PUNARNAVA (*BOERHAAVIA DIFFUSA* LINN.): A COMPREHENSIVE REVIEW

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ABSTRACT

Punarnava is identified as *Boerhaavia diffusa* Linn. It comes under the family Nyctaginaceae. It is commonly known as ‘Punarnava’ in the Indian system of medicines. It is also known as spreading hog weed in English and used extensively in the system of *Ayurveda* to cure many diseases like *Sotha* (Oedema), *Hridrogas* (Cardiac disorders), *Pandu* (anaemia) etc. Its synonyms, morphology, properties, actions and medicinal uses are described in *Ayurvediya Samhitas* as well as *Nighantus*. It is an established herbal drug used for the management of stress, inflammation, urinary tract disorders and cardiac disorders. It possesses many pharmacological activities like diuretic, hepatoprotecive, anti-inflammatotory, anti-diabetic, immuno-modulatory, adaptogenic, anti-convulsant, antistress and antiurolithic activity. The reviews summarize the literature review, synonyms, properties, actions and uses, phyto constituents and pharmacological activities of *Punarnava* (*Boerhaavia diffusa* Linn.).

KEYWORDS: *Punarnava, Boerhaavia diffusa, Ayurveda*, hog weed.

INTRODUCTION

The word *punarnava* literally means, one which renews the body, that is, which brings back the youth. *Punarnava* enjoys an important place among medicinal herbs in India since ancient times. Various parts of *Punarnava (Boerhaavia diffusa)* are used for the treatment of numerous disorders. In Purulia (West Bengal), the tribes eat this plant as a vegetable. *Boerhaavia* leaves are cooked and eaten in Assam also.[¹]
Punarnava is a perennial creeping herb found throughout the waste land of India. The roots are reputed to be diuretic and laxative and are given for the treatment of anasarca, ascites and jaundice. The Boerhaavia sp. has ancient medicinal use in different societies from the times of the B.C. The herbal medicine has evolved and changed through the years. Similarly Punarnava has also been used raw form as well as extract form in various disorders.\[^2\]

In Ayurveda, this drug is known to be used as Mootrala (diuretic), Sothatghna (Anti-inflammatory), Kasahara (Antitussive), jwarahara (antipyretic), Rasayana (rejuvenator). Not only the roots as therapeutic agent but the whole plant of this herb is also being taken as diet by some tribal groups for which mainly the leaves are used. This drug has been cited as Tikta (bitter) and Kashaya (astringent) in Taste. The main useful part is Panchanga (whole plant) but the use of Moola (root) is widely given in Ayurveda classics.

History of any drug gives insight into its morphology, properties and therapeutic or dietary utility as conceived by various authors at different stages of the history. Thus here historical review of Punarnava has been put forward in chronological order.

**VEDIC KALA: (2500 B.C.–600 B.C.)**

Punarnava has been known to be a controversial plant in Ayurvedic literature. In Vedic period there is no controversy about this drug.

In Atharvaveda the Punarnava initially depicted as a plant which almost completely withered in summer and rejuvenates upto green again in rainy period.\[^3\]

**SAMHITAKALA: (2000 B.C. - 1300 A.D.)**

The Samhitakala is the important landmark in the history of Ayurveda. In this kala, the Ayurveda came in the glimpses of the common man. In this period various Samhitas and compiled work of various Acharyas have been done and kept forward. These are following.

**A. Charaka Samhita (1000 - 1500 BC)**

Aacharya Charaka has categorized Punarnava as Swedopaga\[^4\] (an adjunct to sweating therapy), Anuvasanopaga\[^5\] (an adjunct to oleating therapy), Kasahara\[^6\] (anti-tussive), Vayasthapana\[^7\] (rejuvenator) Mahakashaya. It is mentioned in Vamana dravya, Virechana drvaya and Madhura skandha.\[^8\] It is mentioned in Rasayana pada and ingredient of many rasayanas viz. Chyavanaprasha, Baladi rasayana and Indrokta rasyana.\[^9\] It is mentioned in Punarnavaristha i.e. indicated for sotha (inflammation with swelling).\[^10\] It is mentioned in
Punarnava mandoor i.e. indicated in pandu, sotha.\textsuperscript{[11]} Taila (oil), ghrita (ghee) and mishraka (both oil and ghee) prepared with the combination of drugs including Punarnava is indicated for vatavikara.

B. Sushruta Samhita (1000–1500 BC)

Aacharya Sushruta has categorized this plant in Vidaarigandhadi gana,\textsuperscript{[12]} Vatashanshamana varga,\textsuperscript{[13]} Tikta varga\textsuperscript{[14]} and Shaka varga.\textsuperscript{[15]} Sushruta quoted ‘Paunarnavam shakam visheshat shophanashanam’ mentioned in Shaka varga used as anti-inflammatory.\textsuperscript{[16]} Punarnava kalka with milk mentioned in Udraroga.\textsuperscript{[17]} Punarnava has been mentioned as a content of Saireeyakadi taila indicated for khalitya (hair loss) and palitya (premature or greying of hair).\textsuperscript{[18]} It is the one of component of Eksara gana to be used in snake poison.\textsuperscript{[19]} Root of Punarnava with Dhatura mentioned in Alarka visha (Dog bite).\textsuperscript{[20]}

C. Ashtanga Hridaya (7th century)

Punarnava is the ingredient of Bala taila which is indicated for Jwara (fever), yoniroga (vaginal disorders), sutikarog.\textsuperscript{[21]} Ghrita prepared with Punarnava and other drugs is indicated for kasa and vishama jwara.\textsuperscript{[22]} It is the content of Nagabaladi ghrita which is indicated for Rasayana (rejuvenator).\textsuperscript{[23]} Taila prepared with bilva (Aegle marmelos), punarnava and other drugs is indicated for vataja hridroga.\textsuperscript{[24]} Ghrita prepared with kusha (Desmostachya bipinnata), punarnava and other drugs is mentioned in pittaja ashamari.\textsuperscript{[25]} Milk boiled with punarnava i.e. ksheerapaka is indicated in mutrghata and ashmari.\textsuperscript{[26]} Punarnava is one of ingredient in the Dhanwantara ghrita indicated for prameha, prameha pidika, sopha etc.\textsuperscript{[27]} it is the content of Sukumara rasayana which is indicated in vridhhiroga, vatarakta, sotha and udararoga.\textsuperscript{[28]} Punranava is mentioned in Dadhika ghrita along with other drugs which is indicated for gulma, mutraghata, hridshoola, grahaniroga etc.\textsuperscript{[29]} It is an ingredient in Vyoshadi ghrita which is indicated in Mridbhakshanajanya pandu (anaemia caused by eating clay).\textsuperscript{[30]} Punarnava with haritaki, sunthi and devadaru churna along with water used in Sotha.\textsuperscript{[31]} Root of Punarnava paste external apply in kusha roga (skin diseases) along with dadhimanda.\textsuperscript{[32]} Ghrita prepared with patha, vidanga, haridra, daruwaridra, mustaka, bharangi, punarnava etc. is indicated for mridbhakshanajanya roga (disorders originated by eating clay).\textsuperscript{[33]} It is one of ingredient in the Mahamayura ghrita indicated for swasa, kasa, ardita (facial paralysis), yoniroga, bandhya (sterile) etc.\textsuperscript{[34]} Kashmaryaadi ghrita prepared with root of punarnava and other drugs is indicated in vataja yonivikara.\textsuperscript{[35]} In uttaratantra, vishanashaka yavagoo prepared with koshataki, chitraka,
patha, punarnava etc. drugs is best for sarvavisha (all the poisons).[36] Kwath (decoction) prepared with sinduvaar, tagara, shigru, bilva root, punarnava etc. is used in alarka visha (dog bite) and mushika visha (rat poison) along with madhu (honey).[37] It is one of ingredient in Chyavanaprasha rasayana.[38]

D. Kashyapa samhita (6th century)

Punarnava is the ingredient of Traivrita yoga which is indicated in sutika upadrava (postnatal complications) caused by vata.[39] Rasnadi ghrita prepared with rasna, punarnava, kushtha, tagar etc. is indicated in sheetaputana graha rog.[40] Taila or ghrita prepared with bilva, ankola, kapiththa, punarnava etc. is indicated for Andhaputana.[41] Punarnava is the ingredient of Shaishuka ghrita which is indicated in vataja gulma.[42] Ksheerpaka prepared with rasna, madhuka, punarnava etc. is indicated for phakka roga (impaired growth and delayed milestone development in children).[43] Bala taila prepared with bala root, dashamool, shatavari, punarnava etc. is best for massage in all type of vata roga, yoni roga, jeerna jwara (chronic fever) etc.[44] Punarnava taila used in complications produce by excessive use of nasya karma.[45] Punarnava is an ingredient of Shaishuka sneha which is best for Basti karma (enema therapy) and indicated for bala roga (disorders of children).[46] Panchabhautika taila prepared with punarnava and other drugs is indicated in chirotthita netraroga (chronic eye diseases) and this oil used in nasya form.[47] In Khila sthana, punarnava yusha (soup) is mentioned in 25 yushas.[48] Kashaya prepared with punarnava, gokshura, brihati, eranda etc. which is indicated in vatika charmadala (type of skin disease) for stanyashodhana (lactodepurants).[49] Punarnavadi ghrita prepared with punarnava decoction, trikatu, mustaka etc. along with ghrita indicated in sarva sotha (all types of edema).[50] Decoction prepared with vrishchiva (white variety of punarnava), bilva, eranda, tarkari (Clerodendrum phlomidis), punarnava (red variety of punarnava) is indicated in vataja sotha and should be used in sprinkling form.[51] Lepa (face pack) prepared with punarnava and other drugs along with urine of cow which is used in vataja sotha.[52] Taila prepared with panchamoola, varuna, sarala, punarnava etc. is indicated in vata-kaphaja sotha.[53] Taila prepared with dvipanchamool, punarnava, patha etc. is indicated in vataja jwara.[54]
REFERENCES FROM NIGHANTUS

Ashtanga Nighantu- (8th century A.D.)

Punarnava kept into Vidaaryaadi gana and its synonyms has been described in this Nighantu.

Dhanvantari nighantu- (10th century A.D.)[55]

Punarnava kept into Guduchyaadi varga and its properties, synonyms, indications are mentioned.

Shodhala Nighantu- (13th century A.D.)[56]

Its synonyms are mentioned under Guduchyadi varga.

Madanpal Nighantu- (14th cent. A.D.)[57]

Punarnava kept into Abhayadi varga and its properties, synonyms, indications are mentioned.

Kaidev Nighantu- (15th cent. A.D) [58]

Its properties, synonyms, indications are mentioned under Aushadhi varga.

Raja Nighantu- (15th cent. A.D.)[59]

Its 22 synonyms, properties and indications are mentioned under Parpatadi varga.

Bhavaprakasha Nighantu- (16th cent. A.D.)[60]

Its synonyms, properties and indications are mentioned under Guduchyadi varga.

REFERENCES FROM MODERN PERIOD

Dravyaguna vijanam: (P.V. Sharma 20th cen. A.D.)

This is the most famous book of dravyaguna of 20th century. Systematic description of single drugs covering all the headings is available in volume II. Every aspect of Punarnava has been detailed.

Ayurvedic Pharmacopoeia of India: (20th Cen. A.D.)

The description of Punarnava is available in the Part-1, Volume-3. We find macroscopic as well as microscopic study of root in A.P.I.

Sanskrit name, habitat, parts used, constituents, action, properties and uses are described in detail.

**Database on Medicinal Plant:** (CCRAS Vol-1: 20th Cen. A.D., page no.360).

Extensive description regarding all aspects of drug *Punarnava* is available under various captions.

**CONTROVERSIAL STATUS**

*Punarnava* has been known to be a controversial plant in Ayurvedic literature. In Vedic period there is no controversy about this drug. In Samhita period *Punarnava, varshabhu, Kathillaka, Vrishchiva, Vrishchira* and *Vrishchika* have been described together in several places which indicates that these all are separate drugs having similar properties and actions. In some places we have also found that the words like *Punarnave dwe* and *dwi Varshabhu* means two types of *Punarnava* and *Varshabhu* respectively.

The commentators have muddled the subject and created the controversy of *Punanava*. Chakrapani considered *Kathillaka* as *Punarnava* (Ch.Su.27/96) and *Vrishchira* as *Sweta Punarnava* (Ch.Su. 4/23). While Dalhana interpretes *Varshabhu* as *Punarnava* (S.S.Su.46), *Sweta Punarnava* (S.S.Su.21) and *Rakta Punarnava* (S.S.Chi.23).

In Nighantu all these drugs are described as synonyms to each other *Sodhala nighantu* describes other variety of *Punarnava* i.e. *Vaishakha*, which is having profused branches with red margins around the leaves. Botanically three species of *Boerhavia* have been used as *Punarnava* in different parts of India viz. *B.diffusa*, *B.erecta* and *B.rependa*.

*Sharma P.V.* standardized that *Rakta Punarnava* is *B.diffusa* and *sweta Punarnava* is *B. verticillata* on the basis of thorough literature and pharmacological study. For the present article we selected *Rakta Punarnava* which is botanically *Boerhavia diffusa* Linn.

**SYNONYMS OF PUNARNAVA**

*Punarnava* is having many *paryaya* (synonyms). The synonyms quoted in various lexicons and classics were mentioned in Table1.

*Punarnava*- It is perennial regenerating in rainy season.

*Pravrishayani*- It is perennial regenerating in rainy season.

*Mandalpatrika*- It is a spreading herb with round leaves.
Raktakanda- Its reddish stem.
Raktapushpika- Its red flowers.
Vishaghni- It also eliminates toxins and anti-poisonous.
Sothaghni- It is useful for oedema.
Sarini- Because of its diuretic action.

**RASADIGUNAS (PROPERTIES AND ACTIONS)**[^61]

The properties of the drug as per API.
Rasa: Madhura, Katu, Tikta, Kashaya.
Guna: Sheeta, Laghu, Ruksha, Sara.
Virya: Ushna.
Vipaka: Katu.
Karma: Shophahara, Deepana, Vatakara, Kaphaghna, Pittahara.

Therapeutic uses – Sopha, Pandu, Hridroga, Kasa, Arsa, Vrana, Urahkshtashula, Sotha etc.

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**KARMA (ACTIONS) MENTIONED IN DIFFERENT NIGHANTUS**

Sothahara, Lekhana, Deepana, Ruchya, Anulomana, Rechana, Hridya, Kasahara, Vrishya, Mootrajanana, swedajanana, Kushthaghna, Jwaraghna, Rasayana, Vishaghna.

**ROGAGHNATA**

Sotha, Nettaroga, Agnimandhya, Vibandha, Udararoga, Hridroga, Pandu, Kasa, Shwasa, Urakshata, Raktapradara, Mootrakrichchhra, Kustha, Jwara.

**TAXONOMICAL CLASSIFICATION**[^62]

- Kingdom: Plantae.
- Division: Tracheophyta.
- Class: Magnoliopsida.
- Order: Caryophyllales.
- Family: Nyctaginaceae.
- Genus: Boerhaavia.
- Species: diffusa.
- Latin name: Boerhaavia diffusa Linn.

**Chemical constituents**[^63]

Punarnavoside, rotenoids viz. boervinones A, B, C, D and E, lignins viz. liridodendrin and syringaresinol mono- β-D glucoside, flavones and sterols, isofuroxanthone, boervine and hypoxanthine-9-L-arabinofuranoside. The leaves have various nutritive components like vitamin c, sodium and calcium.[^70]

**Part used**

Whole plant, roots.

**Doses**[^64]

1-3 g. of powder, 10-20 ml. (Fresh Juice).
PHARMACOLOGICAL ACTIVITIES

Immunomodulatory effects
The alkaloidal fraction of *Boerhaavia diffusa* was studied for its effect on cellular and humoral functions in mice. Orally administration is significantly inhibited SRBC-induced delayed hypersensitivity reactions in mice. However, the inhibition was observed only during post-immunization drug treatment, while no effect during pre-immunization drug treatment was observed.[65]

Antistress & adoptogenic Activity
The extract improved the stress tolerance by significantly increasing the swim duration & reducing the elevated WBC, blood glucose & plasma cartisol. Immunomodulatory activity was evaluated by carbon clearance & delayed hypersensitivity test. The extract significantly increased carbon clearance, indicating the stimulation of reticuloendothelial system. The extract also produced an increase in DTH response to SRBC in mice.[66]

Hypoglycemic activity
An alcoholic extract of the whole plant of *B. diffusa* exhibited hepatoprotective activity against experimentally induced carbon tetrachloride hepatotoxicity in rats and mice. Study investigating the effect of oral administration of an aqueous solution of *B. diffusa* leaf extract on normal and alloxan-induced diabetic rats showed a significant decrease in blood glucose and a significant increase in plasma insulin levels in normal and diabetic rats. The effect was more prominent than glibenclamide.[67]

Anticonvulsant activity
Study showed the crude methanolic extract of *B. diffusa* and its liriodendrin-rich fraction showed a dose-dependent protection against PTZ-induced convulsions.[68]

Anti-inflammatory activity
Ethanol extract of leaves at dose of 400mg/kg exhibited maximum anti-inflammatory effect with 30.4, 32.2, 33.9 and 32% with carrageenin, serotonin, histamine and dextran induced rat paw edema models, respectively. Ethanol extract of stem bark also exhibited COX-1 and IC50 value of 100ng/ml proving the drug use in the treatment of inflammatory condition.[69]
Uses
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 filtration, 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 (Asthi dhatu) and nerves (Majja Dhatu), and reproductive fluids (Shukra Dhatu).[71]

SUBSTITUTES AND ADULTERANTS[72]
Market samples of Raktapunarnava (Boerhaavia diffusa Linn.) are often adulterated with Trianthema portulacastrum Linn. Two plants are the sources of two different ayurvedic drugs Punarnava and Varshabhu possibly with similar therapeutic effects.

CONCLUSION
Ayurveda is a library of knowledge which inspires each of us to lead a healthy and quality life. With marked changes in the environmental conditions, the effect on the body are well observed as physic-mental disorders. Looking into these challenges, Punarnava is one of the potent herbal drugs that are being used now a days as single or mixed herbal and herbo-mineral formulation. The traditional texts gives us the knowledge about it various properties and formulations being used in various conditions like inflammations, renal stones, anaemia,
jaundice, eye diseases, joint pain etc. the modern research has also proved the efficacy of roots in not only the said disorders but also as antidiabetic, antistress, adaptogenic, immunopotentiator and as antioxidant in various models. Studies have shown that leaves have nutritive components like vit. C, calcium due to which is can be considered as an effective component of the diet.

Various pharmacological activities are shown by different parts of Punarnava (Boerhaavia diffusa Linn.). In view of the many medicinal uses, more clinical studies are also necessary to investigate other grandness of this plant. So we can say that it has been proved as a magical drug due to its multidirectional work. This review article would help the researchers to get a detailed Ayurvedic references about the drug Punarnava (spreading hog weed).

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