phytosterols), Liriodendrin (lignans), Punarnavoside (Rotenoids), Boerhavine (Xanthones) and Potassium nitrate (Salts). The roots contain the rotenoids boeravinones AI, BI, C2, D, E and F besides the new dihydroisofurenoxanthin, Alanine, Arachidic Acid, Aspartic Acid, Behenic Acid, Beta-Sitosterol, Boeravinone A - F, Boerhaavic Acid, Borhavine, Borhavone, Campesterol, Daucosterol, Beta-Ecdysone, Flavone,5-7-dihydroxy-3'-4'-dimetho, Xy-6-8-dimethyl, Galactose, Glutamic Acid, Glutamine, Glycerol, Glycine, Hentriacontane N, Heptadecyclic Acid, Histidine, Hypoxanthine-9-l-arabinofuranoside, Leucine, Liriodendrin, Methionine, Oleaic Acid, Oxalic Acid, Palmitic Acid, Proline, Proline,hydroxy, Serine, Sitosterol Oleate, Sitosterol Palmitate, Stearic Acid, Stigmasterol, Syringaresinol-mono-beta-d-glucoside, Threonine, Triacontan-1-OL, Tyrosine, Ursolic Acid, Valine, Xylose, triacontanol hentriacontane, ß-sitosterol, ursolic acid, 5,7-dihydroxy-3,4-dimethyoxy-6,8-dimethyl flavone, and an unidentified ketone (mp 86°). The roots contain the rotenoid boeravinones AI, BI, C2 , D, E and F besides the new dihydroisofurenoxanthin and an antifibrinolytic agent, Two lignans, liriodendrin and syringaresinol mono-ß-D-glucoside, have also been reported in the roots [1].

Uses [17]

Each part has a different therapeutic value and must be prepared in its own way for maximum benefits. This plant rejuvenates liver, male reproductive system and other organ system; detoxifies liver and skin; aphrodisiac; increases libido, erection and quality and quantity of semen; reduces cough, asthma etc. It is used in Vajikarana preparations. This plant cleanses the kidneys and helps to get rid of renal calculi (kidney stones). Mainly, the roots and the whole plant is used for the medicinal purpose, externally punarnava is used for alleviate the pain and swelling. The fresh juice of its roots instilled into eyes, mitigates the ailments of the eyes like night blindness and conjunctivitis. The paste applied on the wounds, dries up the oozing. Internally, punarnava is beneficial to treat a wide range of diseases. Punarnava is the most commonly used and the best herb to alleviate swelling, due to its potent diuretic property. It boosts up the filteration, rejuvenates the renal functions and takes out the excessive fluids and kleda by augmenting the urinary output. The sesame oil, medicated with punarnava is very useful as an adjunct to oleating enemas in the treatment of ascites of vata type and flatulence. In large doses, punarnava acts as a purgative. Punarnava effectively reduces fever, especially in malaria.The decoction of rasna, sunthi and punarnava is the best panacea for rheumatic swollen joints, as rasna alleviates the pain and vata, sunthi destroys ama and punarnava reduces the swelling.

Punarnava enhances the quality of 6 of the 7 categories of bodily tissues, including nutrient plasma (Rasa Dhatu), blood (Rakta Dhatu), muscle (Mamsa Dhatu), fat (Meda Dhatu), bone marrow and nerves (Majja Dhatu), and reproductive fluids (Shukra Dhatu).

Healing power and curative properties:

For liver disorders (jaundice, hepatitis, cirrhosis, anemia, flukes, detoxification, chemical injury, etc), for gallbladder disorders (stones, sluggish function, low bile production, emptying, and detoxification), for kidney and urinary tract disorders (stones, nephritis, urethritis, infections, renal insufficiency/injury, etc), for menstrual disorders (pain, cramps, excessive bleeding, uterine spasms, water retention), to tone, balance, and strengthen the adrenals (and for adrenal exhaustion and excess cortisol production and in the treatment of following disorders.

Obesity:

The herb has been used in indigenous medicine from time immemorial. Punarnava is highly beneficial in the treatment of obesity as almost all anti-obesity herbal preparations contain it in one or the other form. It is beneficial in the treatment of several common ailments.

Dropsy (edema):

Punarnava increases the secretion and discharge of urine. It is effective in the treatment of dropsy, a disease marked by an excessive collection of a watery fluid in the tissues and cavities or natural hollows of the body. The fresh boiled herb should be given in the treatment of this disease. A liquid extract of the fresh or dry plant can also be given in doses of 4 to 6 gms. The antiedema action is beneficial for congestive heart failure, when it is often administered with arjuna bark.

Ascites:

Ascites is a large belly full of toxic fluid resulting from liver failure. The herb is useful in the treatment of ascites, a disease characterized by accumulation of fluid inside the peritoneal cavity of the abdomen. Punarnava is a much more powerful effect on certain types of ascites which caused due to the cirrhosis of the liver and chronic peritonitis.

Stomach disorders:

The herb is useful in strengthening the stomach and promoting its action. It is beneficial in the treatment of several stomach disorders, particularly intestinal colic. A powder of the root is given in doses of 5 gms (1 tsp) three times a day. It is also useful in killing or expelling intestinal worms.

Asthma:

Punarnava promotes the removal of catarrhal matter and phlegm from the bronchial tubes. It is, therefore, beneficial in the treatment of asthma. A powder of the root can be taken in small doses three times a day.

Fevers and hot flashes:

Punarnava is beneficial in the treatment of fevers. It brings down temperature by inducing copious perspiration.

Skin diseases:

The root of the plant is an effective remedy for several skin diseases. A paste of the root can be applied beneficially as a dressing for edematous swellings. A hot poultice of the root can be applied with gratifying results to ulcers, abscesses and similar skin diseases.

Other discomforts:

The root of the plant is useful in the treatment of several diseases – particularly of the kidney and heart as well as gonorrhea. It is also valuable in anemia, cough, pleurisy, nervous weakness, constipation and paralysis. The tender shoots are eaten as a vegetable. The plant has an official status in the Indian Herbal Pharmacopoeia, 2002, as a diuretic and hepato-protective agent[1].

Other uses[18-24]:

Abdomen, Abdominal Pain, Anemia, Anthelmintic, Anti-inflammatory, Ascites, Asthma, Blood Purifier, Calculi, Cancer(abdominal), Cataract, Childbirth, Cholera, Cough, Debility, Diuretic, Dropsy, Dyspepsia, Edema, Emetic, Expectorant, Eye, Fever, Food, Gonorrhea, Guinea Worms, Heart Disease, Heart Ailments, Hemorrhages(childbirth) Hemorrhages(thoracic) Hemorrhoids, Hepatoprotective, Inflammation(internal), Jaundice, Kidney Disorders, Lactagogue, Laxative, Liver, Menstrual, Ophthalmic, Renal, Rheumatism, Snakebite, Spleen(enlarged), Stomachic, Urinary, Urinary, Urinary Disorders, Weakness, Albuminuria, BeriBeri, Blenorrhagia, Chologogue, Cystitis, Gallbladder, Hepatitis, Hepatotonic, Hepatoprotective, Hydropsy, Liver, Nephritis, Sclerosis(Liver), Spleen(enlarged), Urinary Disorders, Childbirth, Sterility, Yaws, Erysipelas, Anti-flatulent, Appetite Stimulant, Joint Pain, Lumbago, Nephritis, Tonic, Urticaria, Abscess, Anti-convulsant, Boil, Convulsions, Epilepsy, Emetic, Expectorant, Febrifuge, Laxative, Abortifacient, Aphrodisiac, Dysmenorrhagia,

Pharmacological potency [25-27]

- The chloroform and methanol extracts of the roots and aerial parts of *B.diffusa* exhibited hepatoprotective activity against carbontetrachloride intoxication in experimental rats. Hepatoprotective activity of 50% aqueous alcohol extract of the whole plant against experimentally induced carbon tetrachloride hepatotoxicity in rats and mice was observed. Punarnava has also been shown to be hepatoprotective and choleretic, cardiokine, anti-cancer and anti-oxidant. It should always be considered in Hepatitis C because it has demonstrable hepato-protective action. An increase in normal bile flow in

rats and significant decrease in serum bilirubin levels suggest strong choleritic activity, strong stimulating action on the secretory activity of liver. The extract is effective in the maintenance of normal functional status of liver. The extract did not show any signs of toxicity up to oral dose of 2 g/kg in mice. The hepatoprotecive activity of roots of different diameters collected in three seasons, rainy, summer and winter, was examined in thioacetamide-intoxicated rats. The results showed that an aqueous extract (2ml/kg) of roots of diameter 1-3 cm. collected in the month of May (summer), exhibited marked protection of a majority of serum parameters, i.e. GOT, GPT, ACP and ALP, but not GLDH and bilirubin, thereby suggesting the proper size and time of collection of B. diffusa roots for the most desirable results. Further, the studies also proved that the aqueous form of drug (2ml/kg) administration has more Hepatoprotective effect than the powder form. The rotenoid, steroid and flavone isolated from the plant exhibited lowering of enzyme GOT[2].

- *B.diffusa* exhibits differential effects on the GABA levels in various regions of the brain of experimental rats[3].
- The ethanol extract of *B.diffusa* was administered daily in a dose of 250mg/kg, body weight p.o., to pregnant albino female rats during the entire period of gestation.
- B.diffusa was found to be devoid of any teratogenic effect as litter size and survival rate of fetuses were the same as for the normal control group and no fetal anomaly could be detected[4].
- Punarnava has been extensively researched, with findings backing up its traditional uses. It has been demonstrated that punarnavoside is diuretic, anti-inflammatory, anti-fibrinolytic, antibacterical and anti-convulsant.
- Sony and Bhatt demonstrated effectiveness of an herbal mixture containing Punarnava in entamoeba histolytica. It is also anti-fungal. Alcoholic extract of root is anti-bacterial. (Studies on the Indian indigenous drug Punarnava)
- Other studies demonstrated the effectiveness of Punarnava in diabetes and its ability to lower blood lipids in diabetes, as well as showing the antioxidant impact this herb has in diabetes.
- In cancer, Punarnava is anti-metastatic as well as cancer preventive. This immensely useful herb offers hope for many otherwise incurable or difficult to treat conditions including cancer, diabetes, obesity, kidney stones, renal failure and Hepatitis C.
- It is also of great use in common conditions such as allergies and conjunctivitis.
- Effectiveness of B. Diffusa drug in inflammation, renal diseases, and nephrotic syndromes is demonstrated. In a study of 15 patients with nephrotic syndrome treated with the decoction of the crude drug, six responded well becoming totally symptom-free and showing minimal albuminuria and histopathological changes in the kidney; seven patients improved showing relief in symptoms but still showing massive albumin urea and urinary sediments, and one patient deteriorated even after treatment of 2-3 weeks.
- A comparative study for the anti-inflammatory effect of the various parts of the plant in carrageenin induced hind paw oedema showed that the activity was significantly more in alcoholic extracts of roots and leaves as compared to stem and whole plant.

- Aqueous extract and the alkaloid fraction of the root significantly inhibited the increased serum aminotransferase in arthritic animals similar to hydrocortisone.
- Punarna is uses as a Haematinic and growth promoter in children fed with milk fortified with it.
- 50% ethanolic extract of the roots, on oral administration was found to stop intrauterine-contraceptive-device-induced bleeding in monkeys at 50 mg/kg body weight. Punarnavoside is an anti-fibrinolytic agent.

Adulterants used: Red variety *Trianthema portulacastrum* for punarnava roots

CONCLUSION

Finally concluded that Punarna is one of the important potent herb among other, it may become a good food supplementary for which further studies are required to find many more activities of this plant.

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