International Journal of Scientific and Innovative Research 2015; 3(1) : 12-16,
P-ISSN 2347-2189, E- ISSN 2347-4971

VAJRADANTI -TRADITIONAL TO MODERN ERA

*VIBHA SINGH
Department of Oral and Maxillo Facial Surgery, K.G.Medical University, Lucknow,India

*Address for correspondence: Dr. Vibha singh, Professor, Department of Oral and Maxillo Facial Surgery, K.G. Medical University, Lucknow, India. Email ID: vibhasinghraghuvanshi@gmail.com

ABSTRACT

There are approximately 500000 plant species occurring worldwide. The World Health Organization (WHO) estimates that 4 billion people (80% of the World's population) use herbal medicines for some aspect of primary healthcare. These evidences contribute to support and quantify the importance of screening natural plants. In India 2500 plants and 100 species of plants used as regular source of medicine .In developed countries 25% of the medical drugs are based on plants and their derivatives. In Indian traditional systems of medicine (Ayurveda) it is known as sahachara, baana, kurantaka, kuranta, koranda, korandaka, shairiya and pita-saireyaka. This is a plant of miraculous nature. It has wide range of medicinal properties which can be used for welfare of human being without any side effects. It has its traditional use and well documented to use in modern medicine too.

Keywords: *Vajradanti, Anti-inflammatory, Antidontalgic*

INTRODUCTION

There are approximately 500000 plant species occurring worldwide. The World Health Organization (WHO) estimates that 4 billion people (80% of the World's population) use herbal medicines for some aspect of primary healthcare. These evidences contribute to support and quantify the importance of screening natural plants. In India 2500 plants and 100 species of plants used as regular source of medicine. In developed countries 25% of the medical drugs are based on plants and their derivatives. In Indian traditional systems of medicine (Ayurveda) vajradanti is known as sahachara, baana, kurantaka, kuranta, koranda, korandaka, shairiya and pita-saireyaka. In folk medicine it is known as piyaabaasaa, jhinti and katsaraiya. Vajradanti is plant of Ramayan Kal . It was found near Pampa lake . It is known as Kurant, and pita Saireyaka in Sanskrit and vajradanti in Hindi and Baleria prointis in English. It belongs to family *Acanthaecae* and occurs in hotter part of India . *Barleria prionitis* L. (Family *Acanthaceae*; commonly known as Vajradanti) is an annual shrub, 1–3 feet high, found throughout Africa, India, Sri Lanka and tropical Asia.

The chemical constituents present in plants are a part of the physiological functions of living flora and hence they are believed to have better compatibility with the human body. They have stood the test of time for their safety, efficacy, cultural acceptability and lesser side effects. Plant derived medicines have been the first line of defense in maintaining health and combating diseases.

The herbal products today symbolize safety in contrast to the synthetics that are regarded as unsafe to human and environment .These evidences contribute to support and quantify the importance of screening natural plants.

The medicinal properties of Vajradanti are well reported in Ayurveda as anti-inflammatory and diuretic .Leaves are used for treating bleeding gums and tooth ache. It has a long history of healing and curative properties .It is al so known as Vajradanti which means strong teeth. Because of its antidontalgic property it is known as 'Vajradanti'. It is al so known as Porcupine flower.

Oral diseases are major health problems with dental caries . Oral health influences the general quality of life and poor oral health is linked with systemic diseases. The vast diversity

of Indian forest provides several plants which are mentioned in Ayurveda for prevention and management of dental caries. [1] Numerous medicinal plants have been reported in ancient literature for the control of oral diseases. In one of studies , seven plant extracts of Anantmul, Lavang, Maiphal, Peelu, Trifala, Vajradanti and Vedang were found to be effective against Streptococcus mutans and four extracts viz .Lavang, Maiphal, Trifala and Vajradanti were found to be active against Candida albicans. [2]

In traditional health practice bark and leaves of the plants are used for the management of various diseases. Vajradanti is an annual shrub 1-3 feet in height and its leaves are chewed to relieve tooth ache and the parts of the roots are applied to glandular swellings and disperse boil. It also has been reported as anti- arthritic, anti-inflammatory and anti- fertility agent. Juice of the plant is used in cataract and fever. Its leaves are also used in some tribal communities for the treatment of piles and to control irritation .It is used in stiffness of limbs and enlargement of scrotum and sciatica .The leaves of this plant are used to provide healing of wound and relieve joint pain and bleeding gum. [3]

In South India this plant is widely used in neurological disorder like paraplegia, sciatica and also in leprosy and other skin disease .The plant formulation is available for the treatment of dysurea ,rheumatic infections ,internal abscess ,nervine disorders and chronic sinusitis .The crude extract of this plant in oil is used in arresting graying of hair, arthritis and gout.

Picture of Vajradanti (Baleria prionitis) Plant

The natural occurring enzyme inhibitors play an important role in drug discovery program. . Ethanolic extract of B. prionitis yielded a new compound. Glutathione S- transferase (GSTs) are family of enzyme that catalyze the tripeptise .It has also anti- stress and immuno restorative properties . Because of its antidontalgic properties, it is known as Vajrdanti. It is also used in management of asthma , plant ash mixed with honey is given in bronchial asthma [4,5]

PHYTOCHEMISTRY

Hydro methanolic extract of B. prionitis whole plant indicates the presence of glycosides, saponins, flavonoids, steroids and tannins. The leaves and flowering tops were reported to rich in potassium salt. Several phytochemicals like balarenone, pipataline, lupeol, prioniside. A, prioniside B and prinoside C have been isolated from the ethanolic extract of B. prionitis. Number of glycosides including barlerinoside ,verascoside shanzhiside methyl ester 6-O trans –p-coumaroyl 8-O acetylshanzhiside methyl ester, barlerin , acetylbarlerin ,7-methoxydiderroside lupulinoside have also been isolated from the aerial parts. Two anthrax quinones derivatives have been also identified in the plant and their structures were characterized as 1,8 dihydroxy- 2,7dimethyl3,6-dimethoxy anthraquinone and 1,3,6,8 tetra methoxy -2, 7-methoxyanthraquinone.The leaves were reported to contain scutellarein ,melilotic acid ,syringe acid , vanillic acid , p-hydroxyflavones Beside these phytochemicals luteolin -7-O beta D-glucoside 14.14 secostigmata -5 ,14-diene -3-a-ol were also reported in B.prionitis. Methanolic extract of whole plant indicates presence of glycosides ,saponins . Flowers are rich with potassium salt and several phytochemicals .The crude extract of this plant exhibited GST inhibitory activity with ICS50 value of 160muml and results in isolation of six natural products balarenone ,pipataline ,lupeol ,prioniside A prioniside B and prionide C compound.

PHARMACOLOGICAL PROPERTIES

Antibacterial Properties : Ethanol extract of the plant yielded a new compound along with other compounds known as balarenone, which is effective against four bacteria and three fungi viz.

Bacillus species, pseudomonas, staphylococcus aureus, and streptococcus mutans and candida albicans ,and saccarromyces cerevisiae. It has been seen that crude extract of B.prrionitis possessed good activity against dental caries causing oral pathogens where modern therapy has failed . The crude extract of the plant also showed antibacterial activity against staphareus and pseudomonas aeroginosa in initial antibacterial screening.The antibacterial potency of the plants are believed to be due to tannin,saponins, phenolic compounds ,essential oils and flavonoids present in them. The antimicrobial potency of B.prionitis may be due to presence of five iridoid glucoside esters, acetyl barlerin 6,8,di-o-acetyl shanzhisisde methyl ester ,shanzhiside methyl ester verbascoide. This study affirms that extract of *B. prionits* L can damage MDR *E.coli* cell membrane by exerting profound physiological changes that lead to bacterial death. Crude methanolic extract of *B. prionits* L revealed *in vitro* anti-oxidant, total phenol and flavonoid contents, anti-inflammatory and antimicrobial potential. The results are comparable to the standard compounds such as Ascorbic acid, Gallic acid, Quercetin and Ibuprofen to clarify the *in vivo* potential of this plant in the management of UTI infections. Thus the multi-therapeutic characteristics of this plant extract serves as a source of plant derived natural products that modify antibiotic resistance of MDR *E.coli*. Further investigations are in progress to find active component of this plant extract and to confirm its mechanism of action *in vivo***.** Leaf juice is used in stomach disorder and urinary infection. [6,7,11]

Ant-inflammatory Properties : It is reported by various authors that methanolic extract shows anti-inflammatory activities and antimicrobial activities against staph and pseudomonas. The plant is having anti-inflammatory properties and is used in ulcers and itching of leprosy ulcers. Leaves juice are used in stomach disorder, urinary afflictions, fever and catarrh, this plant is especially well known for treating bleeding gum and toothache.[8]

Antihypertensive Properties : Methanolic extract of B.prionitis has profound antihypertensive activity without any side effects.

Diuretic Activity : This plant is rich in potassium and said to contribute to its diuretic action. Its leaves and young inflorescence are diuretic. Leaves juice are used in urinary afflictions. [9,10]

The diuretic property of *B. prionitis* flower extract was performed . The oral administration of aqueous flower extract (200 mg kg^{-1}) was significantly increased the urination and sodium elimination but not potassium in rats. The diuretic effect of flower extract (200 mg kg^{-1}) was found comparable with the reference drug furosemide (20 mg kg^{-1})

Antioxidant properties : The whole plant extract was reported to show potent antioxidant activity. It was observed that leaves showed higher degree of antioxidant potential and high phenolic content in comparison to flower and stem. The methanolic extracts of root ,stem and leaves show significant antioxidant properties.

Enzyme inhibitory effect–The phytochemiclas are reported to inhibit the clinically significant enzymes Acetylchlolinesterase (AChE) and glutathione S- transferase (GST). It has been reported that the methanolic extract of leaf and stem of the plant exhibited AChE inhibitory activities and leaf and stem extract exhibited higher potency of exhibition in comparison to the root extract.

All prionside A,B and C also showed GST inhibitory activity. B and C were more potent GST inhibitors.

Anti- asthmatic Activity : Ash of the whole plant mixed with honey is used for asthma in traditional medicine. It also showed biological activity against respiratory syncyrial virus.

Antidiabetic Activity: It was found the alcoholic extract of leaves was effective in reducing blood sugar in diabetic animals. Oral administration at the dose of 200mg/kg significantly reduced blood glucose glycosylated hemoglobin level and increased serum insulin and liver glycogen level in diabetic rats. It also arrested the weight loss due to diabetes.[12]

Anti-arthritic Activity : It is reported that the methanolic extract of the whole plant showed dose dependent mast cells and erythrocytes membrane protection activity in response to the toxic chemicals.[13] It is also reported as anti-

arthritic, anti-inflammatory and anti- fertility agent[14]

Hepatoprotective Activity : Aerial part of leaves and stem are reported to possess hepatoprotective activity by various authors. The aqueous bioactive fractions have been shown to possess hepatoprotective activity. The irioid fraction significantly reduced the hepato toxin induced elevated level of serum alanine aminotransferase (ALT) aspartate transaminase (AST) , alkaline phosphatase ALP bilirubin and triglycerides in dose dependent manner .The fraction was also found to increase the hepatic glutathione content and reduce the hepatic lipid peroxidation in response to the hepatotoxicity in mice and rats.

Antihelminthic Activity : Chavan et al [15] reported its anti-helminthic properties which was compared with albendazole and it was found that Pheretima posthuma worms were paralyzed at lower dose and caused death on the higher dose.

Antifertility Activity: The plant was reported to possess anti- fertility activity. The oral administration of methanolic extract in male albino rats was found to reduce spermatogenesis in the albino rats. This effect of root extract may be due to presence of iridoid glycosides barlerin and acetyl barlerin via affecting the functions of testicular somatic cells. Verma et al [16] found methanolic extract of plant to produce anti- spermatogenic effect without affecting general body metabolism.

Anti-diarrheal Activity : The anti-diarrheal potential of butanol fraction of B.prionitis leaves has been reported . *In vivo* study showed that butanol fraction dose dependently inhibited the castor oil induced diarrhea. This also reduced the gastrointestinal motility in response to charcoal induced gut transit changes.

Anti- nociceptive Activity : Jaiswal et al [17] reported analgesic activity of B.prionitis flowers. *In vivo* study showed flower extract dose dependently provide a significant increase in analgesio -meter induced force and exhibited significant resistance against pain in mice. The flower extract also provided dose dependent significant reduction in acetic induced abdominal cramping . [14]

Antifungal Activity : Bark of the plant is reported in controlling candidacies and other fungal infections, it has both fungicidal and fungi static activity. Acetone methanol and ethanol extract of B. prionitis bark showed antifungal activity against oral pathogenic fungus Saccharomyces cerevisiae and two strains of Candida albicans . It has been reported that the petroleum ether dicloro methane and ethanol extract of stem and root showed fungi static and fungicidal activities against C.albicans [7,14]

Antiviral Activity : In India and Thailand the decoction of the leaves and flowers of B. Prionitis is used in the treatment of viral fever . The plant shows biological activity against respiratory syncytial virus.isolated two iridoid glycosides that is 6-O trans-p-coumaroyl -8-O acetylshanzhiside methyl ester and its cis isomer from B prionitis .*In vitro* study showed that these glycosides possess potent antiviral activity against Respiratory Syncytial Virus (RSV)with EC50 and IC 50 values of 2.46 and 42.2 microgrammL $^{-1}$ respectively [3,14]

Toxicity : It was reported that extract of leaves and roots of the plant did not show any toxic effect on albino rats. No death was observed up to the oral administration of extract dose concentration 2.5 g/ kg body weight during the 14 days .Singh et al [18] reported that the iridoid gluco side rich aqueous fraction B. prionitis did not produce any abnormality or any mortality up the single oral administration of 3000mg kg $^{-1}$ dose in mice during the 15days of study period .However the intraperitoneal LD50 was determined 25-30mgkg^{-1} for aqueous fraction in mice.[14]

Cyto protective Mast cells play an important role in inflammatory responses and release histamine upon their degranulation to produce various allergic reactions and significant erythrocyte membrane protection against hypotonocity hemolysis and result was compared with reference standard indomethasone [14]

CONCLUSION

Vajradanti is a plant of miraculous nature. It has wide range of medicinal properties which can be used for welfare of human being without

any side effects. It has its traditional use and well documented to use in modern medicine too. A wide range of phytochemical constituents including balarenone ,pipataline ,prionisides ,barlerinoside ,verbascoside ,shanzhisde,methyl ester, barlerin, pipataline, acetylbarlerin, lupulinoside, scutellarein, have been isolated from different part of the plant. Extracts and phytochemicals isolated from the plant have been found to possess wide range of pharmacological activities without any side effects .It is common plant which is found in hotter part of India, but it needs identification and its proper use and standardization.

REFERENCES

1. Reenu Yadav and Dr S.K.Yadav et al. Dental diseases and its cure Asian J Pharm Clin Res, Vol 6, Suppl 2, 2013, 16-20 .
2. Pachori, R. R.1, N.S. Kulkarni1*, M. G. Bodhankar2, and S.C. Aithal3. Antimicrobial Studies of Herbs and Shrubs Against Dental Pathogens Journal of Empirical Biology Vol 1(1) 10-16.
3. P.D.Diwan and Y.A. Gadhikar Assessment of phytochemical composition and antibacterial activity of different extracts of Barleria prionitis leaves against oral micro flora to improve dental hygiene Asian Journal of Pharmaceutical and clinical research Vol 5Suppl2 2012.
4. Kalhari S,Kosmulalage Zahid et al GlutathioneS-Transferase Acetylcholinesterase inhibitory and antibacterial activity of chemical constituents of Barleria prionitis. Z. Naturoforsch 2007. 62b-580-586.
5. Athar Ata, Stephaine A .Van Den Bosch,DrewJ.Harwank and Grant E. Pinwinski. Glutathione S- transferase and acetylcholinesterase inhibiting natural products from medicinally important plants. Pure.Appl.Chem.,Vol 79No 12 pp 2269-2276 .2007.
6. Shukla P, Singh A, Gwari S et al invitro propogation of Barleria Prionitis and its antibacterial activity. International journal of Pharma Professional research Vol 2 Issue 1 Jan2011 .
7. Kamarai Aneja ,Radhika Joshi ,Chetan Sharma Potency of Barleria prionitis L bark extract against oral disease causing strains of bacteria and fungi of clinical origin New Yark Science journal 2010,3(11).
8. Kuldeep Singh, Rupinder Kaur , Sarvjit Singh, B S Bajwa1 and D N Prasad,Antiinflammatory activity of Barleria prionotis Journal of Natural Remedies | ISSN: 2320-3358 www.jnronline.com | Vol 13 (1) | January 2013
9. Bhavana B Mourya , S.B.Bothara Investigation of Antihypertensive activity of leaves of Barleria Prionitis in Doca salt induced Hypertensive rat Int J Pharma Sci Res 18(2)Jan –Feb 2013 n003-17-19.
10. Ghule B.V.Yeole P.G. in vitro and in vivo immunomodulatory activities of iridoids fractions from Barleria prionitis journal of Ethano Pharmacology Vol 141 ,issue 1 ,424-431.
11. Manupati Prasanth Antimicrobial efficacy of different tooth paste and mouth rinse An in vitro study Dental Research Journal Vol 8 no 2 Spring 2011 85-94.
12. Dheer Rana, Bhtanagar Prdeep _A Study of antidiabetic activity of Barleria prionitis Indian Journal of Pharmacology Vol 42, Issue 2 page 70-72_.
13. Dhaked Umesh Nama Gaurav Singnh Devendra Mishra Amit Kumar Nitin Pharmacognostical and pharmacological profile of B areleria prionitis root Research Journal of Pharmacognosy and Phytochemistry 2011,Vol 3,Issue 3. Year : 2011, Volume : 3, Issue : 3
14. D.Banerjee A.K.Maji et al Barleria prionitis Linn A Review of its traditional use ,phytochemistry pharmacology and Toxicity Research journal of phytochemistry 6:31-41.
15. Chavan CB, Hogade MG, Bhinge SD, Kumbhar M and Tamboli A. *In vitro* anthelmintic activity of fruit extract of *Barleria prionitis* Linn. Against Pheretima posthuma. *Int. J. Pharm. Pharm. Sci.* 2010; 2: 49-50.
16. Verma PK, Sharma A, Joshi SC, Gupta RS and Dixit VP. Effect of isolated fractions of *Barleria prionitis* root methanolic extract on reproductive function of male rats: Preliminary study. *Fitoterapia*. 2005; 76: 428-432.
17. Jaiswal SK, Dubey MK, Verma AK, Das S, Vijaykumar M and Rao CV. Evaluation of iridoid glycosides from leave of *Barleria prionitis* as an anti- diarrhoeal activity: An Ethnopharmacological study. *Int. J. Pharm. Sci*. 2010; 2: 680-686.
18. Singh B, Chandan BK, Prabhakar A, Taneja SC, Singh J, Qazi GN. Chemistry and hepatoprotective activity of an active fraction from *Barleria prionitis* Linn. In experimental animals. *Phytother Res*. 2005; 19(5): 391-404.