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Formulations and Evaluations of Herbal Anti-Acne Gel from Coriander and Garlic

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Abstract: ***Acne is an inflammatory condition of the skin's sebaceous follicles. The goal of the current study was to create and assess a coriander and garlic aqueous extract topical anti-acne gel. The antibacterial activity of corianders and garlic aqueous extract against Propionibacterium acnes and Staphylococcus epidermidis was examined. Agar dilution method was used to calculate concentration. The physical characteristics, Spreadibility, extrudability, ph, viscosity of the topical formulations was designed and tested. There are many pharmacological effects of garlic, including antibacterial, anticancer, and anti-inflammatory effects. Fresh pearl garlic or garlic with a single clove was utilised as the raw material in this study to make the garlic extracts. This project's goal is to get the garlic ready. Extracts made with non-chemical methods. The non-chemical extraction, the garlic extract was made by combining honey and garlic in a 1:1 ratio (w/v). The results showed that formulation F1 had the highest drug content (94%), highest level of stability, and zone of greatest efficacy, inhibition among all formulations.***

Keywords: Acne valgaris, Antibacterial activity, Coriander, Garlic, Topical gel

I. INTRODUCTION

The mobility of the dispersing medium is constrained in semi-rigid systems known as gels by an interlacing three-dimensional network of particles or solvated macromolecules of the dispersed phase. The term "gel" is derived from "gelatin. "gel" has roots in the Latin words "gelu" for "frost" Strong primary valences, as those found in silica acid gels, to weaker hydrogen bonds and Vander Waals forces may be the driving forces for the coupling between gelling agent particles.[1].

A. Properties of Gel [2-4]

1) It should have suitable anti-microbial agent.
2) The topical gel must not be sticky.
3) The ophthalmic gel must be sterile.

B. Acne

Acne vulgaris, also known as simply "acne," is a skin condition that affects people that is characterised by red, scaly skin (seborrhoea), pinhead-sized papules (papules), giant papules (nodules), pimples, and scars. Acne affects skin with numerous sebaceous follicles in places like the back, chest [5]

C. Sign and Symptoms of Acne

There are papules, nodules (big papules), comedowns, pustules, seborrhoea (increased oil-sebum discharge), and scarring Acne's appearance varies according to skin tone, and it's linked to psychological and social issues. Acne scarring is a sign of dermal inflammation and is caused by the wound healing process, which deposits collagen in one area [6].

D. Drug Use

Acne is brought on by medications such as phenytoin, isoniazid, phenobarbital, lithium, ethionamide, steroids, azathioprine, quinine, and rifampin [7].

E. Parasitic

The parasite mite Demodex is connected with acne, but it is unclear whether Demodex or bacteria associated with Demodex are to blame for the consequences [8]

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II. PLANT PROFILE

A. *Coriander*



Figure 6: Coriander

1) Scientific Classification

- Kingdom: Plantae
- Clade: Tracheophytes
- Order: Apiales
- Family: Apiaceae
- Binomial Name: Coriandrum sativum L.

The fresh leaves and the dried seeds, which function as both an herb and a spice, are the portions of the plant that are most commonly consumed used most frequently in cooking.

The majority of people think of coriander as having a sharp, lemon or lime flavour, but almost 25% of those polled said the leaves tasted like dish soap. This is likely due to a gene that can recognise certain aldehydes that can give odorant substances a soapy sensation [9].

2) Etymology

The word "coriander," which was first used in English in the late 14th century, is a derivative of Old French coriander, Latin Coriandrum, and Ancient Greek v-korannon (or v-korandron), which may be related to or descended from kóris (a bed bug). It was so named because of its foetid, bed bug-like smell.

3) Leaves

The leaves are variously known as cilantro (in the US and commercially in Canada), fresh coriander, Chinese parsley, or coriander leaves. The fresh leaves are frequently used as a garnish for soup, fish, and meat dishes as well as an ingredient in chutneys, salads, salsa, and guacamole. Coriander leaves are frequently used raw or added to the meal just before serving because heat degrades their flavour. Coriander leaves are used in big quantities and cooked till the flavour is lost in dishes from India and Central Asia. When taken off the plant, the leaves decay fast, and they lose their flavour when dried or frozen[10].

4) Anti-microbial Activity

Coriander (Coriandrum sativum) aqueous infusions and decoctions against 186 bacterial isolates from 10 different genera of the G +ve bacterial population and 2 isolates of Candida albicans isolated from urine samples. The well diffusion method was used. Both the coriander aqueous infusion and decoction against Candida albicans and G-ve urinary pathogens failed to exhibit any antibacterial action.

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B. Garlic



Figure 7: Garlic

1) Scientific Classification

- Kingdom: Plantae
- Order: Asparagales
- Family: Amaryllidaceae
- Genus: Allium
- Binomial Name: Allium sativum

2) Etymology

The word "garlic" comes from the Old English "garlac," which also meant "spear-shaped leek" and "gar" (a spear)[11].

3) Pharmacological Activity of Garlic

Antibacterial Activity:

Garlic's antibacterial effects are ascribed to the compound allicin, which has been shown to be effective against a wide range of pathogens, including antibiotic-resistant Gram-positive and Gram-negative bacteria like Shigella and Escherichia coli[12].

III. MATERIALS AND METHODS

A. Materials

1) Apparatus: Beaker, Spatula, petri dish, funnel, filter paper, pH meter, Glass Slides, Brookfield Viscometer, mortar pestle, Stirrer, measuring cylinder, heater, etc

2) Chemicals: Carbopol 934, PEG, Propylene glycol, methyl paraben, propyl paraben, Triethanolamine, garlic extract, coriander extract.

B. Method

1) Extraction of Coriander

The kelly green leaves were powdered after being shade-dried. This powder, 200gm, was macerated in distilled water at room temperature for seven days.

The solvent was frequently stirred and circulated to reduce the boundary layer phenomena and improve the effectiveness of the extraction procedure. The extracted solution was filtered and marc was compressed after seven days. The expressed liquid and the strained liquid were mixed.

The miscella-named enhanced extract was next concentrated under low pressure in a rotating vacuum flash evaporator. The method was utilised to make the hydroethanolic and ethereal extracts, with a little alteration in the kind of solvent used: distilled waterethanol was used to make the hydroethanolic extract, while ether was used to make the ethereal extract[13].



Figure No 8: Coriander Extract

2) Different ratios of garlic and *Extraction of Garlic*

95% ethanol were used to create the ethanolic extracts. The garlic extracts were produced using three different extraction techniques: maceration, Soxhlet, and ultrasound-assisted extraction. Additionally, the garlic extract was created by combining honey and garlic in a 1:1 (w/v) ratio. The pearl garlic's outer skin or translucent coatings were peeled off, cleaned, and cut into small pieces. The samples of garlic were prepared right before extraction.

Using 95% ethanol, maceration was done using a mixture of garlic and ethanol in the ratios of 1:10, 1:15, and 1:20 (w/v). For 48 hours at room temperature, 200 ml of 95% ethanol were added to 1 g of the sample [14].

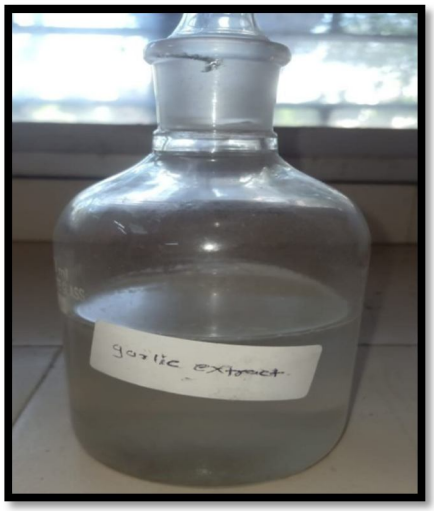


Figure No 9: Garlic Extract

3) Preparation of Gel Base

Propyl paraben was added when the water had slightly cooled after the weighed amount of methyl paraben had been dissolved in 5ml of hot water. After adding 50 ml of distilled water to this beaker, Carbopol 934 was continuously stirred for 20 minutes to dissolve it. This mixture was retained for soaking the next day. The necessary amounts of polyethylene glycol (PEG 400) and propylene glycol were added to another beaker. This combination was stirred into the Carbopol beaker along with the concentration of the aqueous extract that corresponded to its MIC. Distilled water was used to make up the volume, and it was forcefully stirred. The gel's pH was adjusted to 6.8 before Triethanolamine was added[15].

Ingredients	F1	F2	F3	F4
Carbopol 934	0.5	1	1.5	2
PEG 400	5	5	5	5
Propylene Glycol	15	15	15	15
Methyl paraben	0.15	0.15	0.15	0.15
Propyl paraben	0.03	0.03	0.03	0.03
Triethanolamine	q. s	q. s	q. s	q. s
Rose Water q. s	100	100	100	100

Table No 2: Composition of Gel



Figure No9: Gel Base

IV. EVALUATION PARAMETERS

A. Physical Parameter

Physical appearance- The formulations physical appearance was examined visually, and it included:
Colour- A white background was used to assess the formulations colour.
Consistency- By applying to skin, the consistency was evaluated.
Greasiness- By applying the substance to the skin, the greasiness was evaluated.
Odour- By combining the gel with water and sniffing the mixture, the gels scent was evaluated.

B. pH

Within 24 hours of production, 20 mg of the formulation was dissolved in a beaker and its pH was measured using a digital pH metre.

C. Viscosity

Using the Brookfield viscometer spindle 7 at 50 rpm and 25°C, the viscosities of the gel formulations were measured. The viscometer's corresponding dial reading was recorded. The spindle was then gradually lowered after that. The factor listed in the catalogue was multiplied by the dial reading.[16]

D. Extrudability

The weight in grammes needed to extrude a 0.5 cm long ribbon of formulation in 10 seconds is known as extrudability. An ordinary collapsible aluminium tube with a cap was filled with the gel mixture, and the end was crimped shut to seal it. Between two slides were the tubes, to be clamped. After placing a 500g weight over the slides, the cap was taken off. It was measured how far the formulation's ribbon extended after 10 seconds.[17]

E. Spreadability

The area to which a gel easily spreads after application to the skin or affected part is referred to as spreadibility. Spreadibility is measured in seconds and is determined by the amount of stress required for the upper slide to separate from the gel between the two slides. A decrease in the longer it takes to separate two slides, the more spreadable they are. 500 mg or less of the Sand was wiggled between the two slides, which were each 6x2 cm in size. To ensure that the formulation between the two slides, a weight of 100g was placed on the upper slideget uniformly compressed to produce a thin layer. The surplus of the weight was taken off. The slides' sticking formulation was scraped off. A straightforward pulley that was horizontally level with the fixed slide was used to hold the upper slide to the rigid string that received the 20g weight. It was noticed how long it took for the upper slide to detach from the bottom slide.[18]

$$S = M. L/T$$

Where: M-Weight tied to the upper slide, L-Length moved on the upper slide, T-Time Taken

V. RESULT & DISCUSSION

A. pH Measurement

The pH of the formulation ranged from 6.9-7.1, which may be suitable for topical application without discomfort.

Formulation	Ph
F1	6.9
F2	6.7
F3	6.8
F4	7.1

Table No3: PH Measurement

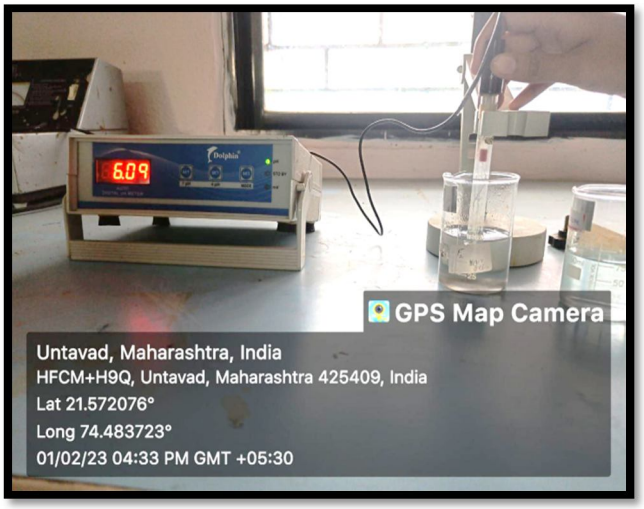


Figure No 11: P^Hmeter

B. Viscosity

The apparent viscosity of the formulations ranged from 34.5±.8 to 38.4±.4cps. The viscosity of formulation increased with increase in the concentration of carbopol content.

Formulation	Viscosity
F1	34.5±8
F2	35.6±6
F3	37.1±1
F4	38.4±4

Table No4: Viscosity

C. Extrudability

The Spreadibility and extrudability of the formulations were found to range from 41.5±.7 to 46.5±.4g/sec respectively.

Formulation	Extrudability
F1	542.9±2
F2	545.6±8
F3	549.4±7
F4	552.8±5

Table No5:Extrudability



Figure No 12: Extrudability

D. Spreadibility

Spreadibility and extrudability of the formulations were found to range from 41.5±.7 to 46.5±.4g/sec and from 542.9±.2 to 552.8±.5g, respectively. The viscosity was observed to increase with decrease in the Spreadibility and vice- versa.

Formulation	Spreadibility
F1	41.5±7
F2	43±2
F3	45±9
F4	46.5±4

Table NO6: Spreadibility

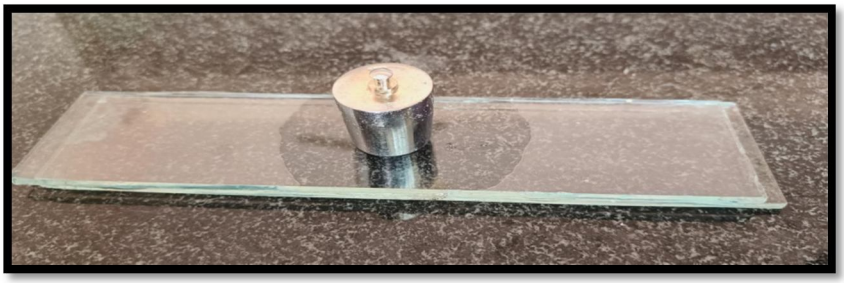


Figure No 13: Spreadibility

E. Preparation of Antibacterial Gel

The weighed amount of methyl paraben (0.15mg) was dissolved in 5ml of hot water and propyl paraben (0.03mg) was added on slight cooling of water. To this beaker carbopol 934 (0.5mg) was dispersed with continuous stirring for 20 min after addition of 50 ml of distilled water. This dispersion was kept overnight for soaking. In another beaker the required quantity of propylene glycol(15ml) and polyethylene glycol (PEG 400) (5ml) were added. This mixture along with concentration of aqueous extract corresponding to its MIC was incorporated to carbopol beaker with stirring. The volume was made up with distilled water and stirring was done vigorously. Triethanolamine was added form the gel by adjusting pH to 6.8. By dissolving a precisely weighed amount of gel (1gm) in 100ml of solvent (phosphate buffer pH 6.8 + ethanol in ratio 40:60), the drug content of the formulations was ascertained. For the formulations to completely dissolve, the solutions were stored for 6 hours after being shaken for 4 hours. The solutions were then properly diluted, filtered through 0.45mm membrane filters, and subjected to a spectrophotometric analysis. The linear regression equation derived from the calibration data was used to calculate the drug content.[19]

F. Antimicrobial Study of the Formulation

100 mg of the gel was dissolved in 10 ml of dimethyl sulfoxide to create the gel solutions. The well diffusion method was used to test the antibacterial activity. Under anaerobic circumstances, P. acne was cultured in ASLA agar medium for 48 hours to produce approximately 1x108 CFU/ml. The surface of the solidified agar plates was swabbed with inoculums. With the aid of an 8mm borer, the equidistance wells in the plates were drilled. The gel solutions in DMSO were placed in each of these wells, and the plates were left at room temperature for 30 minutes to allow pre-diffusion before being incubated for 72 hours under anaerobic conditions in an anaerobic bag with a gas pack and indicator tablets. The bag was then kept in an anaerobic environment at 37°C.To sustain and monitor the anaerobiosis, gas packs containing citric acid, sodium carbonate, and sodium borohydride were utilised. As the anaerobic condition was reached, the methylene blue indicator tablet changed from dark pink to blue to light pink. S. epidermidis culture was created in nutrient agar medium over the course of 24 hours with aerobic conditions. This aerobic bacterium was cultured in test samples for 24 hours in an aerobic environment at 37 °C. The diameter of the zone of inhibition was used to calculate the antibacterial activity. Antibacterial activity was expressed as the mean standard deviation for each well diffusion test across three different experiments.[20]

Formulation	Zone of inhibition (mm) , mean ± SD	
	P. acne	S. epidermis
F1	21.6 ±1.2	20.7 ± 1.05
F2	21.5 ±1.1	20.6 ± 1.03
F3	21.4 ± 0.8	20.5 ± 1.0
F4	21.4 ± 1.1	20.5 ± 0.7

Table No 7: Antimicrobial evaluation

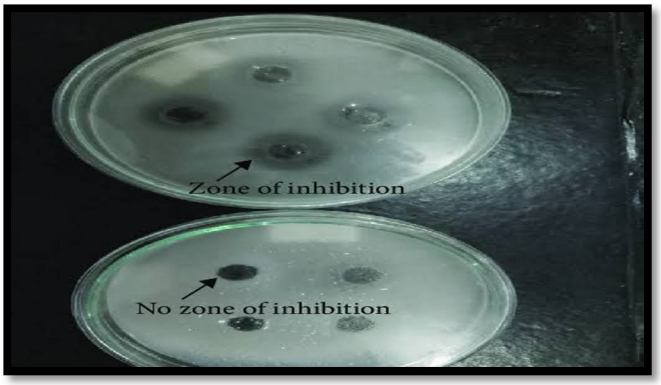


Figure No 14: Zone of Inhibition

Ingredients	F1 mg/ml
Extraction of coriander	94.5
Extraction of garlic	94.5
Carbopol 934	0.5
PEG 400	5
Propylene Glycol	15
Methyl paraben	0.15
Propyl paraben	0.03
Triethanolamine	q. s
Rose Water q. s	100

Table No 8: Optimized Formula



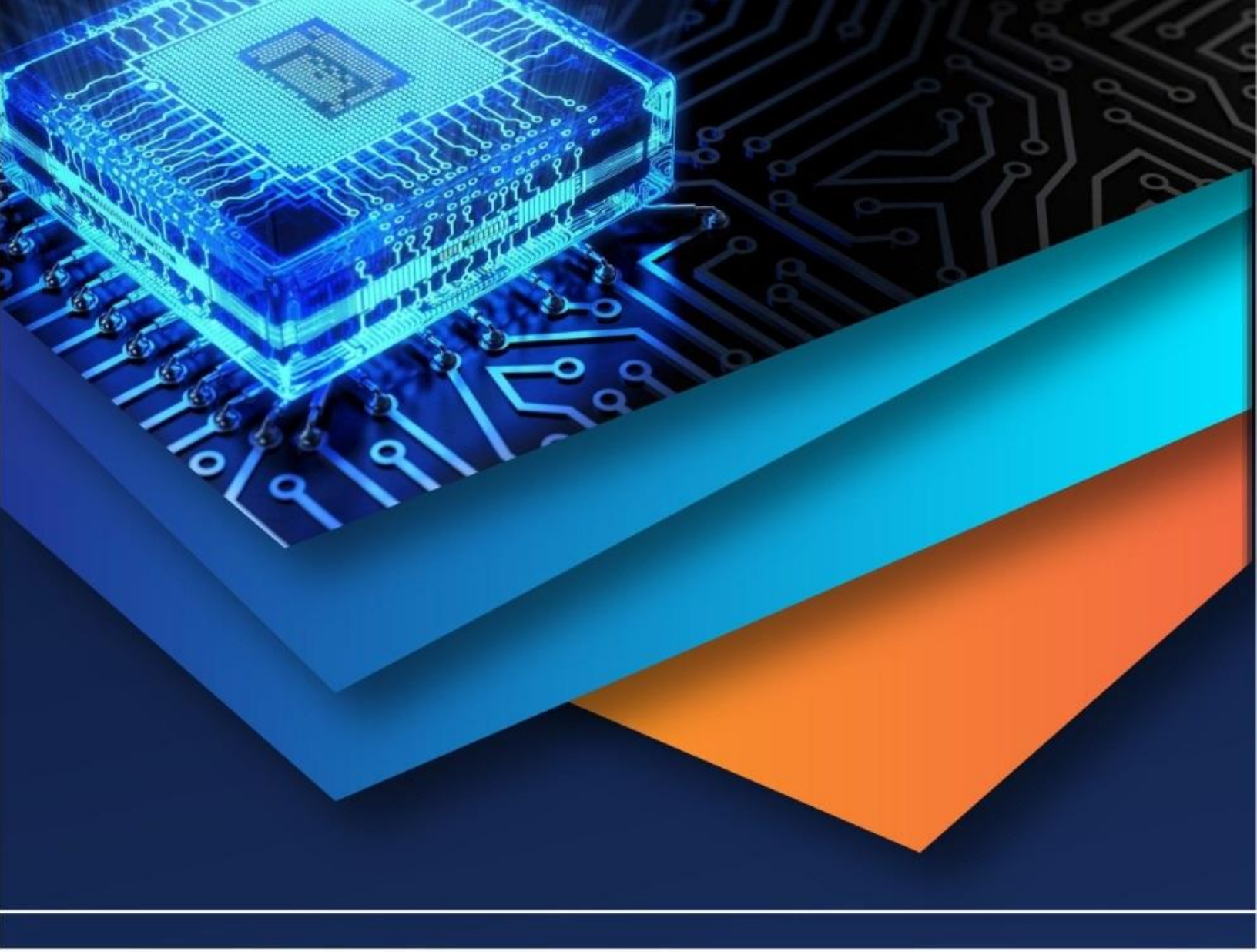
Figure No 10: Antibacterial gel

VI. CONCLUSION

From the above work it was concluded that formulation F1 showed the presence of good antibacterial activity as compared to F2, F3 and F4. Selected formulations also showed positive results in the parameters like pH, Spreadibility, extrudability, viscosity etc. On the basis of these all the evaluating parameter we selected the final optimized formula as F1.

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