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Research Article

Pharmacological Screening of Selected Medicinal Plant Extracts for Hair Growth Activity

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Abstract

*Solanum xanthocarpum,Trigonella foenumgreacum*and *Sesbania grandiflora*herbs are highly used by the rural and tribal people in curing various disorders. The aim of the current investigation is to evaluation hair growth activity of polyherbal extract of*S. xanthocarpum, Trigonella foenumgreacum and Sesbania grandiflora*ThePharmacological screening study provides a strong evidence for the use of the combination of plant in management of alopecia. The plant therefore could be use as a natural source for hair growth and was capable of providing an alternative remedy for the management alopecia. The combination of extract E exhibited hair growth initiation on 8thday . Complete hair growth with minoxidil and control group as observed in 23 and 35 days respectively and while extract E combination was 28 days. The extract combination E exhibited hair length 2.14 mm at 30 days whereas with minoxidil exhibited hair 2.8 at 30 days respectively. Combination of plant extract showed significantly considerable results and exhibited significant increase in hair regrowth.

Keywords: *Solanum xanthocarpum, Trigonella foenumgreacum , Sesbania grandiflora,*extract ,physiochemical study, hair growth.

Introduction

The use of medicinal plants as raw materials in the production of new drugs is ever increasing because of their potentials in combating the problem of drug resistance in micro-organisms.

Demand for medicinal plants is increasing in both developing and developed countries. Research on medicinal plants is one of the leading areas of research globally.

Solanum xanthocarpum (Solanaceae) is an important medicinal herb in Ayurvedic medicine. Various studies indicated that S.*xanthocarpum* possesses antiasthmatic, hypoglycemic, hepatoprotective, antibacterial, analgesic and insect repellent properties. Although the results are very encouraging and indicated that some of the constituents of the plant like solasodine and diosgenin are important therapeutically, the herb should be studied more extensively to confirm these results and reveal other potential therapeutic effects. . In India it is largely found in UP, Punjab, Bihar, Bengal, Uttaranchal, & other north east states. It grows generally in March- April and produce fruits in May- June. It can grows on any type of soil but hot and dry region is more suitable Various traditional claims like immunomodulation, anti-inflammatory, antiallergic, antianaphylactic and antitumor effects of the plant are still remain to be validated scientifically while Alpinia officinarum belong to the ginger family and commonly used for its anti-inflammatory, antihyperlipidemic bioactivity, anticancer, dysmenorrhea, osteoblast, anti-influenza virus activity, antibiotic resistance, antimicrobial effect.[1-5]

Trigonella foenum-graecum L. (Fenugreek) commonly known as methi (in Hindi) has been used as a culinary spice, a flavoring agent and as a medicinal plant from ancient time

The seeds of fenugreek Fenugreek seeds are the most important and useful part of fenugreek plant. These seeds are golden-yellow in colour, small in size, hard and have four-faced stone like structure. Fenugreek seed is 3-6 mm long, 2-5 mm wide and 2 mm thick in geometry. Raw fenugreek seeds have maple flavour and bitter taste but by the process of roasting, their bitterness can be reduced and flavour can be enhanced. Fenugreek seeds are used as spices. The whole seed or its ground powder is used in pickles, vegetable dishes and spice powder. Dried seeds are used as condiments. Fenugreek seeds are gummy, fibrous, sticky and gummy in nature. Biologically, its seeds are endospermic in nature.[6-7]

Material & Methods

Collection of plant material

The seeds of *Trigonella foenumgreacum and lavandula oil* wereprocured from local market while *Solanum xanthocarpum* plants, *Sesbania grandiflora*flowers and*Aloe vera* were collected

from natural habitat and authenticated by Dr. S. N. Dwivedi, Prof. & Head, Department of Botany, Janata PG College, APS, University, Rewa, M.P.

Preparation of plant powder

The seeds of *Trigonella foenumgreacum* were pulverized, sieved through 40 mesh to obtain a coarse powder.While whole plant(comprising of root, stem, leaves, flowers, and fruits) of*Solanum xanthocarpum* and *Sesbania grandiflora* flowers were dried under shade and then powdered with a mechanical grinder. The powder was passed through sieve No. 40 and stored in an airtight container for further use.

Preparation of extracts

About 250-250 gm of dried powder of *Trigonella foenumgreacum*seed,and whole plant part of *Solanum xanthocarpum*and*Sesbania grandiflora* flowers were subjected to soxhlation separately . It was firstdefatted with petroleum ether then exhaustively extracted with ethanol solvent in a Soxhlet apparatus for 36 hours. The temperature was maintained at 40-50 degree centigrade. The solvents were removed by distillation under reduced pressure and the resulting semisolid mass was vacuum dried using rotary flash evaporator to obtain the extract.

To obtain Aloe vera extract, the mucilaginous jelly obtained from the centre (the parenchyma) of the plant leaf of Aloe vera, the thick succulent leaves of Aloe vera were collected, washed with water and a mild chlorine solution and were finally cut transversely into pieces. With a vegetable peeler, the thick epidermis was selectively removed and the inner gel-like pulp in the center of the leaf was separated with a spoon, minced, and homogenized in a mixer.[8-9]

3 PHARMACOLOGICAL SCREENING

Extract of plants was investigated for hair growth activity. 1:1:1 combination of plants extract (2.5 gm Seed extract of *Trigonella foenumgreacum*, 2.5 gm *Sesbania grandiflor a* flower and *2.5 gm* whole plant extract of *Solanum xanthocarpum)*was used for hair growth study.Both qualitative hair growth and quantitative hair growth activity performed. Qualitative hair growth analysis was undertaken by visual observation of two parameters: hair growth initiation time and hair growth completion time. While hair length, hair weight and histological study performed in quantitative hair growth analysis.

Plant Extract	**Quantity**
Seed extract of *Trigonella foenumgreacum*(% w/w)	2.5
Whole plant extract of *Solanum xanthocarpum*(% w/w)	2.5
Flower extract of *Sesbania grandiflora* (% w/w)	2.5
Lavandula oil	3 ml
Aloe vera	5ml

Animals:

Healthy Wistar rats (150-200g) were used for the study. Rats were housed in small cages in environmentally controlled (25 ± 20C, 12h light and dark cycle, with free access to food and water *ad libitum*). Rats were fed with the standard laboratory chow diet during the period of study.

Treatment for hair growth activity in-vivo study:

In which research study to determine the Polyherbal extract to improve hair growth on the wistar albino rat. Eighteen wistar rats are taken in that study and are divided in to the three groups each group contain six rats. In which first group served as control group where there no drug treatment. Second group as a standard where 2 % minoxidil was applied over the shaved area. Third group was topically applied with combination of extract(Seed extract of *Trigonella foenumgreacum*, flower extract of *Sesbania grandiflora* and whole extract of *Solanum xanthocarpum*) and served as test group. Hair from 3 cm^2 area at the dorsal portion of all the rat were shaved using electrical shavers and applied with marketed hair remover to completely remove hair. The polyherbal extract and minoxidil gel formulation were applied to the denuded area of the respective groups two times in a day and control group received no treatment. This treatment was continued for 30 days during which qualitative and quantitative parameter of hair growth was observed and recorded.

In-vivo skin irritation study was conducted for 7 days and observed for any sensitivity and the reaction if any was graded as under -

A – No reaction, B – Slight patchy erythema, C –Slight but confluent or moderate but patchy erythema, D – Moderate erythema, E – Severe erythema with or without edema.

Qualitative Studies on Hair Growth study

Qualitative hair growth analysis was undertaken by visual observation of two parameters: hair growth initiation time (i.e. minimum time to initiate hair growth on denuded skin region) and hair growth completion time (i.e. minimum time taken to complete cover the denuded skin region with new hair).

Quantitative hair growth study

Hair length determination: Hairs were plucked randomly using sterile forceps from the shaved area of selected rats, from each group on 30th day of the treatment. The average length of 25 hairs was randomly selected and measured in millimeter and the results were expressed in mean ± SEM.

Histological studies: On the 10th, 20th and 30th day of treatment one rat from each group was authenticated and skin biopsies were taken from the shaved area and fixed in 10% formalin buffer. Sections of tissue were embedded in paraffin wax and sectioned in to uniform thickness of 10µm. The sectioned tissues were stained with haematoxylin and eosin. From the stained tissue the number of hair follicles per millimeter of the skin and the percentage ratio of different cyclic phases were examined using microscope fitted with an ocular micrometer facility..[10-15]

Results and conclusion

Extraction

The dried powder of plant was extracted with solvents i.e., Ethanol solvent. The solvents were removed by distillation under reduced pressure and the resulting semisolid mass was vacuum dried using rotary flash evaporator to obtain the extract. The percentage yields of various extract was presented in Table 2.

Table 2: Extractive value of different extract

Sr.No.	Plant name	Extractivevalues(%w/w)
1.	*Trigonella foenum-graecum*	16.12
2.	*Solanum xanthocarpum*	12.27

3	*Sesbania grandiflora*	18.5

PHARMACOLOGICAL SCREENING OF PLANT EXTRACTS

Qualitative Evaluation of In Vivo Hair Growth.

Throughout the 30 days study period, all the groups of animals were observed closely to determine the hair growth initiation and completion time. This was achieved using a magnifying lens that enabled observation of minute changes in the hair growth pattern. The point at which a tiny prickle of hair growth was observed and it was noted as the initiation time. Combination of extract E treated animals showed significant reduction in hair growth initiation and completion time as compared to control and minoxidil treated animals (Table 1).

In control group animals, initiation of hair growth in denuded area was observed in 13 days. Hair growth initiation was noted in the first week (6 days) in mice of minoxidil treated standard group. The combination of extract E exhibited hair growth initiation on 8^{th}day .Similarly the time taken for complete hair growth on shaved area was promoted with minoxidil treatment as well as extracts. Complete hair growth with minoxidil and control group as observed in 23 and 35 days respectively and while extract E combination was 28 days. (Table 1).

Qualitative observation of hair growth

Table No 1 Effect of Extracts on Hair Growth Initiation and Completion Time

Group	**Treatment**	**Time taken to initiate the growth (in days)**	**Time taken for complete growth (in days)**
Group I	Control	13±0.70	35.20±1.23
Group II	2% Minoxidil	6.08±0.81	23.8±0.73
Group III	Extract combination (E)	8.76±64	28.2±0.61

Values are mean ± SEM

Quantitative hair growth Study

Hair length Determination

The length of the hair began to increase until the end of the treatment course. The E combination of extract produced a greater effect on the length of hair when compared to other group. The extract combination E exhibited hair length 2.14 mm at 30 days whereas with minoxidil exhibited hair 2.8 at 30 days respectively. E combination of extract treated groups produced a significant effect on the length of hair when compared to other groups. This may be due to the premature switching of follicles from the telogen to anagen phase of hair growth cycle. Average hair length of each group at 30^{th} day has been given in Table.2.

Table No 2 Effect of different combination of Extract on Hair length

Group of	**Formulation**	**Hair Growth in mm Mean+ S.D**
		30 days
Group I	Control	1.19±0.31
Group II	2% Minoxidil	2.82±0.32
Group III	Extract combination (E)	2.14±0.26

Values are mean ± SEM

Histological studies

E1 combination of extract on the development of hair follicles

The hair follicle count, skin thickness and color appearance were observed. Wherecombination of extracts positive changes observed from day 10. Combination of plant extract showed significantly considerable results and exhibited significant increase in hair regrowth. Increase in the thickness and presence of hair follicles in the subcutis layer were taken as an evidence for transition of follicles from telogen to anagen phase of hair growth.

A considerable difference in cyclic phases of hair growth was observed in groups treated with minoxidil and E combination extracts. An increase in the number and size of hair follicles has been designated as an indicator for the transition of hair growth from the telogen to anagen phase.

To examine the progression of hair follicles in the hair cycle, hematoxylin – eosin staining was performed, since an increase in size and number of hair follicles can be observed in the deep subcutis (Datta *et al.,* 2009). The photomicrographs obtained indicated that control (simple) treated animals had less percentage of anagenic hair follicles (51.3 %) while the E (68.8 %) and minoxidil (70.4 %) treated animals showed maximum percentage of anagenic hair follicles and higher follicle density. (Table.3)

Table No 3 Effect of Extracts different combination on per cent of hair follicles

Group of 20 days	**Formulation**	**Anagen**	**Telogen**	**T/A ratio**
Group I	Control	51.3±0.69	43.4±0.89	0.84
Group II	2% Minoxidil	70.4±0.65	26.2± 0.17	0.37
Group III	E Extract combination	63.4±58	30.2±0.62	0.48

Values are mean ± SEM

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