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Antimicrobial Effect of *Hildegardia barteri* (Mast) Seed Oil Extract on Some Fungi and Bacteria

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ABSTRACT

Seed oil extract of *Hildegardia barteri* was investigated for antimicrobial activities against some bacteria and fungi species using the microbial inhibition assay. An aliquot (0.1ml) of each seed oil extract was tested for anti-bacteria and anti-fungi activity. Fluconazole and Streptomycin were used as control for fungi (*Aspergillus niger, Trichophyton* species and *Candidas albicans*) and bacteria (*E. coli*, *S. aureus*, *P. aeruginosa* and *B. subtilis*) respectively. The results showed that there was no antifungal activity against *Aspergillus niger*, *Trichophyton* spp and *Candidas albicans*. The antifungal sensitivity test of seed oil extract of *Hildagardia barteri* using agar well diffusion assay showed that there were no zones of inhibition on the growth against *C. albicans* and *Trichophyton* sp. After 48 hours of incubation. Similarly there was no growth inhibitory activity when the positive control (Fluconazole) was used. However, there was growth inhibitory activity against *Aspergillus niger*. There was also no anti-bacterial activity when seed oil extract of *Hildegardia barteri* was used against *E. coli*, *S. aureus*, *P. aeruginosa* and *B. subtilis* for the zones of inhibition were 0.0mm. However, the zones of inhibition after 24hours of incubation using Streptomycin as the control showed that *E. coli* was 270mm, *S. aureus* was 390mm, *P. aeruginosa* was 365mm and *B. subtilis* was 385mm. Thus, the research results suggested that the seed oil extract of *Hildergadia barteri* did not provide antimicrobial properties against the fungi and bacteria used in this study.

Keywords: *Hildegardia bateri*, seed oil extract, *Candida*, *E. coli*, antibacterial activity, antifungal activity.

Introduction

Plants have been used for thousands of years in traditional medicine and medicinal plants have been found to contain active metabolites called phytochemicals (Sofowara *et al*., 1993; Ogbonna *et al*., 2007) or secondary metabolites (Duru *et al*., 2010; Karou *et al*., 2011). Knowledge and applications of ethno medicinal properties of plants date back to about 300 years BC (Okwu *et al*., 2009). These organic chemical substances are stored in matured cells of various organs of plants such as roots, stems, leaves, flowers, fruits and seeds (Prescott *et al*., 2002).

In some African countries such as Ghana, Mali, Nigeria and Zambia, the first line of treatment for 60% of children with light fevers may be, due to malaria is the use of herbal medicine at homes (Fischetti *et al*., 2001; Talaro *et al*., 2002).

The development of resistance to most of the available antimicrobial agents and the high cost of treatment consequent upon this resistance has necessitated the search for new, safe and effective agents for the treatment of infections (Jamil, 2007).

Medicinal plants have provided a source of inspiration for novel drug compounds, as plants derived medicines have made large contributions to human health and well-being (Bello *et al*., 1983). The primary benefits of using plant derivatives are that they are relatively safer than synthetic alternatives, offering profound therapeutic benefit and are much affordable for treatment (White, 1997).

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Hildegardia barteri is one of the 12 species of malvaceae trees, placed in the sub-family sterculiaceae. It has a pan tropical distribution in West Africa, East Africa, Madagascar, Southern India, Philippines, Indonesia, Northern Australia and Cuba (Bodey 1993; Limla *et al*., 2004). The species was introduced in 1832 and revised in 1954. Additional species have been described in or transferred to the genus in subsequent years.

Hildegardia barteri is commonly known as Mast and called *Kariya* in Hausa; other names include; *Ufuku eso* in Ibo, and *Okurugbedu shish*i in Yoruba. It is found in dry tropical forest in West Africa from the Ivory Coast to Southeastern Nigeria. A general description of the plant has been given by Ciocan and Bara (2007), and Trease and Evans (1996).

Bacteria and Fungi affect humans and many animal species such as goats, dogs, etc. Infections constitute a large share of human diseases of microbial origin. Fungi and Bacteria are generally wide-spread. Essential oils and extracts obtained from plants have recently gained prominence and scientific interest (Burt, 2004; Holley and Patel, 2005). Fungi and Bacteria affect both man and many other species alike. Dermatophytes are transmitted by direct contact with infected host (human or animal) or by direct or indirect contact with infected exfoliated skin or hair in clothing, combs, hair brushes, theater seats, cups; furniture e.t.c. Depending on the species the organism may be viable in the environment for up to 15 months.

The antimicrobial activity of essential oils from oregano, thyme, sage, rosemary, clove, coriander, cinnamon, garlic and onion against food related microorganisms as well as their applications in food system have been investigated and reviewed (Goodman and Koenig, 1970; Lee *et al*., 1990; Gill *et al*., 2002). The presence of phenol compounds in essential oils have been recognized as the bioactive components responsible for the antimicrobial activity against fungal infections in which dermatomycoses are the most common (Gugnani *et al*., 1975; Abdel – Hafez *et al*., 1995).

As at the time of this present investigation, there is yet any study that documented the extraction and antimicrobial effects of *Hildegardia barteri* (*kariya)* seed oils. Whether the seed oil extract of *Hildegardia barteri* plant have anti-bacterial and anti-fungal properties is the subject of this investigation.

Materials and Methods

Collection and Identification of Plant Material

The seeds of *Hildegardia barteri* were collected from Nok 9º30'N; 8º08'E, Jaba Local Government Area of Kaduna State on 19th March, 2013 and these were taken to the herbarium at the Department of Biological Sciences of the Ahmadu Bello University, Zaria, Nigeria, where they were identified and given a voucher number V/N:4884.

Study Laboratory

Seed oil extraction was carried out in the Department of Pharmacognosy and Drug Development while the agar diffusion test was carried out in the Department of Pharmaceutics and Pharmaceutical Microbiology, while the bacteria and fungal isolates were obtained from the Department of Pharmacognosy, Ahmadu Bello University, Zaria, Nigeria.

Preparation of Plant Material and Extraction

Crude oil samples were obtained from the kernels by cold pressing and solvent extraction. The seeds were hand peeled and were air dried and grinded into powdered form using mortar and pestle which was made ready for extraction of oil. Grinded seed powder (530g) of *Hildergardia barteri* were weighed and was extracted using hexane with soxhlet apparatus and this was allowed for some hours and the oil was poured into a medical bottle and labeled and stored until needed for use. Nutrient agar and Saboroud dextrose agar (SDA) media were used to culture the selected bacterial (*E. coli*, *S. aureus*, *P. aeruginosa* and *B. subtilis*) and fungal isolates (*Aspergillus niger*, *Trichophyton* species and *Candidas albicans*) used for the study.

While agar well diffusion test was carried out to determine the antibiotic activity of the seed oil extract of *Hildegardia barteri* against the selected fungi and bacteria. Fluconazole and Streptomycin were used as control for fungi and bacteria respectively.

At the end of incubation for 24hours the zones of inhibition for *E. coli*, *S. aureus*, *P. aeruginosa*, *B. Subtilis* and *C. Albicans* were determined, and were recorded in millimetres.

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Results

The result of the antibacterial activity or zones of inhibition of seed oil extracts of *Hildegardia barteri* against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Bacillus subtilis* is shown in Table 1 and the zones were 0.0mm each. The result of the antibacterial activity of the seed oil extracts of *Hildegardia barteri* against selected fungi is as shown in Table 2.

Table 1: Antibacterial activity of the seed oil extracts of *Hildegardia barteri* against bacteria

Test Bacteria Isolate	Average zones of inhibition (mm)	
	Streptomycin (Control)	***H. barteri* seed oil extract**
Escherichia coli	270	0
Staphylococcus aureus	390	0
Pseudomonas aeruginosa	365	0
Bacillus subtilis	385	0

Table 2: Anti-fungal activity of the seed oil extracts of *Hildegardia barteri* against selected fungi

Test Fungal Isolate	Average zones of inhibition (mm)	
	Fluconazole (Control)	***H. barteri* seed oil extract**
Trichophyton sp	0	0
Aspergillus niger	0	220
Candida albicans	0	0

Discussion

This present study has revealed the antibacterial activity of seed oil extracts of *Hildegardia barteri* against selected bacteria used in the study. The zones of inhibition of seed oil extracts of *Hildegardia barteri* against *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, and *Bacillus subtilis* were 0.0mm each. The results obtained shows that the seed oil extract of *Hildagardia barteri* had no growth inhibitory activity against *P. aeruginosa* and *B. subtilis.* In contrast, the positive control (Streptomycin) showed inhibitory activity against all the bacterial isolates used in this study (Table 1). However, the results obtained for seed oil extract of *Hildagardia barteri* which had no growth inhibition were at variance with the reports of (Ushiel and Adamu, 2010) where ethyl acetate extracts of *Borreria verticillata* showed inhibitory effect on *S. aureus* while hot and cold absolute ethanol extracts of dried mesocarp of *Vocanga africana* also showed antimicrobial activity against *S. aureus.* The antifungal sensitivity test of seed oil extract of *Hildagardia barteri* using agar well diffusion assay showed that there were no zones of inhibition on the growth against *C.albicans* and *Trichophyton* sp. and similarly there was no growth inhibitory activity when the positive control (Fluconazole) was used.

However, seed oil extract of *Hildagardia barteri* showed growth inhibitory activity against *Aspergillus niger* (Table 2). This report agrees with the works of Caccioni *et al*. (1998), which shows that Flemminello were inhibitory against *Penicillium digitatum* and *Penicillium indicum* but there was no zone of inhibition on the growth of *Trichophyton* sp. by fluconazole.

The lack of efficacy of the seed oil extract relative to the conventional antibiotics tested is an indication of the absence of the bioactive components in the extract (Dorr and Barnett, 1990). Again the findings from this research showed that the seed oil extract of *Hildegardia barteri* are not potential drug sources for the treatment of infections and diseases caused by *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Bacillus subtilis*, *Trichophyton* sp., *Candidas albicans* and *Asperillus niger* to humans. This study is in conformity with the reports of Adebayo *et al*. (2015), who reported that physicochemical characteristics of *Hildegardia barteri* seed oil extracted were fatty acid of myristic, palmitic, stearic and linolenic acids which are mainly saturated and unsaturated fatty acids. Therefore, the non-conventional seed oil extracts of *Hildegardia barteri* produced may find relevance in the food or biofuels industry subject to further investigations.

In conclusion, the present study shows that the seed oil extract of *Hildegardia barteri* had no antibacterial and antifungal effects. It therefore suggests that the seed oil extract of *Hildegardia barteri* cannot be a source of bioactive compounds that could be candidates in the treatment of disease associated with *E.coli*, *S.aureus*, *P.aureginosa*, *B.subtilis*, *C. albicans*, *A. niger* and *Trichophyton* sp. This work promotes *Hildegardia barteri* tree beyond its use as a mere ornamental plant. Originality/value - This study is the first to document the extraction and antimicrobial effects of *Hildegardia barteri* (*kariya)* seed oils.

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References

Abdel – Hafez, S. I. I., El-said, A.H.M. and Maghraby, T. A. (1995). Studies on fungi isolated from skin diseases and associated fungi of students in Qena and Red sea Governorates, Egypt. *Bull. Fac. Assiat. Univ. 24:* 181-209.

Adebayo, A.W; Ogunsina, B.S and Gbadamosi, O.S (2015). Effect of cold-pressing and solvent extraction on some characteristics of *Hildegardia barteri* (Kariya) seed oil. *Journal of Food Science*. *45(4)*: 625-633.

Bello, C.S.S., Elegba, O.Y. and Dada, J.D. (1983). Sexually transmitted Disease in Northern Nigeria. *British Journal of Veneral Diseases. 59*: 202-205.

Bodey, G.P. (1993). *Candidiasis pathogenesis, diagnosis and treatment*. New York, NY. Raven press. *pp*. 105-111

Burt S. (2004). Essential oils:their antibacterial properties and potential applications in foods –a review.*Int. Journal of Food Microbiol. 94 (3):* 223-253.

Caccioni, D. R. L., Guizzardi, M., Biondi, D. M., Renda, A. and Ruberto, G. (1998). Relationship between volatile components of citrus fruit essential oils and antimicrobial action on *Penicillium digitatum* and *Penicillium intalicum*. *Int. J. Food Microbiol. 43*: 73-79

Ciocan, I. D. and Bara, I. I. (2007). "Plant Products as Antimicrobial agents." *Sectiunea Genetica si Biologie Moleculara. Analele Stiintifice ale Universitatii, Alexandru Ioan Cuza*. *pp*151-156.

Dorr, L.J. and L.C. Barnett. (1990). A new species of *Hildegardia* (Sterculiaceae) from Somalia. *Kew Bulletin. 45*: 577-580.

Duru, C. M. and Onyedineke, N. E. (2010). " Invitro Antimicrobial Assay and Phytochemical Analysis of Ethanolic Extracts of *Vocanga africana* Seeds." *Journal of American Sciences*. *6(6)*: 625-627.

Fischetti, A. V., Novick, R. P., Ferretti, J. J., Portnoy, D. A. and Rood, J. I. (2001). *"Gram-Positive Pathogens."* ASM Press Washington DC. *pp* 367-371, 414-421.

Gill, A. O., Delaquis, P., Russo, P. and Holley, R.A. (2002). Evaluation of anti-listerial action of Cilantro oil on vacuum packed ham. *Int. Food Microbiol. 73*: 83-92.

Goodman, J.S. and Koenig, M.G. (1970). *Nocardia* infections in a general hospital. *Ann. NY. Acad. Sci. 174*: 552-567.

Gugnani, H.C., Wattal, B.L. and Sandhu, R.S. (1975). Dermatophytes and other Keratinophitic fungi recovered from small mammals in India. *Mykosen. 18:* 329-538.

Holley, R.A. and Patel, D. (2005). Improvement in shelf-life and safety of perishable foods by plant essential oils and smoke antimicrobials. *Food Microbiol*. *22:* 273-292.

Jamil, B. (2007). "Isolation of Bacillus subtilis mit-4 from soil and its potential of polypeptide antibiotic production". *Pak J. Pharm Sci. 20(1)*:26-31.

Karou, D., Tchadjobo, T., Ilboudo, D. and Simpore, J. (2011). "Sub-Saharan Rubiaceae:A Review of their Traditional Uses, Phytochemistry and Biological Activities." *Pakistani Journal of Biological Sciences*. *14(3)*: 149-169.

Lee, M.M. Diven, D.G. Smith, E.B. and Pupo, E.B. (1990). Onychomycosis. *Archives of Dermatology. 126:* 402.

Limla, O.F., Lantero, M.I. Batan Court, A. Armas E. and Villoch, A. (2004). Prevalence of *Candida albicans* and *Trichophyton vaginalis* in pregnant women in Havana city by an immunological latex agglutination test. *Medscape General Medicine*. *6(4)*: 50.

Ogbonna, A. I., Makut, M. D., Gyar, S. D. and Adamu, E. U. (2007). "Antimicrobial Activity of the Ethanolic Extracts of the Seed of *Ricinus cummunis* L." *Nig Journal of Biotechnology*. *18:* 40-43.

Okwu, D. E. and N. F. Uchenna. (2009). "Exotic Multifaceted Medicinal Plants of Drugs and Pharmaceutical Industries." *African Journalof Biotechnology*. *8:* 7271-7282

Prescott, M. L., Harley, J.P. and Klein, D. A. (2002) 5th Ed. *"Microbiology"* McGraw-Hill Pub. New York. *pp* 506, 813-816, 973-978.

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Sofowara, A. (1993). "Medicinal plants and Traditional Medicine in Africa." Spectrum Books ltd, Ibadan, Nigeria. *pp* 30-35

Talaro, K. P. and Talaro, A. (2002). 4th Ed. *"Foundations in Microbiology."* McGraw-Hill Inc. New York. *pp* 546-551, 614-615.

Trease, G. and Evans, W. (1996) 12th Ed. *"Pharmacognosy"* Alden Press, Oxford.

Ushiel, O. A. and Adamu, H. M. (2010). "Phytochemical Screening of *Borreria verticillata* Leaves." *Journal of Agriculture, Biotechnology and Ecology*. *3(1)*: 108-117.

White, K. (1997). Desseminated Candidiasis changes in incidence underlying Diseases and Pathology. *American Journal of Clinical Pathology*. *65:* 30.

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