Formulation Development and Evaluation of Poly Herbal Hair Oil for Hair Growth Stimulating Activity

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Abstract

Herbal formulations always have attracted considerable attention because of its lesser and nil side effect compared with synthetic drugs. The concept of beauty and cosmetics are an ancient as mankind and civilization. Various herbal beauty products are widely used and continuously increasing in their demand by the common people because of lesser side effects and with better safety and security profile The objective of the present study is to prepare poly herbal hair oil using *Emblicaofficinalis* (Amla), *Eclipta prostrate* (Bhringraj), *Azadiractaindica* (Neem), *Tinosporacardifolia* (Giloy), *Bacopamonnieri* (Bramhi), *Mesuaferra* (Nagkesar), *Cyperus rotendus* (Nagarmutha), *Nardocstachys jatamansi* (Jatamansi), *Psoralia caryfolia* (Bakuchi), *Acorous calamus* (Vacha) and *Abrus precatorious* (Gunja). The six different oil formulations were prepared using different oil base either single or in combinations with different concentrations. For the purpose the powdered drugs soften by cold maceration process for overnight and further the extraction was done in oil base by boiling method. The formulated herbal oils of different concentrations were evaluated for proximate analysis and various parameters such as Viscosity, Saponification value, pH, Acid value, Grittiness, Skin irritation, Sensitivity test, Moisture content, and Specific gravity are reported in this paper. Further the prepared oils will be evaluated for their hair growth stimulating activity.

Keywords: Hair, polyherbal, Oil, maceration, evaluation

Introduction

Hair is one of the imperative parts of the body derived from ectoderm of the skin, it is ornament structure along with sebaceous gland. Hair is a dead part with no nerve connections. The hair follicle has the unique ability to regenerate itself [1-3]. The basic part of hair is bulb (a swelling at the base which originates from the dermis), root (which is the hair lying beneath the skin surface), shaft (which is the hair above the skin surface) [4]. Hair germs begin from an aggregation of keratinocytes in the stratum basal of the epidermis. The initiating factor is the underlying dermal fibroblast cells [1].

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The keratinocytes elongate, divide and relocate to the dermis [2]. Dermal fibroblasts then form a dermal papilla beneath the hair germ. This causes stimulation of the basal stem cells to up-regulate their cycle, producing cells that will keratinise and form the hair shaft [3]. Two swellings form on the shaft, one containing stem cells for follicle regeneration, the other becomes a sebaceous gland which will secrete sebum onto the hair shaft. The follicles develop from an ectodermal bud which invades the mesenchyme during embryonic development [4]. The mesoderm also condenses during the development creating an outer mesodermal component to the embedded part of the hair [5].
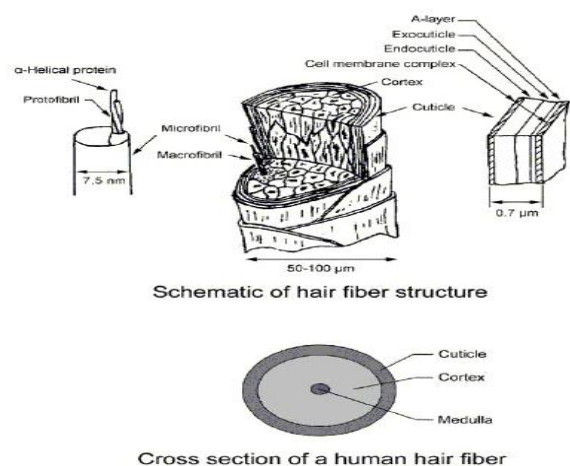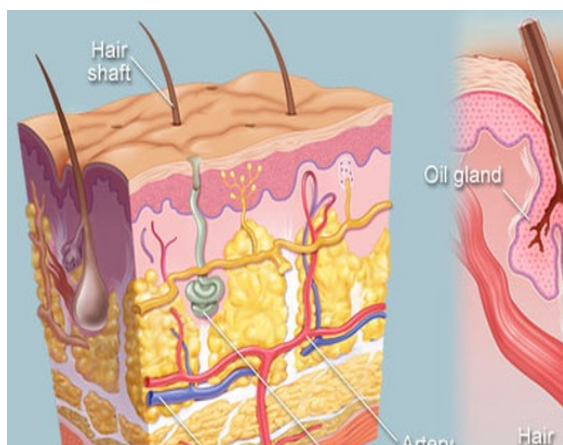

Fig. 1: Schematic structure of hair fiber

Fig. 2: Structure of hair

Hair Growth Cycle

Hair grows from the follicle, or root, underneath the skin. The hair is 'fed' by blood vessels at the base of the follicle, which give it the nourishment it needs to grow [6]. Between starting to grow and falling out years later, each hair passes through four stages: anagen, catagen, telogen and exogen. Every hair is at a different stage of the growth cycle [7].

The growth of hair is cyclic phase divided into following- anagen (growth), catagen (involution) and telogen (rest) [5]. Pigmentation problems (Fading), dandruff and falling of hair (Shedding) are associated problems with hair [6]. The loss of hair is not life threatening, but has profound impact on social interactions [7]. There are no concord views on hair loss, it is quite controversial issue [8, 9].

Over time, the length of the anagen stage decreases. Therefore, the hair may become weaker and thinner after each cycle. That's why it's important to ensure your diet is rich in specific nutrients to maintain normal, healthy hair growth[8].
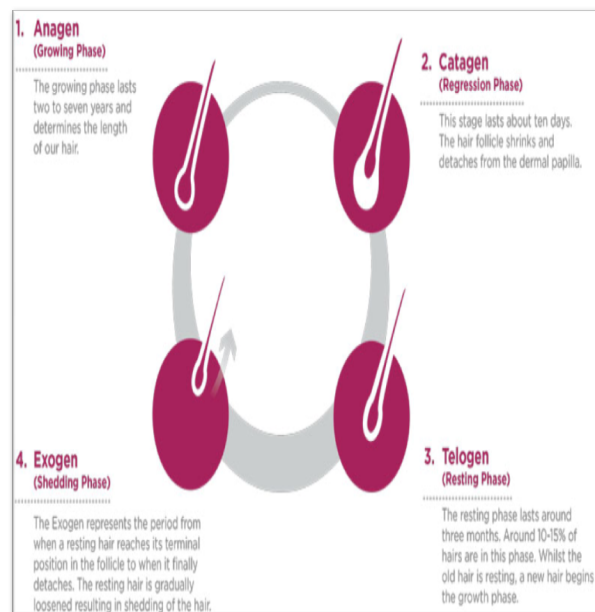

Fig.3: Schematic Representation of Hair Growth Cycle

In Ayurveda, Baldness is known as Khalitya. The loss of hair from the skull is known as baldness.

Baldness is a very common problem of the modern world.

Certain disease like acute fevers, syphilis, anaemia, myxodema and influenza may be the cause of baldness. Also anxiety and nervous shock may lead to baldness. Heredity also plays a major role in the premature baldness. Eczema of the scalp also leads to fast hair loss. Presence of dandruff or lice and imbalance of the hormones also cause hair loss.

According to ayurveda, all hair problems including hair loss is caused due to the aggravation of the pitta.

Types of hair loss
Androgenetic or androgenic alopecia (baldness)

It is the most common cause of hair loss in men also known as hereditary baldness.11 In androgenetic alopecia hair follicle size is reduced and duration of anagen is diminished while an increase in the percentage of hair follicles in telogen [10].

Alopecia areata

In alopecia areata the hair is lost from the scalp (alopecia areata totalis) or from the whole body (alopecia areata universalis) [11].

Telogen effluvium

Telogen effluvium is characterized by the early entrance of a large no of hairs in to telogen phase at one time [12].

Chemotherapy-induced alopecia

This type of hair loss is occurred due to the side-effects of cancer therapy [13].

Collection and identification of plant

For the preparation of polyherbal hair oil all the ingredient viz. Amla, Bhringraj, Brahmi, Neem, Giloy, Jatamansi, Gunja, Nagkesar, Nagarmutha, Vacha and Bakuchi were procured from the local vendors. The plant materials were procured in powder form. Further the procured powdered drugs were subject to pharmacognostical studies for conformation [14]. Coconut oil, Sesame oil, Aloe oil and Mustard oil used as oil base in single or in combination for the preparation of oil. This oil bases were procured from the local vendor.

Methodology [15-17]

- Weigh the powder form of drug up to 10% individually.
- Further cold maceration performed with water for overnight.
- Weigh the moist drug accurately and transferred in beaker and the oil base added to sufficient quantity to produce 100 ml.
- By using the different concentrations of drugs and different combinations of oil base the formulation was done for the better hair growth stimulating activity. The different formulations prepared by following the procedure are depicted in the table 2.
- The mixture heated for 8-10 hour between the temperatures 60 to 70°C.
- Allow the oil to cool to room temperature and filtered by using filtration assembly.

Formulation

Formulation of oil was prepared by using different formulation compositions as mentioned in table 1.

Table 1: Formulation compositions of different prepared polyherbal hair oil formulation

S. No.	Ingredients	Formula composition					
		F1	F2	F3	F4	F5	F6
1	Bringhraj	10%	10%	10%	10%	10%	20%
2	Brahmi	10%	10%	10%	10%	10%	20%
3	Neem	10%	10%	10%	10%	10%	20%
4	Amla	10%	10%	10%	10%	10%	20%
5	Giloy	10%	10%	10%	10%	10%	20%
6	Jatamansi	10%	10%	10%	10%	10%	20%

7	Vacha	10%	10%	10%	10%	10%	20%
8	Bakuchi	10%	10%	10%	10%	10%	20%
9	Nagkesar	10%	10%	10%	10%	10%	20%
10	Gunja	10%	10%	10%	10%	10%	20%
11	Nagarmutha	10%	10%	10%	10%	10%	20%
12	Coconut oil	q.s.50 ml	-	-	-	All oils in equal amount to q.s. 50 ml	All oils in equal amount to q.s. 50 ml
13	Sesame oil	-	q.s.50 ml	-	-		
14	Olive oil	-	-	q.s.50 ml	-		
15	Mustard oil	-	-	-	q.s.50 ml		

Physicochemical evaluation of poly herbal hair oil

Investigations were carried out to study the physicochemical and phytochemical properties of the formulated oil preparations. The formulation herbal oil was evaluated for qualitative and quantitative parameter like pH, acid value, Saponification value, viscosity, specific gravity, and organoleptic property. Determinations of these parameters are very essential to assure the quality, safety, and efficacy of this formulation [18,19].

Sensitivity test
The prepared herbal hair oil was applied on 1 cm skin of hand and exposed to sunlight for 4-5 min [20].

Acid value
Preparation of 0.1molar solution weighted 0.56g of KOH pellets and dissolved water and stirred continuously. The prepared 0.1 molar KOH solution .Was filled in the burette. Preparation of sample: measured 10ml oil and dissolved in 25ml of ether mixture and shocked. Added 1ml of phenolphthalein solution and titrate against with 0.1molar KOH solution. The acid value of the prepared oil was calculated by using formula[21]:

$$\text{Acid value} = 5.61n\backslash w$$

Where, n= number of ml 0.1 molar KOH, w= weight of oil

Saponification value
2g of oil was accurately weighed and transferred into a 250ml iodine flask.25ml of 0.5m alcoholic potassium hydroxide was added and boiled under reflux on a water bath for 30 mins. Phenophthalein was added as indicator and titrated against 0.5m HCl (a). Similarly blank was performed (b) without the sample. The saponification value of the prepared oil was calculated by using formula [22]:

$$\text{Saponifation value} = 28.05 \text{ (b-a)}\backslash w$$

Where, W= weight in gram of the solution [23].

pH
pH of the poly herbal hair was detected using pH meter. Take the formulated oil in beaker individually now deep the ph meter in beaker and weight for 1minute till the reading come, as the pH meter show the reading note it down individually. Before using pH meter deep it into the water [24].

Viscosity
Viscosity is determined by means of Brook field's viscometer. In which firstly take sample of prepared oil and then use spindle no 63 for viscosity determination now start brook field viscometer and weight for 1 min and reading is noted down in centiposise [25].

Specific gravity
Take two specific gravity bottle, rinsed it with distilled water, dry it in ovenfor 15min, cool, closed it with cap and weight it (a). Now fill the

same specific gravity bottle with the sample and closed it with cap and again weight it (b). Determine the weight of sample per milliliter by subtracting the weight (b-a) [26].

Organoleptic property
Organoleptic properties such as colour, odour was determined manually.

Results and Discussion
Herbal hair oil is one of the most well recognized hair treatments. Herbal hair oil not only moisturizes scalp but also reverses dry scalp and dry hair condition. It provides numerous essential nutrients required to maintain normal function of sebaceous glands and promotes natural hair growth. The herbal hair oil was prepared as showed in *Figure 4* from various herbs (*Table 1*) and their importance in the formulation is presented in *Table 2*. Formulation development was done with the optimized formula and evaluated by mean of various parameters like sensitivity test, color, odor, irritation test, grittiness test, specific gravity, pH, viscosity, acid value and saponification value. The results are depicted in the *Table 3*. Hence, from the present investigation it was found that the formulated herbal hair oil has optimum standards and further standardization and biological screening establishes the efficacy of formulated herbal hair oil.

Fig. 4: Prepared poly herbal hair oil formulations

Table 2: Role of individual ingredients in poly herbal hair oil formulation

S. No.	Ingredient	Role
1	Bringhraj (*Eclipta prostata / Eclipta alba*)	Hair growth and alopecia [27-28]
2	Brahmi (*Bacopa monniera*)	Nervine tonic, enhance protion kinase activity and also used for treatment for Dementia [29-30]
3	Neem (*Azadiracta indica*)	Antimicrobial, in the treatment of dandruff in hair and relief in itching [31]
4	Amla (*Emblica officinalis*)	Hair growth, provide nutrition to hair and also causes darkening of hair [32]
5	Giloy (*Tinospora Cordifolia*)	Antiallergic, antioxidant, anti-inflammatory, enhance memory [33-34]
6	Jatamansi (*Nardostachys jatamansi*)	Hair growth, Flavoring agent [35]
7	Vacha (*Acorus calamus*)	Antibacterial Properties, analgesic and anti-inflammatory activity [36-38]
8	Bakuchi (*Psoralea corylifolia*)	Antibacterial, antiscabies, antifungal hence prevent dandruff [39]
9	Nagkesar (*Mesua Ferrea*)	Antiallergic, astringent and cooling effect [40]
10	Gunja (*Abrus recatorious*)	Alopecia, antidandruff [41]
11	Nagarmotha (*Cyperus scariosus*)	Antibacterial, antigungal, flavouring agent [42-43]
12	Coconut oil	Vehicle
13	Sesame oil	Vehicle
14	Olive oil	Vehicle
15	Mustard oil	Vehicle

Table 3: Evaluation of poly herbal hair oil

S. No.	Parameter	Observation of poly herbal hair oil					
		F1	**F2**	**F3**	**F4**	**F5**	**F6**
1	Colour	Green	Light green	Dark brown	Light green	Brown	Brown
2	Odour	Characteristic	characteristic	Characteristic	characteristic	Characteristic	characteristic
3	pH	5.1	5	5.3	5.2	6	6.2
4	Viscosity	6cp	6cp	7cp	8cp	7cp	8cp
5	Acid value	2.8	3.48	2.93	3.9	2.89	3.83
6	Saponification value	336	378	350	336	354	394
7	Specific gravity	0.920	0.897	0.946	0.934	0.9188	0.9064

Conclusion

From the present investigation it was found that the formulated herbal hair oil has optimum standards and further standardization and biological screening establishes the efficacy of formulated herbal hair oil.

References

1. Hordinsky MMD. Advances in Hair Diseases. Advances in Dermatology. 24: 2008; 245-259.
2. Thorat RM, Jadhav VM, Kadam VJ. Development and evaluation of polyherbal formulations for hair growth promoting activity. International J Pharma Tech Res. 1(4): 2009; 1251-1254.
3. Osorio F, Tosti A. Hair Weathering, Part 1: Hair Structure and Pathogenesis. Cosmetic Dermatology. 24: 2011; 533-538.
4. Jain PK, Joshi H, Dass DJ. Drug that causes hair loss and promotes hair growth - A Review. International J Res Pharma Biomed Sci. 3(4): 2012; 1476-82.
5. Thorat R, Jadhav V, Kadam V, Sathe N, Save A, Ghorpade V. Evaluation of herbal hair oil in reducing hair fall in human volunteers. International J Pharmaceutical Res Devlp-online.2009; 6.
6. Purwal L, Prakash SB, Gupta N, Pande MS. Development and Evaluation of Herbal Formulations for Hair Growth. E-Journal Chemistry. 5(1): 2008; 34-38.
7. Cotsarelis G, Millar SE. Towards a molecular understanding of hair loss and its treatment. Trends Molecular Med. 7(7): 2001; 293-300.
8. Ohyama M. Management of hair loss diseases. Dermatologica Sinica. 28: 2010; 139-145.
9. Springer KMD, Brown MMD, Stulberg DLMD. Common hair loss disorders. American Family Physician, 68(1): 2003; 93-102.
10. Cotsarelis G, Millar SE. Towards a molecular understanding of hair loss and its treatment. Trends Molecular Med. 7(7): 2001; 293-300.
11. Gilhar AMD, Etzioni AMD, Paus RMD. Alopecia Areata. The New England Journal of Medicine. 366: 2012; 1515-25.
12. Obaidat NAMD, Rawashdeh BTMD, Wreikat ARAMD, Awamleh AAMD. A Potential relation between telogen effluvium and iron deficiency in adult females. Journal of Research in Medical Sciences. 12(1): 2005; 62-66.
13. Grevelman EG, Breed WPM. Prevention of chemotherapy-induced hair loss by scalp cooling. Annals of Oncology. 16: 2005; 352-358.
14. Nadkani, A, K., India Material Medica, Popular Prakashan Pvt. Ltd., Bombay, 1954; 631.

15. Khare, C. P., Ravikumar. , Encyclopidea of India Medicinal Plants, Springer-verlag Berlin Heidel berg, Newyork, 2004; 177.
16. Hirokastu, E. &kitaura, T., Volatile Constituents of asisari radix, Koryo, Jorupenoy-Oli, Seiya Kagaku nikanswwtoronkaikoenyoshishu 48, 2004; 7-9.
17. Khare, C. P., Encyclopedia of India Medicinal Plants, Springe-verlag Berlin Heidel Berg, New York, 2004; 335.
18. Daniel, M., Medicianl Plants Chemistry and Properties, Oxford and IBH Co. Pvt. Ltd., New Delhi, 2006; 116.
19. Aruoma, OI, Spencer, JP, Rossi, R. An evaluation of the antioxidant and antiviral action extracts of rosemary and provencal herbs, Food ChemToxicol, 34, 1996; 449-456.
20. Gautam S, Dwivedi S, Dubey K, Joshi H. Formulation and evaluation of herbal hair oil, Int J Chem Sci, 10(1), 2012; 349-353.
21. Bohlin L, Goransson U., Backlund A. (2007). Modern pharmacognosy: connecting biology and chemistry. Pure Applied Chemistry, 79, 763-774.
22. Gordon MC, David JN. Natural product drug discovery in the next millennium. Pharm Biol, 39: 2001; 8–17.
23. Wink M. Introduction Biochemistry, role and biotechnology of secondary products. In: Wink M, editor. Biochemistry of Secondary product Metabolism. Florida: CRC press, Boca Raton. 2000; pp. 1–16.
24. Cor JS, Beach JF, Blair A, Clark AJ, King J, Lee TB, et al. Disodium chromoglycate. Adv Res. 5: 1970;190–6.
25. Yates A. Yates Garden Guide, Harper Collins Australia, Australia: 2002.
26. McDonagh AJ, Messenger AG. The Pathogenesis of alopecia areata, Dermatological Clinic, 14: 1996; 661-70.
27. Chokotia L S, Vashistha P, Sironiya R, Matoli H. Pharmacological activities of *Eclipta alba* (L.), International J Res Devpl Pharm Life Sci. 2(4), 2013; 499-502
28. Roy RK, Mayank Thakur, Dixit VK. Hair growth promoting activity of *Eclipta alba* in male albino rats. Arch Dermatol Res. 300: 2008; 357-64.
29. Bhattacharya SK. Ghosal S. Anxiolytic activity of a standardized extract of *Bacopa monniera*: An experimental study. Phytomedicine. 5: 1998; 77–82.
30. Aguiar, Sebastian, Borowski T. Neuropharmacological Review of the Nootropic Herb *Bacopa Monnieri*. Rejuvenation Research 16(4): 2013; 313–326.
31. Kokate CK, Purohit AP, Gokhle SB. Pharmacognosy, 38th edn, Pune: Nirali Prakashan, PP.296.
32. Wagner H, Bladt S, Zgainski FM. Plant drug analysis, Berlin: Verlas,194.
33. Sarangi MK, Soni S. A review on giloy: the magic herb. Inventi Rapid: Planta Activa Issue 2, Vol 2013.
34. Bhawya D, Anilakumar KR. In-vitro antioxidant potency of *Tinospora cordifolia* (gulancha) in sequential extracts. International J Pharm Biol Arch, 1(5): 2010; 448-456.
35. Sahu R, Dhongade HJ, Pandey A, Sahu P, Sahu V, Patel D, Kashyap P. Medicinal properties of *Nardostachys jatamansi* (A Review). Oriental J Chemistry, 32(2): 2016; 859-866.
36. Tilavat Y, Parmar R. A brief review of medicinal properties of Vacha (*Acorus calamus* Linn.) from Nighantus. J Ayurveda integrated Sci. 2(3): 2017; 263-265.
37. Aqil F, Ahmad I. Antibacterial properties of traditionally used Indian medicinal plants. Methods Find Exp Clin Pharmacol. 29: 2007; 79-92.
38. Singh C, Jamwal U, Singh P. *Acorus calamus* (sweet flag): An overview of oil composition, biological activity and usage. J Med Aromatic Plant Sci. 23: 2001; 687-708.
39. Rajput S, Meena, Singh S, Rama Murthy A, Brief review of bakuchi (*Psoralea corylifolia* Linn.) and its therapeutic uses, Ayurpharm Int J Ayur Alli Sci., 3(11), 2014, 322-330.
40. http://www.planetayurveda.com/mesua-ferrea.htm

41. Chaudhari KS, Sharma R, Pawar PS, Kashikar VA. Pharmacological activities of *Abrus precatorius* Linn.-A Review. International J Ayurvedic Herbal Med. 2(2), 2012; 336-348.
42. Lahariya AK, Rao JT. In-vitro antimicrobial studies of the essential oil of *C. scariosus* and *Ocimum basilicum* Indian Drugs, 1979; 150-52.
43. Gupta SK, Sharma RC, Aggarwal OP and Arora RB. Anti-inflammatory activity of essential oil isolated from *Cyperus scariosus* (R.Br.) Indian J Experimental Biol. 10: 1972; 41-44.