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Barleria prionitis Linn. A Drug with Multidimensional Approaches

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ABSTRACT

Barleria prionitis Linn. (*Acanthaceae* Family) is aneternal, *Ayurvedic* herb that is dispersed throughout the tropical parts in India. Numerous uses are stated in *Ayurveda* classics which reveals that either the entire plant or its specific parts has been used for *Sothahara* (~decrease edema), *Raktashodhaka* (~blood purifier), *Sukrashodhana* (~ purification of semen), *Mutrala* (~diuretic), *Kusthaghana* (~skin disease), and for *Jawaraghana*(~fever) properties. Many researches has been carried out to explore the potency of this plant which discloses anti bacterial, antihelminthic, antifungal, antifertility, anticancer, anti oxidant, anti cataract etc. activities and acetylcholine esterase and glutathione s-transferase (GST) inhibitory activity of the extract and isolated molecules of this plant without any toxic effects. Many phytochemicals have been isolated from the different parts of this plant such as pipataline, balarenone, verbascoside, barlerinoside etc. This medicinal plant has huge potentials that stated in *Ayurveda* classics which are still uncovered for that reason it is still underutilized plant. There is also controversy present in its activities in *Ayurveda* and biomedicine such as *Sahachara* have a potency of *Shukrashodhana* but in modern science research has been done on its antifertility activity. So along with its numerous traditional uses, the current article also represent its phytochemical profile, pharmacological augmentation and toxicity that will be beneficial for further researches.

KEYWORDS

Ayurvedic herbal drug, Barleria prionitis Linn., Phytochemical profile, Sahachara, Traditional uses

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INTRODUCTION

Herbal drugs are being utilized in the treatment of disease conditions since ancient time**.** Still we are depending on herbal drugs because of their safety, efficacy and cost effective. *Barleria prionitis* Linn. (*Acanthaceae* Family) is aneternal, *Ayurvedic* herb that is dispersed throughout the tropical parts in India. Vernacular names of this plant are *Kurantaka, Koranda, Kerandaka, Sahachara, Sahacharah, Saireyaka, Ananta, Bana, Pitapushpaka, Pitasaireyaka* (Sanskrit), *Shinti* (Asamese), *Kantajati* (Bengali), *Kanta-Saerio, Kantasalio, Kanta Shelio* (Gujrati), *Sahachara* (Hindi*), Sahachara, Mullugorate, Mullugorante, Haladigorate (*Kannada*), Koranta, Koranti, PiwalaKoranta, Koreta (*Marathi*), Chemmulli (Siddha), Sammulli, Shemmuli, Varamuli (*Tamila*), Katsaraiya, Piyabaasa (Unani), Pila Bansa, PiyaBansa (Urdu),* porcupine flower, Common yellow nail dye (English)[1-2]. In classics *Aacharyas* apprise about its therapeutic uses and mention it by different name such as *Saireya* (*Charaka* and *Sushruta*), *Saireyaka* (*Sushruta*), *Kuranta, Kurantaka* (*Bhavaprakasha*), *Katsaraiya, Sahchara* etc. In *Ayurvedic* classics properties of *Sahachara* is given as Sweet (*Madhura*), Bitter (*Tikta*), and Sour(*Amla*) in taste, having pharmacologically property (*Guna*) of unctuousness (*Snigdha*), active potency (*Virya*) is hot (*Ushna*) and transformed state after digestion (*Vipaka*) is Pungent (*Katu*). According to these properties it pacify *Vata* and *Kapha Doshas* (humors) and also subdues diseased produced by *Vata* and *Kapha Doshas* (humors)[1-3]. There are four categories of *Sahchara* or *Sareyaka* stated in *Ayurvedic* text on the basis of color of flower (*Pushpa*) which consist *Shweta Sareyaka* (*Barleria acanthoides*), *Rakta Sareyaka* (*Barleria cristata* linn.), *Neela Sareyaka* (*Barleria strigosa* wild) and *Peeta Sareyaka* (*Barleri aprionitis* linn). Either the entire plant or its specific parts has been used for the treatment in different disease conditions since ancient times. In traditional classics medicinal properties of *Barleria* is stated as *Sothhara* (eliminating edema), *Raktasodhaka* (blood purifier), *Sukrasodhana* (purification of semen), *Mutrala* (diuretic), *Kusthaghana* (skin disease), and *Jawaraghana* (fever)[2,4]. The *Ayurveda* texts were closely inspected and information regarding *B. prionitis* L. was assembled carefully. The diversefigures of *B. prionitis* L. from researches, along with its traditional facts was summarized and presented to develop a better understanding of the concept of *B. prionitis* L. and help to fill in the gaps of knowledge. Numerous

reviews have been published on different medicinal uses of this plant hence in this review focus has been build to highlight the traditional uses, validation of that traditional uses by modern researches, phytochemical profile, and pharmacological augmentation of *B. prionitis* L. that will be beneficial for further researches.[**Figure 1-** Picture of ***Barleria prionitis*** Linn.**]**

Fig 1 Barleria prionitis linn

Chemical Composition – *Barleria prionitis* does not contain any alkaloidal principle with the exception of the large amount of a neutral and acid resin soluble in light petroleum ether[4]. Many phytochemical constituents like pipataline, balarenone,shanzhiside, acetylbarlerin,barlerinoside, methyl ester, verbascoside, prionisides, lupulinoside, scutellarein have been separated from the discrete parts of this herb[5]. Different solvent extract from leaves of this plant which have mainly antibacterial activity consist Petroleum ether extract, ethanol extract Balarenone, pipataline and methanolic extract of the calli[6]. Ethanolic extract (*Pheretima posthuma)* from whole plant have Antihelminthic activity[7].Methanolic extract from Bark, leaf tissue sap andleaf exudates of this plant have antifungal activity[8-9]. Flavonol glycoside (mainly the iridoid glycosides and three phenyl propanoid glycosides) extracted from this plant have antiviral activity[10].

Divergent Utilization of *B.prionitis*L. (*Sahachara*)

Uses of different part of *B.prionitis*L.[1, 4]

Uses of leaves – *Swarasa* (Juice) of the leaves used in cracked and macerated feet, in children it is used in catarrhal affections that is accompanied with fever and phlegm, asthma, bleeding gums (leaf juice is apply on bleeding gums), eczema and itching (paste of leaves is applied topically).

Uses of Root –Paste of root is used in boils and glandular swelling, *MulaKwatha* (root decoction) is used for mouth ulcers as a mouthwash and for treatment of rat bite poisoning, root decoction is given.

Uses of Bark – A medicated oil which formed by boiling the leaves and stem with sesame oil is mentioned for cleansing wounds, fresh juice of the bark is mentioned in anasarca (generalized edema) and bark powder is given in obesity.

Uses of Whole plant – Used in graying of hair (medicated oil prepared by plant part and this oil is used for scalp massaging) and inflammatory condition of joints (A plant decoction is prepared and taken internally) etc.

Different Activities of *B.prionitis*L.

Antibacterial Action – *B. prionitis*L.has a special affinity to the pathogens that are responsible for human infections, especially this plant's phytochemicals, to the pathogens that create dental carriers. A study was carried out which focuses on disclosing the antibacterial activity of *B. prionitis*L.Phytochemicalstudyof this plant explore the presence of alkaloids, terpenoids, saponins, flavonoids, tannins and phenolic compounds, carbohydrates and glycosides. *B. prionitis*L.antibacterial callus potency of leaf explants has shown activity against all bacteria but the strongest against Lactobacillus acidophilus[6].

ActionagainstFungus– *B. prionitis*L.methanol extract was deemed to have a control over candidiasis and other oral infections. A study was done on the antifungal activity of this plant's bark on fungi which are involved in oral diseases of humans i.e. two Candida albicans strains and Saccharomyces cerevisiae against the standard drug amphotericin –B. This study revealed, the methanolic extract of *B. prionitis* L. bark showed much more potent activity against all the tested oral fungi namely S.cerevisiae, C.albicans strain 1 and C.albicans strain 2, than the standard drug amphotericin –B[7-8].

Antifertility Action – A study was done on the antifertility activity of *B.prionitis*L. on male rats. In this study methanol root extract of *B.prionitis* L. were given orally to male rats in the dose of 100 mg / kg of the. The total study duration were 60 days, and the mineral extract decreased male rat fertility by 100 %. Antifertility effects of *B. prionitis*L. appeared to be arbitrated by the Leydigand Sertoli cell functions that leads to spermal physiomorphology[9]. Another study also revealedantispermatogenic activity [10-11]. Another study published on antifertility activity, in which an active β-sitosterol (BS) component was isolated from *B. prionitis*L.methanol extract and assessed for its anti - fertilization potential in male albino rats. A studywas carried out on rats, in which Olive oil (Group - I, control), β-sitosterol (BS) at 5 (Group II), 15 (Group III), and 25 mg / kg body weight (BW) (Group IV) were orally administered to rats for 60 days. Body weight was assessed weekly.This study revealed that the BS from the *B. prionitis* L. roots impairs the spermatogenesis and leads to antifertility[12].

Anti Cancer Action – A study was conducted on the anti - cancer activity of

B.prionitis L. In this study an oil was prepared from the whole plant and it was externally applied in the acute cysts in the blood vessels. This study revealed the effective anti cancer properties of this plant[13]. An isolated phenolic compound from *Barleria cristata* var alba (a variety of *Barleria*) was evaluated as a chemopreventive agent[14]. *B. prionitis* L. is mentioned in the treatment of pteyrgium in *Ayurveda* classics. *Swarasa* (juice) of *Barleria prionitis* is indicated in the eye after the pteyrgium incision, to stop further pterigium growth, because pterigium is prone to regeneration after the incision. Therefore, *Ayurveda* clearly shows that the uncontrolled growth of cells is being controlled by the *B. prionitis* L.[15].

Anti Oxidant Activity- A study was conducted on the antioxidant activity of various extracts of the entire plant of *B.prionitis* L. This study revealed that the aqueous extract and ethanolic extract was the most effectual antioxidant. Along with these extracts some glycosids, were isolated from *B.prionitis* L., including Barlerinoside, Shanzhiside methyl ester, 6-O - trans - p - coumaroyl-8-O - acetyl shanzhiside methyl ester etc. also observed to have antioxidant activity [16].

Hepato Protective Activity –Isolated Iridoid from ethanol water aerial part extraction (leaves and stems) of *B.prionitis*L., afforded significant hepato protection in the mice and rats in which hepatotoxicity is induce by carbon tetrachloride, galactosamine and paracetamol. High levels of serum alanine aminotransferase (ALT), aspartate transaminase [AST], alkaline phosphate (ALP), bilirubine, and triglycerides were significantly reduced by oral administration of the Iridoid fragment in a dose dependent manner. The fraction also increased the hepatic glutathione content and reduced lipid peroxidation in mice and rats in response to hepatotoxicity[17].

Anti -Arthritic Activity – The ethyl acetate fraction (in dose of 125 and 250 mg / kg) of *B.prionitis*L. leaves significantly suppressed joint swelling after administration in formaldehyde induced arthritis model- and also reduced significant levels of FCA - induced arthritis rat model[18,19]. The Aquarious Fraction (TAF) fraction has an antiarthriticand anti inflammatoryproperty in a model of adjuvant rats for Mycobacterium tuberculosis. The oral dose of TAF at 12.5 - 100 mg/kgsignificantly inhibited the migration of leukocytes and lowers the erythrocyte sedimentation rate (ESR) and exudes in pleural cavity, which indicated the inhibition of vascular permeability in arthritis-induced rats [20].

DiureticActivity – A study was carried out on rats in which aqueous flower extracts of *B. prionitis* L.wasorally administered in the dose of 200 mg/kg. A comparable statistically significant diuretic effect (12.58± 0.80 urine volume in 24 h) was observed on the floral extract (200 mg kg-1), compared to furosemide at 20 mg / kg (12.58± 0.80 urine volume in 24 hours) and increased sodium elimination[21].

Antiviral Activity – A studyhas been conducted on the antiviral activity of *B. prionitis* L. in which the three phenylpropanoid glycosides, namely luteoside A, luteoside B and luteoside C and Iridoid glycosides were isolated and demonstrated a powerful in vitro action against respiratory syncytial viruses[22].

Property against Diabetes – A study was carried out on diabetic rats to explore the antidiabetic activity of *B. prionitis*L. In this study oral alcoholic extract of *Barleria* leaves administered at dose of 200 mg/kg body weight, it significantly reduced the blood glucose, glycosylated hemoglobin and increased serum insulin and liver glycogen levels in diabetic rats[23].

Anti Inflammatory Activity- The use of *B. prionitis* L. in the management of inflammation has been demonstrated by several reports. In vitro - enzyme - based cyclooxygenase (COX-1 and COX-2) tests were performed to assess *B. prionitis* L. anti - inflammatory activity. Dichloromethane, oil ether, and ethanol extracts from leaves, stems and roots were found to have significant COX-1 and COX-2 inhibition with subsequent inhibition of prostaglandin synthesis involving the sensation of pain[24]. Another study found that the root's aqueous extract fractions (FR - III and FR - IV) inhibited the carrageenan - induced rat paw edema significantly. The oral dose concentration of FR - III and FR - IV at 400 mg / kg body weight inhibited the paw edema by 50.64 and 55.76%, respectively and the results were comparable to the reference standard drug Indomethacin with 60.25 percent inhibition[25]. Anti - inflammatory activity also existed in rats with ethanolic extract of flowers. Oral floral extract administration in dose of 200 mg / kg body weightshowed significant dose - dependent reduction in carrageen - induced swelling and cotton pellet granuloma weight[26].

Anti-Nociceptive Activity –Analgesic activity of *B. prionitis* L. flowers was evaluated using artificial pain induced by UgoBasileAnalgesymeter and writhing models induced by acetic acid. In vivo study showed that the dose of the flower extract depended on a significant increase in the force induced by analgesio - meters and showed substantial resistance to mice pain. Dose dependent dose related

significant reduction in writhing characteristics was also provided by the reduction in abdominal cramping induced by acetic acid. The extract provided a statistically significant reduction of writhing by 5.24 percent at a dose concentration of 50 mg / kg body weight[26].

Activity to prevent diarrhea - A study was carried out on the anti - diarrheal potential of *B. prionitis* L. leaves butanol fraction. Study in vivo showed that the dose of the butanol fraction inhibited the castor oil induced diarrhea and enteropooling in Sprague dawley rats was induced by PGE2. In response to changes in the gut transit induced by charcoal, the butanol fraction also reduced gastrointestinal motility[27].

Activity of gastric protection – A trial has been performed to evaluate methanol extract anti - ulcer activity derived from *B. prionitis* L. leaves. This study shows that methanol extract of *B. prionitis* L. has an antiulcer activity. The test was performed in two different dose i.e. 250 and 500mg / kg using protocols of ethanol- and indomethacin ulcer. A statistically significant reduction in the ulcer index in *Barleriaprionitis*was found in comparison with control groups in both models (P=.05)[28].

Activity against hypertension – The methanol extracts of *B. prionitis* L. at dose of 200 mg and 400 mg / body weight had an anti - hypertension effect as 136,5±2,51, 146±2,21 and 143±3,11 mm Hg for systolic blood pressure and 103±2,54, 100,5±2,74 and 105,5±2,35 mm Hg diastolic blood pressure after six weeks of therapy. The effect of *B. prionitis* L. at dose of 400mg / kg body weight was better than *B. prionitis* L. at dose of 200 mg/ kg body[29].

Activity of the enzyme inhibitor - The inhibitory activity against glutathione s - transferase (GST) (IC50 values 160µg / mL) was shown by isolated balarenone, pataline, lupeol and 13,14-seco - stigma-5 and 14-diene-3-α-ol from *Barleria*ethanol extract. The derivative biochemical compound called 8-amino-7-hydroxypipataline exhibited inhibitory activity of acetylcholinesterase (AChE) where the value of IC50 was 36.8 µm[30-31].

CNS Depressive Activity – A study was conducted to assess the efficacy of 70% ethanol extract from *B. prionitis* L. leaves on Swiss albino mice's central nervous system. The ethyl - acetate fraction (125 and 250 mg / kg) and diclofenac treatment (4 mg / kg) considerably increased motor coordination time in rota rod test[32]. The study found that the test drug had CNS stimulant activity but compared to the standard drug fluoxetine hydrochloride, it was found that the stimulant activity of fluoxetine hydrochloride in mice was 91.93%, whereas the test drug only

stimulated the animal by 49.72% using an acto-photometer. It suggested that in animal models ethanol extract from *B. prionitis* L. exhibits CNS depressing activity[33].

Larvicidal Activity - LC50 values were 34,756 µg / ml, 31,351 µg / ml and 28,577 µg / ml in leaf acetone, chloroform and methanol extract with 10,301, 31,351 and 4,093 chi - square values against Japanese encephalitis vector, Culextritaeniorhynchus respectively [34] .

Activity againstDentalPlaque – A study was done on the efficacy of *B. prionitis* L. extract (10g pulverized bark soaked in 100ml of ethanol for 24h) as mouthwash in comparison with standard chlorhexidine mouthwash on the oral health. Ethanolic extract of bark and chlorhexidine showed equally effective against dental plaque[35].

Toxicity –*B. prionitis* L. has no toxic substances as stated in classical *Ayurveda*text and it has been proven by previous studies. In classics it is described as *Vishapaha* (anti toxic)[36] and it is also mentioned in *MushikaVisha* (rat poisoning)[37].A study was conducted which reported that the *B. prionitis* L. iridoidglucosides rich aqueous fraction did not produce any signs of abnormalities or mortality up to a single oral administration of 3000 mg / kg dose in mice during the 15-days period of study[18]. An additional study was conducted on *B. prionitis* L. alcoholic extract of the root and leaves in adult albino rats, where there was no death even after the extract dose concentration of 2.5 g / kg in the body weight was administered orally during the 14 days of the study [23].

AYURVEDIC REFERENCES REGARDING *SAHACHARA* (*B.PRIONITIS* L.) –

Divergent utilization of *Sahachara*(*B. prionitis* L.)is discoveredin numerous diseases conditions by bio medicine. In *Ayurveda* classics *Sahachara*is also elaborated in different forms along with its mode of administration in various diseases. *Acharyas* classifies *Sahachara* in different categories according to its properties. It is mentioned in *AargwdhadiGana* as *DasiKurantaka* (*Piyavasa*) which pacifies *KaphaDosha*, have property of *Vishanashaka* (anti toxic) and *Vranashodhana* (purification of wound) and being utilized to get rid from *Meha* (diabetes), *Kushta*(skin disease), *Jwara* (fever), *Vamana* (~ it decreases intestinal motility hence reducing the vomiting) and *Kandu* (itching)[38]. It also stated in*VarunadiGana*as*Aartagala (NilaPiyavasa*)which take action as *Medohara* (antilipidemic) and mollify *Shirashoola*(head ache), *Gulma*(abdominal disorders) and *AbhyantraVidradhi*(internal abscess)[39]. It also narrated in *VirtarvadiGana*as*SahacharaDwaya* (*Neela*

and *PeetaSahachara*) i.e. two verities of *Sahachara* which is beneficial in *VataVikara*(neuromusculo skeleton disorders), *Ashamari*(calculus), *Sharkara* (passing of gravel), *Mutrakrichha* and *Mutraghata* (renal and urethra related disorders)[40]. It is also one of the ingredient of *KantakaPanchmula* which acts as *Raktapittahara*(~ pacify hemorrhagic disorders), *Shophahara* (anti edematous), *Sarvamehahara* (antidiabetic or pacify nephrotic disorders) and*ShukraDoshaVinashana* (purification of semen)[41].It is categorized in *VatasansamanaVarga* (group of medicines which pacify the *VataDosha*) as *Aartagala* (*NilaPiyavasa*) and *Sahachara* (*Piyavasa*)[42].

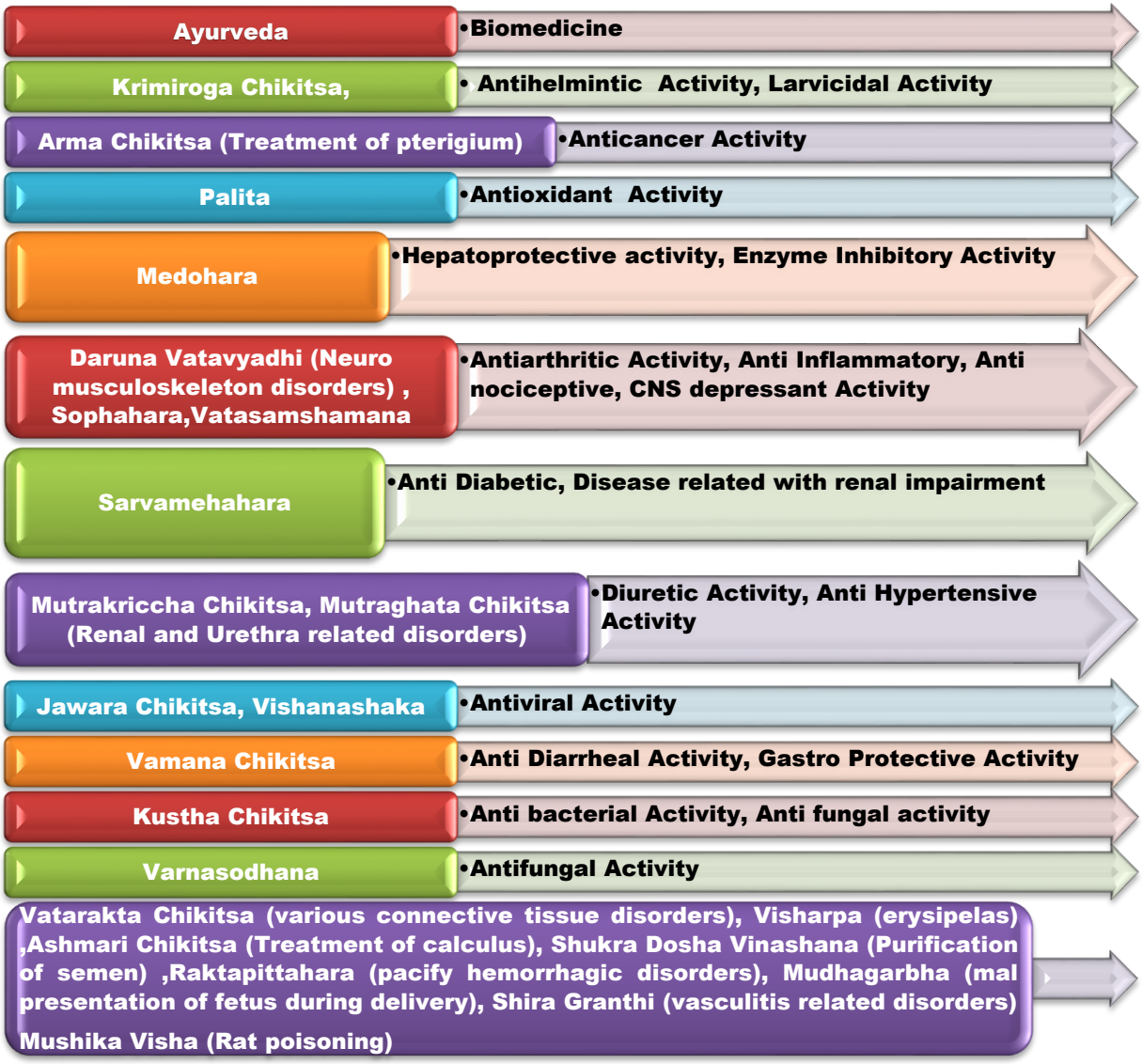

Fig 2. Comparative Analysis of effects of *Barleria prionitis* Linn in *Ayurveda* and Biomedicine

In *Ayurveda* classics,addition to these properties*Sahachara* is also authorized to used in *Krimiroga*(helminthiasis) in form of *Swarasa* (extracted juice)[43] and in

KaphajaVisharpa(erysipelas due to *KaphaDosha*) in the form of *Lepa* (external application)[44]. Different parts of *Sahachara* like flower etc. with different mode of administration advised in *PalitaRoga* (graying of hair) by *Acharyas*such asits oil (*SahacharadiTaila*[45], *MahanilaTaila*[46], *Saireyakadi Taila*[47]) is advice in the form of *Nasya*(administration of drug through nose), *Pana*(oral administration of drug) and *Shiroabhyanga*(in form of head massage). *Sahachara Taila* with different mode of administration i.e. *Pana*, *Abhyanga* (massage), *Nasya* and *AnuvasanaBasti* (oil enema) is described in *DarunaVatavyadhi*[48]. *Sahachara* is one of theconstitute of *BhutikadiTaila* which is prescribed in *VatajaVikara*[49].In *VataraktaChikitsa*(various connective tissue disorders)different type of *Lepa* of *SahacharaMula* is mentioned[50-51]. *SahacharaSadhitaGhrita* is stated in *AshamariChikitsa.* In *VatajaAshmari*(oxalate of lime calculus) it mentioned as *Aartagala (NilaPiyavasa)*[52] and in *PittajaAshmari* (uric acid calculus) it mentioned as *Kuruntika* (*Katasaireya*)[53-54]. *SaireyakaTaila* is mentioned in thetreatment of *Mudhagarbha*(mal presentation of fetus during delivery) [55] and in acute stage of *ShiraGranthi* (vasculitis related disorders) for *Pana* (oral administration)[56]. Oral administration of root of *Saireyaka* mixed with *Madhu*along with *Tandulambu* is mentioned in *MushikaVisha* (rat poisoning) [37].**[Figure 2 –** Comparative Analysis of effects of *Barleriaprionitis* Linn in *Ayurveda* and Biomedicine**]**

CONCLUSION

In *Ayurveda*, *B. prionitis* L.inhabited a notable position. In this review the comprehensive figure provided on *B.prionitis*L. such as its customary uses, phytochemistry, pharmacology and toxicity which might be added value in the scientific evaluation of medicinal use of this plant. Considerable literature observation disclose the optimistic uses which consist anti bacterial, antihelminthic, antifungal, antifertility, anticancer, anti oxidant and anti cataract activity. Glutathione s-transferase andacetylcholinesterase inhibitory activity.Hepato-protective, anti-arthritic, diuretic, antiviral, anti diabetic, anti-inflammatory, anti-nociceptive, anti-diarrheal, gastro protective, anti-hypertensive, enzyme inhibitory, CNS depressant and larvicidal activities of the extract and isolated molecules of this plant without any toxic effects. Along with its lot of traditional uses the current review also show its pharmacological action and phytochemical profile that will be beneficial for future researchers.

FUTURE APPROACHES – In contemporary science research wasdone on antifertility activity of *B. prionitis*L.but in *Ayurveda* classics property of this drug is mentioned as *Shukrashodhana* (purification of semen) or *ShukraDoshanashana* (pacification of disease related to semen) which denotes its action on faulty spermatogenesis. Hence we found that there is a controversy in *Ayurveda* and contemporary science regarding the action of *Sahachara*drugs. Further researches should be done to explore that how the active compound of this plant interact with the living organisms and affects the function of the body. *Ayurveda* mentioned the action of *Sahachara* in *VisharpaChikitsa* (erysipelas), *ArmaChikitsa* (pterygium), *AshmariChikitsa* (calculus), *KusthaChikitsa* (skin diseases), *AabhyantaraVidardhi* (internal abscess) and in *MudhgarbhaChikitsa* (mal presentation of fetus during delivery), hence we found the multidimensional approaches of *Sahachara* in *Ayurveda* science. Till date no work have been carried out on the above given properties and actions of the drug. So in future more work should be conducted to explore the action, mechanism and efficacy of the drug.

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