



**A REVIEW OF THE PUNARNAWA (*BOERHAAVIA DIFFUSA LINN.*) :- A PLANT WITH
MANY MEDICINAL USES**

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ABSTRACT

Today's increasing world population is facing large number of diseases because of their hasty schedule and unhealthy environment. For treatment of these diseases various medicines are used. These medicines contain chemicals that are lethal and unsafe for our body. Ayurveda is the natural and herbal medicine system that is very safe and demand of today. It has no side effect and biodegradable in nature. Ayurveda deals about body care and different food and drinks that promote health. The references to the principles of ayurvedic medicines are found in many Vedas particularly in the atharv-veda. Mythology states^[1] about ayurveda that Lord Brahma, the creator, imparted the knowledge of Ayurveda to Shri Prajapati Daksha who, in turn, passed it on to the Shri Ashwinikumara then proffered this knowledge to Lord Indra. Lord Dhanwantari was instructed by Lord Indra to spread, this invaluable science of longevity on the earth. Acharya Sushruta, a renowned surgeon and student of Lord Dhanwantari, wrote his famous compendium on surgery the Sushruta Samhita. To Acharya Charaka, who probably lived sometime between the second century B.C. and the second century A.D., goes the credit for the famous treatise on general medicine, the Charaka samhita and Sushruta Samhita are the two ancient treatises on which Ayurveda is based. Ayurveda promotes natural and herbal medicines that are biodegradable and very safe for human consumption as it has no side effect. *Boerhaavia diffusa linn.* commonly known as punarnava is a perennial herbaceous plant belonging to family Nyctaginaceae widely studied and has a long history of therapeutic uses by the indigenous and tribal people and also in Ayurvedic and Unani medicines. The chemical presents in the whole plant of *Boerhaavia diffusa* L. which makes it as outstandingly useful plant is now been traced out. Now, it is regarded as anti-inflammatory, antioxidant, antiaging, anticancerous, antibacterial, antistress, hepatoprotective and antidiabetic compound. Its biological used as a kidney and heart tonic and also to treat general fever, jaundice, obesity, asthma and to kill intestinal worms. The present paper provides a detailed account as well as its medicinal and ethnobotanical use of the plant *Boerhaavia diffusa* linn. In this review, we will try to discuss the multifunctional uses of the plant and also we will try to summarize the innovative research on this plant.

KEYWORDS: Ayurveda, *Boerhaavia diffusa* L., Diseases, Ethanobotanical uses, Medicinal properties, Nyctaginaceae.

INTRODUCTION

Dravya (drug) has been considered as essential one of the four basic factors of the treatment in chikitsa chatuspada. Acharya charaka stated that the efficacy of the drug depends upon the habitat, nature, preservation and administration etc.^[2] From ancient times herbal drugs as medicines for the treatment of wide range of diseases. Medicinal plants have played very pivotal role in world health. In spite of recent advancement in modern medicine plants still have an important contribution to health care of people. **Punarnava** literally means 'bring back to life' or 'renewer'. It is creeper that grows wild mainly in India and Brazil throughout year but dries during the summer. This creeper bears small fleshy leaves, small reddish pink flowers and fruits in winter. It is bitter in taste & has cooling effect. It bears high

medicinal value and power to rejuvenates the whole body i.e. regular use of Punarnava makes the person young and energetic, full of vigour & vitality. Punarnava corrects the digestive ailments, alleviates fluid retention through kidney and also very helpful in curing heart diseases. Punarnava is also used for the treatment of respiratory distress, anemia, and hernia. Punarnava also maintain proper lipid and cholesterol level thus helpful for liver problem also. It is well known drug in Ayurvedic therapeutics, having very wide use for curing the diseases. It is an important and commonly available drug found throughout the India. Since Samhita period the identity of the drug has been well documented. The plant being part of nature, Ayurvedic scholars have given position to them. Charak has said that for the successful management of the disease, it is essential to select proper

medicine (Ca. Su. 20/20). Punarnava is used as a Rasayana in Ayurveda, it helps to rejuvenate and heal the body. Furthermore, it comes with hepato-protective, immuno-modulatory, anti-cancer, anti-diabetic, hypoglycemic, anti-fibrinolytic, anti-inflammatory, diuretic, antibacterial, anti-oxidant, anti-asthmatic, and anticonvulsant properties.

Classical review of drug

1) Charaka Samhita: Acharya Charaka categorised Punarnava as swedopaga^[3] (an adjunct to sweating therapy), anuvasanupaga (an adjunct to oleating therapy), kaashara (anti-tussive) and vayasthapana (rejuvenator). Its mool (root) has been written to be used with dahi maanda in kushtha (skin disorder).

2) Sushruta Samhita: Acharya Sushruta has categorised this plant in vidharigandhadi gana^[4] and shaak varga. In this Vedic text, punarnava mool has been told to be used in pittaj ashmari (renal stones); milk boiled with root, Shotha (anti-inflammatory); mool kwatha with shunthi, Mooshaka vish (rat bite), mool (root) of shveta variety with honey), Alarka visha (bite of a rabied dog); mool (root) of shveta variety with dhatura seed powder and water and in jvara (all types of fever); ksheerpaka of mool of shveta (white) variety.

3) Ashtanga Sangraha: In this Ayurvedic text Punarnava is included in Kaashara mahakshaya^[5] (as antitussive) and Vayasthapana mahakshaya (decoction effective as rejuvenator). Punarnava mool (root) is quoted to be effective in Madatyta (alcoholism); Ghee to be prepared with decoction of punarnava, milk and madhuyashti kalka, as Rasayana (rejuvenator), Punarnava powder is to be used. The plant has also been included as Shaak (as vegetable diet).

4) Bhavprakash Nighantu^[6]: This is one of the most authentic texts of Dravyaguna written in 16th century A.D. In this text the two varieties of Punarnava have been illustrated separately. These are shveta (white) and rakta (red) punarnava. Shveta punarnava has its synonyms as shvetmoola, shothaghni, and dirghapatrika.

It is said to have katu (pungent) and kashaya (astringent) taste and is used in pandu (anaemia), shotha (inflammation), decreased digestive fire, udaroga (abdominal disorders) and for the elimination of vayu (flatus), vish (toxins), kapha (phlegm). Rakta Punarnava has its synonyms as raktpushpa, shilatika, shothaghni, ksudra varshabhu, varshketu and kathillaka. It is constituted by tikta (bitter) rasa, has katu vipaka and is sheetal (coolant), light and increases vata in the body. It is malasangrahaka (astringents) in action and is beneficial in kapha, pitta and rakta disorders. Karvellaka (bitter gourd) and rakta punarnava (red variety) have both been named as kathillaka in Anekartha naam varga. It has been told to be used in Sanhdivaata (Osteoarthritis); Punarnava kwatha with kalka of kapur and shunthi to be given for seven days, and in various eye disorders.

5) Haarit Samhita^[7] kwatha of punarnava mool has been told to be effective in nidranasha (insomnia).

6) Sodhal Nighantu^[8], Acharya Sodhal has described its uses in yonishool (vaginal pain), delayed parturition and vishvikara.

MODERN REVIEW

In modern period, the crude drugs have extensively been classified and studied according to their taxonomy. In view of this classification, the Punarnava is categorised as under; Kingdom: Plantaeae Order: Caryophyllales Family: Nyctaginaceae Genus: Boerhavia Species: Boerhavia diffusa The other synonyms of this drug are Boerhavia adscendens, Boerhavia caribaea, Boerhavia coccinea, Boerhavia paniculata and Boerhavia viscosa. Reference is also found that there are six species which are found in India: Boerhavia diffusa, Boerhavia chinensis, Boerhavia rependa, Boerhavia repens, Boerhavia erecta and Boerhavia rubicunda. This plant is found throughout the warmer parts of the country up to the height of 2000 m in the Himalayan area. It is also found grown in the wastelands and fields after the rainy season.^[9-10]



Figure 1. Author collecting the herb.



Figure 2. Punarnava herb collected.



Figure 3. Dried Punarnawa.



Figure 4. Punarnawa powder.

DRUG REVIEW

Biological name: Boerhaavia diffusa

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Caryophyllales

Family: Nyctaginaceae

Genus: Boerhaavia 1.3

Common Names: -santhi, moto satado, ataki, sanadika, gonajali, sanadika, sothaghna, etc.

Geographical Distribution and Habitat:- *Boerhaavia diffusa* (Nyctaginaceae) plant is a perennial species growing prostrate or ascending upward in habitats such as grasslands, agricultural fields, fallow lands, wastelands, residential compounds, ditches and marshy places during rains. *Boerhaavia diffusa* plant is consisting of 40 species is distributed in tropical and subtropical regions and warm climate. It is found in Pakistan, Ceylon, Australia, Sudan and Malay Peninsula, extending to China, Africa, America and Islands of the Pacific that is found in warmer parts of these countries. 6 species of *Boerhaavia diffusa* plant are found in India, namely *Boerhaavia diffusa*, *B. erecta*, *B. rependa*, *B. chinensis*, *B. hirsute* and *B. rubicunda* in warmer parts and all over up to 2,000 m altitude in the Himalayan area. The plant is also cultivated to some extent in West Bengal.^[11-13]

Macroscopic Characters

Stems: Stems of *Boerhaavia diffusa* are greenish purple, stiff, slender, cylindrical and swollen at nodes or thick at the nodes, minutely pubescent or nearly glabrous. They are prostrate divaricately branched; branches from common stalk about 1 m in length. Stems are pale greenish below and light reddish brown above.^[14]

Roots: Roots of *Boerhaavia diffusa* are elongated, fusiform, tapering and somewhat tuberous or somewhat tortuous, cylindrical, 0.2–1.5 cm in diameter, surface soft to touch but rough due to minute longitudinal striations and root scars, fracture, short. Roots of *Boerhaavia diffusa* grow up vertically downwards striking deep into the soil. Old roots are often marked with knotty scars of fallen rootlets. Roots have no distinct odor; taste is slightly bitter, sweet, and pungent. They are cream or light brownish yellow, with very soft skin.^[15]

Leaves: Leaves of *Boerhaavia diffusa* are contradictory in unequal pairs, ovate-oblong or sub orbicular, apex rounded or slightly pointed, base subcordate or rounded. Leaves size is larger ones 25–37 mm long and smaller ones 12–18 mm long and colour is green and whitish below, glabrous above. Margin entire or sub undulates, dorsal side pinkish in certain cases, thick in texture, petioles nearly as long as the blade, slender.^[16]

Flowers: Flowers of *Boerhaavia diffusa* are very small, lower part greenish, ovoid and upper part pink in colored, funnel-shaped, nearly sessile or shortly stalked, 10–25 cm, in small umbells, arranged on slender long stalks, 4–10 corymb, axillary and in terminal panicles, small, acute, bracteoles, perianth tube. Flowers are internally sessile in small umbells, about 10 - 25 mm in length. Fruits are one seeded nut, glandular, rounded and about 0.5 cm in size that is 6 mm long clavate, broadly and straightforwardly 5 ribbed. Whole plant of *boerhaavia diffusa* is devoid of fragrance and taste is bitter.^[17]

Microscopic Structures

Stem: *Boerhaavia diffusa* stem that is transverse section of stem illustrates epidermal layer containing uniseriate glandular trichomes and multicellular which consists of an ellipsoidal head and 9-12 stalked cells, 150–220 µm

long cortex that consists of 1–2 layers of parenchyma, endodermis indistinct, pericycle 1–2 layered and thick-walled often containing scattered isolated fibers, stele which is consisting of various small vascular bundles frequently joined simultaneously in a ring and various large vascular bundles scattered in the ground tissue, and intrafascicular cambium present.

Root: Transverse section of *Boerhaavia diffusa* linn root illustrates a cork composed of thin-walled agely elongated cells with brown walls in the outer few layers and 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 and several concentric bands of xylem tissue alternating with wide zone of parenchymatous tissue present below cortical regions and number of bands vary according to the thickness of root of *Boerhaavia diffusa* and composed of vessels, tracheids, and fibers. Vessels generally originate in clusters of 2–8 in radial rows, containing reticulate thickening, small, thick walled, tracheids and simple pits. Fiber saseptate, thick-walled, spindle shaped and elongated with pointed ends. Phloem takes place as hemispherical outer surface each group of xylem vessels and created of sieve elements and parenchyma, broad zone of parenchymatous tissue. Two successive rings of xylem elements arranged of thin-walled additional or fewer rectangular cells organized in radial rows, central areas of root of *Boerhaavia diffusa* occupied by main vascular bundles, many raphides of calcium oxalate in single or in group present in cortical section. Parenchymatous tissue in between xylem tissue and simple starch grains, compound containing 2–4 components originate in abundance in most of cells of cortex.

Leaves: Transverse section of *Boerhaavia diffusa* leaf illustrates anomocytic stomata on both the sides, several, a few short hairs, 3–4 celled that is present on the margin and on veins, palisade one layered, spongy parenchyma 2–4 layered among tiny air spaces. Idioblasts having raphides intermittently cluster crystal of calcium oxalate and orange-red resinous substance present in mesophyll. Palisade ratio 3.5–6.5, stomatal index 11–16, and vein islet number 9–15.^[18-19]

Phytochemistry

Phytochemicals are natural bioactive compounds found in plants, including the medicinal plants, fruits, vegetables, flowers, leaves, roots and fibers and they act as a defense system against diseases or more accurately protect plants against diseases. The therapeutic abilities, including antioxidant property, antimicrobial and anticarcinogenic properties of higher plants are due to the occurrence of secondary metabolites like flavonoids etc. The medicinal values of these plants lie in bioactive phytochemical constituents with the intention of produce exact physiological actions on the human and animal body. A number of the most significant bioactive

phytochemical constituents are the alkaloids, glycosides, carbohydrates, flavonoids, essential oils, tannins, steroids, terpenoids and phenolic compounds. These biologically active chemical constituents recognized as secondary metabolites in medicinal plants, form the establishments of modern prescription drugs. In recent decades, there are many reports on the use of medicinal plants. From the previous studies, it was found out that the accurate amount of active chemical constituent are frequently unidentified. Therefore, it was discovered that multiple chemical constituents are generally responsible for the therapeutic effects of the plants. These multiple chemical constituents may take action synergistically and can hardly be divided into active parts. Furthermore, the herbal chemical constituents may be different depending on the harvest seasons, plant origins, drying procedure and other aspects. The *Boerhaavia diffusa* linn contains a huge number of such chemical constituents as alkaloids, steroids, triterpenoids, lipids, flavonoids, lignins, carbohydrates, proteins, and glycoproteins. Punarnava also have been isolated such chemical constituents including Boeravinone A-F, hypoxanthine 9-Larabinofuranoside, ursolic acid, punarnavoside, lirodendrin, and a glycoprotein having a molecular weight of 16–20 kDa, considered in detail for their biological activity. Punarnavine C₁₇H₂₂N₂O m. p. 236–237°C. *Boerhaavia diffusa* linn also contains 2- α -sitosterol, palmitic acid, arachidic acid, β -Sitosterol, ester of β -sitosterol, hexacosanoic, stearic, tetracosanoic, urosilic acid, β -Ecdysone, triacontanol, Hentriacontane etc. The herb and roots of punarnava are rich in proteins and fats. The herb contains 15 amino acids, with 6 essential amino acids, whereas the root contains 14 amino acids, as well as 7 essential amino acids. Plant contained large quantities of potassium nitrate, besides punarnavine.^[20-21]

Chemical constituents of Root: - The root contains 14 amino acids, including 7 essential amino acids (total 11.54 %). These are: alanine 1.18; arginine 0.75; aspartic acid 0.95; glutamic acid 1.45; leucine 0.88; methionine 0.45; ornithine 0.96; phenylalanine 0.71; proline 0.5; serine 0.85; threonine 0.79; tryptophan 0.65; tyrosine 0.72; asparagines 0.0; glycine 0.0 and valine 0.75 %²⁹. The root of *Boerhaavia diffusa* linn was reported to yield a new dihydrofuranoxanthone and c-methyl flavone designated as borhavine and borhavone respectively. Other four new compounds have been isolated as boerhavisterol, boerhavanostenyl benzoate, boerhadiffusene, diffusarotenoid and a known rotenoid, boeravinone were also isolated from its roots. Roots presented fewer flavonoid derivatives quercetin-3-O-robinobioside and eupalitin-3-O-galactosyl (1-2)-glucoside, but exhibited one phenolic acid, caffeoyltartaric acid, which was absent in leaves.^[22-23]

Therapeutic Uses

- Herb is used as diuretic
- Expectorant
- Stomachic

- Prescribed in the treatment of jaundice
- Given in the loss of digestive power
- Enlargement of spleen
- Used for relieving abdominal pains

CONCLUSION

Ayurveda is itself a library of knowledge which inspires each of us to lead a healthy and quality life. With marked changes in the environmental conditions, the effects 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 nowadays as single or mixed herbal and herbal-mineral formulation. The traditional texts gives us the knowledge about its various properties and formulations being used in various conditions like inflammations, renal stones, anaemia, jaundice, eye diseases, joint pains etc. The modern research has also proved the efficacy of roots in not only the said disorders but also as antidiabetic, antistress, adoptogenic, immunopotentiator and as antioxidant in various models. Studies have shown that leaves have nutritive components like Vitamin C, sodium and calcium due to which it can be considered as an effective component of the diet. Further studies can be aimed for the analysing the effect of punarnava in of diseases like insomnia, delayed parturition and Yonishool (vaginal pain) for which the references are available in ancient texts. Not only this, but the scope of this drug also lies in the fact that more formulations with other herbs and minerals can be formulated and tested which can prove to be beneficial in animal and human life as well.

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