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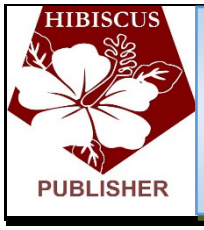

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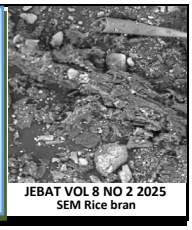

Efficacy of *Mimosa pudica* Leaf Extracts on Microorganisms Associated with Razor Bumps

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Abstract

Razor bumps, medically known as *pseudofollicullitis barbae*, occur when hairs become ingrown after shaving or other hair removal methods. This study investigated the antimicrobial properties of *Mimosa pudica* against microorganisms causing razor bumps in Lokoja, Kogi State. Leaf extracts were obtained through maceration and tested using Agar Well Diffusion. Results showed significant antimicrobial activity against *Trichophyton verrucosum, Trichophyton shoenleinii, Microsporum canis,* and *Staphylococcus aureus*, with inhibition zones ranging from 0.67±0.10mm to 30±1.30mm. The study concludes that *Mimosa pudica* leaf extract effectively combats fungal and bacterial isolates associated with razor bumps. The study thus recommends further research on the plant's potential against other skin diseases and exploration of other plant parts.

INTRODUCTION

Razor bumps are ingrown hairs that develop after paring or using other hair-removing methods, such as waxing or plucking. The medical term for razor bumps is *pseudofollicullitis barbae*. In grown hairs develop when hair starts to grow back into the skin, rather than over and out. After removing hair by paring, waxing, or plucking, the hair may coil and turn inward. As the new skin cells grow over the hair, they become trapped and cause a bump to form. Razor bumps can develop on any area of the body where a person shaves or removes hair, including the face, head, legs, underarms, and pubic area [1].

Traditionally, *Mimosa pudica* extract incorporated with other sauces in the poly herbal expression was used to treat injuries [2]. The study of the plant also shows that the methanolic extract of the roots has good wound healing and skin conditioning activity due to its phenolic constituents [3]. 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 conditions [4]. In some traditional healthcare systems, their roots are resolvent, alternative, and useful in the treatment of conditions arising from blood contamination and corrosiveness, dyspeptic complications, piles, hostility, and leprosy, etc. Decoction of the root is used with water to gargle in order to reduce a toothache. It is veritably useful in treating diarrhea, amoebic dysentery, bleeding piles and urinary infections. It stops bleeding and promotes the wound healing process. It's substantially used in herbal medications for gynecological diseases. It has been said to have medicinal properties to cure skin conditions. It's also used in conditions like bronchitis, general weakness, and incompetence.

The content of *Mimosa pudica* has a capacity to arrest bleeding and it hastens the process of healing of injuries. It's recommended for diarrhea, amoebic dysentery and bleeding piles. Some herbal croakers recommend it for bronchitis, general weakness and incompetence. All five parts of the plant, that is, leaves, flowers, stems, roots, and fruits, are used as drugs in the traditional healthcare systems. In India, different parts of the plant have been in popular use for treating a wide array of affections. Recent inquiries show that the extract of this plant has contraceptive potential [5]. It has been revealed that *Mimosa pudica* is a mood enhancer and improves circulation of the blood. Some believe mimosa can reduce the onset of baldness. Due to

its capability to promote healthy cell growth, it's used in soaps, creams, capsules, and detergents, which are applied as facial cleaners [5]. *Mimosa pudica* root is used to treat dyspeptic complications, piles, hostility, leprosy, dysentery, vaginal and uterine complaints, inflammations, burning sensation, fatigue, asthma, leucoderma, and blood conditions. In Western medical studies, mimosa root is used for treating wakefulness, perversity, premenstrual pattern, menorrhagia, hemorrhoids, skin injuries, and diarrhea [6].

It is also used to treat whooping cough and complications in children, and there are some substantiations to suggest that mimosa is effective in relieving the symptoms of rheumatoid arthritis. However, all parts of the mimosa plant are reportedly poisonous if taken directly. Its consumption is not recommended for pregnant or nursing ladies. Due to these reports, it is best to consult experts before using mimosa internally [7]. Razor bumps are more than just an annoyance; in some cases, they can cause endless damage if they are not treated. Razor bumps can be a serious problem through itching, a pruritic sensation and prickly and painful. Synthetic ointments and other chemical substances used in treating razor bumps are not readily available and are expensive. Razor bumps generally do not beget serious health problems, still their presence and appearance can be bothersome and can affect existing confidence, hence the need to give a lasting solution to it. This study aimed to assess the antimicrobial efficacy of *Mimosa pudica* on microbial isolates associated with razor bumps.

MATERIALS AND METHODS

Study of Area
Lokoja is located in the guinea savannah zone of Nigeria. It lies on latitude 7º49'3" N and longitude 6º41'34" E at an altitude of 45 to 150 m above sea level, on the western bank of the Niger River, close to its confluence with the Benue River.

Samples Collection
Sufficient leaves of the mimosa plant (*Mimosa pudica*) were collected during the early hours of the day and conveyed to the herbarium. A plant taxonomist in the Herbarium of the Department of Biology, Federal University Lokoja, authenticated the identity of the plant material. Strains of *Trichophyton verrucosum, Trichophyton shoenleinii, Microsporum canis* and *Staphylococcus aureus* isolated from patients suffering razor bumps were procured from Federal Teaching Hospital, Lokoja.

Preparation of Extracts
The fresh leaves of the mimosa plant were washed completely with running tap water and also with sterile water, to remove dirt and air-dried to constant weight. The dried leaves were then blended using a ménage electric blender. The leaf powder was stored, sealed in labeled reagent bottles for further use. The bioactive constituents were extracted using the maceration technique of extraction [8].

Extraction of plants Material
Three 100 g of the powdered plant material (*Mimosa pudica* leaves) was weighed on a weighing balance and kept in separate holders. 500 mL of water, n-hexane and ethanol were then transferred to the holders of the powdered plant material. This was shaken completely and allowed to stay overnight. The result was then filtered and heated at 50 ˚C in a water bath until the solvent contents were fully evaporated. The dry extracts were then collected and weighed in varying concentrations.

Culture Media
The media used in this study were Potato Dextrose Agar (PDA) and Saboraud Dextrose Agar (SDA) to enumerate fungal strains, while Nutrient agar and Peptone Agar were employed for the expression of bacterial strains. The media were prepared in accordance to the manufacturer's instructions by weighing specific grams and dissolving them in appropriate volumes of water and then sterilized by autoclaving at 121 ˚C.

Identification of Isolates
The pure cultures of the isolate were subjected to microscopic examination with the view to confirming the identity of the organisms. A clean, grease-free glass slide was used for identification. A drop of water was placed in the center of the slide and a small portion of the fungal pure isolate was cut out aseptically with a sterile inoculating needle. The piece was placed on the water drop, teased out and covered with a cover slip. The slide was mounted on the microscope for observation. The viewing was done with the lower magnification (×40) objective lens.

The nature of the mycelia, the types of regenerating bodies, and the spore structures served as the criteria for the identification of the strains. The strains were compared and verified with those of the mycological atlas [9]. Bacterial strains were identified based on morphological and culture characteristics. Bacterial isolates were observed for morphological features using Bergey's Manual of Determinative Bacteriology. They were subsequently subjected to Gram staining and cell shapes were determined under an ×100 objective lens of the light microscope. Morphological comparison with keys in the manual was used for the identification of each strain.

Antimicrobial Sensitivity Test
Antimicrobial activities of the plant extracts were tested using the agar well diffusion technique. The set of culture plates was inoculated with the isolated microbes. Wells were made on the agar surface with a cork borer (8mm). 50 µL of each extract concentration was then poured into the well using a sterile syringe and the plates were incubated for 7 days for fungal isolates and 24 hours for bacterial isolates at room temperature. All the inoculated plates were labeled with the name of the microbial strains. All the plates were then observed for any zone of inhibition. The result was read by observing the zone of inhibition of microbial growth in each plate. Plates showing zones of inhibition were measured with the aid of a transparent meter ruler and recorded.

Data Analysis
Measured and recorded zones of inhibition were presented in tabular format, indicating the concentrations and mean inhibition zones. Tabulated data were analyzed for ANOVA at $p<0.05$ using the SPSS software version 20.

RESULTS
A measurable inhibitory activity against all fungal and bacterial isolates associated with razor bumps was detected with the antimicrobial assessment of *Mimosa pudica* leaf extracts, including *Trichophyton verrucosum*, *Trichophyton schoenleinii*, *Microsporum canis*, and *Staphylococcus aureus*. Inhibition zones increased proportionally across all concentrations tested (50–200 mg/mL), which indicates a dose-dependent response. The results showed that the ethanolic extract produced the greatest antimicrobial effect among the various solvent extractions.

This is followed by the n-hexane extract, and the last and least effect was given by the aqueous extract, showing the lowest inhibition. This trend follows the well-known reports of ethanol to extract a broader spectrum of antimicrobial phytochemicals such as flavonoids, tannins, and alkaloids [10,12,13]. The ethanolic extract produced zones of inhibition up to 30–31 mm for *T. schoenleinii* and *M. canis* at 200 mg/mL, significantly higher than the aqueous extract (≤1.2 mm) and moderately higher than the n-hexane extract (2–4 mm) (**Tables 1** to **3**). The results in this study fits with earlier phytochemical studies demonstrating that organic solvents recover more potent bioactive compounds from *M. pudica* [8,12].

Table 1. Antimicrobial activity of *Mimosa pudica* aqueous leaf extract against test organisms. Values are mean ± standard error.

Isolate Strains	50 mg/ml	100 mg/ml	150 mg/ml	200 mg/ml	Control
Trichophyton verrucosum	0.70±0.10	0.67±0.10	0.80±0.10	1.00±0.12	18±0.10
Trichophyton shoenleinii	0.84±0.50	0.86±0.50	0.9±0.50	1.01±0.50	17±0.10
Microsporum canis	1.08±0.60	1.00±0.60	1.08±0.60	1.20±0.60	18±0.10
Staphylococcus aureus	1.30±0.50	1.27±0.50	1.50±0.50	1.90±0.50	20±0.10

Table 2. Antimicrobial activity of *Mimosa pudica* n-Hexane leaf extract against test organisms. Values are mean ± standard error.

Isolate Strains	50 mg/ml	100 mg/ml	150 mg/ml	200 mg/ml	Control
Trichophyton verrucosum	2.00±0.20	3.10±0.20	4.00±0.40	4.10±0.40	18±0.1
Trichophyton shoenleinii	1.50±0.50	1.70±0.70	2.00±0.50	3.10±0.50	17±0.1
Microsporum canis	2.20±0.20	2.20±0.20	3.10±0.20	4.00±0.20	18±0.1
Staphylococcus aureus	2.00±0.20	3.10±0.50	3.00±0.50	4.10±0.50	20±0.1

Table 3. Antimicrobial activity of *Mimosa pudica* ethanol leaf extract against test organisms. Values are mean ± standard error.

Isolate Strains	50 mg/ml	100 mg/ml	150 mg/ml	200 mg/ml	Control
Trichophyton verrucosum	11.00±0.07	15±0.03	18±0.2	21±0.2	18±0.1
Trichophyton shoenleinii	11.10±0.08	14±0.90	16±0.07	28±0.07	17±0.1
Microsporum canis	12.00±0.04	18.10±1.10	19±1.3	30±1.3	18±0.1
Staphylococcus aureus	12.10±0.07	14.00±1.00	14.20±1.00	16.00±1.10	20±0.1

DISCUSSION

The robust efficacy of ethanolic extracts demonstrated in this study aligns with prior findings that emphasize the antimicrobial properties of *M. pudica* leaves, which is attributed to their abundant phytochemical composition [8,12,13]. Surboyo et al. [11] research also showed that *M. pudica* extracts had strong antimicrobial effects against harmful bacteria like *E. coli* and *Salmonella* Typhi [11]. The differences in inhibition zones among the microorganisms is likely due to differences in their metabolic rate, nutrient needs, temperature tolerance, and inoculum density. The works of Kalimuthu et al. [10] have already discussed these factors. These traits can affect the vulnerability of dermatophytic fungi and *S. aureus*, of which both have been found to be associated with razor bumbs or pseudofolliculitis barbae, a condition studied extensively by Gordon and David [5] and Perry et al. [9].

The antimicrobial properties of *M. pudica* extracts and their significance in contemporary ethnobotanical applications have been shown by recent chemical analyses. Gandhi et al. [9] established significant antimicrobial and antioxidant properties in *M. pudica* leaf extract, thereby corroborating the findings of this study [13]. Moreover, ethnobotanical surveys persist in emphasizing the significance of *Mimosa* species in the treatment of infections and inflammatory conditions within traditional medicine [14]. In general, *M. pudica* exhibited strong antimicrobial properties. This is especially when it is extracted with ethanol. This indicates considerable potential for the development of plant-derived therapeutics for conditions such as razor bumps.

CONCLUSION

Mimosa pudica leaf extracts possess measurable antimicrobial activity against both fungal and bacterial isolates associated with razor bumps. Ethanol was the most effective extraction solvent, yielding significantly greater inhibition zones compared to n-hexane and aqueous extracts. The results suggest that *M. pudica* contains potent phytochemicals with therapeutic potential for managing skin infections. Further studies should investigate other plant parts, evaluate purified compounds, and assess potential topical formulations for dermatological use.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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AUTHORS' CONTRIBUTION

Olaomi A.A. contributed to conceptualization and design of the study, drafted and reviewed the manuscript. All authors reviewed and approved the final version for submission.

DATA AVAILABILITY STATEMENT

Data available on request.

AI USAGE DECLARATION

The author used generative AI for language editing only. The author takes full responsibility for the content.

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