

Formulation and evaluation of an antiacne peel-off mask with Terminalia Chebula and Coffee extracts.

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ABSTRACT

Acne is a persistent skin condition caused by the clogging of hair follicles by sebum and dead skin cells. It can lead to feelings of anxiety and low self-esteem, and in extreme cases, depression or suicidal thoughts. It can be treated through alterations to one's diet, the use of medicinal medicines, and even surgical operations. It can be classified into three severity levels: mild, moderate, and severe. A study published in November 2021 revealed the consensus of 24 international plastic surgeons and dermatologists regarding the most effective energy-based devices for the treatment of acne scars. The peel-off formulation was made by dissolving carbapol (940 grade) in 20 ml of water and methyl paraben, adding sodium carboxymethylcellulose and propyl The formulation of a peel-off mask was evaluated for physical characteristics, folding endurance, pH, spreadability, thermodynamic stability, skin irritation, and peeling time. The peel test was conducted to determine the antiacne activity of Terminalia Chebula and coffee against Propionibacterium acne. The results showed that F3 formulation of Terminalia Chebula and coffee had the highest activity, while F1 had the lowest activity. The physiochemical properties of the peel-off mask were studied, such as pH, colour, spreadability, washability, peeling time, and peeling time. The pH ranged from 7-7.3, which was suitable for topical applications without discomfort.

Keywords: Skin irritation, Terminalia chebula, acne

I. INTRODUCTION

Acne, also known as acne vulgaris, is a persistent skin condition that is caused by the clogging of hair follicles by sebum (oil) and dead skin cells (also known as keratin). People who have this condition often have blackheads or whiteheads, pimples, greasy skin, and the ability to scar. The areas of the skin that are most frequently affected

include the back, the upper half of the chest, and the face. These parts of the body have a disproportionately large number of oil glands. It is possible that the appearance could lead to feelings of anxiety and low self-esteem, and in more extreme cases, depression or suicidal thoughts. An individual's vulnerability to acne is mostly inherited in approximately eighty percent of cases. There is a lack of clarity regarding the relationship between diet and smoking, and neither cleanliness nor sun exposure appear to be contributors. Androgen hormones appear to be a component of the underlying mechanism because of their ability to increase sebum production in people of both sexes. Another important factor that contributes to acne is an overgrowth of the Cutibacterium acnes bacterium, which is found naturally on the skin. [9] Acne can be treated in a variety of methods, including through alterations to one's diet, the use of medicinal medicines, and even surgical operations. Reduce the severity of the disease by reducing your consumption of simple carbohydrates like sugar. Azelaic acid, benzoyl peroxide, and salicylic acid are some of the therapies that are commonly employed. These acids are applied topically to the skin that is affected by the condition. Acne can be treated with retinoids applied topically or taken orally, depending on which method is preferred by the patient. Antibiotic treatment, on the other hand, can promote the evolution of bacteria that are resistant to antibiotics. [10] It is possible for women to avoid acquiring acne by using a variety of birth control medicines. Isotretinoin pills are typically reserved by dermatologists for the treatment of severe acne because of the increased risk of side effects. [11] There are members of the medical profession who believe that acne should be treated early and aggressively in order to decrease its overall and long-term impact on people. [6] In 2015, acne was the ninth most widespread disease in the world, and it was estimated that it affected 633 million people

all over the globe. [12] It is estimated that between 80 and 90 percent of adolescents in Western countries suffer from acne at some point throughout their teenage years. [13] Some rural communities have reported lower rates of acne when compared to countries that have a more industrialised population. [14] Both children and adults, both before and after puberty, have the potential to be affected. Although acne is more uncommon in people as they get older, more than half of those who still have it in their 20s and 30s have it, and a smaller number of those who are in their 40s still suffer with it. [3] Classification Acne vulgaris (Greek: "point," and Latin: vulgaris, "common") can be broken down into three different severity levels—mild, moderate, and severe—in order to select the most suitable treatment plan. [13] There is no one method that everyone agrees on for determining how severe 8 acne is. [9] Mild acne is characterised by the presence of blocked skin follicles, also known as comedones, and is often confined to the face. Mild acne may also include occasional inflammatory lesions. [13] When compared to mild occurrences of acne, which emerge on the trunk of the body, acne that is considered to be of moderate severity is characterised by a greater number of inflammatory

papules and pustules appearing on the face. [13] Acne is considered to be severe when the distinctive facial lesions are nodules, which are painful 'bumps' resting under the skin, and when there is considerable involvement of the trunk in the condition. [13] [15] Large nodules used to be referred to as cysts in the past. In the medical literature, extreme cases of inflammatory acne have been referred to as nodulocystic acne. [Citation needed] [Citation needed] [25] True cysts are uncommon in people who suffer from acne; the condition is now more commonly referred to as severe nodular acne, which is the nomenclature of choice. [15] Acne inversa (L. invert, "upside-down") and acne rosacea (rosa, "rose-colored" + -ceus, "forming") are not types of acne; rather, they are alternative names that refer to the skin conditions hidradenitis suppurativa (HS) and rosacea, respectively. HS is an acronym for hidradenitis suppurativa, which means "suppur [16] Although HS and acne vulgaris share certain overlapping characteristics, such as a propensity to clog skin follicles with debris from dead skin cells, HS is not acne and is therefore considered to be a separate skin disorder. Acne is characterised by a number of distinguishing characteristics that does not have. [16]

Table: Types of Acne

	Injury type	Type of Acne	Degree	Gravity
Non inflammatory	Blackhead	Comedonica	I	Mild
	Pimple	Papular-pustular	II	Moderate
Pustule				
Inflammatory	Nodule	Nodular	III	Moderate to Severe
	Cyst		IV or conglobata	
	Scar		V or fulminant	Serious

Signs and symptoms: Acne is characterised by a rise in the oily sebum that is secreted by the skin, as well as the appearance of microcomedones, comedones, papules, nodules (big papules), pustules, and most commonly, scarring. Acne is a common skin condition. [17] Acne can look different on people of different skin tones. It's possible that this will lead to psychological and societal issues. [13] Scars Scarring from acne is brought on by inflammation deep inside the dermis, and it is estimated that 95%

of persons who have acne vulgaris will experience it at some point [18].The scar is the result of abnormal healing and inflammation of the dermis ..Scarring is most likely to occur with acne that is severe, but it is possible with any kind of acne vulgaris [18].The aberrant healing response that occurs after dermal inflammation can cause either an increase in the amount of collagen that is deposited at the location of the acne lesion or a decrease in the amount of collagen that is present there [20].Acne scars that are atrophic are the most

frequent type of acne scar (accounting for roughly 75 percent of all acne scars).. Atrophic acne scars are caused by the body's healing reaction and result in the loss of collagen.[20] .Atrophic acne scars can be further classified into subcategories such as ice-pick scars, boxcar scars, and rolling scars [18].Boxcar scars are indentation scars that are spherical or ovoid in shape and have sharp margins .. Their size ranges from 1.5–4 millimetres across.Ice-pick scars are deep scars that are long and thin (less than 2 millimetres across), and they extend into the dermis .Rolling scars are larger than ice-pick and boxcar scars, measuring between 4 and 5 millimetres across, and have a pattern of depth in the skin that looks like a wave ..Rarely seen, hypertrophic scars can be identified by their elevated collagen content, which occurs as a result

of an aberrant healing response.They are described as being elevated from the skin and having a hard appearance.Keloid scars, on the other hand, can generate scar tissue beyond the confines of the incision in which they originated, whereas hypertrophic scars never extend beyond these boundaries.Acne can leave behind keloid scars, which typically appear on the trunk of the body and are more common in men and those with darker skin .. Keloid scars also tend to be more severe.[21] In November of 2021, a study was published that revealed the consensus of twenty-four renowned international plastic surgeons and dermatologists regarding the most effective energy-based devices for the treatment of acne scars. [22] The study was conducted by a team of researchers from the United States, Canada, and the United Kingdom.

Table: Types of Acne Scar

Scars	Characteristics
Box car scars	Angular scars occur on cheeks and can be either superficial or deep similar to chickenpox scars
Ice pick scars	Deep pits are most common, sign of acne scarring
Rolling scars	Wave like appearance in skin
Hypertrophic scars	Thickened or keloid scars
Pigmented scars	True scars, Change in the skin's pigmentation, As a result of nodular or cystic acne, inflamed red mark

Materials and methods

Terminalia Chebula seeds And Coffee seeds are obtained from a local Ayurvedic shop and verified by the Pharmacognosy department of the Ideal College Of Pharmacy and Research, Kalyan, Mumbai.

Chemicals and Reagents

The chemicals Glycerin, Polyvinyl alcohol(PVA), Carbapol(940 grade), Sodium Carboxymethyl Cellulose(NaCMC), Methyl paraben, Propyl paraben, Talcum powder, Triethanolamine were obtained from Pallav chemicals private limited (India).

Preparation of extract

A powdered aqueous extract of T. chebula was made by finely pulverising the seeds using a pestle, mortar, and levigates. This formed a powder. In order to make use of the coffee seeds in the subsequent extraction process, they were first screened and then crushed into a fine powder.

Cutting and peeling the leaves of the aloe vera plant were required in order to extract the aloe vera gel.

Procedure for Formulation of a Peel off mask

The peel-off formulation was made by first dissolving carbapol (940 grade) in 20 ml of water and methyl paraben and then waiting until the carbapol swelled, which we referred to as phase-I of the preparation. The next step was to dissolve the polyvinyl alcohol in 30 millilitres of hot water while maintaining a temperature of 60 degrees Celsius. After the polyvinyl alcohol was dissolved, sodium carboxymethylcellulose and propyl paraben were added, which we referred to as the phaseII step. After phases I and II have been prepared, phase I is introduced to phase II while a mechanical stirrer is used to gradually combine the two phases after that extracts of haritaki and coffee were added with continuous stirring. In order to keep the solution's pH stable and attain the appropriate consistency in the formulation, triethanolamine was added to the mixture. Talcum powder was incorporated in order to keep the

opaque quality of the formulation. The total volume was adjusted to its final state using filtered water. Rose water was included in the composition in order to give it a new aroma. After adding the full ingredients, whisk the mixture consistently for

several Minutes, or until a smooth dispersion is achieved. After the formulation had been prepared, it was examined for additional evaluation parameters.

Sr.no.	Ingredients	Optimized Concentrations (%)		
		F1	F2	F3
1.	Terminalia Chebula and Coffee Extract	1gm	1.5gm	2gm
2.	Honey	-	0.5gm	1gm
3.	Glycerine	1gm	1gm	1.5gm
4.	Polyvinyl alcohol(PVA)	5gm	6gm	7gm
5.	Carbapol(940 grade)	0.5gm	0.5gm	0.5gm
6.	Sodium Carboxymethyl Cellulose	0.1gm	0.2gm	0.3gm
7.	Talcum powder	2gm	2gm	2gm
8.	Propyl paraben	0.02gm	0.02gm	0.02gm
9.	Methyl paraben	0.2gm	0.2m	0.2gm
10.	Triethanolamine	2ml	2ml	2ml
11.	Distilled Water	Qs	Qs	Qs

Table: Formula of peel off mask



Figure: Prepared Formulation

Evaluation Parameters

Physical evaluation

Physical characteristics, including color, look, and consistency, were evaluated for the formulation before use.[11,13,19]

Folding Endurance

They were manually measuring ready films' folding durability. Peel-off Mask covered skin. A 3x3 cm strip of film was dried, divided into equal pieces, and then folded repeatedly until it broke the number of folds the film could withstand at the exact location before breaking.

pH and Spreadability

The topical peel-off Mask's pH was measured digitally. One gram of formulation was dissolved in 100 ml of distilled water for two hours. Table 1.3 shows the pH readings of the formulations.11,18,20

Spreadability: The time it took two slides to separate from the cream, which was positioned in between the slides under a given force, was used to

gauge the spreadability. The quicker the two slides can be separated, the better the spreadability.[21]

$$= \frac{M_{\text{weight tied to upper slide}} \times L_{\text{length of glass slides}}}{T_{\text{time is taken to separate slides}}}$$

Thermodynamic Stability studies

This experiment tested the peel-off formulations' low- and high-temperature stability. With 24-hour storage at each temperature, there are six cycles between 4 °C and 40 °C. When tested at these temperatures, the formulation was stable.[21]

Table: Thermodynamic Stability of Formulations

Thermodynamic Stability	Formulation code		
	F1	F2	F3
4°C	Stable	Stable	Stable
40°C	Stable	Stable	Stable

Skin Irritation Study

Peel-off masks must not irritate or sensitize the skin. Using the Draize modified scoring method, the peel-off Mask was assessed for skin irritation. detected 0.0.[1,16]

The peel mask was put on the skin in an even way. The peel was given time to dry. After 15 minutes, the peel was taken off the skin's surface. Observations showed that the peel came off easily without breaking, as shown in Table 1.9 below.[11,13,19]

Peel Test

Table 1.5: Formulation peeling time

Formulation code	Peeling time (minutes)
F1	30
F2	33
F3	33



Fig: Peel test

ANTIACNE SCREENING

Materials and methods

Collection of bacterial cultures

The media used for the analysis was nutrient agar for propionibacterium acne.

Methodology

Antiacne activity of allium sativum(garlic) peel-off as well as standard clindamycin was done at same time using (wel diffusion method) and zone of inhibition was noted.

Maintenance of bacterial cultures

The bacterial were subcultured and maintained on nutrient agar slant and stored in a refrigerator at 4 degree Celsius. 4. Bacterial inoculum preparation Bacterial inoculum was prepared by inoculating a loop full of organism in 10ml of nutrient broth and incubated at 37 degree Celsius for 12 hours under anerobic conditions in a jar with a lit candle inside till a moderate turbidity and then used for the determination of Antiacne activity.

Medium 2.8gm of Nutrient agar is added in 100ml distilled water and autoclaved at 121 degree Celsius for 15 minutes at 15lbs and poured in a sterile petri plate upto a uniform thickness and the agar is allowed to set at ambient temperature and used.

Antiacne screening

This method was followed to determine the antiacne activity Nutrient agar were inoculated with broth cultures of Propionibacterium acne. Well (10mm diameter and about 1cm of a part) were made in each of these plates using sterile cork borer. A nutrient agar plate with gel formulation was made. The gel formulation were dissolved in DMSO and added into the wells of agar plates with standard clindamycin. The plates were sealed and the cultured plates kept in the jar and lit candle inside then the jar is closed firmly. The candle flame will consume most of the oxygen in the jar and will produce an elevated level of carbon dioxide the whole setup kept in incubator for 48 hours at 37degree Celsius. Zone of in inhibition was measured in mm. Measurement of zone of inhibition Measurement of zone inhibition for all gel formulation against standard clindamycin was measured.

The activity (A.I) and % inhibition was then calculated using the following formula:

$$A.I = \frac{\text{Mean zone of inhibition for sample}}{\text{Zone of inhibition obtained for standard}} \times 100$$

Table: Zone of inhibition of formulations against Propionicbacterium acne

SR.NO	FORMULATION	ANTIBACTERIAL ACTIVITY					
		Zone of inhibition in mm		Mean	Activity index	% Inhibition	Std Clindamycin
1	F1	13.4	13.8	13.6	0.5913	59.13	23
2	F2	15.5	15.1	15.3	0.6710	67.1	22.8
3	F3	18.1	17.8	17.95	0.7804	78.04	22

II. RESULT

In the present antiacne study of Terminalia Chebula and coffee against the P.acne the F3 formulation shows highest activity against P.acne. F1 shows lowest activity. The inhibitory activities of all extract reported in a table of Antiacne screening. Also the various physiochemical properties of the peel-off mask were studied i.e.

pH, colour, spreadability, washability, peeling time(status of peel-off film). Consistency and homogeneity of all formulation were found to good. Also all the formulation were washable. The pH of the formulations ranged from 7-7.3 which is suitable for topical applications without discomfort. Cooling and smooth effect was produced on application of skin.

Table: Evaluation Results

Formulation code	F1	F2	F3
Evaluation Parameters			
Colour	Brown	Brown	Brown
Odor	Sweet	Sweet	Sweet
Consistency	Semi-solid	Semi-solid	Semi-solid
Washability	Good	Good	Good
pH	7.29	7.00	7.00
Spreadability (cm)	6.67	6.67	6.67
Skin Irritation	Non irritant	Non irritant	Non irritant
Peeling time (minutes)	30	33	33
%inhibition	59.13	67.1	78.04

III. CONCLUSION

The result of present study show that the traditional usage of herbal substances possess compounds with antiacne properties that can be used as antiacne agents in new drugs for the therapy of infectious diseases caused by P.acne. and without showing skin irritation or edema all formulation show a good peel-off property and the prepared formulation when applied show no irritation and it is safer to use.

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