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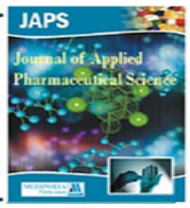


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# Inhibition of Pathogenic Microorganisms by Ethnobotanical Extracts of Fruit Peels of *Musa paradisiaca*

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**ABSTRACT**

Ethanolic and water extracts of fruit peels of *Musa paradisiaca* were investigated for antimycotic activities and phytochemical properties on *Trichophyton rubrum, T. mentagrophytes, Microsporum canis, Microsporum audouninii* and *Epidermophyton floccosum*. The phytochemial analysis revealed that saponins, alkaloids, phenols, flavonoids and tannins were the active compounds. The agar diffusion method was used to assay for the antifungal properties on the test isolates the standard drug used was fluconazole. The results showed that the extract at different concentrations inhibited the growth of all the test isolates. The ethanolic extract was more effective than the water extract of the plant and zones of inhibition increased with increase in concentration of extract the result of this investigation demonstrate the potentials of *Musa paradisiaca* extracts as a source of chemotherapeutic agent that could be harnessed for use in health care delivery. This work also authenticates the use of *Musa paradisiaca* in traditional soap production which is used by some people to treat skin infections.

**Keywords:** Antifungal, ethanolic extract, Musa paradisiaca, Phytochemical, Plant extract, water extract.

## INTRODUCTION

Phytochemicals are substances that plants naturally produce to protect themselves against viruses, bacteria and pharmacologic effects. *Dracaena manni* contains a variety of phytochemicals –alkaloids, glycosides, flavonoids and tannins (Banso and Adeyemo, 2007). These phytochemicals also reported to have growth inhibitory effect on *Eschericha coli, Proteus vulgaris, Staphylococcus aureus and Streptococcus pyrogenes*, thereby making the plant a potential antimicrobial agent. Furthermore, Chukwuedo *et.al.,* (2007) revealed the presence of resin, tannin, alkaloid, flavonoids and sulphur in the leaf of *Nelsonia canecan* which was used to treat foot – rot in ruminant. The animals did not show any adverse effects which implies that the extract is not toxic. Plantain (*Musa paradisiaca*) is popular in West and Central Africa, which accounts for about 49.60% of the world production; followed by South America, 25.10%; Asia and Central America 15.70% and 9.6% respectively.

Over 45million tonnes is now produced worldwide (Udoh *et.al.*, 2005). *Musa paradisiaca* are starchy staple foods, which are fried, baked, boiled, roasted and consumed alone or together with other foods. About 70million people in West Central Africa are estimated to derive more than one quarter of their food energy requirements from plantains while also consuming banana as a fruit dessert. *Musa paradisiaca* is a giant herb. The pseudostem (false stem) are cylindrical in structure, arise from an underground rhizome and carry the foliage. The growing tips (or meristem) of the plantain remain near the soil level. The pseudostem consist of overlapping leaf sheaths which renders support to the rachis of the mother plant. The plant require a hot and humid environment. Thus, the tropical climate is most suitable. An average temperature of $30^0$C and a rainfall of at least 100mm per month are ideal. Plantains do not tolerate very strong winds and fall more readily than do banana plants. They perform on poor soils because they are a bit less demanding on nutrients (Udoh *et.al.*, 2005). The fruit peel and stalk of *Musa paradisiaca* are claimed to be medicinal and also are used as one of the raw material used to manufacture the traditional black soap used by some people to treat/ prevent various skin infections both for adults and children. However Myina (1996) observed that this soap is being used in combination with other chemical substances for the treatment of acne, eczema, black spots and scabies. Despite its poor colour and odour, the traditional black soap is believed by many of its users to be more effective than the conventional modern ones. In West Africa, traditional soap making had been practiced before the introduction of modern soap making techniques (Onuchukwu, 1989). This work was therefore undertaken to authenticate the plants antifungal potentials.

## MATERIALS AND METHODS

### Plant collection, preparation and extraction

Fresh plantain fruit peels were gotten from plantain fruit bought from Ekonu-nwa Market in Owerri Metropolis, Imo state, Nigeria. 200gm of the oven dried plantain fruit peel was ground into fine powder using a mechanical grinder. About 20gm of the fine powder was weighed into 250ml of ethanol (95%) in a conical flask. This was covered, shaken every 30 mins, for 6hrs and then allowed to stand for about 48hrs. The solution was filtered using Whatman No1. filter paper. The filtrate was evaporated to dryness using a rotary evaporator. The extract was stored in the refrigerator.

## PREPARATION OF CRUDE EXTRACT

The method of Akujobi *et. al.*, 2004 was adopted. The crude extract was diluted with 30% dimelthylsulphoxide to obtain 250mg/ml, 200 mg/ml, 150mg/ml, 100mg/ml, and 50mg/ml concentrations. To obtain the Hot water extract, 200gm of the crude extract were weighed out and extracted with 200ml of distilled water for 4hours. The resultant infusion was filtered using Watman filter paper. It was further subjected to evaporation on a hot plate and stored in air tight plastic containers in a refrigerator at $10^o$C. it was then diluted to the desired concentrations and used as the need arises.

### Test Microorganisms

Test organisms for screening, *Trichophyton rubrum*, T. *mentagrophytes*, *Microsporum canis*, *M. audouinii and Epidermophyton floccosum* were isolated from active lesion from school children suffering from dermatophytosis infections from some Primary schools in Owerri town. The criteria for identification were based on reference to Rebell and Taplin 1970 and Campbell and Stewart, 1980.

## TEST FOR ANTI FUNGAL PROPERTIES

The Agar diffusion technique was used in the investigation following methods described by Pelezer and Chan (1977), Cheesbrough (1984) and Miller *et. al*., (1984). Circular disc of 7mm diameter were punched out from Whatman No: 1 filter paper, the disc were wrapped in an Aluminium foil and kept in a glass plate, the plate and the forceps were autoclaved for 15min at $121^0$C. The sterile paper discs were placed in petri dishes containing Sabouraud Dextrose Agar and impregnated with o.1ml of the plant extract using sterile pipette. They were then dried in hot air oven at $40^0$C for 20minutes. A sterile swab stick was used to seed the agar plate with the test organisms. The plates were incubated by inverting them in an incubator set at $37^0$C for 72hours. The diameter of the observed inhibition zones were measured with transparent metric ruler. A control disk containing fluconazole 150mg/ml was used as control.

The minimum inhibition concentration of the extracts was determined by using the tube method (Atlas, 1995). This is defined as the least concentration of extract that showed an inhibitory effect on any of the test dermatophytes. It was recorded as the MIC.

### Preliminary phytochemical analysis of plant extract

This was carried out according to the methods described by Trease and Evans (1989).

## RESULTS

Table 1 shows the result of the Phytochemical screening of fruit peel of *Musa paradisiaca*. The screening revealed that the extract contains alkaloids, flavonoids, phenols, saponins and tannins. The sensitivities of different concentrations of the ethanolic and hot water extract of *Musa sp* against various fungi are shown in tables 2 and 3.

All the plant extracts had antifungal properties, though, the ethanolic extract was more effective than the water extract of the plant. The highest effect was exhibited on *Microsporum canis* at 250mg/ml concentration with zone diameter of 18.50mm, while the least was on *Microsporum audouinii* at 50mg/ml concentration with zone diameter of 1.20mm. In general, the zone of inhibition increases with increase in the concentration of the extract both in ethanolic and hot water extract.

**Table. 1:** Phytochemical screening of fruit peel of *Musa sp*.

| TEST | Remark |
|---|---|
| Alkaloids | + |
| Anthranoids | - |
| Anthraquinone | - |
| Flavonoids | + |
| Phenols | + |
| Phlobatanins | - |
| Saponins | + |
| Tannins | + |

**Key**: (+) = present
(-) = absent

**Table. 2:** Sensitivities of different concentrations of the ethanolic extract of *Musa sp* against various fungi.

| | Zone of inhibition (mm) | | | | |
|---|---|---|---|---|---|
| Concentra -tion of extract mg/ml | *T. rubrum* | *T. mentagrophytes* | *M. canis* | *M. audouinni* | *E. floccosum* |
| 250 | 17.5 | 15.51 | 18.50 | 16.60 | 13.50 |
| 200 | 17.0 | 14.61 | 18.00 | 16.10 | 13.00 |
| 150 | 15.5 | 11.10 | 15.50 | 10.00 | 9.50 |
| 100 | 11.1 | 7.21 | 12.10 | 6.10 | 3.11 |
| 50 | 5.5 | 4.00 | 6.50 | 4.21 | 2.50 |

**Table. 3:** Sensitivities of different concentrations of the Hot water extract of *Musa* sp against various fungi.

| | Zone of inhibition (mm) | | | | |
|---|---|---|---|---|---|
| Concentra -tion of extract (mg/ml) | *T. rubrum* | *T. mentagrophytes* | *M. canis* | *M. audouinni* | *E. floccosum* |
| 250 | 12.03 | 10.40 | 11.70 | 10.50 | 8.50 |
| 200 | 11.05 | 9.40 | 11.11 | 9.45 | 5.40 |
| 150 | 13.20 | 5.50 | 8.01 | 4.50 | 2.20 |
| 100 | 8.40 | 2.45 | 4.25 | 2.50 | 2.00 |
| 50 | 2.14 | 1.30 | 2.10 | 1.20 | 1.40 |

## DISCUSSION AND CONCLUSION

Result obtained from this study showed that both ethanolic and water extracts of fruit peel of *Musa sp* have antifungal properties which inhibited the growth of all test organisms. This findings is in agreement with the findings of Okechukwu *et. al*., (2009), Banso and Adeyemo, (2007), Chukwuedo *et. al*., (2007), who found that various extracts of plants inhibited the growth of some microorganisms. High concentration of the extracts resulted in increased antifungal activity. As compared to the control fluconazole could be explained by the pure nature of the chemical compound as against that of the plants extract which are still crude and impure.

Preliminary phytochemical screening revealed the presence of alkaloid, flavonoids, phenols, saponins, tannins. These secondary plants metabolites are believed to be responsible for the observed antifungal effects. Also some parts of *Musa sp* plants like the fruit peel under investigation and the stalk which are used for black soap production may be possible because of the presence of saponins and phenols dictated during the preliminary phytochemicals screening. This phytochemicals have a distinctive foaming, soapy characteristics.

In conclusion, the result of this investigation demonstration the potentials of *Musa paradisiaca* extract as a source of chemotherapeutic agent that could be harnessed for use in the health care delivery. This work also authenticate the use of *Musa sp*. in soap production which is believed by many of its users to be effective than the conventional modern ones.

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