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Antifungal activity by ethanolic extracts of medicinal plants against *Malassezia furfur*: A potential application in the treatment of Dandruff

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Abstract: Alopecia is a major distressing dermatological disorder. It is caused due to several reasons such as nutrition, stress, microbes, chemicals (hair gels and sprays), and tangles. Dandruff is one of the most afflicting problem confronted in healthcare and cosmetics. *Malassezia* sp. is an opportunistic pathogen on the normal skin flora which is a causative of dandruff under unfavourable conditions. Traditionally dandruff is treated using a large number of medicinal herbs but the complete cure is far from reach. The present investigation dealt with study of the potentiality of *Evolvulus* alsinoides, *Lawsonia inermis, Hibiscus rosa-sinensis, Azadirachta indica* and *Murraya koenigii* against *Malassezia furfur*. The work was also emphasized in determining the minimum fungicidal concentration of each plant extracts against *Malassezia* sp. to know the efficiency of the herbs in treating dandruff. The results obtained were promising that it would help in formulating a polyherbal mixture to treat dandruff and enrich hair growth.
Key words: Alopecia, Dandruff, *Malassezia* sp., Polyherbal formulation.

Introduction:

Hair loss is a distressing dermatological disorder making its prevalence more than 2000 years and is considered as a major problem in primary health care as well as cosmetics [1]. Dandruff is a chronic scalp disorder typified by evident flakes induced by prompt turnover of scalp cells.It is reported that approximately 30% of dermatophilic infections are due to lipophilic yeasts[2].

*Malassezia*sp.a part of the normal skin flora is a lipophilic, dimorphic and yeast-like fungus and a causative of dandruff, pityriasis versicolar, seborrheic dermatitis, etc.,[3].In the current scenario, many chemical substances are used for treating dandruff by controlling the abundance of fungi on the scalp. Despite of the availability of a wide variety of antifungal agents the complete cure of dandruff is far from reach. Medicinal herbs are shifting from periphery to mainstream use, as a greater number of people make an assiduous effort to opt for herbal formulations over the allopathic compounds, since these are devoid of side effects and cost effective.

Evolvulus alsinoides a perennial herb has different uses like hair growth, anxiolytic, syphilis, analgesic and anti-inflammatory activity [4]. All the parts of A*zadirachta indica* has been used in ayurvedic medicine for more than 4000 years due to its medicinal properties[5]. The leaves and flowers of *Hibiscus rosa-sinensis* have hair growth promoting activity [6].

Powdered leaves of *Lawsonia inermi s*are used both as a cosmetic dye and as a remedy for boils, wounds and some mycotic infections[7]. The leaves of *Murraya koenigii* are valued for its anti-diabetic,

antioxidant, antimicrobial, anti-inflammatory, hepatoprotective activity [8]. The present work is an attempt to find the antidandruff activity of the plant extracts and find its minimum fungicidal concentration.

Methodology:

Plant material collection and extraction:

Leaves of *Evolvulus alsinoides*, A*zadirachta indica, Hibiscus rosa-sinensis, Lawsonia inermis, Murraya koenigii* were collected and shade dried. The dried plants were grinded into coarse powder and were subjected to ethanol extraction using Soxhlet apparatus[9]. The filtered extracts were concentrated using rotary evaporator and freeze dried. The lyophilized extracts were preserved separately.

Isolation of dandruff causing agent:

Samples were collected by scraping the scalp cells of the subjects suffering from dandruff. The isolates was inoculated on Sabouraud's agar supplemented with olive oil. The plates were incubated at 37˚C for 7 days [10].

Antidandruff assay:

Various concentrations of the extracts were prepared in sterile water and the resultant extracts were used to determine its antidandruff activity through well diffusion method. Isolates of dandruff were inoculated on Sabouraud's agar supplemented with olive oil by spread plate technique. The plates were incubated at 37˚C for 7 days. The radius for the zone of inhibition was measured in millimetres and recorded against the corresponding concentration. Experiments were carried out with three replicates per treatment [11].

Results and discussion:

Antidandruff activity has been carried out for ethanolic extracts of *Evolvulus alsinoides, Lawsonia inermis, Azadirachta indica, Hibiscus rosa- sinensis and Murraya koenigii.* All the extracts demonstrated a significant antifungal activity towards *Malassezia furfur*. Dandruffis a common disease caused by *Malassezia furfur*. The lipophilic nature of these organisms induces hydrolysis of human sebum tri-glycerides into free fatty acids that cause both hair loss and prompt turnover of scalp cells [12]. Thus the isolates grew well on Sabouraud's agar medium enriched with olive oil.

Malassezia furfur grew as a white to tan cream coloured colonyon Sabouraud's media (Fig 1). All the plant extracts showed a reasonable inhibitory zone on *Malassezia furfur*. Since the experiments were conducted in three replicates, standard deviation was calculated. Table 1 shows the Minimum Fungicidal Concentration and zone of inhibition of the plant extracts.

A.  B. 

Fig 1 A and B: Growth of isolates of dandruff on Sabouraud's media supplemented with olive oil

Table: 1 Minimum Fungicidal Concentration and Zone of Inhibition of the plant extracts

S.No.	Herbs	Minimum fungicidal concentration (mg/ml)	Zone of Inhibition (mm)
1	*Evolvulusalsinoides*	0.2	6 ± 0.153
2	*Lawsoniainermis*	0.5	11 ± 0.05
3	*Hibiscus rosa-sinensis*	1	2 ± 0.029
4	*Azadirachtaindica*	0.5	13 ± 0.058
5	*Murrayakoenigii*	0.5	12 ± 0.351

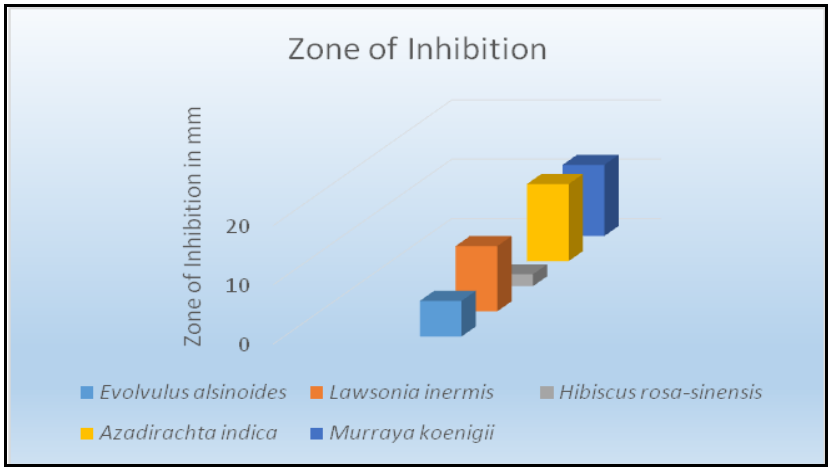

Fig 2: Antidandruff activity of the plant extracts on *Malassezia furfur*, represented as zone of inhibition in mm

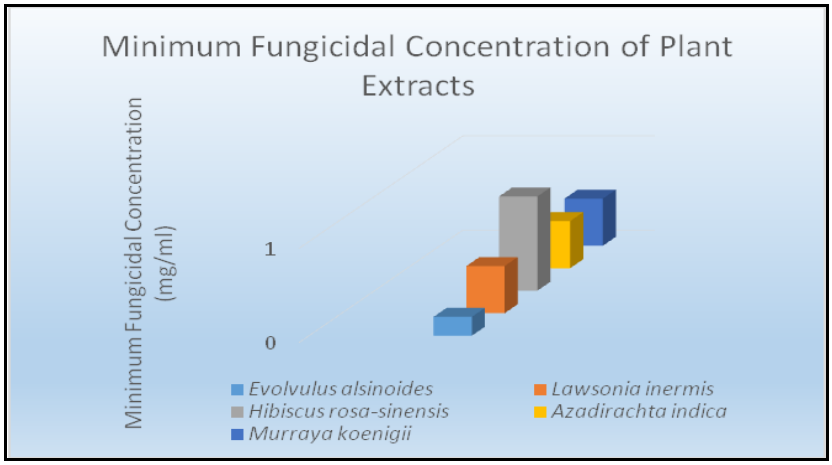

Fig 3: Minimum Fungicidal Concentration of the plant extracts to treat dandruff in mg/ml

Fig 4: Zone of inhibition of the plant extracts

Fig 2 shows the antidandruff activity of the plants, represented by zone of inhibition. Among the plant extracts tested *Azadirachta indica* exhibited the highest zone of inhibition followed by *Murraya koenigii* and *Lawsonia inermis*. *Hibiscus rosa-sinensis* showed the lowest zone of inhibition. Fig 3 shows the Minimum Fungicidal concentration of the plant extracts. It is inferred that *Evolvulus alsinoides* at its minimum fungicidal concentration of 0.2 mg/ml exhibited a reasonable zone of inhibition. On the contrary *Hibiscus rosa-sinensis* exhibited low fungicidal activity with concentration of 1 mg/ml. The plant extracts except *Hibiscus rosa-sinensis* exhibits a reasonable antidandruff activity. The zones of inhibition of the herbal extracts indicated a reasonable antifungal activity on *Malassezia furfur*(Fig 4).

Conclusion:

All the plant extracts showed a significant antidandruff activity and also been used traditionally to induce hair growth. The results obtained from the work are encouraging and would probably help to make a polyherbal mixture which find its application in inducing hair growth activity.

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