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RESEARCH ARTICLE

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Antifungal activity of *Mimosa pudica* leaves extracts against fungal isolates from razor bumps in Sokoto Metropolis, Nigeria

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ABSTRACT

2 out of the eight fungi isolated from razor bumps shows a significant zone of inhibition. Trichophyton verrucosum and T. soudanense revealed highest diameter of zone of inhibition at 200mg/ml, 250mg/ml and 300mg/ml for ethanol and aqueous extracts of M. pudica leaves respectively while Microsporum canis revealed the least diameter of zone of inhibition at 150mg/ml, 200mg/ml and 250mg/ml in ethanol and aqueous extracts of M. pudica leaves. T. concentricum, and M. gypseum was not inhibited in ethanol and aqueous extracts respectively. The presence of phytochemical components might be the reason for the inhibition in growth of some of the microorganisms.

INTRODUCTION

Traditionally, the extracts of *Mimosa pudica* herbs incorporated with other herbs in the poly herbal formulation was used to treat wounds [1]. The study of the plants also shows that methanolic extracts of the roots exhibit good wound healing activity and skin diseases due to phenols constituents [2]. The root is bitter, acrid, cooling, vulnerary, alexipharmic, and used in the treatment of leprosy, dysentery, vaginal and uterine complaints, inflammations, burning sensation, asthma, leucoderma, and fatigue and blood diseases [3]. In some traditional Healthcare System, its root is resolvent, alternative, and useful in the treatment of diseases arising from blood impurities and bile, bilious fevers, piles, jaundice, and leprosy, etc. Decoction of the root is used with water to gargle to reduce toothache. It is very useful in treating diarrhea, amoebic dysentery, bleeding piles and urinary infections. It arrests bleeding and promote wound healing process. It is mainly used in herbal preparations for gynecological disorders. It has been said to have medicinal properties to cure skin diseases. It is also used in conditions like bronchitis, general weakness and impotence. The content of *M. pudica* has a capacity to arrest bleeding and it fastens the process of healing of wounds. It is recommended in diarrhea, amoebic dysentery and bleeding piles. Some herbal doctors recommend it for bronchitis, general weakness and impotence. All the five parts of the plant that is, leaves, flowers, stems, roots, and fruits are used as medicines in the traditional healthcare systems. In India, different parts of the plant have been in popular use for treating various ailments since long. Recent researches show that the extract of this plant has contraceptive properties [4].

Many researchers have revealed that *M. pudica* is a mood enhancer and improves circulation of the blood. Some believe Mimosa can reduce the onset of baldness. Due to its ability to promote healthy cell growth, it is used in shampoos, creams, capsules, and soaps which are applied as facial cleansers [4]. *M. pudica* root is used to treat bilious fevers, piles, jaundice, leprosy, dysentery, vaginal and uterine complaints, inflammations, burning sensation,

fatigue, asthma, leucoderma, and blood diseases. In Western medicine, Mimosa root is used for treating insomnia, irritability, premenstrual syndrome, menorrhagia, hemorrhoids, skin wounds, and diarrhea [5]. It is also used to treat whooping cough and fevers in children, and there is some evidence to suggest that Mimosa is effective in relieving the symptoms of rheumatoid arthritis. All parts of the Mimosa plant are reportedly toxic if taken directly. Its consumption is not recommended for pregnant or nursing ladies. Due to these reports, it seems to be best to consult a physician before using Mimosa internally [6]. It is used in parts of the southeastern Nigerian as herbal remedy for hyperglycemia. It produces liquid oleoresin, which has been used as medicine by indigenous people for more than 400 years. The oleoresin is produced in the tree's trunk, stem, and leaves and is traditionally used as an anti-inflammatory agent and in the treatment of a variety of genitor-urinary tract diseases and skin ailment.

MATERIALS AND METHODS

Sample Collection

The leaves of the mimosa plant (*Mimosa pudica*) were collected around kwalkwalawa River along University Road, Sokoto. The plant material was authenticated by a plant Taxonomist in the Herbarium, Department of Biological Science, Usmanu Danfodiyo University, Sokoto.

Preparation of Extracts

The fresh leaves were washed thoroughly 2-3 times with running tap water and once with sterile water, to remove dirt and air dried to constant weight for 5-7 days. The dried leaves were then blended using a household electric blender. The leaf powder was stored sealed in five labeled reagent bottles for further use. The bioactive components were extracted using the methods of [7].

Extraction of plants materials

One hundred grams of the powdered plant material (*M. pudica* leaves) was weighed on a weighing balance (mettler 166) and kept in a container. Five hundred milliliters of ethanol and water was transferred to the container of the powdered extract, respectively. This was shaken thoroughly and allowed to stay overnight. The solution was filtered and heated at 50^{o}C for 72 hours until the aqueous content evaporated completely. The dry extract was collected and weighed in varying concentration.

Sub-Culturing of Fungi Stock Culture Isolated from Razor bumps

More Potato's Dextrose Agar (PDA) plates were prepared and allowed to solidify. A small portion of each of different fungal colony singly placed in the center of the Potato's Dextrose Agar (PDA) plate and allowed to inoculate at room temperature (28 ± 2^{0}C) for 21 days. Subculture was done to obtain the pure isolate. The developing fungal colonies were sub-cultured repeatedly on fresh PDA plate until pure cultures of the isolate were obtained [8].

Determination of Minimum Inhibitory Concentration

The Minimum Inhibitory Concentration (MIC) was determined as the least concentration that showed an inhibitory effect on test organism using the tube method. Two fold serial dilutions were made using nutrient broth. Then 5 ml of a solution of the extracts (250 mg/ml) was added aseptically to 5 ml of double strength medium and mixed by shaking. Using a fresh pipette, 5 ml of the mixture was transferred to test tube 2 which contained 5ml of the single strength medium. This too was mixed by shaking and from it 5 ml was taken into test tube 3 aseptically and mixed by shaking. The 9^{th} tube containing no test compound served as control. Finally, to each tube was added 0.2 ml inoculums of the test organisms aseptically. The test tube were covered with cotton wool and incubated at 37^{0}C for 21 days and then observed for turbidity. The lowest concentration that inhibited growth of test organism was noted as the MIC.

Antifungal Sensitivity Test

Antifungal activities of the plant extracts were tested using Agar Well diffusion method [9]. The prepared culture plates were inoculated with the isolated fungal. Wells were made on the agar surface with 6mm cork borer. The extracts were poured into the well using sterile syringe. The plates were incubated at 37 ± 2^{O}C for 21 days. All the inoculated plates were also labeled with the name of the fungal culture. At the end of this period, all the plates were observed for any zone of inhibition. The result was read by observing the zone of inhibition of fungal growth in each plate. Plate showing zone of inhibition were measured with the aid of meter ruler. The diameter of the inhibition was measured and recorded respectively.

RESULTS

Antifungal activity of *M. pudica*

Result of antifungal test using the ethanol and aqueous extracts of *M. pudica* revealed that the leaves of the plant exhibited antifungal effect against some of the isolated fungi from the razor bumps. Using four different concentrations of 150mg, 200mg, 250mg and 300mg. the potential sensitivity of extract was obtained against some of the fungal isolates tested. *T. verrucosum, M. ferrugineum, T. shoenleinii, M. canis, T. soudanense* and *M. gyseum* were sensitive to ethanol extract while *T. concentricum and T. rubrum* was not. *T. verrucosum, M. ferrugineum, T. shoenleinii, T. rubrum, T. concentricum, T. soudanense* and *M. canis* were also sensitive to aqueous extract while *M. gyseum* was not. The zone of inhibition was recorded and presented in Table 1 below:

Table 1: Diameter Zone (mm) of Inhibition of Ethanol and Aqueous Extracts of *M. pudica* leaf on Fungal Isolates from razor bumps

Test organism	Ethanol extract conc. Mg/ml				Aqueous extract conc.Mg/ml			
	150	200	250	300	150	200	250	300
Trichophyton verrucosum	2	4	3	5	3	3	4	4
Microsporum ferrugineum	3	0	0	1	4	1	2	0
Trichophyton schoenleinii	0	2	0	0	2	1	3	4
Trichophyton rubrum	3	0	5	0	1	2	1	0
Trichophyton concentricum	0	0	0	0	2	2	3	4
Trichophyton soudanense	2	4	6	5	1	3	5	7
Microsporum canis	1	1	0	0	0	0	1	0
Microsporum gypseum	3	5	0	4	0	0	0	0

Key: Diameter of cork borer is 14mm

Antifungal Activity of *M. pudica* in Aqueous and Ethanol extracts

The result in Table 2 showed that leaf extract with different solvent inhibited the growth of all the bacteria isolate. At 300mg/ml of 0.50±1.27, highest growth inhibition was recorded in ethanol extract. The least growth inhibition was also recorded in aqueous leaf extract at 150mg/ml at 0.12±0.67. This was similar in all the result, showing that the result is significant ($p>0.005$).

Table 2: Antifungal activity of Aqueous and Ethanol extracts of *M. pudica* leaf

Extracts	Conc. (mg/ml)	Leaf extract
Ethanol	150	0.12±0.70
	200	0.50±0.84
	250	0.62±1.08
	300	0.50±1.30
Aqueous	150	0.12±0.67
	200	0.52±0.86
	250	0.60±1.08
	300	0.50±1.27

Values are means ± standard error

DISCUSSION

The extracts of *M. pudica* leaves shows highest zone of inhibition against *Trichophytom verrucosum* and *T. soudanense* but not effective against other isolates. The presence of phytochemical compounds of the studied plants part, the inhibitory zone and concentrations at which values were effective on the tested organisms highlight that there were variations in the antifungal potency of the plants. The variation in sensitivity could also be attributed to differences in growth rate of isolated organism nutritional requirement, temperature and inoculums size [10]. Similar results were obtained by [1], whose results revealed maximum zone of inhibition when *M. pudica* leaf extracts were used against *E. coli*, *Lactobacillus* and *Salmonella typhi*.

The extracts indicates significant difference ($p<0.05$) inhibitory activity of aqueous and ethanol extracts. Antifungal activity of the ethanol extracts appeared to be more effective than aqueous extracts since ethanol could extract a wide variety of active components as compared to aqueous [12].

CONCLUSION

The cell wall of the fungi is more complex in lay out than some other microbes like bacteria. In spite of this permeability differences, however, some of the extracts have still exerted degree of inhibition against some fungi as well. In the present study, *M. pudica* leaf extract possesses antifungal activity against some of the tested fungi and the plant contains potential antifungal component for the therapy of infections. From the studies, it is concluded that traditional plants may represent new sources of antimicrobials with stable, biologically active components that can establish a scientific base for the use of plants in modern medicine and the compounds are known to be biologically active, therefore, aid the antifungal activity. These local ethno-medical preparations and prescriptions of plant sources should be scientifically evaluated and then disseminated properly and the knowledge about the botanical preparations of traditional sources of medicinal plants can be extended for future investigation into the field of pharmacology, phytochemistry, ethno botany and other biological actions for drug discovery.

Considering the antifungal potentials of *M. pudica*, further research should be carried on skin diseases and how effective it can be against it. Other parts of *M. pudica* like the stem and root should be included with the leaf against fungi.

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