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Antifungal Activity of Medicated Soap Produced from Stem Bark Extract of *Anogeissus leiocarpus* Plant

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Abstract
Ethanolic extract of the stem bark of *Anogeissus leiocarpus (A. leiocarpus)* plant was used as an additive to produce medicated soap. The pH, moisture contents, chloride contents, total fatty matter, insoluble impurity of the medicated soap was determined. The antifungal activity of the medicated soap against *Aspergillus niger* (*A. niger) and Penicillum expansum* (*P. expansum)*, was also determined. The results showed that the medicated soap produced has pH (10.7), moisture contents (17.0%), chloride contents (0.55%), total fatty matter (39.5%) and insoluble impurity (3.18%). The results of the antifungal activity showed that the medicated soap produced has activity against A. *niger* (9.0 mm) and *Penicillum expansum* (5.0 mm). These results agreed with the claims by the traditional healers that the plant can be used in producing medicated soap.

Keywords: *Penicillum expansum*, plants, soap, medicinal, total fatty matter

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Introduction
Demands for skincare products such as skin toning and rejuvenating damaged or aged skin is on the increase in Africa. There has been a surge in skincare products to the extent that improper use of skincare products has emerged. De-pigmentation of skin and especially the face is a common problem, especially in Urban Areas. The partial cause of this problem is inadequate public enlightenment and an inadequate regulatory mechanism. Interest to refer to natural products for skincare is, therefore, an emerging area. Strategic mechanisms to harness available natural plant-based products for skincare and treatment is an urgent area to be addressed (Ernest, 2001).

The World Health Organization estimated that perhaps eighty percent of the inhabitants of the world rely chiefly on traditional medicine (Sexana, 2001) and the use of plants for traditional medicine purposes dates back to antiquity (Ogunyemi, 1991). Many of the plant's materials used in traditional medicine are readily available in rural areas and this has made traditional medicine relatively cheaper than modern medicine. Over sixty percent of Nigeria rural population depends on traditional medicine for their health care need (Apulu *et al*., 1992). Medicinal properties of plants are normally dependent on the presence of certain phytochemicals such as alkaloids, anthraquinones, cardiac glycosides, saponins, tannins polyphenols, etc., which

are the bioactive compounds responsible for the antimicrobial's property (Ebana *et al*., 1993). Medicinal plants contain a pharmacologically active compound that over the years has been exploited in traditional medical practices for the treatment of various ailments (Kubmarawa *et al*., 2007). Soaps that kill or inhibit the growth of microorganisms such as bacteria, viruses, molds, slime, fungi etc., are called medicated soaps. The antimicrobial agent could be synthetic chemicals or plants or animal extracts (Phuonget *et al.,* 2008).

In ethnormedicine *A. leiocarpu*s is employed in the treatment of variety of diseases. Hot aqueous extracts of the leaves are used in the treatment of stomach, rheumatic pains, inflammatory disorders, and dysentery (Irvine, 1961; Etta, 1984). An indication that plant leaves may possess antiflammatory and analgesic properties among others. The roots and leaves are used for nausea, colic and in epilepsy management (Bouquet *et al*., 1971; Iwu, 1993). In eastern parts of Nigeria, the young leaves are used as vegetables for sauces and porridge for meals. The anti-hypertensive effects of extracts of the stem bark has been reported by Olusola *et al*., 1997. Extracts of stem bark of *A. leiocarpus* have also demonstrated some level of invitro activity against *Trypanosoma brucei* (Atawodi, 2005). The aqueous methanol extract, has exhibited anti-diarrhea activity (Agunu *et al*.,2005). The fruit is used to improve fertility and to treat anemia, jaundice, leprosy and dysentery (Orwa *et al*., 2009). The root is used for gonorrhea treatment and women drink a decoction of it for backaches while the young tender leaves are pounded and the juice squeezed into the eyes to treat infections (Kubmarawa *et al*., 2007; Orwa *et al*., 2009). Therefore, the aim of this research was to produce medicated soap from stem bark extract of *A. leiocarpus* and determine its antifungal activity.

Materials and Methods

Sample Collection and Preparation

The stem bark of *A. leiocarpus* used in this study was collected in May, 2020 from Hong local government area of Adamawa state, Nigeria. The plant was identified by Dr Zakari B. Garba in the Department of Biological Sciences, Modibbo Adama University of Technology, Yola. The plant samples were air-dried at room temperature for three weeks after which, the dried plant sample were grounded into powder using mortar and pestle. The powdered plant samples were used for extraction.

Extraction of Plant Sample

200g of the powdered plant samples were macerated in 500ml hydro-alcoholic solution (ethanol 70% water 30%) with occasional shaking for 72hrs and then filtered using Whatman filter paper No 1. The filtrate was concentrated using a rotary evaporator at 40^{o} C.

Test Microorganisms

The following microorganisms were used in this study: *A. niger and Penicillum expansum.* They were all obtained from microbiology laboratory of federal medical centre, Yola. Cultured on Potato Dextrose Agar plates for 3 days at 25°C.

Formulation of the Medicated Soap

The boiling process was used during the soap preparation. 40ml of the oil mixture (Palm Kernel and Cotton seed oil) was place in the 500cm^3 beaker and 5.0g of the *A. leiocarpus* extract was added. 4.0g of Sodium hydroxide (NaOH) in 20cm^3 of water was added to the mixture of oils and extract in the beaker. The mixture was heated for an hour in a water bath, maintaining the temperature in the range of 80 - 90^{0}C with frequent stirring at a time interval. 1 drop of distilled water was added occasionally to prevent the content of the flask from becoming solid due to evaporation of water and alcohol during heating. After one hour of heating, 100cm^3 of a saturated solution of sodium chloride was added to the hot mixture and let to cool. The addition of the salt solution throws the soap out of solution ("salting out"). The soap float on the surface of the solution, it was filtered and placed in a mold to dry.

Determination of Antifungal Properties of Soap

The antifungal properties of the soap were determined using the radial growth method (Banso *et al*, 1999). Solutions of the soap were made. 0.05mg/ml of the solution was introduced into McCartney bottles containing 18ml of sterile potato dextrose agar. The mixtures were poured into Petri dish and allow to solidify. The plates were inoculated with 5mm diameter of the fungal culture. Plates were incubated at 25ºC for 72 hours. Antifungal activities were expressed in terms of diameter of growth in millimetre (mm).

Quality Determination of Soap

P^H Determination

Soap was grated into fine particles, 10g of the fine flakes was weighed into a beaker, and 10ml of distilled water added and dissolved completely by continuous stirring. The pH of the solution was determined using a pH meter.

Determination of Chloride Content

The soap was scrapped with knife to give fine flakes. 1g was weighed into a conical flask and dissolved in 30ml of distilled water. The soap solution was titrated with 0.1M $AgNO_3$ using K_2CrO_7 as indicator. The chloride content was calculated using the formula.

$$Chloride\ content\ \% = \frac{Titre\ value\ x\ 0.00345}{Weight\ of\ sample\ taken} x\ 100$$

Determination of Total Fatty Matter

3g of the soap sample was boiled with 75ml of distilled water and the solution cooled. The mixture was separated using a separating funnel, 75ml of ether and 5ml of dilute H_2SO_4 were added, shaken well and allowed to separate. The lathered layer was collected and extracted repeatedly with two quantities each of 25ml of ether. The ether extract was washed with water to neutralize the reaction using methyl orange as indicator. It was then filtered through anhydrous Na_2SO_4 (on glass wool) and evaporated to dryness in a conical flask (Previously weighed). The conical flask was cooled and reweighed. The total fatty matter was calculated as:

$$\text{Total fatty matter} = \frac{a}{b} x\ 100$$

Where a = weighed of residue in the flask

b = weight of sample taken

Determination of Insoluble Impurity

Five grams (5g) of grated soap sample was measured and dissolved in 50ml of kerosene; it was warmed to affect the dissolution of the oil. It was then filtered through a weighed filter paper. The filter paper together with the residue was dried in an oven and then cooled in a desiccator and reweighed. Insoluble impurity was calculated as:

$$\text{Insoluble impurity} = \frac{a - b}{C} \times 100$$

Where a = weight of filter paper plus residue

Where b = Weight of empty filter paper

c = Weight of sample

Results and Discussion

The pH of the soap produced was found to be 10.7 which fall within the stipulated range limit of soap by NAFDAC (9.5-12.0). Tetmosol and Dermocare sold in the market have pH of 10.9 and 10.5 respectively, which also falls within the pH limit. Moisture content of the soap produced was found to be 17.0 %. The result of moisture content (17.0%) obtained from the soap produced from ethanolic extract of *A. leiocarpus* was within the maximum limit required by NAFDAC which is (31% max.) compared to those of tetmosol and dermocare with values of 13.4% and 12.5% respectively. The chloride content of the soap produced was found to be 0.55 %, which falls within the permissible limit by NAFDAC, compare to those of tetmosol and dermocare with values of 0.46% and 0.40% respectively. Total fatty matter of the soap produced was found to be 39.5 % and the value was less than the minimum value stipulated by NAFDAC which is 62.0%. This may be due to some impurity present in oils blended for the soaps making. The results obtained for tetmosol and dermocare sold in the market are also less

than the minimum required by NAFDAC, which is 41.4% and 40.7% respectively. An insoluble impurities value was found to be 3.5 % for the soap produced. It falls within the maximum limit required by NAFDAC which is 5.0%, Max. Tetmosol and dermocare soap have insoluble impurity values of 3.2% and 3.0% respectively. That means the produced soap has high insoluble impurity than the one sold in the market.

Table 1: Some physicochemical characteristics of soap produced compared to some soaps sold in the market

Parameters Determined	Soap Produced	Tetmosol Soap	Dermocare Soap	Limit (NAFDAC)
P^H	10.7	10.90	10.50	9.50 – 12.0 Max
Moisture Contents %	17.0	13.40	12.50	31 Max
Chloride Contents %	0.55	0.46	0.40	1.0 Max
Total Fatty Matter %	39.50	41.40	40.70	62.0 Min
Insoluble Impurity %	3.18	3.20	3.00	5.0 Max

Table 2: Antifungal activity of the soap produced compared with some soaps sold in the market

Microorganisms	Zone of Inhibition (mm)		
	Soap produced	Tetmosol	Dermocare
A. niger	9.0	6.0	6.2
P. expamum	5.0	8.0	9.5

The results of the antifungal activity showed that the medicated soap produced has activity against A. *niger* 9.0 mm and *P. expansum* 5.0 mm. (Table 2) antifungal activity of the *produced* soap 9.0 mm against *A. niger* was higher than that of the tetmosol and dermocare with 6.0 mm and 6.2 mm respectively. These results agree with the claims by the traditional healers that stem bark of *A. leiocarpus* plant can be used as a remedy to Fungal Infection.

Conclusion

The results obtained from this study showed that the soap produced from the ethanolic extract of stem bark of *A. leiocarpus* has antifungal properties on the test organisms. These results agreed with the claim by the traditional medical practitioners that the stem bark extract of *A. leiocarpus* can be used to cure skin infections caused by fungi.

Recommendation

This soap is in no way inferior to commercial medicated soaps sold in the market ineffectiveness, hence interest should be referred to the available natural plant-based product for skincare and treatment than soaps produced from chemical reagents causing depigmentation of the skin.

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