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FORMULATION AND EVALUATION OF HERBAL HAIR GEL FOR THE TREATMENT OF DANDRUFF

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ABSTRACT

Herbal formulations widely improved for primary health care and have growing demand in the world market mainly in india, where they occur in various countries for better cultural acceptability and better compatibility with human body and lesser side effects and more effective as comparative to synthetic drug. Gels have been employed in wide variety of products including skin and hair care preparation. The objectives of present study involves formulate and evaluate herbal hair gel for the treatment of Dandruff by using aqueous extracts of fenugreek, neem, hibiscus and different concentration of Carbopol 934 as a gel base. The evaluation of herbal gel was done on different parameters like physical appearance, pH, homogeneity, spreadability, viscosity, extrudability, anti fungal activity were examined. Formulation F4 Herbal gel showed acceptable rheological properties with applicable Spreadability, pH, Extrudability properties than other formulations. Anti fungal activity of Formulation F4 with 1 % leaves extract herbal gel shows significant activity when compared with standard. Hence formulation F4 showed best results because all the parameter showed satisfactory results.

KEYWORDS: Fenugreek, Neem, Hibiscus, Herbal formulation, Herbal gel, Dandruff treatment.

I. INTRODUCTION

Herbal formulation shall mean a dosage form consisting of one or more herbs or processed herb(s) in specified quantities to provide specific nutritional, cosmetic benefits, and/or other benefits meant for use to diagnose, treat, and mitigate diseases of humans. Herbal formulations are the traditional form of Indian medicine which was developed by ancient sages. Herbals are the preparations used to enhance the human appearance.

Dandruff is a scalp disorder called seborrhoeic dermatitis caused by Pityrosporum ovale. it represents one of the most common dermatological skin conditions and is a chronic, non-inflammatory condition of the scalp that is characterized by excessive scaling of scalp tissue. Various antifungal agents are employed in hair care preparations for the treatment of dandruff. These products show many side effects such as loss of hair, increased scaling, itching, irritation, nausea, and headache.

1.1. Common sites of dandruff distribution

The distribution is classically symmetric and common sites of involvementare as follows.

- Hairy areas of head.
- Eyebrows and eyelashes.
- Beard.
- Fore head.
- The external ear canals.
- Post auricular creases.

1.2. Causes of dandruff

- Neurological abnormalities like depression and parkinsonism.
- Life style factors including incorrect skin care, stress, excessive perspiration.
- Diet factors including poor nutrition, alcoholism, food allergies.
- Environmental factors include pollution, exposure to dust, uv light exposure and climate changes like cold, dry winters cause dandruff.
- Immunological abnormalities.
- Cosmetic factors includes excessive use of harsh shampoos, hair dryers and use of alkaline soaps .
- Associated dermatological diseases like psoriasis, seborrhoeic dermatitis.
- Seborrhoeic dermatitis is also associated with genetic abnormalities, HCV infection.
- Hormonal factors include increased sebaceous gland action at the time of puberty and increased androgen levels which triggered by stress.

1.3. Symptoms & Complications

- Mostly seen as white oily looking dead skin dotted on hair.
- They might drop on dresses to heighten your embarrassment often.
- Possibility of itchy scalp.

- Head may feel tingly.
- Red, flaky, greasy patches of skin.
- Condition may worsen in winter.
- May also develop in babies, especially newborns causing a scaly, crusty scalp (Seborrheic dermatitis, or cradle cap).

2. MATERIALS AND METHODS

2.1. Collection

The Fresh Plant Leaves of Fenugreek, Neem, Hibiscus were collected from a medicinal garden of our college. Other Polymers and chemicals used in present study were of analytical grade purchased from Finar Chemicals limited, india.

2.2. EXTRACTION

Preparation of Pharmaceutical Aqueous Plant Extract

The Fresh Plant Leaves of Fenugreek, Neem, Hibiscus were carefully selected washed with distilled water to remove unwanted foreign materials like soil and dusts. After washed plant material was dried under shade at room temperature without direct exposure of sunrays. It was then coarsely grounded by using mechanical device into small pieces. By using blender were crushed to make powder. The powdered plant material was passed through sieve no # 40 and stored in an airtight container for further use. Desired quantities of herbal drug were weighed and each herb macerated with water in conical flask. Dried herbs were allow to mix with water by moderate shaking of conical flask for 5 days. After 5 days content were filtered out by using simple filtration method and filtrates were collected in separately vessel. The extracts were preserved in airtight containers and kept at 6˚C until further use.

Composition of extract

S.No	Name of ingredients	Quantity
1	Extract of Fenugreek	0.500 mg
2	Extract of Neem	0.250 mg
3	Extract of Hibiscus	0.250 mg

2.3. Filtration

Filtration of extract was done by using simple filter paper and funnel for three times.

2.4. Evaporation

Evaporation was done by using electronic water bath. Filtrates were allowed to evaporate in evaporating pan at 60 ^{0}C temperature until the desired concentration of the extract was obtained.

2.5. FORMULATION OF HERBAL GEL

2.5.1. Preformulation Study

Preformulation studies are needed to ensure the development of a stable as well as effective and safe dosage form. It is a stage of development during which the pharmacist characterizes the physico –chemical properties of the drug substances and its interaction with various formulation components. Goals of Preformulation study :To determine the necessary physico- chemical parameter of a new drug substance.

2.5.2. Experimental design

During formulation gelling agent used at different concentrations, resulting in five different batches of gels for herbal leaves extract, total five batches prepared. In this case Carbopol 934 gelling agent were taken.

I. Carbopol 934 (at concentration 0.5%, 1%, 1.5%, 2 %, 2.5%).

2.5.3. Preparation of Gel

i) Preparation of gel with Carbopol 934

Five different herbal hair gel formulations were prepared by simple gel formulation preparation method with carbopol 934 gel base. The gel formula contains methyl paraben, propyl paraben, glycerine, poly ethylene glycol (PEG), carbopol 934, PVP and triethanolamine. Carbopol 934 and Measured quantity of extract was dispersed in 50 ml of distilled water and mixed by stirring continuously in a magnetic stirrer at 1200 rpm for 30 min. Take 2 ml of Propylene glycol and Glycerin. And add weighed quantity of Polyvinylpyrrolidone, methyl paraben and propyl paraben to it with constant stirring. The mixture was neutralized by drop wise addition of Triethanolamine for adjustment of required pH (6.8-7). Mixing was continued until a transparent gel was formed. Finally volume made up to 100 ml by adding remaining distilled water. And to obtain the gel at required consistency.

Quantitative composition of leaves extract gel formulation.

S no	INGREDIENTS	F1	F2	F3	F4	F5
1	Leaves extract(g)	1	1	1	1	1
2	Carbopol 934(g)	0.5	1	1.5	2	2.5
3	Glycerin(ml)	2	2	2	2	2
4	Propylene glycol(ml)	2	2	2	2	2
5	PVP(mg)	0.5	0.5	0.5	0.5	0.5
6	Methyl paraben(g)	0.2	0.2	0.2	0.2	0.2
7	Propyl paraben(g)	0.1	0.1	0.1	0.1	0.1
8	Triethanolamine(ml)	q.s+pH 6.5 - 7	q.s+pH 6.5 - 7	q.s+pH 6.5 – 7	q.s+pH 6.5 - 7	q.s+pH 6 5 - 7
9	Distilled water(ml)	100	100	100	100	100

3. Physicochemical evaluations

A) Appearance/clarity

The herbal gel formulations were observed carefully by naked eye for appearance/clarity, colour, odour and presence of suspended particulate matter if any. It was further assessed by observing them against a dark and white background.

B) Determination of pH

The pH of the hair gels were determined by digital pH meter. One gram of gel was dissolved in 25 ml of distilled water and the electrode was then dipped in to gel formulation for 30 min until constant reading obtained. And constant reading was noted. The measurements of pH of each formulation were replicated two times.

C) Determination of Viscosity

The measurement of viscosity of the prepared gel was measure by using Brookfield Viscometer. The gels were rotated at 100 rotations per minute and the viscosity values were noted.

Test conditions

- Type of equipment-Brookfield RVDV-II +Pro
- Spindle- T-bar
- Spindle code –S 96
- Sample volume- 10.0ml
- Rpm –100

D) Spreadability

The Spreadability was determined by parallel plate method which is widely used for determining and quantifying the Spreadability of semisolid preparations. Various formulations (1 g) were pressed between two 20 × 20 cm horizontal plates, the upper of which weighed 125 g. The spread diameter was measured after 1 min.

It was calculated using the following formula.

$S = M \times L/T$

Where, S – Spreadibility

M – Weight in the pan (tied to the upper slide),

L – Length moved by the glass slide

T – Time (in sec.) taken to separate slides completely each other.

E) Bioadhesive strength

Bioadhesive strength was determined by using glass slide and wooden block apparatus. Bioadhesive strength used to measuring the force required to detach the formulation from cellophane membrane. Specified amount that is 1 gm of prepared gel was taken on glass slide wrapped with cellophane membrane. Intimate contact was provided by the movable glass slide was placed on fixed slide. Two minute contact time was given to ensure intimate contact between formulation and membrane. The weight was added in the pan which is provided to apparatus until slides got detached. The bioadhesive force, expressed as the detachment stress in dyne/cm2 was determined by the formula.

Bioadhesive strength (dynes/cm2) = Mg /A.

Where, M= weight required for detachment in gram,

g = acceleration due to gravity (980 cm/s2),

A = area of mucosa exposed.

F) Extrudability

The gel formulations were filled in standerd capped collapsible aluminum tubes and sealed by crimping to the end. Weights of the tubes were recorded. The tubes were placed between two glass slides and were clamped. 500 gm was placed over the slides and then the cap was removed. The amount of the extruded gel was collected and weighed. The percentage of the extruded gel was calculated (>90% extrudability: excellent, >80% extrudability: good, >70% extrudability: fair).

G) Anti-fungal Activity

The inhibition of fungal growth under standardized conditions may be utilized for demonstrating the therapeutic efficacy of antifungal drugs. The microbiological evaluation of gels was done using cup-plate method, which depends upon diffusion of the drug from the gel contained in the cup through a solidified agar layer in the petridish to an extent such growth of the added microorganism is prevented entirely in a zone around the cup. Wider zone of inhibition is an indicative of better release of the drug from the base.

Medium Used: Sabouraud dextrose broth.

Test Organism: Candida albicans species The low pH and high sugar content of this media make them particularly selective for fungi and inhibitory to bacteria.

Composition of Sabouraud Dextrose Broth Medium.

S.No.	Content	Quantity
1	Glucose	40 gm
2	Peptone	10 gm
3	Agar	20 gm
4	Water	1000 ml

Dissolve the ingredients with heat and filtered through cotton gauze and adjust to pH 5.4 autoclave at 121 ^{0} C for 2 hrs.

Test Procedure

The antifungal studies were carried out to ascertain the biological activity of herbal hair gel formulation prepared against fungi. This was determined by sabouraud dextrose diffusion test employing“cup plate technique” using previously sterilized petri-dish. Solution of gel prepared formulation and pure ketoconazole as a standard 1mg/ml was poured into cups bored of size 8 mm in to wells of sabouraud dextrose plate previously seeded with test organism (Candida albicans). After allowing diffusion of solution for 2 h, the plates were incubated at 27^0 c for 48 h. The zone of inhibition measured around each cup was compared with that of the standard.

4. RESULTS AND DISCUSSION

The present work aimed to increase anti dandruff activity of gel formulation with using carbopol 934 as a gelling agent. The prepared formulations were characterized for Physical appearance, pH, Spreadability, Viscosity, Homogeneity, Extrudability and Antifungal activity.

4.1.In vitro evaluation parameters

S.no	Formulation	Physical Appearance	pH	Viscosity (Cps)	Spradability	Bio adhesive strength (dyne/cm^2)
1	F1	Greenish	5.9	2100	13.12	1225
2	F2	Greenish	6.2	2435	14.44	1386
3	F3	Greenish	6.6	3214	16.25	1404
4	F4	Greenish	7.1	4325	23.63	1623
5	F5	Greenish	6.8	4108	17.93	1529

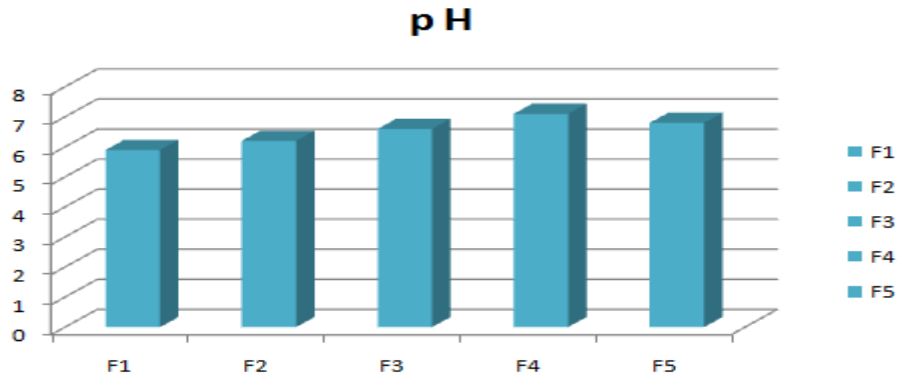
4.2. In vitro evaluation parameters.

S no	Formulations	Weight ofn Empty collapsible tube (gm)	Weight of empty Collapsible tube + gel (gm)	Weight of the grams extrudded	Extrudability (%)amount
1	F1	2.50	17.65	14.18	80.33
2	F2	2.50	17.65	14.39	81.52
3	F3	2.50	17.65	14.79	83.79
4	F4	2.50	17.65	16.10	91.21
5	F5	2.50	17.65	15.80	89.51

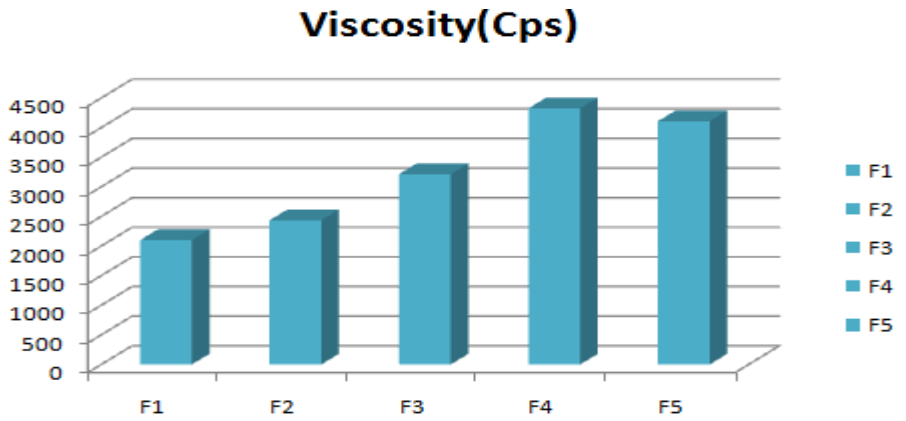
4.3.In vitro Anti Fungal study

Among the all formulations, F4 showed better release and maximum zone of inhibition when compared to other formulation. Hence, Herbal Hair gel formulation F4 was considered as best formulation.

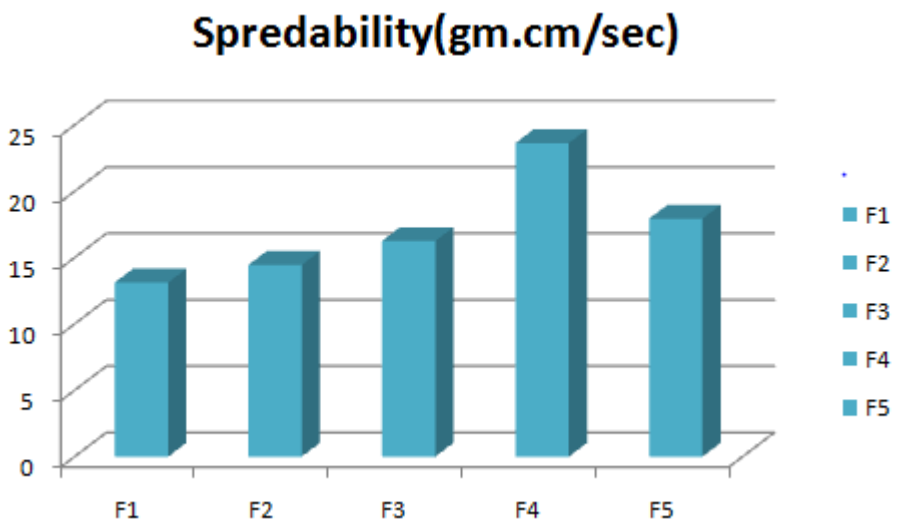
Formulations	Zone of inhibition (mm)
F1	11 mm
F2	14 mm
F3	18 mm
F4	23 mm
F5	20 mm



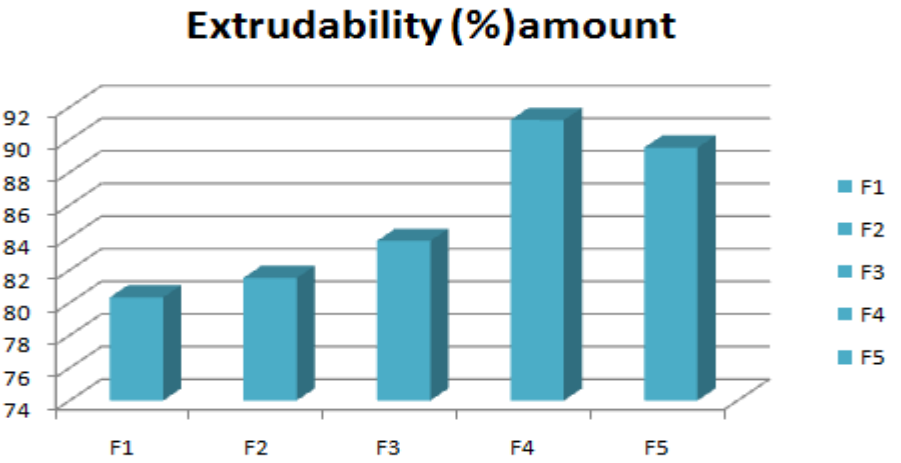
pH parameters of all the formulations



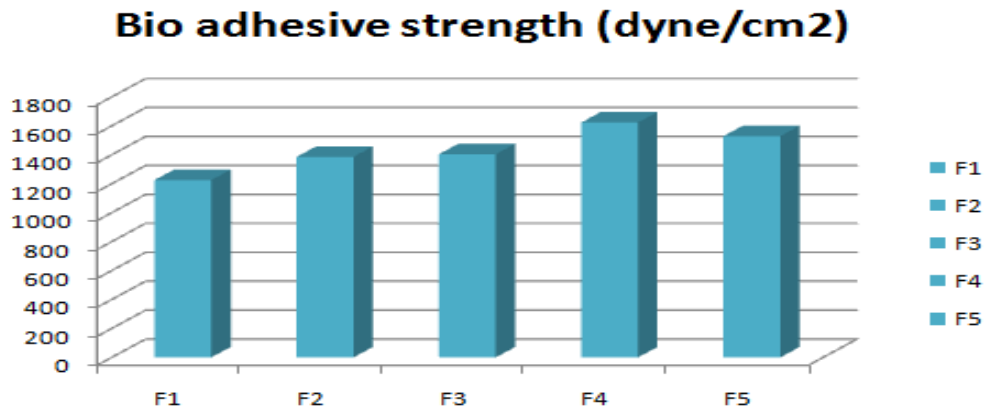
Viscosity parameters of all the formulations



Spredability parameters of all formulations



Extrudability parameters of all formulations



Bio adhesive strength parameters of all formulations.

5. SUMMARY AND CONCLUSION

- Herbal formulations widely improved for primary health care and have growing demand in the world market mainly in India and more acceptable in the belief that they are safer than synthetic one. It is very good attempt to establish the herbal hair gel containing aqueous leaves extracts of fenugreek, neem, hibiscus leaves. These plants have been reported in literature having good anti- dandruff, antibacterial, anti oxidant activity.

- The physical compatibility studies suggest that polymer selected i.e. Carbopol 934 were found to be compatible with drug extract.
- All the formulations were evaluated by determining various parameters like Physical appearance, pH, Rheological studies, Spreadability, Extrudabilty and Anti fungal activity etc.
- However, from the above mention results it can be concluded that the herbal hair gel formulation F4 containing 2 gm of Carbopol 934 was suitable for topical application and it shows comparable good results. Formulation F4 with 1% leaves extract herbal hair gel showed the highest percentage of good spreadability, extrudability, rheological properties and anti fungal activity.

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