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Formulation and Evaluation of Herbal Anti-Dandruff Hair Gel



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ABSTRACT

Herbal medicines are still the mainstay of about 75 – 80% of the world's population, mainly in developing countries, for primary health care because of better cultural acceptability, better compatibility with the human body, and lesser side effects. Herbal medicines consist of plants or their parts to treat injuries, disease, or illness and are used to prevent and treat disease and ailments or to promote health and healing. Herbal medicines are the oldest form of health care known to mankind. Hair gel was prepared with extracts of henna leaves, fenugreek seed, and lemon juice to treat dandruff. Six formulations were prepared with varying concentrations. The formulations were subjected to different evaluation tests like pH, viscosity, spreadability, and anti-microbial activity. The F6 showed the best formulation with a maximum zone of inhibition against the Malassezia furfur and Bacillus subtilis.



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INTRODUCTION

Dandruff is a skin condition with symptoms that include flaking and sometimes mild itchiness caused to the scalp. They are many bacteria, and fungi causing scalp infections which lead to further hair problems or skin issues¹. Medically it is defined as pityriasis simplex capitis – shedding of dead skin from the scalp. It may be dry or greasy, dry dandruff appears silvery and white, while greasy flakes appear pale yellowish and may have an unpleasant smell.

Historically there have been multiple other descriptive names reflecting the fungal cause of this condition, such as pityriasis simplex and pityriasis capitis (referring to *pityrosporum*), and *furfuracea* (referring to *Malassezia furfur*). It is a common embarrassing disorder that affects 5% of the global population². Dandruff affects the aesthetic value and causes itching and keratinocytes play a major role in the expressions and generation of immunological reactions during dandruff formation. The severity of dandruff may fluctuate with the season and often worse in winter. Dandruff is a common scalp condition that produces irritating white flakes and an itchy scalp, excessive drying of the skin, and overactivity of the oil gland known as seborrhea³.

MATERIALS AND METHODS

Materials

Fenugreek, Lawsonia, and Lemon were purchased from the local market. Methyl paraben and propyl paraben were purchased from S D fine chem products, Mumbai. Carbopol 940, Triethanolamine, and Polyethylene glycol were procured from Isochem laboratories Angamaly, Kochi.

Extraction of lawsone

It is done by maceration method. 100 gm of dried powdered henna leaves were soaked in 1000 ml of water and left for 24 hours. The solution was filtered using the Whatman filter paper. This filtrate was concentrated using an evaporator and a yield of 18.6% was obtained.

Extraction of Fenugreek

100 gm fenugreek seeds were washed and soaked in a wet muslin cloth. They were kept for 2 days for germination. After germination, 10 gm of seeds were taken and crushed with 70 ml

of distilled water in a mortar and pestle. After complete crushing, the mixture was centrifuged at 5000 rpm for 15 minutes and the supernatant was collected.

Preparation of gel

Weigh the required quantity of Carbopol 940 and dispersed it in 25 ml distilled water in a beaker. Keep the beaker aside for half an hour to swell Carbopol 940 and then start stirring at 1200 rpm by using a mechanical stirrer for 30 minutes. Solution A - add the required quantity of henna extract, lemon juice, and polyethylene glycol in one beaker and stirred properly. Solution B – add fenugreek juice, methylparaben, [and propylparaben in polyethylene glycol in another beaker. Disperse solutions A and B in Carbopol 940 with constant stirring. Finally, add a remaining quantity of distilled water to make up 50 ml of formulation and add triethanolamine dropwise to the formulation until the pH become neutral to get the required gel consistency.

Table 1: Composition of different gel formulations

Ingredients	F1	F2	F3	F4	F5	F6
Fenugreek extract	0.5ml	1ml	1.5ml	2ml	2.5ml	3ml
Lawsone extract	0.5ml	1ml	1.5ml	2ml	2.5ml	3ml
Lemon juice	0.5ml	0.5ml	0.5ml	0.5ml	0.5ml	0.5ml
Polyethylene glycol	10gm	10gm	10gm	10gm	10gm	10gm
Methyl paraben	0.007g	0.007g	0.007g	0.007g	0.007g	0.007g
Propyl paraben	0.007g	0.007g	0.007g	0.007g	0.007g	0.007g
Carbopol 940	0.5g	0.5g	0.5g	0.5g	0.5g	0.5g
Triethanolamine	0.06ml	0.06ml	0.06ml	0.06ml	0.06ml	0.06ml

Evaluation of gel

Physical evaluation:

Physical parameters such as color, appearance, odor, and consistency were checked visually.

The pH of formulation:

The pH of the formulated gel was determined using a pH meter. The electrode was immersed in the gel and readings were recorded from a pH meter.

Viscosity study:

The viscosity of the gel formulation was determined by using a Brookfield viscometer, sample spindle no.63, and a speed of 10 rpm. The value of the viscosity is displayed in the form of cP.

Spreadability:

The weighed quantity of gel (about 0.5) was sandwiched between two glass slides. 100g of weight was placed on the slides. The weight was removed for a specific period of 10 min. The weight was removed, and the diameter of the spread circle was measured at different points. Spreadability was calculated using the equation:

$$S = (M \times L) / T$$

Where,

S is spreadability, M is the weight placed on the slide, L is the diameter of the circle in cm and T is Time in sec.

Anti-Bacterial activity of gel:

Each nutrient agar plate was prepared by pouring a mixture of medium and subculture into a Petri dish. Wells are made with a sterile cork borer. The formulation was poured into wells. This Petri dish was incubated at 37°C for 24 hrs. The zone of inhibition was measured.

Anti-Fungal activity of gel:

Each sabouraud dextrose agar plate was prepared by pouring a mixture of medium and subculture into plates. Wells were made with a sterile cork borer. The formulation was poured into wells. This Petri dish was incubated at 37°C for 24 hrs. The zone of inhibition was measured.

RESULT AND DISCUSSION

Table 2: Comparative evaluation results of formulations

Test	F1	F2	F3	F4	F5	F6
Color	Yellow	yellow	Orange	Reddish-orange	Reddish-brown	Reddish-brown
Odor	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant	Pleasant
pH	6.82	6.90	6.21	7.36	7.13	7.40
Viscosity 10rpm	2400	4500	4760	4830	4608	4412
Spreadability	20g.cm/sec	20g.cm/sec	20g.cm/sec	20g.cm/sec	20g.cm/sec	20g.cm/sec

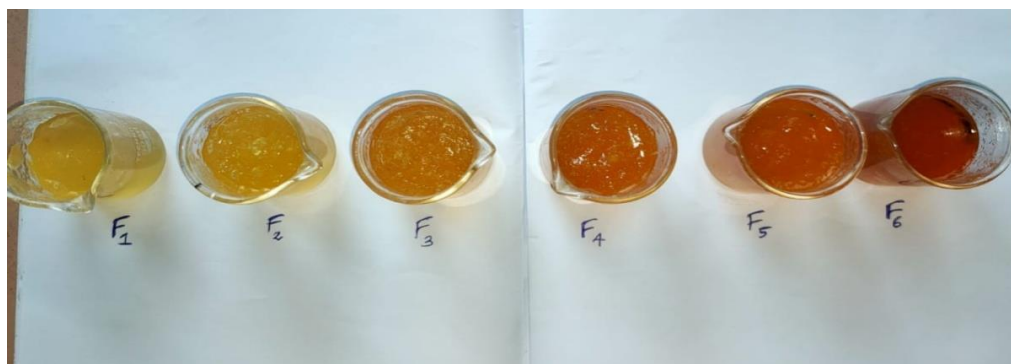


Fig. 1 Herbal anti-dandruff hair gel formulations

Table 3: Zone of inhibition of various formulations

Sl.No	Microorganism	F1(mm)	F2(mm)	F3(mm)	F4(mm)	F5(mm)	F6(mm)
1	Bacillus subtilis	7	9	11	12	13	15
2	Malassezia furfur	11	12	14	15	16	18

All six formulations were subjected to antimicrobial activity. Both antibacterial and antifungal activity was determined by measuring the zone of inhibition. The formulation F6 showed a good zone of inhibition when compared with other formulations.

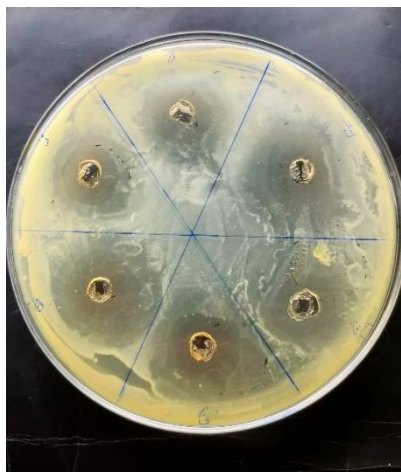


Fig.2 Antibacterial activity of formulations

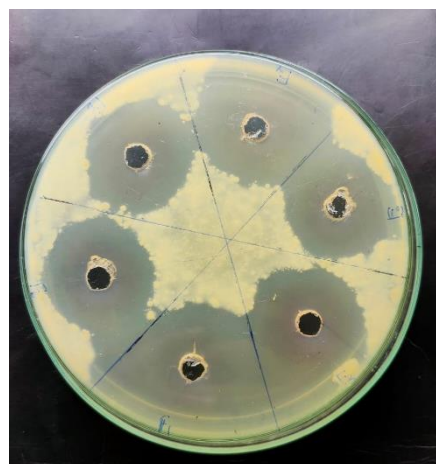


Fig.3 Antifungal activity of formulations

CONCLUSION

Herbal medication is considered safer than allopathic medicines due to lesser side effects and low cost. The present work has been undertaken to formulate herbal hair gel formulation containing extracts of henna, fenugreek, and lemon juice which are preferably used in case of dandruff. The gel was formulated using carbopol 940 as a polymer. Six hair gels were formulated with different concentrations. The formulated gel was evaluated for parameters such as Ph, viscosity, antimicrobial activity, and spreadability whereas consistent homogeneity was found with no skin irritation. Based on antimicrobial activity, F6 was selected as an optimized gel formulation. F6 shows maximum zone of inhibition against *Malassezia furfur*.

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