



PREPARATION AND EVALUATION OF HERBAL ANTI-ACNE GEL

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ABSTRACT

Herbal formulations have growing demand in the world market. The present work deals with the development and evaluation of the herbal Anti-Acne gel containing hydro-alcoholic extract of Neem leaves (*Azadirachta indica*) and the fruits of Nutmeg (*Myristica fragrance*). The plants have been reported in the literature having good anti-microbial, anti-oxidant and anti-inflammatory activity. Various formulation batches i.e., F1 to F15 were prepared and evaluated for various parameters like colour, appearance, consistency, washability, pH, spreadability and antimicrobial activity.. Optimized formulation was compared with the marketed preparation. Amongst all the formulation studied batch F4 was found optimum for all the parameters. It is a very good attempt to establish the herbal gel containing hydro-alcoholic extract of neem leaves (*Azadirachta indica*) and fruits of nutmeg (*Myristica fragrance*).

KEYWORDS: Carbopol, HPMC, Neem, Nutmeg, Microbial assay



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INTRODUCTION

Acne vulgaris is an extremely common disorder of the skin (piloosebaceous unit) that affects virtually all individuals at least once during life. The incidence of acne peaks of teenage, but substantial numbers of men and women between 20-30 years of age are also affected by the disorder¹. Acne may be classified as comedonal, papular, pustular, cystic, and nodular. Comedonal acne is non-inflammatory and divided into two types: whiteheads and blackheads. White heads (closed comedo) present as fresh or white colored, raised bumps whereas blackhead (open comedo) present as open pores containing dark colored skin roughage consisting of melanin, sebum, and follicular cells. Papules appear as red, solid, elevated lesions often less than 5 mm in diameter. Pustules are circumscribed skin elevations containing purulent material. Cysts and nodules are solid, elevated lesions involving deeper dermal and subcutaneous tissue. Cysts are less than 5 mm in diameter whereas nodules exceed 5 mm. The pathogenesis of acne involves multiple physiological factors. These include follicular hyper proliferation; increased sebum production due to higher androgen levels and colonization of organism, *Propionibacterium acnes*^{2, 8}. Novel concepts have emerged to help better understand its pathogenesis; these include variations in target cell sensitivity, biological markers, neuro-endocrine, genetic, and environmental factors. Plenty of herbal as well as synthetic ingredients are reported to have remarkable beneficial effect on acne vulgaris³. They may have different mechanisms like, (a) Control sebum secretion, (b) Antibiotics which inhibit *Propionibacterium acne*, the main causative organism of acne, (c) Keratolytic which removes the keratin layer and prevents the trapping of sebum under the skin, (d) Anti-inflammatory which prevents the worsening of the condition due to inflammation or redness etc. Numbers of formulations are available in the market with a variety of active pharmaceutical ingredients for the treatment of

acne. Topical formulations, available in the market are as follows: Gel, Cream, Lotion, Face wash or cleansers, Face pack or mask. Neem (*Azadirachta indica*, *Meliaceae*) and nutmeg (*Myristica fragrance*, *Myristicaceae*) are reported to have very beneficial effect on acne due to anti-microbial, anti-inflammatory and anti-oxidant activities of different chemical constituents.

MATERIALS AND METHODS

Collection of Plant material

Leaves of neem were collected from the local area of Guntur in the month of August, 2012. Fruits of nutmeg were purchased from the local market of Guntur.

Preparation of Extracts

Leaves of neem were cut into small pieces. Fruits of nutmeg were crushed to make powder. Desired quantities of herbal drugs were weighed and were individually added to the conical flask containing five times volume of 1:1 water-ethanol mixture. The contents were allowed to boil on water bath under reflux condition for about 30 min. The contents were filtered out and residues were again boiled with five times volume of 1:1 water-ethanol mixture in the water bath under reflux condition for about 15 min. The contents were filtered out and filtrates were combined. Filtrate was allowed to evaporate in evaporating pan until the desired concentration of the extract was obtained⁴.

Development of Formulations

Various formulation batches were prepared according to the Table 1⁵. The desired concentration of gelling agents was weighed accurately and dispersed in hot purified water (not more than 60°C; 50 % weight of the batch size) with moderate stirring, avoiding air entrapment and allowed to soak overnight. Desired quantity of methyl paraben was dissolved in the remaining amount of water by

gentle heating. Desired quantity of polyethylene glycol 4000, propylene glycol and herbal extracts were added to the above mixture. This was finally mixed with previously soaked gel

formulation. Triethanolamine was added at last to adjust the pH. Prepared formulations were filled in a suitable container and labeled accordingly.

Table 1
Composition of developed formulations

Ingredients	Quantity taken per 100 gm gel (in grams)														
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13	F14	F15
Neem	5	5	5	5	5	5	5	-	-	-	-	-	1.5	2	2.5
Nutmeg	-	1	1.5	2.5	2	-	-	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Carbopol (934)	-	-	0.5	1	1.5	-	-	-	-	1.5	1	0.5	-	-	0.5
Carbopol (940)	0.5	1	1.5	-	-	-	-	0.5	1	1	1.5	-	-	-	-
HPMC (K4M)	3	3.5	4	-	-	-	3	3.5	4	-	-	-	-	3	3.5
PEG 4000	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Propylene glycol	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Methyl paraben	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Purified water	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s	q.s

EVALUATION OF FORMULATIONS

Physical evaluation

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

Washability

Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

pH

pH of 1% aqueous solution of the formulation was measured by using a calibrated digital pH meter at constant temperature ⁶.

Spreadability

Spreadability was determined by an apparatus suggested by fabricated in-house. The apparatus consists of a wooden block with a fixed glass slide and movable glass slide with one end tied to weight pan rolled on the pulley, which was in the horizontal level with fixed slide. The spreadability of the formulated gel was measured on the basis of 'Slip and Drag' characteristics of gel. An excess of gel (about 2g) under study was placed on this ground slide. The gel was then sandwiched between

two slides. One kg weight was placed on the top of the two slides for 5 min to expel air and to provide a uniform film of the gel between the slides. Excess of the gel was scrapped off from the edges. The top plate was then subjected to pull off 50 gm. Mix with the help of string attached to the hook and the time (T, in seconds) required by the top slide to move a distance of 7.5 cm be noted. A shorter interval indicated better spreadability.

MICROBIAL ASSAY

The antibacterial activities of different formulations were determined by modified agar well diffusion method. In this method, nutrient agar plates were seeded with 0.2 ml of 24 h broth culture of *Propionibacterium acnes*, a causative organism for acne vulgaris. The agar plates were allowed to solidify. A sterile 8 mm borer was used to cut wells of equidistance in each of the plates. 0.5 ml of formulations, herbal extracts and marketed clindamycin gel were introduced into the wells at randomly. The plates were incubated at 37°C for 24 hours ⁷. The antibacterial activities were evaluated by measuring the zones of inhibition (in mm). The results of evaluation are shown in Table 2.

Table 2
Evaluation of formulations

Formulation/ (Code)	Batch	Colour	Consistency	Washability	pH	Spreadability (gm-cm/sec)	Zone Of Inhibition (mm)
Clindamycin (10mg/ml)		Colourless	Semi-solid	Good	7.05	27.71	10
Neem extract		Green	-	-	-	-	8
Nutmeg extract		Orange	-	-	-	-	5
F1		Green	Fluid	Good	7.12	186.5	4
F2		Green	Semi-solid	Good	7.15	11.31	4
F3		Green	Semi-solid	Good	7.09	03.94	5
F4		Green	Semi-solid	Good	7.15	62.50	7
F5		Green	Semi-solid	Good	7.23	03.62	5
F6		Green	Stiff	Good	7.31	13.01	4
F7		Green	Semi-solid	Good	7.05	10.71	3
F8		Orange	Semi-solid	Good	7.36	50.87	3
F9		Orange	Fluid	Good	7.20	53.87	2
F10		Orange	Semi-solid	Good	7.80	12.36	2
F11		Orange	Semi-solid	Good	7.41	02.34	5
F12		Orange	Semi-solid	Good	7.12	168.1	5
F13		Orange	Fluid	Good	7.36	02.45	6
F14		Orange	Fluid	Good	7.29	52.41	2
F15		Green	Semi-solid	Good	7.64	60.14	3

RESULTS AND DISCUSSIONS

The results of this investigation showed that all developed formulations had an inhibitory effect on the *P.acnes*. Formulation F2-F5, F8, F11-F14, and F15 had semisolid consistency. All the formulations were found homogenous, easily washable. All the formulations had very slightly alkaline pH which was compatible with normal skin physiology. Amongst all the formulations F4, F7, F11, F13 and F15 had very optimum spreadability. All the formulations showed considerable zone of microbial inhibition. Herbal extract and formulation F4 showed comparatively more antimicrobial activity than other formulations. However, the activity of

standard drug clindamycin is more than that of all developed formulation.

CONCLUSION

Natural remedies are more acceptable in the belief that they are safer with fewer side effects than the synthetic ones. Herbal formulations have growing demand in the world market. It is a very good attempt to establish the herbal gel containing hydro-alcoholic extract of neem leaves (*Azadirachta indica*) and fruits of nutmeg (*Myristica fragrance*). This study revealed that the developed single herbal formulation F4 was comparatively better than other formulation.

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