

Herbal plants excellence on dandruff comparatively with commercial hair care products solace to women

¹Saranya. K, ²Karthiga laxmi. T. R. S, ³Karthika. S, ⁴Sangeetha. Y, ⁵Ramesh Babu N. G

¹Associate Professor, ^{2,3,4}Student, ⁵Professor and Head
Department of Biotechnology
Adhiyamaan College of Engineering, Hosur-635 109, Tamil Nadu, India

Abstract: Many anti-fungal shampoos, whether synthetic or herbal, are commercially marketed all over the world. The present study deals with the efficacy of different herbal extracts, shampoos and oils on dandruff causing fungus isolate *Malassezia*. Isolation of *Malassezia* was carried out by using sabouraud dextrose agar (SDA). Different herbal extracts of *Phyla nodiflora*, *Carcia papaya*, *Centratherum punctatum*, *Indigofera tinetora*, *Capsicum frutescens*, *Moringa oleifera*, commercial shampoos and oils were taken to test the effectivity against *Malassezia* using adar cup method. Dilution of samples at different concentrations 5%, 15%, 25%, 50% and 75% (v/v) and Minimum Inhibitory Concentration (MIC) method was performed. In agar cup method, Zone of Inhibition formed in *Centratherum punctatum*, *Phyla nodiflora*, Shampoos A and B. In MIC method, Zone of Inhibition formed in *Centratherum punctatum* at 75%, 50%, 25%, 15% and 5%, *Phyla nodiflora* at 75% and Shampoo B at 75%, 50% and 25%. Herbal extracts proved to be more effective compared to synthetic shampoo and oil as the herbal extracts have lesser adverse effects than the latter. The highest Zone of Inhibition was obtained in *Centratherum punctatum* extract.

Index terms: Dandruff, Herbal extracts, *Malassezia*, MIC, and SDA

1. INTRODUCTION

Women were not given due care for health status. According to reports, in India, the life expectancy at birth of women has increased to an average of 68.3 years. The health and nutrition status of women leaves much scope for improvement. The health of women is linked to their status in the society parallel. One of such health defects is Dandruff, a very common scalp disorder with high prevalence in the women population all over the world. It is caused by numerous host factors in conjunction with *Malassezia sp.*^[1] Dandruff cannot be completely cured, but can be controlled. In general, Dandruff occurs after puberty in Females and persists a lot many more years.

The pathogenesis of dandruff involves hyper-proliferation, resulting in deregulation of keratinization. Dandruff scale is a cluster of corneocytes.^[2] It has a large degree of cohesion with one another and detach as such from the surface of the stratum corneum. A more severe form of the condition, which includes inflammation of the skin, is known as seborrhoeic dermatitis. It has retained a large degree of cohesion with one another and detach as such from the surface of the stratum corneum. In the physiological spectrum of scaling about 487,000 cells/cm² get released normally after detergent treatment and their number goes upto 800,000 cells/cm² during dandruff and seborrhoeic dermatitis.

There are natural effective remedies to control dandruff in Ayurveda but presently women are depending on commercial shampoos containing some antifungal compounds like Zinc pyrithione, Coal tar, Ketoconazole, Selenium sulfide, etc. which are the active ingredients that fight dandruff. Zinc pyrithione can't do heavy-duty stuff and it may be due to stubborn dandruff. Coal tar works by slowing the rate at which the skin cells on your scalp die and slough off. If a day of using coal tar is skipped, the dandruff may reappear because coal tar does nothing to address the underlying cause of dandruff. Ketoconazole can dry out the hair. Selenium sulphide provides up to 7 days of protection against stubborn dandruff. This makes it ideal for people who experience stubborn dandruff and related scalp issues.

Risk factors include having certain skin or medical conditions and the use of inappropriate hair products. The symptoms include itching and many flakes from a woman's scalp. In serious condition, women can also have red irritated areas on other areas of the body, such as the inside of their ears, eyebrows, or areas other of the face At present, several species of *Malassezia* have been isolated and reported. Plant products contain various phytochemical compounds like alkaloids, flavonoids, tannins, steroids, etc. which have efficient antifungal activity.^[1] The present study was carried out to compare the anti-dandruff efficacy on extracts of herbal plants and compared with those of commercial shampoos and oils.

2. MATERIALS AND METHODS

Sample collection

Malassezia species was initially scraped from a volunteer by sterilizing the region with few drops of 70% ethanol.^[3] Flakes were collected from the scalp by partitioning the hair with a sterile comb and scrapping approximately one-inch area using a sterile blunt scalpel. The specimen was then transferred into a sterile bottle and kept in dark to prevent exposure to sunlight.

The plant species used for the present study were *Phyla nodiflora*, *Carcia papaya*, *Centratherum punctatum*, *Indigofera tinctoria*, *Capsicum frutescens* and *Moringa oleifera* collected from the herbal garden of Santhigiri Siddha and Ayurvedic Medical College, Trivandrum, Kerala. The commercially available shampoos and oils were taken as A and B which were purchased from the local grocery shop. Shampoos and oils were diluted with double distilled water to varying concentrations of 5%, 15%, 25%, 50%, 75% and 100% for further assays.^[4] All the assays were always carried out with a set of controls.

Isolation of fungi

A loop full of sample was inoculated in 50 ml of Sabouraud dextrose agar (SDA) by using pour plate method, with chloramphenicol to avoid bacterial contaminants. The plates were then incubated at 37 °C for 2 days. The culture was subjected to Gram's staining technique using Melville Matheson *et al.* (1999) protocol.^[5]

Preparation of plant extract

The extracts of *Phyla nodiflora*, *Carcia papaya*, *Centratherum punctatum* were obtained by using homogenization method^[6] and extracts from *Indigofera tinctoria*, *Capsicum frutescens*, *Moringa oleifera* were obtained by using decoction method.^[7]

Anti-dandruff activity

Agar cup method

Antifungal activity was performed using agar cup method. Two days prior inoculated culture was inoculated in Sabouraud dextrose agar (SDA). Each plate contained a well of 0.6 cm in diameter in which 100 µL of 100% concentrations of different herbal extracts, shampoos and oils were added. The plates were then incubated at 37 °C for 2-3 days to measure zone of inhibition (ZOI).^[4]

Biocide activity

500µL of different concentrations of herbal extracts, shampoos and oils were checked for biocide activity at concentrations of 5%, 15%, 25%, 50% and 75% (v/v). The plates were then incubated at 37 °C for 2-3 days, to measure biocidal activity^[4] Biocide activity was carried out using Mistry Zoya *et al.* (2016) and Saranya K *et al.* (2016) protocol.^[8]

Phytochemical screening

The herbal extracts obtained by homogenization and decoction techniques were subjected to the following tests: Alkaloids,^[9] Flavonoids^[10], Saponins^[11], Tannins^[2], Phenols^[12], Glycosides^[2], Proteins.^[13]

3. RESULTS

Isolation of *Malassezia* species

The microorganism isolated from Sabouraud Dextrose Agar (SDA) was identified as *Malassezia sp.* using Gram staining and BLAST sequencing methods.

Anti-dandruff activity

Agar cup method

Agar cup method was performed throughout the experiment for herbal sample extracts, shampoos and oils to determine zone of inhibition. The Zones of Inhibition (ZOI) with diameter were given in the Table 1.

Table 1: Samples and their respective Zones of Inhibition in diameter (cm)

Sl. No.	Samples	Zones of Inhibition (ZOI) in diameter (cm)					
		Agar cup method	Concentrations				
			75%	50%	25%	15%	5%
1	<i>Phyla nodiflora</i>	1.2	1.1	Nil	Nil	Nil	Nil
2	<i>Carcia papaya</i>	Nil	Nil	Nil	Nil	Nil	Nil
3	<i>Centratherum punctatum</i>	2.4	1.8	1.7	1.4	1.3	1
4	<i>Indigofera tinctoria</i>	Nil	Nil	Nil	Nil	Nil	Nil
5	<i>Capsicum frutescens</i>	Nil	Nil	Nil	Nil	Nil	Nil
6	<i>Moringa oleifera</i>	Nil	Nil	Nil	Nil	Nil	Nil
7	Shampoo A	2.1	Nil	Nil	Nil	Nil	Nil
8	Shampoo B	1.3	1.1	1	0.9	Nil	Nil
9	Oil A	Nil	Nil	Nil	Nil	Nil	Nil
10	Oil B	Nil	Nil	Nil	Nil	Nil	Nil

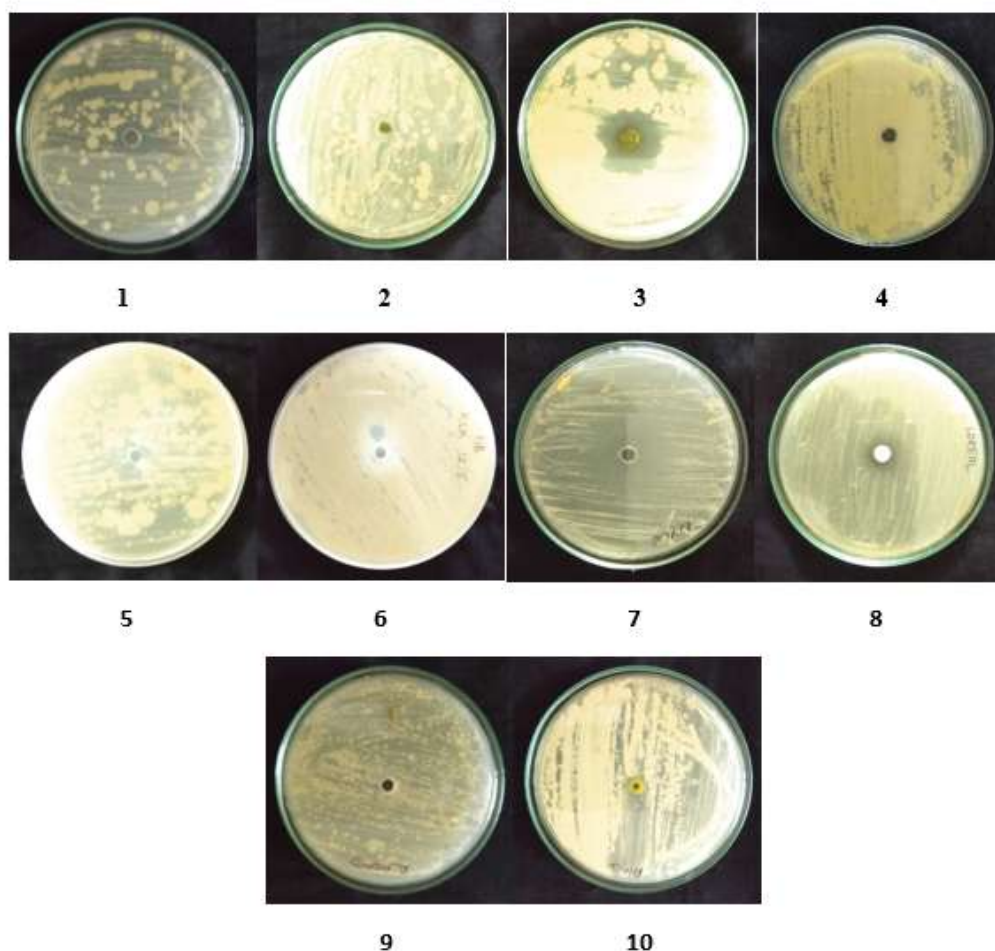


Figure 1: Anti-dandruff activity of different samples of herbal extracts, shampoos and oils on *Malassezia* sp.

- | | |
|----------------------------------|----------------------------|
| 1- <i>Phyla nodiflora</i> | 6- <i>Moringa oleifera</i> |
| 2- <i>Carcia papaya</i> | 7- Shampoo A |
| 3- <i>Centratherum punctatum</i> | 8- Shampoo B |
| 4- <i>Indigofera tinctoria</i> | 9- Oil A |
| 5- <i>Capsicum frutescens</i> | 10- Oil B |

Biocide activity

The biocide activity was performed with varying concentrations of 75%, 50%, 25%, 15% and 5% for herbal extracts, shampoos and oils and was tabulated and differences were shown in Figure 2.

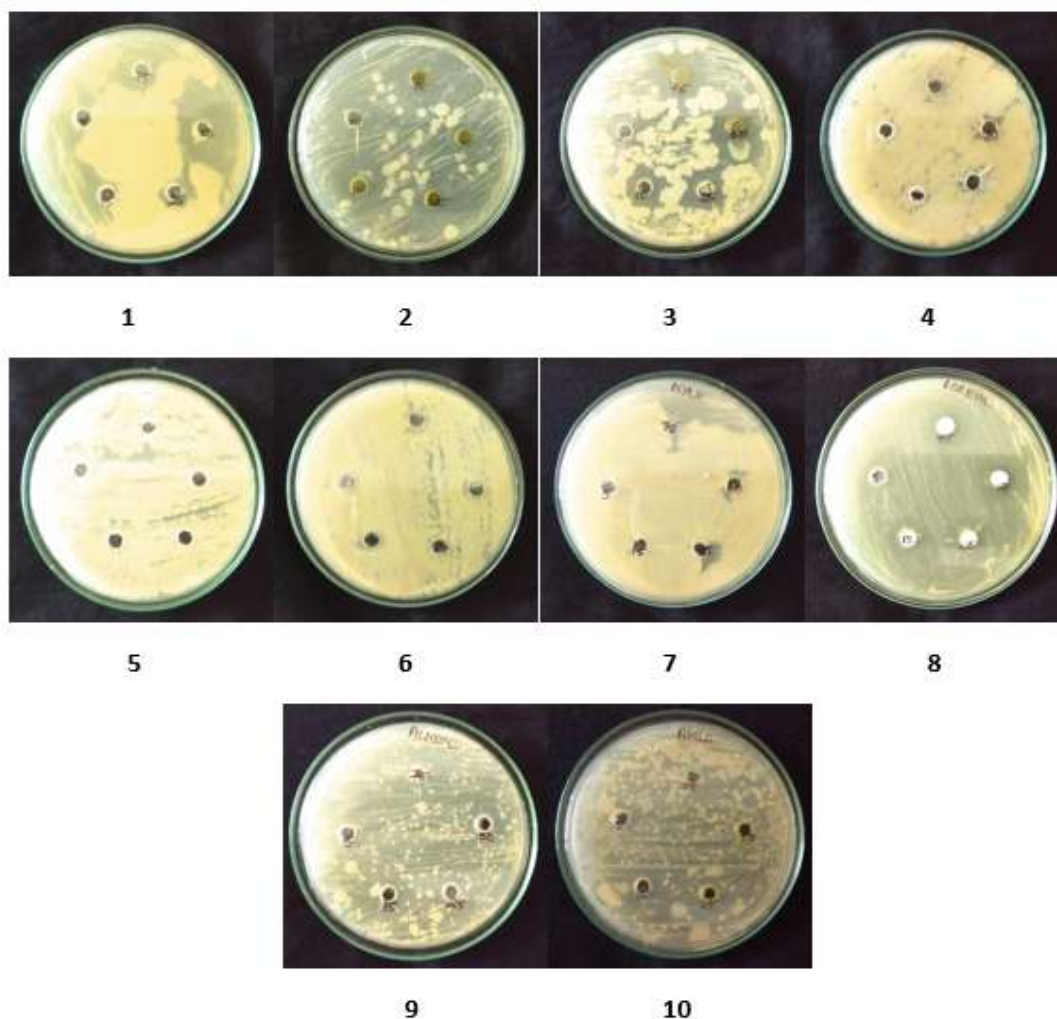


Figure 2: Effect of different concentrations of different samples on *Malassezia*

- | | |
|----------------------------------|----------------------------|
| 1- <i>Phyla nodiflora</i> | 6- <i>Moringa oleifera</i> |
| 2- <i>Carcia papaya</i> | 7- Shampoo A |
| 3- <i>Centratherum punctatum</i> | 8- Shampoo B |
| 4- <i>Indigofera tinctoria</i> | 9- Oil A |
| 5- <i>Capsicum frutescens</i> | 10- Oil B |

Qualitative phytochemical screening

Table 2: Qualitative phytochemical analysis

S. No.	Phyto-chemicals	<i>Phyla nodiflora</i>	<i>Carcia papaya</i>	<i>Centratherum punctatum</i>	<i>Indigofera tinctoria</i>	<i>Capsicum frutescens</i>	<i>Moringa oleifera</i>
1	Alkaloids	+++	+++	+	+++	+++	+++
2	Flavonoids	+++	+	++	+	+++	+
3	Saponins	+	+++	++	-	+++	+++
4	Tanins	+	-	++	-	-	-
5	Phenols	-	+	+	+++	+	++
6	Glycosides	-	-	-	+	-	+++
7	Protein	++	+	++	-	-	-

-Not detectable using the assay followed, + Present in minor amount,
 ++ Present in moderate amount, +++ Present in higher amount

DISCUSSION

Phyla nodiflora was a fungistatic against *Malassezia sp.* It was rapidly inhibiting the concentration of dandruff causing microorganism at its highest and also in least concentration.^[14] Both the ethanolic extract and aqueous extract of *Centratherrum punctatum* showed antifungal activity on fungus *Aspergillus niger*.^[15] Musfirah anjum *et al.* (2018) reported that methanolic leaf extracts of *Carcia papaya* showed antifungal activity while aqueous leaf extracts did not show inhibitory action against fungi.^[16] *Indigofera tinctoria* showed good antimicrobial activity over bacterial and fungal isolates from human patients.^[17] The leaf extract of *Capsicum frutescens* could inhibit the growth of *Aspergillus flavus* to a greater extent compared to *Aspergillus niger* and *A. flavus* thus contributing in antifungal activity.^[18] Patel *et al.* (2014) reported that antifungal activity of ethanolic and aqueous extract of *Moringa oleifera* leaf was highly active against *Saccharomyces cerevisiae* and active against *Candida tropicalis* and not showing any activity against *Candida albicans*.^[19]

The biocide activity method was performed at different concentrations such as 5%, 15%, 25%, 50% and 75%. A plate with 500 µL leaf extract of *Centratherrum punctatum* showed zone of inhibition at 75%, 50%, 25%, 15% and 5%. A plate loaded with 500 µL leaf extract of *Phyla nodiflora* showed zone of inhibition at 75%. A plate with 500 µL of diluted shampoo B showed zone of inhibition at 75%, 50% and 25%.

The herbal extracts of *Phyla nodiflora*, *Carcia papaya*, *Indigofera tinctoria*, *Capsicum frutescens* and *Moringa oleifera* showed best results for alkaloids and flavonoids. The herbal extracts of *Carcia papaya*, *Capsicum frutescens* and *Moringa oleifera* showed best results for saponins. *Indigofera tinctoria* gave best result for phenols. In *Moringa oleifera*, glycosides were in higher amount. Among these, 3 of the herbal extracts showed best results for all the tests.

CONCLUSION

There are many natural herbs that can control and eliminate mild dandruff. These herbal remedies are considered safe and have often been found quite effective. When using herbal remedies for dandruff, it is vital to be aware of how they will react with other medications, natural supplements, and medicinal herbs. Results of the present study reveal the antidandruff activity of different herbal extracts, shampoos and oils against *Malassezia sp.*, the dandruff causing organism. The future research of the work could be to purify and isolate the compound which is responsible for the inhibition of the dandruff causing organism and develop it into a potential herbal product like herbal shampoo and hair lotions. This study will have implications in the field of cosmetics since it will be cost effective and there will be no adverse effects.

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Conflicts of interest

There are no conflicts of interest.

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