Indian Journal of Agriculture and Allied Sciences
A Refereed Research Journal

ISSN 2395-1109
Volume: 1, No.: 4, Year: 2015

Received: 18.10.2015, Accepted: 30.11.2015

NATURE'S ANTI-INFLAMMATORY: PUNARNAVA (Boerhavia diffusa Linn.)

Awanish Pandey[1], Gyan Chand Morya[2], Hari Shanker Mishra[3] and Anugraha Narain Singh[4]
[1&2]P.G.Scholars, [3]Lecturer, Department of Dravyaguna, L.H.S.P.G.Ayurveda College, Pilibhit, U.P. and [4]Reader, Department of Dravyaguna, S.L.B.S.S. Ayurveda College, Allahabad ,U.P., E-mail: avi24hr4u@gmail.com, Corresponding Author: Awanish Pandey

Abstract: *Inflammation in Ayurveda is known by different names in different contexts namely Shotha, Shopha, Svayathu and Utsedha. Inflammation and edema associated with it is duly recognized in Ayurveda as a pathological manifestation, while modern medicine considers inflammation as a symptom or rather as a healing response of the body in wounds. Inflammation are due to Shroto- dushti (clogging of channels) by Ama (toxic waste of metabolism) i.e. disturbances in micro-channel circulation. Herbal medicines are associated with several therapeutic experiences and practices of indigenous systems of medicine, which serve as guideline for the selection, preparation and application of herbal formulations to achieve therapeutic benefits. In Ayurveda, Punarnava is one of the focus drugs having potent therapeutic potential. The name Punarnava itself means "Rejuvenation".Punarnava shothaghni punarnavakari cha. (P.V.Sharma, Dravyagunasutram) It has Immunomodulater, Adaptogenic, Anti-oxidant, Hepato-protective, Anti-inflammatory, Anti-diabetic, Diuretic, Antiviral, Anticonvulsant properties. The review indicates that this herb justifies its name by its Rasayana and Anti-oxidant properties. This paper explains the evidence based information on the morphology, phytochemistry and therapeutic potential of this plant, classical as well as modern therapeutics.*

Keywords : *Punarnava, Rejuvenation, Anti-inflammatory, Rasayana*

Introduction: Inflammation in *Ayurveda* is *Shotha*. The disturbances in micro-channel circulation in inflammation are due to *Shroto-dushti* (clogging of channels) by *Ama* (toxic waste due to deficient metabolism). Classification of *shotha* in *Charaka Samhita* as *Ekanga* (localised), *Ardhanga* (regional) and *Sarvanga (*general/dropsy) is based on etiology and may be again classified into two types - due to intrinsic factors (*Nija*) and exogenous (*Agantuja*).[1]

Nija (intrinsic factors)	Agantuj (exogenous)
1. Vataj	1. Abhighata (Trauma)
2. Pittaj	2. Bhallataka(pushpa, phala)/Alleregy
3. Kaphaj	3. Krimi(Infection)
	4. Visha (Toxicity)
	5. Dahan (Burn)
	6. Himvata (Climatic changes)

Pathological Features of inflammation: Degenerative disorder like Diabetes, Atherosclerosis, Parkinson's syndrome, Alzheimer's disease, osteoarthritis and rheumatoid arthritis share a common pathological feature of inflammation. Obesity, ageing and metabolic syndrome is also characterized by a low grade chronic inflammation.[2]

Punarnava is a potential and focus drug since Vedic era. Etymological derivation of word *Punarnava* (punar + nava), " Punar " means- once again and "nava" means becoming new, is the best lead towards its pharmacological properties. *Boerhavvia diffusa* Linn. (Nyctaginaceae) has been recognized as official botanical source of the classical drug *Punarnava*. This is also known as spiderlings as this plant grows low and spreads like spider. *B.* diffusa commonly having red flowers was named in honor of 'Hermann Boerhaave', a famous Dutch physician of the 18th century.[3] Plant dries up during the summer season and regenerates again during the rainy season. Multiple benefits of *B. diffusa* made it true miracle of nature. Numerous studies have been conducted on different parts of *B. diffusa.*

Morphology: Boerhaavia diffusa, is a perennial herbaceous creeping weed. It is up to one metre long or more, having spreading branches. The stem is prostrate, woody or succulent, cylindrical often purplish, hairy and thickened at its nodes[4]. The leaves are simple, thick, fleshy, and hairy, around in unequal pairs, green and glabrous above and usually white underneath; ovate, oblong, round or subcordate at the base; margins smooth, wavy or undulate. Flowers minute, subcapitate, 4-10, together in small bracteolate umbels, red or rose, but the white varieties are also known. Fruit achene, detachable, ovate, oblong, pubescent, five-ribbed, glandular, anthocarpus and viscid on the ribs. Seeds germinate before onset the monsoon. The plant grows profusely in the rainy season and mature seeds are formed in October- November.

Phytochemistry: Generally whole plant contains phytochemical constitutents as punarnavine (Alkaloids), β-sitosterol (Phytosterols), Liriodendrin (lignans), punarnavoside (Rotenoids), Boerhavine (xanthones) and Postassium nitrate (salts). The roots contains the Borhavinone A-F(AI, BI, C2, D, E and F) besides the new dihydroisofurenoxanthin, Alanine, Arachidic Acid, Aspartic Acid, Borhavine, Borhavic acid Campesterol, Daucosterol, Beta Ecdysone, Glutamic Acid, Glutamine, Glycine, Hentriacountance 9-1- arabbinofuranoside, Leucine, Liriodendrin, Methoine, oleaic Acid, oxalic Acid, Plamitic Acid, Proline,proline, Hydroxy Serine, Sitosterololeate, Sistosterol palmitate, stearic Acid, Stigmasterol Tyrosine ursolic Acid, Valine Xylose triacountanolhentriacontane, B- Tyrosine , ursolic Acid; 5,7 dihyoxy-68 dimethyl flavones, and an unidentified ketone [5].

Varieties: In Bhavprakash two varieties of *Punarnava* has been illustrated separately. These are *shweta* (white) and *rakta* (red) *Punarnava*. *Shweta Punarnava* has synonyms *shwetmoola, shoothaghni* and *dirghapatrika*. *Rakta Punarnava* has synonyms *raktpushpa, shilatika, shothanghni, ksudra varshabhu, varshketu* and *kathillaka* [6].

Pharmacological Properties

Image 1:Boerhavia diffusa Linn. ,Natural habitat

1. Classical

***Raspanchaka*: [7]**

Rasa	*Madhura, Tikta, Kashaya*
Guna	*Laghu, Ruksha*
Virya	*Ushna*
Vipaka	*Madhura*
Karma	*Anulomana, shothahar, Mootral, Tridoshshamaka*

Properties: *Shweta punarnava* has *katu* (pungent) and *kashaya* (astringent) taste and is used in *pandu* (anaemic), *shotha* (inflammation), *Agni deepak*, *udar roga* (abdominal disorders) and for the elimination of *vayu* (flatus), *vish* (toxins), *kapha* [6].*Rakta Punarnava* is *tikta* (bitter) *rasa,* and *katu vipaka* and is *sheetal* (coolant), increases *vata* in the body. It is *malasangrahaka* (astringents) in action and is beneficial in *kapha pitta* and *rakta* disorders [6].According to Acharya P.V.Sharma, *Punarnava* is *tridosh shamak, mutravirechniya* (diuretic). [7]. Acharya Charaka has classified it as *Kasa-hara* (anti-tussive), *swedopaga*, *Anuvasanopaga, vayasthapana*-rejuvenator.[8] Sushrut has considered it in *Vidarigandhadi* gana [9] and *shaka* varga [10]. He has indicated it in *pittaj ashmari* (renal stones). [11] Milk boiled with *Punarnava* root and *shunthi* is used in *shotha* (anti-inflammatory).[12] Ashtanga Sangrah

has mentioned in *kasahar* and *vayasthapana mahakashay*. [13]

Pharmacological Properties: Immunomodulater, Adaptogenic, Anti-oxidant, Hepatoprotective, Anti-inflammatory, Anti-diabetic, Diuretic activity, Antiviral, Anticonvulsant property [4].

Classical Uses

Anaemic Oedema: *Punarnavamandura* [14]

Generalised Oedema

1. Paste of *Punarnava*, *sunthi* and *mustaka* should be taken in dose of 10gm with milk 640ml.[15]
2. *Punarnavadyarista* .[16]
3. The vegetable of *Punarnava* is particularly efficacious in oedema.[17]
4. Decoction or paste of the root of *Punarnava* mixed with *shunthi* should be taken followed by intake of milk for a month.[18]
5. *Punarnava*, G*uduchi* and G*uggulu* pounded in equal quantity alleviate oedema, *gulma, udara* and disorders of *kapha.*[19]

Edema during Pregnancy: Decoction of *Punarnava* root, D*evdaru* and M*urva* mixed with honey should be taken.[20]

Traditional Medicinal Uses: The root is mainly used to treat gonorrhea, internal inflammation of all kind, dyspepsia, edema, jaundice, menstrual disorders, anemia, liver, gallbladder and kidney disorders, enlargement of spleen, abdominal pain, abdominal tumors, and cancers. It cures corneal ulcers and night blindness and helps restore virility in men. People in tribal areas use it to hasten childbirth.

Pharmacological and Clinical Properties

Rasayana Properties: Ethanolic extract of roots of *B.diffusa* was evaluated for anti-stress, adoptogenic activity in albino mice, by swim endurance test and cold restrain stress .The extract improved the stress tolerance and reduced elevated WBC, blood glucose and plasma cortisol. The extract significantly increased DTH response to SRBC in mice, which was comparable with that of Levamisol, indicating stimulatory effects on lymphocytes and accessory cell type required for the expression of reaction [4].

Immunomodulation: The alkaloidal fraction of *B.diffusa* was studied for its effect on cellular and humoral functions in mice. Oral administration of the fraction (25-100 mg/kg) 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. A significant dose related increase in antibody titer was observed during pre and post immunization treatment. The alkaloidal fraction failed to show any blastogenic responsiveness of murine splenocytes to Concanvalin A (Con A) and lipopolysaccharide (LPS). Similarly, it did not display any mitogenic activity. The present study has shown in vivo immune-stimulatory activity of *B. diffusa* alkaloidal fraction without an in vitro effect.

Hepatoprotective Activity: *B. diffusa* extract is found to be Anti hepatotoxic and hepatoprotective. An aqueous extract of thinner roots of *B. diffusa* at a dose of 2mg/kg exhibited remarkable protection of various enzymes such as serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase and bilirubin in serum against hepatic injury in rats. The study shows a beneficial activity of the *Punarnava* root for the treatment of the jaundice.

Anti inflammatory Activity: Ethanol extract of leaves at dose of 400 mg/kg exhibited maximum anti-inflammatory effect with 30.4, 32.2, 33.9 and 32% with carragenin, serotonin histamine and dextran induced rat paw edema models respectively. Ethanol extract of stem bark also exhibited COX-I and IC-50 value of 100ng/ml proving the drug use in the treatment of inflammatory conditions.

Diuretic Activity: Maximum diuretic and anti-inflammatory activities of *Punarnava* observed is therapeutically highly efficacious for the treatment of renal inflammatory diseases and early onset of the liver cirrhosis and chronic peritonitis. The root is used to treat other renal ailments (calculations and cystitis), seminal weakness and blood pressure.

Anti-diabetic Activity: A study was carried out to investigate the effects of daily oral administration of aqueous solution of *B.diffusa* leaf extract (BLEt) (200mg/kg) for 4 weeks on blood glucose concentration and hepatic enzymes in normal and alloxan induced diabetic rate. A significant decrease in blood glucose and significant increase in plasma insulin levels were observed in normal and diabetic rats treated with BLEt. The results indicate that the reduction in blood glucose produced by the extract is probably through rejuvenation of pancreatic beta-cells or through extra pancreatic action. This study depicts that daily intake of *B.diffusa* extract by Diabetic Mellitus patients may be useful in the prevention and treatment of the

Diabetes-induced hyper-lipidemia and atherosclerosis. [4].

Conclusion: The multiple benefits of *B. diffusa* made it true miracle of nature. Numerous studies have been conducted on different parts of *B. diffusa*. A detailed and systemic study is required for identification, cataloging and documentation of plants, which may provide meaningful way for the promotion of the traditional knowledge of herbal medicinal plant.

References

1. Pandey, Kashi Nath & Chaturvedi, Gorakh Nath. (2009). *Charak Samhita of Agnivesh* (Ed) Vidyotani Hindi Commentary (CS.Su.18/34) Chaukhamba Bharati Academy, Varanasi, India.
2. Mitchel, R.N. and Cortan, R.S. (2003). Acute and chronic inflammation in Kumar, Citran, Robbins: Basic pathology, Chapter 2
3. Chopra, G.L. (1969). Angiosperms: Systematics and Life cycle. S. Nagin & Co., Jalandhar, Punjab, India, pp.361- 365.
4. Kuldeep Rajpoot, Mishra, R.N. (2011). Boerhaavia diffusa roots (*Punarnava*mool)-Review as Rasayan (Rejuvenator/ Antiaging). *International Journal of Research in Pharmaceutical And Biomedical Sciences* 2(4): 1454-1458.
5. Kumar, Mayank, Irchhaiyar, Singh, Mahendra. (2012). Morphology, phytochemistry & pharmacological profile of Boerhavia diffusa:An overview, *Research journal of International journal of current pharmaceutical research*, 4(3), page no.4-8
6. Mishra, Bhav. (2013). *Bhava Prakash Nignantu*, Hindi Commentary (Ed.) Chuneker K. C. Chaukhambha Bharti Academy (Guduchyadi verga) pp.406.
7 Sharma, P.V. (2006). *Dravaygun vigyana*, Vol-2, Chaukhambha Bharti Academy, pp.631.
8. Pandey, Kashi Nath & Chaturvedi, Gorakh Nath. (2009). *Charak Samhita of Agnivesh* (Ed.) Vidyotani Hindi Commentary (CS.Su.4pp.85-98) Chaukhamba Bharati Academy , Varanasi, India.
9. Shastri, Ambika Dutta. (2011). *Sushruta Samhita of Sushruta* (Ed) *Ayurveda* Tatava Sandipika Commentary (SS.Su.38/4.pp.182), Chaukhamba Sanskrit Sansthan, Varanasi, India.
10. Shastri, Ambika Dutta. (2011). *Sushruta Samhita of Sushruta* (Ed) *Ayurveda* Tatava Sandipika Commentary (SS.Su.46/255.pp.264), Chaukhamba Sanskrit Sansthan, Varanasi, India.
11. Shastri, Ambika Dutta. (2011). *Sushruta Samhita of Sushruta* (Ed) *Ayurveda* Tatava Sandipika Commentary 2011 (SS.ch.7/11.pp.53), Chaukhamba Sanskrit Sansthan, Varanasi, India.
12. Shastri, Ambika Dutta. (2011). *Sushruta Samhita of Sushruta* (Ed) *Ayurveda* Tatava Sandipika Commentary (SS.ch.23/12,pp.130), Chaukhamba Sanskrit Sansthan, Varanasi, India.
13. Tripathi, Ravidutt. (2011). AS.Su.15Chaukhamba Sanskrit pratishyhan, Jawaharnagar, Delhi *International Journal of Research in Pharmaceutical And Biomedical Sciences* 2(4):1454-1458
14. Pandey, Kashi Nath & Chaturvedi, Gorakh Nath. (2009). *Charak Samhita of Agnivesh* (Ed), Vidyotani Hindi Commentary (CS.Ci.16.93-96) Chaukhamba Bharati Academy,Varanasi, India.
15. Pandey, Kashi Nath & Chaturvedi, Gorakh Nath. (2009). *Charak Samhita of Agnivesh* (Ed), Vidyotani Hindi Commentary (CS.Ci.12.23) Chaukhamba Bharati Academy,Varanasi, India.
16. Shastri, Ambika Dutta. (2011). *Sushruta Samhita of Sushruta* (Ed) *Ayurveda* Tatava Sandipika Commentary (SS.Su.46.255), Chaukhamba Sanskrit Sansthan, Varanasi, India.pp.264
17. Shastri, Ambika Dutta. (2011). *Sushruta Samhita of Sushruta* (Ed) *Ayurveda* Tatava Sandipika Commentary (SS.Ci.23.12), Chaukhamba Sanskrit Sansthan, Varanasi, India. Pp.130
18. Sharma, P.V. (2014). Classical uses of medicinal plants, Chaukhambha Vishvabharti, Varanasi, India, pp. 248.
19. Tripathi Harihar Prasad, Harita Samhita commentary 2009; Chaukhmba Sanskrit Series, Varanasi,Ch.3-25/4, pp.370
20. Kashyap Samhita edited by Pt.Hemraj Sharma, Garbhini Chikitsa, pp.96, Chaukhambha Sansthan, Varanasi, India.