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Research Article

PHYTOCHEMICAL AND ANTIFUNGAL ACTIVITY OF FOLK MEDICINAL PLANT *BARLERIA PRIONITIS* L. (VAJRADANTI)

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ABSTRACT

Objective: The aim of the present study is to examine preliminary phytochemical investigations, qualitative analysis, and antifungal activity of *Barleria prionitis* L. leaf extracts.

Methods: Aqueous and crude extract of *B. prionitis* leaf powder examined by Poisoned food assay to find out the inhibition (%) of fungi at 1 (%), 2 (%), and 3 (%) concentrations.

Results: Flavones, flavanols, flavonols, saponins, and other phytochemicals were observed in leaf powder extract. *B. prionitis* crude extract inhibits *A. flavus* by 48.74 (%).

Conclusion: This study shows useful preliminary, phytochemical investigation of *B. prionitis* L. leaf extracts as well as its antifungal activity. Further research needs to be carried out to purify other compounds contained and to conduct bioactivity assays. The leaves crude extract has depicted antifungal activity against *Aspergillus flavus* and *Aspergillus niger*. The aqueous extract of leaves seemed to not affect the fungal strains that were examined. The findings suggest that crude extracts of *Barleria prionitis* L. leaves provide the substantial potential for the development of a completely new broad range of antifungal herbal formulations.

Keywords: Antifungal, Aqueous, Crude, *Barleria prionitis* L, Phytochemical.

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INTRODUCTION

In recent times, environment and climate change have turned out to be a subject of rising attention to various scientists. Environmental degradation puts more strain on human health mainly impacting exposures to pollutants, water, soil, and chemicals in the climate. It has the potential to cause respiratory, cardiovascular, and infectious diseases.

Nowadays, microbes are becoming more drug-resistant and the global warming influence biological multiplicity of parasite and effect their evolution and the capability of exotic species to attack new areas. Microbial diseases of the skin are frequently transmitted by being in touch with an infected individual. Although skin in general provides a barrier to infection, when it is penetrated by micro-organisms, develops infection. Since earlier civilizations, plant extracts have been utilized to treat skin infections. Plant extracts are now becoming increasingly useful for antimicrobial agents as many microorganisms develop resistance to drugs.

The *Barleria prionitis* L. is most often referred as the "Porcupine Flower." It has been shown to be helpful in the control of bleeding gums and toothaches. It is known as Sanskrit "Karunta," "Kurantaka," and "Pita– Saireyaka." The plant is used to reduce inflammation, irritation from leprosy sores and to reduce grey hair. Diuretic qualities are found in the leaves and in immature inflorescences. Leaf extract is being used to treat stomach disorders, urinary diseases, fever, and colds. It is used to treat badly bruised soles of feet and pimples during the wet season. It is termed as "Vajradanti" for its anti-dontalgic qualities [1]. *Barleria prionitis* L. is widely utilized in skin diseases and inflammations. Leaves are utilized to promote healing of wounds [2]. Plants have therapeutic properties owing to phytochemical content in them that have a different physiological effect on the human body. Phytochemicals regulate protect and control many of the diseases in human beings though the active principles differ from plant to plant because of their diverse biochemical nature (Fig. 1).

There are a few reports on the use of plants in skin diseases by some tribal communities (Table 1).

METHODS

Collection of plant materials

Information about the usage of plants for skin problems such as eczema, scabies, ringworm, cuts, wounds, rashes, itching, and other ailments were obtained from *Sahariya* tribals. Plants were identified with the assistance of flora and other authentic literature available within the department. Identification was finally confirmed at NBRI, Lucknow (U.P.).

Selected plant species which is used against skin diseases were collected. The samples were dried in shade and powdered.

Microorganisms used

Two fungi, that is, *Aspergillus flavus* and *Aspergillus niger* were obtained from Birla research institute, Gwalior and maintained in laboratory at 4°C on P.D.A. media by sub-culturing method.

Preparation of phyto extracts

Phytoextracts were obtained using the procedures listed below:

1. Aqueous extract: 25 g of fresh leaves were heated in 100 ml of water for 2 h to get aqueous extracts at specific conc. of 1%, 2%, and 3% after which the extract was strained and 50 ml of volume was kept by adding the required quantity of water.

Table 1: Review of various tribal communities use *Barleria prionitis* in skin diseases

Name of the tribal	Place	Plant parts used	Skin diseases
Bhil	Jhabua, M.P.	Leaves	Cuts
Kondh	Phulbani, Orissa	Leaves	Scabies
Oraons	Surguja, Orissa	Leaves	Wounds
Paliyar	T. Nadu	Stem bark, leaf	Skin diseases
Paniyas	Wayanad, Kerala	Whole plant	Eczema, Black heads, ringworm, fungal diseases
Sahariya	Sheopur, M.P.	Leaves	Skin diseases
Tharus	Varanasi, U.P.	Leaves	Boils
Vasava	Ahmedabad, U.P.	Leaves	Skin rash, Scabies
Gujjar	Uttarakhand	Leaves	Skin allergy

2. Crude extract: 25 g of fresh leaves were soaked in a pestle and mortar with 50 ml distilled water and the extract was kept 24 h/7days and then strained to obtain crude extracts at 1%, 2%, and 3% conc. After extracting, the required quantity of water was added to adjust the 15 ml volume. This extract has a conc. of 100%, that is, (1:1 weight/volume basis).

Antimicrobial assay

Poisoned food technique

The fungal activity of *B. prionitis* against the fungi was tested using the poisoned food technique. This 6 mm diameter fungal growth disk was excised from the periphery of 3–7 day old cultures and inoculated aseptically in the central core of a Petri dish comprising the PDA with a specific amount of plant extracts. The appropriate control (i.e., no plant extract) was established.

At 25°C, the inoculation plates were maintained. Between 48 h and 36 h following incubation, the circumference of the fungus was observed every 24 h.

After incubation colony diameter was measured and compared with control. Percent inhibition of growth of fungus due to plant extract was calculated as followed [3].

Percentage mycelia inhibition = [(dc-d1)/dc] × 100 = I

dc = colonial size in controls, d1 = colonial diameter in extracts dc = colonial diameter in control, d1 = colony diameter in extract.

Phytochemical analysis

Phytochemical analysis of alkaloids, anthraquinones, cardenolides, flavonoids, flavonols, flavonols, flavones, flavanols, flavononones, iridoides, leucoanthocyanin, phenolics, saponin and steroids aqueous extract was done for the presence or absence of active secondary metabolites (Table 2) [4].

RESULTS AND DISCUSSION

Flavones, flavanols, flavonols, saponins, and other phytochemicals were observed in the extract (Table 2). Flavones were found in *B. prionitis* Aqueous extract (1%) inhibited pathogens at reduced level. Flavonoids are hydroxylated phenolic compounds that found in plants produce in reaction to microbial infection. This is not unusual that they were being discovered to be efficient antimicrobial compounds *in vitro* against a wide variety of microorganisms. The plant extracts analyzed did not contain any alkaloids. These phytochemicals have antimicrobial properties and are proven to work through various methods. The aqueous extract showed inhibition towards *A. flavus* (3.23% and 2.22%, respectively) but no inhibition toward *A. niger* (Table 2 and Fig. 2).

Fig. 1: *Barleria prionitis* L.

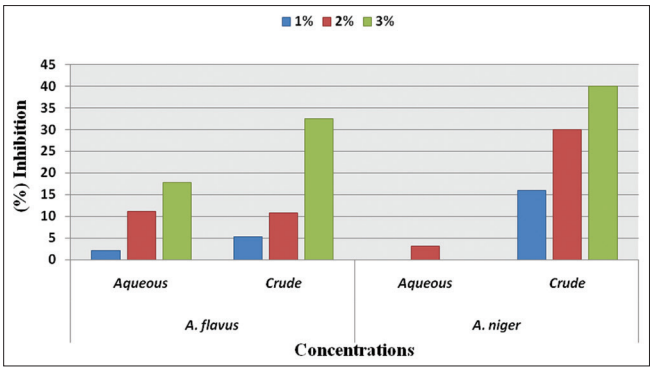

Fig. 2: Inhibition of fungi (%) with different concentrations of *B. prionitis* L. leaf extracts

Its crude extract inhibits *A. niger* and *A. flavus* by 16% and 5.40%, respectively.

With crude extract (2%) there was 11.11%, 3.23% inhibition against *A. flavus* and *A. niger.* whereas higher inhibition 30% and 10.9% was observed against *A. niger* and *A. flavus*.

Crude extracts of *B. prionitis* leaves were discovered to have antimicrobial activity against a fungus species (*A. flavus*) (48.74%). The crude extract looks to be far more active than the aqueous extract. The inhibitory efficacy of *B. prionitis* aqueous extract was not discovered. According to research, the antifungal action of the extract is due to the presence of various compounds in the extract. Reports indicate that the antifungal activity is due to the presence of different compounds in the extract including flavonols, flavones, flavanols, iridoids, and saponins [5-7] (Table 3).

These findings validate traditional knowledge of indigenous users about plant species as antimicrobial agents and they provide early scientific justification for the usage of these plants for antifungal activity. To ensure proper sustainability usage of such plants, local communities understanding should be increased, merging traditional knowledge with modern science. The findings of this study also indicate the therapeutic use of the plants tested, implying that some plant extracts include antimicrobial characteristics that could be employed as antimicrobial agents in novel medicine to treat contagious disorders caused by pathogens.

The foremost active extracts are often subjected to isolation of the therapeutic antimicrobials and undergo more pharmacological evaluation.

Table 2: Qualitative analysis of phytochemicals

S. No.	Name of the test	Observation	Result
1.	Alkaloid 5 g dried leaf powder+10% ethanol in room temperature for 48 h+25 ml of 0.1 NH_2SO_4.	No precipitate	Alkaloids absent
2.	Anthraquinones Leaf powder heated 1 h with H_2SO_4+chilled+strained+Chloroform+2 ml NH_3	Brown color	Anthraquinones absent
3.	Cardiac glycosides By rectified spirit, fresh tissue was erased+10% solution of NaOH and 0.3% solution of Nitropruside	Pale green color	Cardenolides absent
4.	Flavonoids (Shinoda test) Little of Mg ribbon+HCL	Dark green color	Flavonoids absent
5.	Flavanonols Zn powder+HCL	Pale yellow color	Flavanonols absent
6.	Flavonols To the extract a pinch of Boric acid+few droplets of CH_3COOH were added.	Light yellow color	Flavonols present
7.	Flavones and flavanols Some droplets of H_2SO_4 were added	Pale orange color	Flavones and Flavanols present
8.	Flavanones Some droplets of Conc. HNO_3 were added	Olive green color	Flavanones absent
9.	Leucoanthocyanin 0.5 g of sample was heated with 2N HCL+water bath for 20 min. The extract was left to cool down at room temperature+filtered+filtrate 5 ml of Iso-amyl alcohol.	Pale green color	Leucoanthocyanin absent
10.	Iridoids Powdered leaves+5 ml of 1% aqueous HCL+for 6 hours+1ml of Trim hill reagent was added to the 0.1 ml of extract+heated for short time in a flame and color change was noted.	Violet color	Iridoids present
11.	Phenolics Leaf powder+aqueous ethanol overnight+1-2 droplets of 1% aqueous FeCl.	Pale yellow color	Phenolics absent
12.	Saponins Leaf powder boiled after cooling+gently shaken to froth+rest for 10–15 min.	Persistent froathing	Saponin present
13.	Steroids 2 ml of acetic anhydride+2 ml H_2SO_4 in a 0.5 g ethanolic extract	Blue/green color	Steroids present

Table 3: Inhibition (%) of fungi at different concentrations of *B. prionitis* L. leaf powder extracts

S. No.	Name of Pathogens	Extract	Concentration of extract in (%)			Mean (%) grand mean
			1%	2%	3%	
1.	*A. flavus*	Aqueous	2.22	11.11	17.78	10.37 (38.66)
		Crude	5.40	10.90	32.44	48.74 (30.75)
2.	*A. niger*	Aqueous	-	3.23	-	1.07 (27.50)
		Crude	16.00	30.00	40.00	28.66 (38.00)

CONCLUSIONS

The above results justify the utilization of this plant in folk medicine to treat skin diseases. The most important active extracts are frequently treated to antifungal isolation and further pharmacological testing. Plants have the potential to produce novel metabolites, as per a preliminary phytochemical examination of their antifungal activity. The discovery of antifungal activity in a crude extract may lead to the development of new antifungal drugs. Therefore, plants with a broad activity spectrum may aid in the development of new chemical types of antibiotics that work as selective agents in the improvement of health.

CONFLICTS OF INTEREST

None.

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