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A REVIEW ARTICLE ON THE POPULAR MEDICINAL PLANT IN AYURVEDA - PUNARNAVA (*BOERHAAVIA DIFFUSA*)

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ABSTRACT

This analysis's goal is to provide thorough confirmations of the pharmacological and phytochemical characteristics of Boerhaavia diffusa, Belong to Nyctaginaceae family, commonly referred to as "Punarnava." It is a heuristic medicinal phytochemical reservoir with a lengthy ethnomedical history. One of the earliest eastern treatments mentioned by Ayurveda as a potential treatment for a number of illnesses is this one. The plant is rich in flavonoids, steroids, glycosides, and other polyphenolic chemicals. Numerous pharmacological studies have demonstrated its potential for use in traditional applications as immunostimulants, antioxidants, ophthalmics, anti-inflammatory drugs, semen, aphrodisiacs, and antiasthmatics. In this review paper, we have focused on phytochemistry, the registration of plant compounds, those that have documented pharmacological effects, common uses, and therapeutic principles.

Keywords-Punarnava, *Boerhaavia diffusa*, Pharmacological properties, *Medicinal uses*.

Introduction-

Punarnava is a significant plant that has great medicinal benefits for sotha. Despite occasional reports from contemporary study that it is diuretic, the main Ayurvedic scriptures do not promote its use for Mutrala. In the literature, it is also valued as a Rasayana medicine. With the exception of the Vayah sthapana group. Two varieties of Punarnava were cited by Caraka (see Kasahara, Anuvasanopaga, and Svedopaga groups). He used the synonym "Kathilla" to characterize Punarnava in the Sakavarga. Susruta added Punanava and Varsabhu to the Saka varga. Medicinal plants have been used for ages, and traditional medical systems from many different ethnic groups have used them. [1]. According to the expertise of thousands of doctors and traditional medical practices from different ethnic groups, medicinal plants have been utilized to cure a wide range of illnesses. [2]. The management and control of a wide range of medical conditions are greatly aided by the plant-based Indian medicinal system (Ayurveda) [3].The moment to catalog and research phytochemicals that have therapeutic effects and scientific support for people's claims about medicinal plants has arrived. Finding a unique biomolecule will also turn out to be a novel way to treat problematic medical issues [4]. A continuous plant found across the Indian wastelands, Boerhaavia diffusa L. Punarnava (Nyctaginaceae) is referred to as "Punarnava" in the Indian medical system. [5]

Aim and Objective

to assess the research on Punarnava (Boerhaavia diffusa) in light of Ayurvedic literature.

Methodology

Materials pertaining to Punarnava (*Boerhaavia diffusa*) were gathered from a variety of books and magazines, Ayurvedic and modern textbooks, reputable works, prestigious reviews, manuscripts, etc.

Taxonomical classification-

Taxonomical classification of *Boerhavia diffusa* L .is as below:

Kingdom- Plantae

Clade- Tracheophytes

Clade- Angiosperms

Clade- Eudicots

Order- Caryophyllales

Family- Nyctaginaceae

Genus- *Boerhavia*

Species- *B. diffusa*

Synnonys- Axia cochinchinensis Lour., Boerhavia adscendens Willd., Boerhavia caespitosa Ridl., Boerhavia ciliatobracteata Heimerl, Boerhavia coccinea var. leiocarpa (Heimerl) Standl.,Boerhavia coccinea var. paniculata (Kuntze) Moscoso, Boerhavia diffusa var. leiocarpa (Heimerl) C.D.Adams, Boerhavia diffusa var. obtusifolia Choisy, Boerhavia diffusa var. paniculata Kuntze, Boerhavia diffusa var. pubescens Choisy, Boerhavia friesii Heimerl, Boerhavia paniculata f. esetosa Heimerl, Boerhavia paniculata f. multiglandulosa Heimerl ex Parodi, Boerhavia paniculata var. guaranitica Heimerl, Boerhavia paniculata var. leiocarpa (Heimerl) Heimerl, Boerhavia repens var. diffusa (L.) Hook.f., Commicarpus africanus (Lour.) Dandy

VERNACULAR NAME :

Sanskrit Name	:	Punarnava
English	:	Hogweed, Pigweed
Hindi	:	Sant, Gadahpurna
Kannada	:	Sanadika, Komme
Malayalum	:	Tavilama, Talutama
Tamil	:	Mukkurattai, Mukkarattai-kirai
Telugu	:	Attamamide
Bengali	:	Punanva
Punjabi	:	Itsit
Marathi	:	Ghetuli
Gujarathi	:	Vakha – Khaparo

VARIETIES :

According to Nighantus, 2 varieties

1. Shveta
2. Rakta

According to Raj Nighantus, 3 varieties

1. Shveta 2. Rakta 3. Neela

Habit- A perennial plant with many branches that creeps and has strong roots that resemble fusi form.

Habitat: The perennial herb Boerhavia diffusa is widely distributed in the southern United States, the Pacific, and India. It is a weed that grows on stone revetments, by roadsides, and in poor soil. It is found up to 2,000 meters above sea level in warmer climates.

Botanical characteristic features: Taproot – elongate, tapering, narrowly fusiform, perennial, and somewhat tuberous but not particularly robust. It grows vertically downward and burrows so deeply into the ground that it is quite impossible to dig up its whole length. Its skin is delicate and its exterior is cream or light brownish yellow. There are typically knotty scars from dropped rootlets on the surface of the roots. Stem: Almost nonexistent and quite short. Branches: although usually rooted at the nodes, many are subscandent or, more frequently, creep or trail toward the ground. In addition to being nodose and joined with the internodes, these branches are frequently quite long, cylindrical, light reddish brown above and pale greenish below. These might spread out three to five feet in all directions. Leaves : Simple, opposite, estipulate, and short-petioled, the petioles have a groove above and range in length from six to sixteen mm. At a node, the two leaves are not the same size, and the big, White, pink, carmine, or purple flowers are typically seen in clusters of two to ten. About 2 mm long, somewhat extended stamens and style. Fruits are glandular pubescent, clavate with a rounded apex, and about 3.5 mm long. [6,7, 8, 9, 10, 11]

Flowering & Fruiting: August-December.

Main Plant Punarnava ***Boerhaavia difusa***

Substitute Plant- Varshabhu *Trianthema portulacastrum*

Geographical distribution

There are 40 species in the Boerhaavia genus, which is found in tropical and subtropical climates and has warm weather. It spans the Malay Peninsula, Africa, America, the Pacific islands, Ceylon, Australia, and Sudan in addition to China. B. diffusa, B. chinensis, B. hirsu, and B. rubicund are among the six species found in India. are 40 species of Boerhaavia. It is a persistent, pervasive hogweed that grows mostly in ditches, waste areas, and marshy areas following rain. The plant is also widely grown in West Bengal. The plant is abundant in rainy season[12,13,14]

Useful parts-

- The somewhat tuberous main or tap root

- Root, leaves, Whole plant

Microscopic Characters

There are cork cells visible on the surface, acicular calcium oxalate crystals up to 40 µ long, calcium oxalate crystals about 25 µ long, thin, narrow fibers with sharp ends and a narrow lumen 800 µ long, simple to five-compound oval to rounded starch grains up to 15 µ long, simple pitted vessels up to 200 µ long, and few parenchyma with few starch grains, among other features of this powder. [15,16]

The phyto-chemical components

Punarnavine (Alkaloids), Beta-Sitosterol (Phytosterols), Lirodendri lignans, Rotenoid, Bogravinones (Xanthones), and Nitrate Potassium are typically the following phytochemical ingredients. The whole plant typically contains the following components (salts). Rotenoids are used in root canals together with the most recent forms of alanine, behenic acid, boerhavone, campestarol, daucosterol, beta-ecdysone, and flavone.boeravinones XY-6-8-dimethyl, 5-7-dihydroxy-3'-4'-dimethyl, C2, D, E, and F, BI, AI, and 5-7-dihydroxy-3'-4'-dimethyl. Glutamic acid, glutamine, glycerol, glycine, galactozone, histadine, hypoxanthine-9-l-arabinofuranoside, and centriacontane N. [17].

PHARMACOLOGICAL PROPERTIES. (Acc. to Ayurveda)

Rasa	:	Madhura, Tikta, Kashaya
Guna	:	Laghu, Ruksha
Virya	:	Ushna
Vipaka	:	Katu
Doshakarma	:	Kaphavatahara
Karma	:	Shothahara, Vayahsthapana, Deepana

Indication in Ayurveda- Shotha, Pandu, Visharoga, Raktapitta, Braghna, Udara, Hrudroga, Shwasa.

Internal uses : [18,19,20,21,22,23,24]

- Digestive system : It is administered internally for constipation, ascites, toxicity, and agnimandya. Three grams is the dosage used to cause vomiting.
- Circulatory system : beneficial for oedema, anemia, and heart problems. Vegetable leaves are eaten to lessen edema.
- Respiratory system: Useful in cough, asthma and urahkshat.
- Reproductive system: Menorrhagia, (root decoction of red variety is used). Seeds are aphrodisiac.
- Eye diseases: Cataract, chronic conjunctivitis, blepharitis, (roots rubbed in honey is locally applied)
- Urinary system: Acts as a diuretic in dysuria

- Skin: Useful in reducing swelling and foul smelling in skin disorders.
- Satmikarana : As a rasayana therapy in general debility. Antidote to snake poison and rat bite (used internally).

Boerhaavia diffusa is a well-known plant with practical medicinal properties in both the conventional and folk streams of indigenous medicine systems. It tastes unpleasant and astringent. The seeds are blood purifiers. Seeds are utilized as digestion aids and energy boosters. Root juice is used to treat rheumatism, encephalitis, asthma, and urinary tract conditions.

Important Formulations based on Ayurveda[25]

Ayurvedic texts and the market contain a variety of formulations, some of which are described below:

Punarnavaastaka Kwatha, Punarnavarishta, Punarnavadi Mandoora, Punarnavadi Taila, Punarnava Rasayana, Punarnavaasava, Punarnavaambu, Mahanarayana Taila, Shishna Varti, Sukumara Ghruta

DOSAGE

Decoction of root : 5-10 ml.

Powder seeds : 1-3 gms.

Juice of whole plant : 5-10 ml.

Substitute plant- *Trianthema portulacastrum* Linn.

Therapeutic Uses

The herb is used to treat jaundice, digestive weakness, spleen enlargement, and stomach discomfort. It also acts as a diuretic, expectorant, and stomachic. [27]

Bacteriostatic properties

Petroleum ether, chloroform, and methanol crude extracts of aerial and root sections from the Boerhaavia diffusa plant were tested for their in-vitro antibacterial efficacy against six microorganisms, including E. coli ATCC 69314, K. pneumoniae NCIM 2719, P. aeruginosa NCIM 2200, and S. aureus NCIM 2200, by YL Ramchandra et al., 2012[28].They tested Gram-negative and Gram-positive bacteria, including A. tumefaciens NCIM 2943, S. aureus NCIM 2080, and B. subtilis MTCC 441, using the agar well plate method. They discovered that the

methanol crude extract of the plant's aerial portion had strong antibacterial activity in comparison to petroleum ether extract and chloroform extract [28]. The phytochemicals found in B. diffusa leaves may be the cause of their antibacterial action against various Gram-positive and Gram-negative bacteria. [29]. Gram-positive bacteria and all gram-negative bacteria were suppressed by ethanol extract.

Pharmacological Activity:

Anti-diabetic Activity

When rats and mice were subjected to carbon tetrachloride, Nalamolu et al. (2004)[29] discovered that an alcoholic extract of the whole plant of B. diffusa demonstrated hepato-protective effect. An oral treatment of an aqueous solution of B. diffusa leaf extract led to a considerable increase in plasma insulin levels and a significant drop in blood glucose in a study of normal and alloxan-induced diabetic rats. Glibenclamide affects the body more strongly.[30]

Anti-nociception Activity

When animals were given naloxone (5 mg/kg) beforehand, the analgesic effects of morphine and juice—but not decoction—were significantly reversed by the abdominal induction of acetic acid. According to the active anti-nociceptive B. diffusa idea, fresh leaf juices are the main source of this substance, which has a potent antibacterial impact when evaluated in these pain models [31]. Hiruma-Lima et al. (2000).

Hepatoprotection Activity

Significant thioacetamide hepato-protection effectiveness was demonstrated by B. diffusa aqueous root extract (2 ml/kg). according to Rawat et al., 1997[22], as well as significant resistance against most serum measures, such as GOT, GPT, ACP, and ALP, but not GLDH and bilirubin. Research has shown that an aqueous medication (2 ml/kg) has stronger hepato-protective properties than a powder[32].

Anti-inflammatory Activity

Ethanol extract of leaves at 400 mg/kg had the most anti-inflammatory activity with 30.4, 32.2, 33.9, and 32 percent with carrageen in rat paw edema models induced by serotonin, histamine, and dextran, respectively. With an IC50 value of 100ng/ml, COX-1 was also found in an ethanol extract of stem bark, suggesting that the drug may be utilized to treat

inflammatory diseases. [33] Bhalla and associates, 1978. The anti-inflammatory properties of a plant latex extract were assessed using an inflammatory model generated by carrageenan. [34] In 2003, Kulkarni et al.

Anti-Convulsant Activity

The crude Methanolic extract of *B. diffusa* and its liriodendrin-rich fraction were found to protect against PTZ-induced convulsions in a dose-dependent manner. [35, 36]

Anti-stress and immuno-modulatory Activity

Researchers found that cold lowers stress and that ethanol extracts of B. diffusa roots increased stress resistance in a swim endurance test. Increased carbon clearance suggested reticulo-endothelial system activation and immunomodulatory activity. The DTH response to SRBC increased in mice, resulting in signaling cell-mediated immunity and stimulatory effects on accessory cell types and lymphocytes.

Anti-Bronchial Asthma Therapy

In bronchial asthma therapy, dried leaves *Dhoompan* has a role to play in treating bronchogenic asthma. [37]

Anti-Viral Activity

According to Verma and Awasthi et al., 1979 [38], the aqueous extract of dried root powder administered prior to virus inoculation produced the highest antiviral activity in each case. The B. diffusa plant has been said to possess antimicrobial qualities. It was just recently found that this plant possesses antiviral properties against phytopathogenic viruses. If used as a foliar spray in the field, this antiviral characteristic might shield some commercially valuable crops against plant virus infection. [39]

Anti-genetic Activity

It is made up of many substances that are clinically necessary. Shukla et al. (2003) [40, 41, 42] state that B. diffusa is a popular herbal remedy. This technique (RAPD) measures the genetic diversity in Boerhaavia diffusa comparing accessions from different geographical origins within the Indian Territory using spontaneous amplified polymorphic DNA [43].

Discussion-

The medicinal plant known as punarnava (Boerhaavia diffusa) is utilized extensively in Siddha, Ayurveda, and traditional folk medicine due to its many health advantages. Punarnava is known as "spreading hogweed" in English, but its Sanskrit name, "rejuvenator" or "reviver," comes from its capacity to bring back health and energy. With origins in traditional medicine, punarnava is a multipurpose plant that promotes overall health and well-being. Its medicinal value is still being confirmed by current research, which connects traditional knowledge with modern uses. However, under a healthcare professional's supervision, its use should be customized to meet each patient's needs.

Conclusion

The most common uses of punarnava are for renal and urinary disorders. Punarnava contains diuretic and anti-inflammatory qualities. It is used as a heart and kidney tonic. It is prevalent across India, especially in the rainy season. Punarnava contains diuretic and anti-inflammatory qualities. Its flavor is strong and harsh. The entire plant has therapeutic qualities, especially the roots. The herb punarnava is most frequently used in Ayurvedic medicine to treat urinary tract infections and renal problems. Punarnava is used to treat obesity, jaundice, and general fever. More research is required to guarantee the events' veracity. These behaviors would be verified by pharmacological action on lab animals.

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Conflict of Interest -Nil

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