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## Research article

### COMPARISON OF POTENCY OF ANTIFUNGAL ACTION OF DANDRUFF SHAMPOOS AND DIFFERENT PLANT EXTRACTS

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#### ABSTRACT

**Context:** Dandruff a very common scalp disorder with high prevalence in population is caused by numerous host factors in conjunction with *Malassezia furfur*. Most of the commercially available anti-dandruff hair shampoos contain some form of antifungal agent(s) that appear to reduce the incidence of the disease. There are no good scientific studies done to prove the antifungal activity of commercially available hair shampoos. **Aim:** In this study commercially available shampoos were assessed for antifungal activity against a human dandruff isolate of *M. furfur*. The shampoos were Head & Shoulders, Clinic All Clear, and Pantene etc. The results demonstrated that all six of the assayed hair shampoos have some antifungal effect on growth of *M. furfur*. These products have poor efficacies, more side effects and give scope for recurrence of symptoms. **Methods and Materials:** Therefore different plant extracts that possess various active compounds which have antifungal activity could help to overcome the incidence of the disease and also avoid the emergence of resistance in the pathogen. The plant extracts were tested in different concentrations like 1:5, 1:10, 1:20 and they were hibiscus, neem, soap nut, etc. The inhibitory action was studied using agar well assay and disc diffusion method and the results indicated in percentage of inhibition. **Conclusion:** The study was significant as not only efficient known plant products with anti-dandruff activity could be compared with commercially available shampoos but also their better efficacies at minimum concentrations could be identified. This can help make a polyherbal mixture that could be incorporated in hair oil or shampoos for better anti-dandruff activity.

**Keywords:** *Malassezia furfur*, Dandruff, plant extracts, anti-dandruff hair shampoos

#### INTRODUCTION

*Malassezia species* formerly known as *Pityrosporum* is a lipophilic, dimorphic opportunistic yeast causing skin and hair infections like *Pityriasis versicolor*, seborrheic dermatitis and dandruff, etc<sup>[1][2]</sup>. Dandruff medically described as *Pityriasis capitis* is caused by *Malassezia species* like *M.furfur*, *M.globosa*, *M.restricta*<sup>[3]</sup>. It is a common scalp disorder and also a major cosmetic problem as it causes hair fall<sup>[4]</sup>. It has been investigated and reported that there was no complete cure for this disease. This disease is of global prevalence and needs effective therapeutic

remedy. There are natural effective remedies to control dandruff in Ayurveda<sup>[5]</sup> but presently people are depending on commercial shampoos containing some antifungal compounds like miconazole, ketoconazole, selenium sulphide etc. Plant products contain various compounds like alkaloids, flavanoids, tannins, terpenoids etc which have efficient antifungal activity<sup>[6] [7]</sup>. These compounds can be used in combination as polyherbal mixtures for controlling dandruff. The present work was a comparative study of the effect of commercial anti

dandruff shampoos and natural plant products to evaluate their anti fungal efficacy. There are no reports of such comparative study and this study gives significant information about the higher antifungal efficiency of natural products at low concentration which can be exploited for commercial poly herbal preparations.

**Aim:** The present study was undertaken to find the comparison of efficacy of different types of plant extracts verses chemical shampoos.

## MATERIALS AND METHODS

**Isolation of culture:** In the clinical study the organism was isolated from scalp of person suffering from Dandruff and maintained on Sabouraud's media<sup>[8]</sup> (which is a defined selective media for medically significant fungi and inhibits growth of normal flora) slants and stored in refrigerator at 4<sup>0</sup>C for one month.

**Growth and Identification:** The isolate was screened by plating the scalp swab on Sabouraud's media enriched with 2 % lipid source like olive oil. The organism was identified based on cultural, microscopic and biochemical methods.

**Cultural:** Growth pattern and colony morphology was observed on Sabouraud's media enriched with a lipid source like olive oil/ butter<sup>[9]</sup>.

**Microscopic:** Gram stained smear of the culture was observed under microscope for cell morphology<sup>[10]</sup>.

**Biochemical:** The organism was biochemically tested

by using gelatin hydrolysis test, litmus milk reaction, fermentation of carbohydrates like dextrose, xylose, rhamnose, raffinose and mannitol and the results were recorded<sup>[11]</sup>.

**Inoculum preparation:** The inoculum of *Malassezia furfur* was prepared by inoculating in 5ml of Sabouraud's broth and incubated at 30<sup>0</sup>C such that there are 10<sup>6</sup> cell/ ml<sup>[12]</sup>.

**Dilution of shampoos:** The commercially available shampoos as mentioned in (Table 1) along with their active ingredient were diluted with sterile distilled water to get 10 fold, 20 fold dilution. These were used for antifungal assays.

**Table 1: Active ingredients in different commercially available shampoos**

Active antidandruff ingredients	Shampoos
Zinc Pyrithione	Head and shoulders, Pantene, Garnier, Loreal
Selenium sulphide	Head and Shoulders, Nuetrogena
Ketoconazole	Nizoral , Vivel Ultra Pro

**Preparation of plant extracts:** The different plant sources tested are mentioned in (Table 2) along with their generic names, appropriate plant part used and dosage<sup>[7]</sup>. The plant part was collected from the plant source washed thoroughly, cut into smaller pieces and ground into fine paste. The fine paste was made into a solution with sterile distilled water, centrifuged at 5000 rpm and the supernatant was used as sample for anti fungal assays.

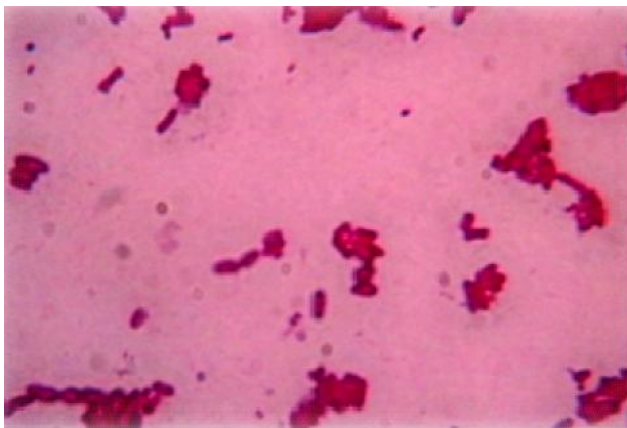
**Table 2: Different plant extracts used and their common names<sup>[7]</sup>**

Scientific name	Plant part used for extraction of active compound	Part used	Extracted i.e. Alcohol/ aqua	Dose used for antifungal activity
<i>Azadirachta indica</i>	Neem	Leaf	Water	1:10
<i>Piper betle</i>	Betel leaf	Leaf	Water	1:5
<i>Ocimum tenuiflorum</i>	Tulsi	Leaf	Water	1:5
<i>Murraya koenigii</i>	Curry leaf	Leaf	Water	1:5
<i>Hibiscus rosasinensis</i>	Hibiscus flowers	Flower	Water	1:5
<i>Aloe vera</i>	Aloevera	Leaf	Water	1:20
<i>Coriandrum sativum</i>	Coriander	Leaf	Water	1:5
<i>Mentha asiatica</i>	Mint	Leaf	Water	1:5
<i>Phyllanthus emblica</i>	Amla	Fruit	Water	1:20
<i>Citrus limon</i>	Lemon	Fruit	Water	1:20
<i>Sapindus mukorossi</i>	Soapnut	Fruit	Water	1:20
<i>Alpinia galangal</i>	Dumparashtram	Root	Water	1:5
<i>Lawsonia inermis</i>	Henna	Leaf	Water	1:10
<i>Hibiscus rosasinensis</i>	Hibiscus leaves	Leaf	Water	1:5

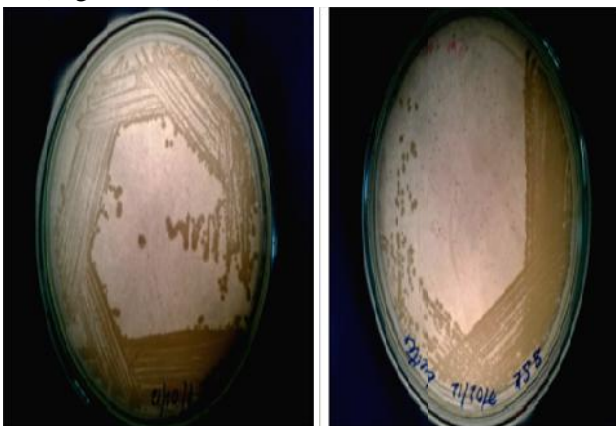
**Antifungal Assays:** The antifungal activity of antifungal shampoos and plant extracts was tested by disc diffusion method and agar well assay<sup>[13]</sup>.

**RESULTS**

*Malassezia furfur* grew as white to tan cream colored colony with smooth pasty consistency on Sabouraud's media and the cells appeared bottling shaped when observed microscopically (Fig 1). The Biochemical studies indicated that fermentation of dextrose and xylose produced acid but no gas. Maltose, lactose, rhamnose, raffinose and mannitol were not fermented by *M. furfur*. Liquefaction of gelatin was observed and there was acidification of litmus milk.



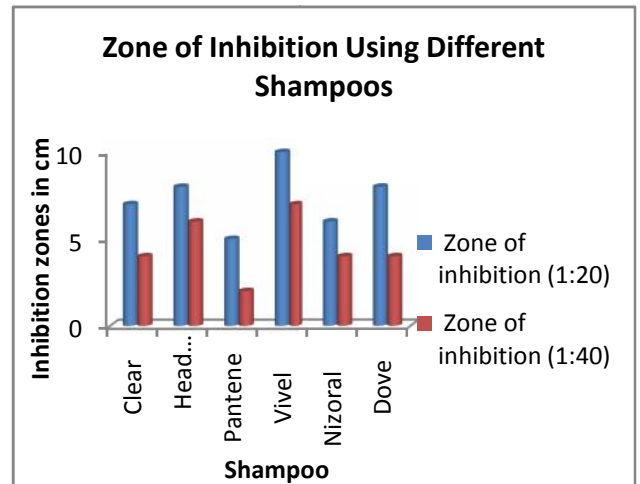
**Fig 1: Microscopic observation of *Malassezia furfur***  
**Effect of lipid source on the growth of *M. furfur*:** Among the fatty substances tested, *M. furfur* grew well in Sabouraud's dextrose broth and agar medium containing olive oil followed by butter, coconut oil etc (Fig 2 A and B).



**Fig 2 A and B: Growth of *Malassezia furfur* on Olive oil (A) and butter (B)**

**Antifungal Assay:** Among the Antidandruff shampoos tested every shampoo showed a very good

zone of inhibition. The highest was for Vivel followed by Head and Shoulders and Dove (Fig3).

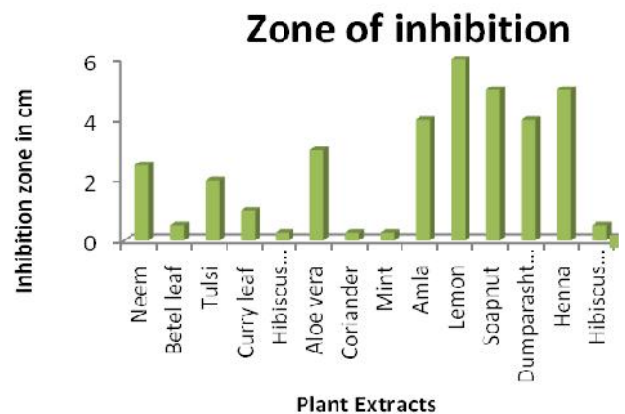


**Fig 3: Anti fungal activity of different shampoos, represented by zone of inhibition (in cm)**

The zones of inhibition of different plant extracts indicated significant antifungal activity on *Malassezia furfur* (Fig 4).



**Fig 4: Plates showing zone of inhibition for different plant extracts**



**Fig 5: Anti fungal activity of different plant extracts, represented by zone of inhibition (in cm) on *Malassezia furfur***

Among the plant extracts tested Lemon showed the highest zone followed by Soap nut, Henna, Aloe vera and Neem (Fig 5). Comparatively the plant extracts shampoos showed a high zone of inhibition than the shampoos. The inhibition zones of antidandruff shampoos at low concentrations almost matched with those of plant extracts.

## DISCUSSION

Dandruff is a common disease caused by *Malassezia species* especially *Malassezia furfur*. The lipolytic activity of these organisms induces hydrolysis of human sebum tri-glycerides into free fatty acids that cause both hair loss and scalp [14]. Medically significant fungi are known to grow on Sabouraud's agar medium. The present isolate being lipolytic grew well on olive oil and Butter enriched medium this is in accordance with other reports on growth of *Malassezia* [15].

All the antidandruff shampoos had good antifungal activity but there is considerable variation in the potency of their antifungal activity depending on the active compound and its concentration. In the present study the best antidandruff shampoo was Vivel Ultra Pro as it contains Ketokonazole which is reported to be anti-malassezial agent [16]. This was followed by Dove and Head and Shoulders as they contain antifungal compounds like Zinc Pyrithione. Most of the plant extracts were showing good antifungal activity almost equivalent to that of commercially available shampoos. Lemon, Henna, Soap nut, Amla had more antifungal activity and this could be because of their active compounds like Citric acid in Lemon and Amla and Saponins in Soap nut [17]. As there are no reports of such comparative aspect the present study gives significant information about the higher antifungal activity of natural products at low concentration which can be exploited for commercial poly herbal preparations. Use of natural plant products is not only cost effective but also negligible side effects. [18] [19].

## CONCLUSION

The present study was significant as not only efficient known plant products with anti-dandruff activity could be compared with commercially available shampoos but also their better efficacies at minimum

concentrations could be identified. Further this research work can help make a polyherbal mixture that could be incorporated in hair oil or shampoos for better anti-dandruff activity.

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