



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Research Paper

Formulation and Evaluation of Betel Leaves (*Piper Betel L.*) and Jackfruit (*Artocarpus Heterophyllus Lam.*) Extract as Antiacne Cream

Divya Gharde*, Atharva Galbale, Ameya Gangane, Rutuja Gahukar, Prajakta Gadling, Tushar Dhote, Sachin Dighade

Institute of Pharmacy and Research, Anjangaon Bari Road, Badnera, Amravati

ARTICLE INFO

Published: 27 Jun. 2025

Keywords:

Acne vulgaris, Herbal formulation, Piper betel, Artocarpus heterophyllus, Anti-acne cream, Antimicrobial evaluation

DOI:

10.5281/zenodo.15756469

ABSTRACT

The present study aimed to develop and evaluate a herbal anti-acne cream formulated with Piper betel (betel leaves) and Artocarpus heterophyllus (jackfruit seeds) extracts, along with Aloe vera, glycerine, lavender oil, and other excipients. Acne vulgaris, a common inflammatory skin condition, is often aggravated by bacterial activity, excess sebum production, and hormonal factors. Herbal ingredients offer antimicrobial and anti-inflammatory properties with minimal side effects. The prepared formulations (F1, F2, F3) were evaluated for physicochemical properties, irritancy, spreadability, FTIR characterization, and antimicrobial activity. Results confirmed that the cream was stable, non-irritating, and effective against acne-causing bacteria (*Staphylococcus aureus*, *Propionibacterium acnes*, and *Staphylococcus epidermidis*). The formulation shows potential as a natural, safe, and effective alternative to conventional anti-acne treatments.

INTRODUCTION

Creams are topical products applied to the skin, consisting of viscous liquid or semi-solid emulsions of oil-in-water or water-in-oil types. Their consistency varies with oil and water proportions. They serve cosmetic purposes like cleansing, beautifying, protecting, and therapeutic roles, targeting localized effects to deliver active

ingredients into deeper skin layers. Creams can be ayurvedic, herbal, or allopathic, catering to specific skin needs, and typically contain active substances in a suitable base. Types include cleansing, cold, foundation, vanishing, massage, and hand and body creams. Our project aims to develop a herbal cream that reduces acne and skin irritation, diminishes wrinkles, and enhances skin glow.

***Corresponding Author:** Divya Gharde

Address: Institute of Pharmacy and Research, Anjangaon Bari Road, Badnera, Amravati

Email ✉: ghardedivya333@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



Types of skin creams:

They are divided into two types.

- 1. Oil-in-Water (O/W) creams:** - These consist of tiny oil droplets that are distributed within a continuous aqueous phase. An emulsion where oil is dispersed as droplets throughout the water phase is referred to as an oil-in-water (O/W) emulsion.
- 2. Water-in-Oil (W/O) creams:** - These are made up of small water droplets that are spread throughout a continuous oily phase. When water serves as the dispersed phase and oil acts as the dispersion medium, the emulsion is classified as a water-in-oil (W/O) type.

Acne: - A skin condition referred to as acne leads to inflammation or infection in the oil glands. Skin blemishes typically manifest as red, infected areas that emerge from otherwise healthy skin. While it can occur on various parts of the body, it

predominantly affects the face. Acne can take on different forms, but the most prevalent shape is circular, and depending on its cause and stage, it may appear red, black, or white. This condition can arise from bacteria infiltrating the oil glands and infecting the skin, or it may be non-inflammatory due to blockages in the oil glands. Acne is a troubling concern, particularly for teenagers and adolescents. According to global statistics, approximately 85% of the population will experience this skin issue between the ages of 12 and 25, with nearly 8% of adults aged 23-24 years old also affected, and only 3% of adults experiencing acne between the ages of 35 and 44. *Propionibacterium acnes* and *Staphylococcus aureus* have been identified as contributors to acne, as these bacteria have been found in samples taken from acne patients. Additionally, the rising resistance of acne-causing bacteria to antibiotics poses a significant concern.

Types of Acne

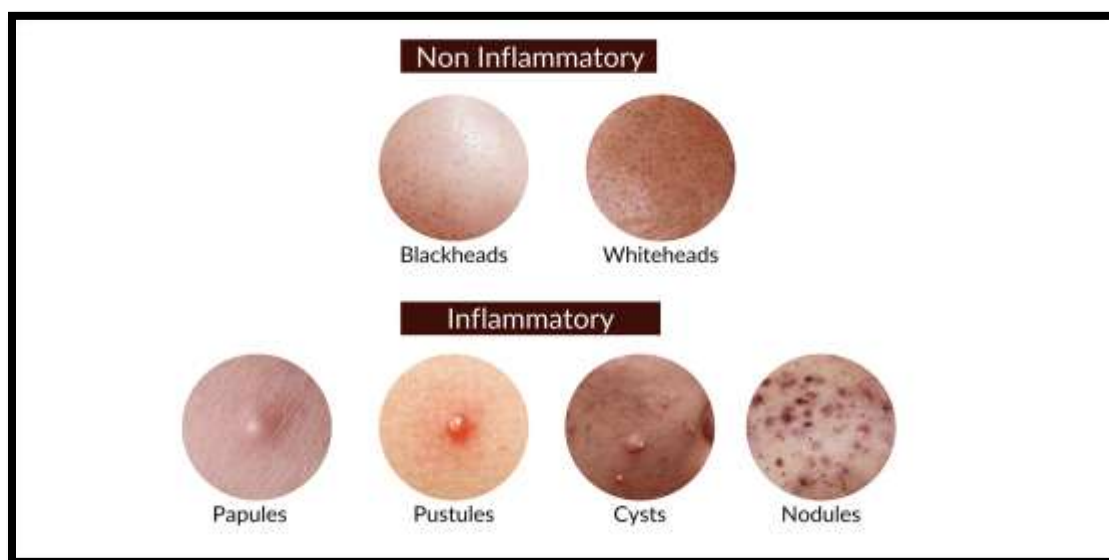


Figure No. 1: Types of Acne

a) Non-inflammatory Acne

1) Whiteheads: Pimples that stay beneath the surface of the skin.

2) Blackheads: Appears in black colour. Rise to the skin's surface.

b) Inflammatory Acne

- 1) Papules: Leads to the formation of a small red bump on the skin.
- 2) Pustules: The top layer of the skin will be filled with pus.
- 3) Nodules: This is the severe form of acne. Leads to painful breakouts.
- 4) Cysts: Leads to the formation of scars. It is present deep in the skin and causes more pain.

Causes of Acne

1. Hyperactive sebaceous glands (overactive lipid secretion).
2. Hyperkeratosis (accelerated keratinization) at hair infundibulum.

Benefits of Natural Anti Acne Cream

1. Fights the bacteria that cause Acne & pimples.
2. Reduce Breakouts, Whiteheads, and Blackheads.
3. Helps to Reduce Acne Scars.
4. Reduces the appearance of Blemishes and Dark Spots.
5. Penetrates Clogged Pores and helps to prevent future Breakouts.
6. Soothes & relieves irritated skin.

MATERIALS AND METHODS: -

Active Ingredients: -

1. Betel Leaf



Figure No. 2: Betel leaf

Synonym: Paan, Nagvalli, Piper betle,

Biological Source: The betel leaf is a species of flowering plant in the pepper family Piperaceae.

Drug family: Piperaceae

Chemical constituents: Terpinen-4-ol, Safrole, Eugenol, Hydroxyl chavicol, Eugenyl acetate, Allyl pyrocatechol monoacetate.

Uses:

1. Betel leaf is used for pain relief.
2. It is effective against skin fungal infection.
3. Used for treating inflammation and wound.
4. Betel leaves have antibacterial and antifungal properties, making them useful in treating infections.

2. Jackfruit Seed



Figure No. 3: Jackfruit Seed

Synonym: Kathal, Panas (hindi), Kanthal (Bengali), palaa (tamil), Phanas (Gujrati & Marathi) & Chakka (Malayalam)

Biological source: The biological source of jackfruit is the tree species *Artocarpus heterophyllus*.

Drug Family: Moraceae

Chemical constituents: Resveratrol (trans 3,5,4 trihydroxystilbene), polyphenol, Flavonoids, phenolic acid, carotenoids, Beta carotene and lutein, prenylflavonoids, sterol, hydroxycinnamic acid & glycosides.

Uses:

1. Jackfruit contains phenolic & flavonoids compounds that help reduce inflammation.
2. It shows antioxidant property, they protect cells from oxidative damage and aging.

3. Jackfruit seeds contain calcium & phosphorous, essential for bone health, improving digestion, it provides Vitamin C, vitamin A, potassium and dietary fiber.

Extraction of plant material:

Piper betel leaf extract: A 20 g sample of coarse powder was placed in a sample tube with two ceramic chips. The setup included a condenser above a heating mantle, connected to a water pump. Ethanol was added until about 200 ml flowed through the siphon tube. The heating mantle was set to 70°C, and extraction continued for 3 hours until the siphon tube's ethanol was colorless. After extraction, the assembly was turned off, and the extract was transferred to a porcelain dish over a water bath for solvent evaporation. Once evaporated, the extract was dried and stored in an airtight container at 4°C for later use.



Figure No. 4: Piper betel leaf extract

Jackfruit seed extract: A 10 g Jackfruit seed powder was added into 200 ml distilled water and soaked (6 hr and 8 hr) at room temperature then

stirred constantly. The slurry was filtered and filtrate stored in airtight container for further use.



Figure No. 5: Jackfruit seed extract

Table No. 1: Formulation of Antiacne cream

Sr No.	Ingredients	Quantity		
		F1	F2	F3
1.	Betel leaf extract	0.8 g	0.5 g	0.5 g
2.	Jackfruit seed extract	1 ml	1 ml	1.5 ml
3.	Aloe-vera	1 ml	1.5 ml	1 ml
4.	Beeswax	1.8 g	1.7 g	1.5 g
5.	Liquid paraffin	3.5 ml	3 ml	3 ml
6.	Cetyl alcohol	0.3 g	0.2 g	0.4 g
7.	Borax	0.08 g	0.08 g	0.06 g
8.	Methyl paraben	0.02 g	0.02 g	0.04 g
9.	Glycerine	1.5 ml	2 ml	2 ml
10.	Lavender oil	q. s	q. s	q. s
11.	Distilled water	q. s	q. s	q. s

Method of Preparation of Antiacne cream:

1. Heat liquid paraffin, Cetyl alcohol and beeswax in a borosilicate glass beaker at 75 °C and maintain that heating temperature. (Oil phase)
2. In another beaker, dissolve borax, Glycerine, methylparaben and distilled water and heat this beaker to 75 °C to dissolve borax, Glycerine and methylparaben and to get a clear solution. (Aqueous phase)
3. Then slowly add this aqueous phase to heated oily phase.
4. Then add a measured amount of aloe Vera gel, Betel leaf extract and Jackfruit seed extract and stir vigorously until it forms a smooth cream.

5. Then add few drops of Lavender oil as a fragrance.
6. Then put this cream on the slab and then add few drops of distilled water.
7. Then the cream mix in a geometric manner on slab to give smooth texture.

EVALUATION OF CREAM: -

1. Physical Evaluation:

The physical parameters of cream like colour, odour, consistency, and state of formulation were used to further evaluate the formulation.

Sr. No	Evaluation test	Formulation [F1]	Formulation [F2]	Formulation[F3]
1	Color	Green	Green	Green
2	Odor	Lavender like	Lavender like	Lavender like
3	Texture	Smooth	Smooth	Smooth
4	State	Semisolid	Semisolid	Semisolid

2. Measurement of PH:

PH of formulation was measured using a digital pH meter by diluting 1g of the formulation in 9 ml of diluted water.

Sr. No	F1	F2	F3
PH	5.65	5.98	6.03

3. Irritancy:

Make the area (1 cm²) on the left-hand dorsal surface. Then the cream was applied to the area and the time was noted. Then it is checked for irritancy, erythema and edema no. if any for an interval up to 24 hour and reported. The formulations pass the test.

4. Washability:

A small amount of cream is applied on the hand and it is then washed with tap water. The Antiacne cream of all formulation was easily washable.

5. Spradability:

The spread ability was measured in terms of the number of seconds it took for two slides to separate from the cream that was positioned between them when subjected to a specific load. It was recorded how long it took the slide to slip off. The spreadability of formulations was found to be Good.

6. Phase separation:

Prepared cream was kept in the closed container at temperature 37⁰C away from light. Then phase

separation was checked for 24 hours for 15 days. No any change observed in cream that is no phase separation.

7. Greasiness:

Basically, the purpose of this this test is to determine whether cream is greasy or oily. We can conclude from the results that none of the formulations were greasy. After applying the cream in the shape of a smear to the skin's surface and observing whether the smear was greasy or not, we can conclude that all three formulations were non-greasy.

8. FTIR Testing:

Fourier Transform Infrared (FTIR) is a widely used method for identifying chemical constituents

and elucidating compound structures, particularly in pharmaceutical analysis. It provides molecular-level information, allowing investigation of functional groups, conformations, and quantitative analysis. Common methods include attenuated total reflectance (ATR), diffusive reflectance, and microspectroscopy. The ATR-FTIR technique offers advantages such as low material requirements, quick verification, and high sensitivity. It is also used for rapid FTIR measurements of liquids, including oils and extracts, and for studying biological samples.

Discussion and analysis:

1. Betel leaf

Table No. 2: Discussion and analysis of Betel leaf

Sr. No	Functional Group	FTIR peak (cm ⁻¹)	Range FTIR peak (cm ⁻¹)
1	C-H Stretching >CH ₂	2930.96	2936-2916
2	Skeletal (CH ₃) ₃ -C	2154.58	1255-1245
3	C=C Stretching Non-conjugated	1672.03	1680-1625
4	=C-H Stretching & Deformation R.CH=CH ₂	1413.088	1420-1410
5	C-O Stretching Aryl Alkyl	1259.57	1270-1230
6	C-O stretching	1073.43	1075-1020
7	≡C-H deformation	639.43	680-610
8	C-I stretching	531.41	600-465

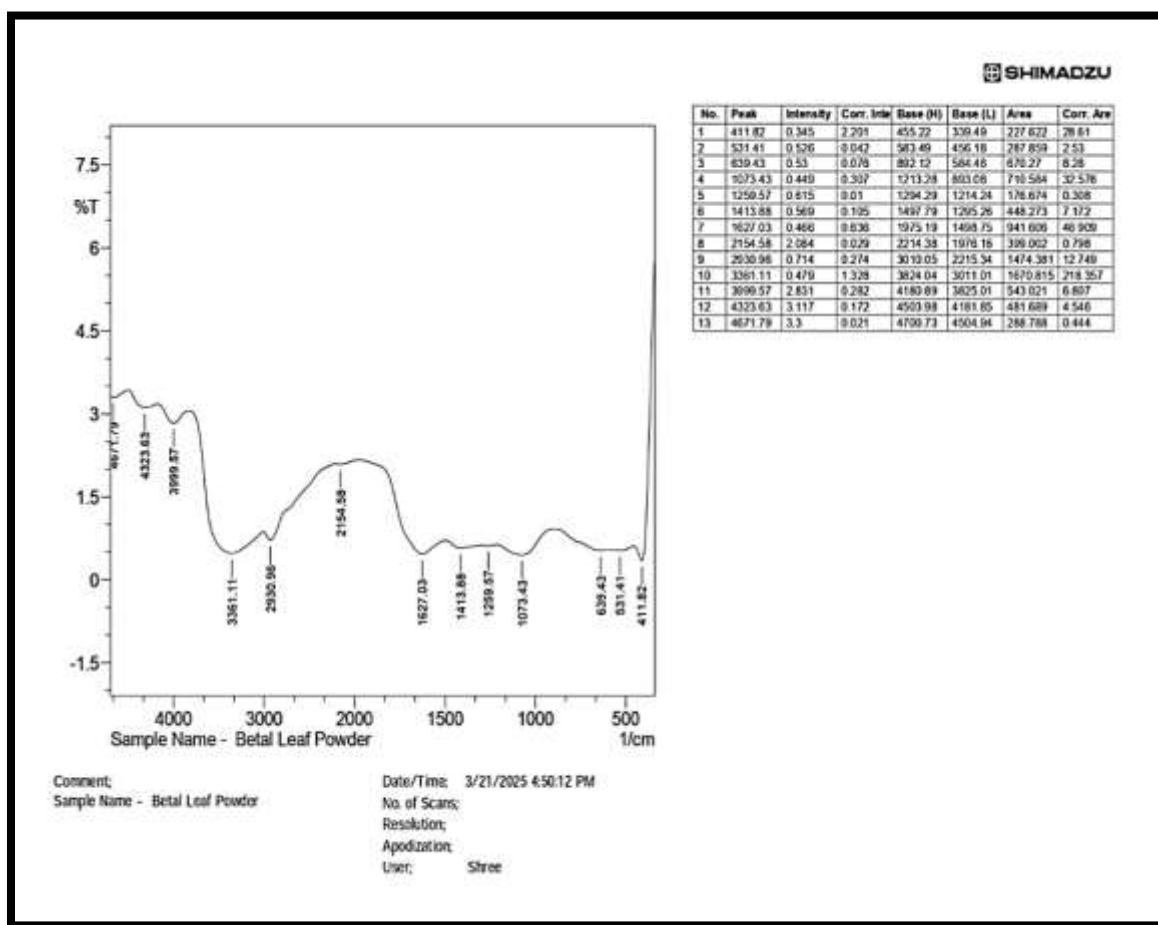


Figure No. 6: FTIR Spectrum of Betel Leaf

2. Jackfruit Seed

Table No. 3: Discussion and analysis of Jackfruit Seed

Sr. No	Functional group	FTIR peak (cm ⁻¹)	Range FTIR peak (cm ⁻¹)
1.	-NH Stretching	3381.36	3398-3381
2.	CH stretching	2928.07	2396-2916
3.	C≡C Stretching	2134.33	2140-2100
4.	C=C=C Stretching	1941.44	1955-1930
5.	N-H deformation	1638.60	1650-1590
6.	C-H deformation	1372.41	1380-1370
7.	Skeletal (CH ₃) ₃ -C	1250.89	1250-1200
8.	S=O Stretching	1062.21	1070-1035
9.	C-Br Stretching (monobromo alkane)	523.70	600-500

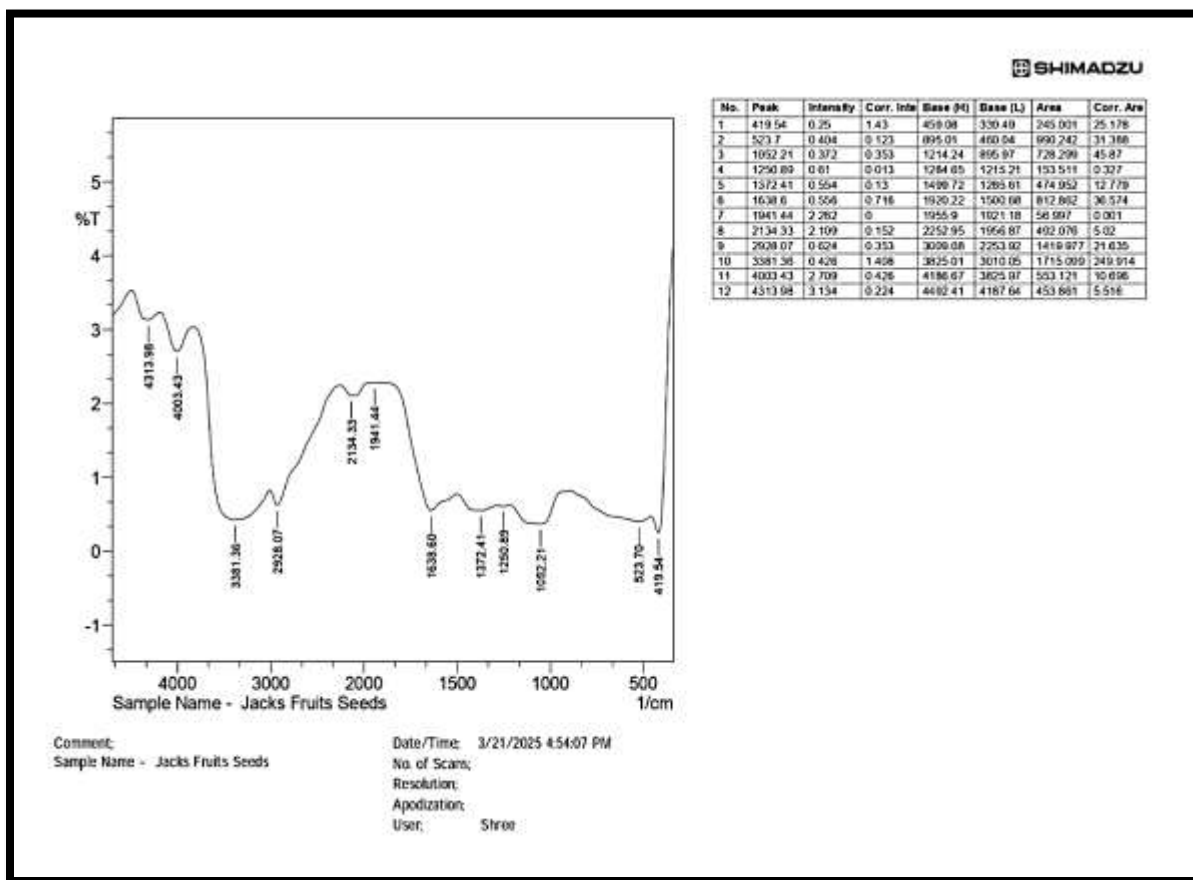


Figure No. 7: FTIR Spectrum of Jack Fruit Seed

Interpretation: Both jack fruit and betel leaves contains hydroxy, aliphatic, amide, and carboxy group presence of same group they show synergistic effect and due to presence of OH group in both the medicinal plant show antimicrobial property.

Antibacterial activity against Staphylococcus aureus, Propionibacterium acnes, Staphylococcus epidermis

Method Used: Kirby-Bauer disk diffusion method. Antibacterial Activity Zone of Inhibition in (mm).

9. Microbial Testing:

Sr. No	Sample	Staphylococcus aureus	Staphylococcus epidermis	Propionibacterium acne
1	Anti-acne cream diluent	-	-	-
2	Tetracycline	22mm	22mm	22mm

(-) No zone of inhibition Interpretation.
 Sensitive: Zone of inhibition in more than 12mm.
 Moderately Sensitive: Zone of inhibition between 12-8mm.

Resistant: Zone of inhibition less than 8mm.

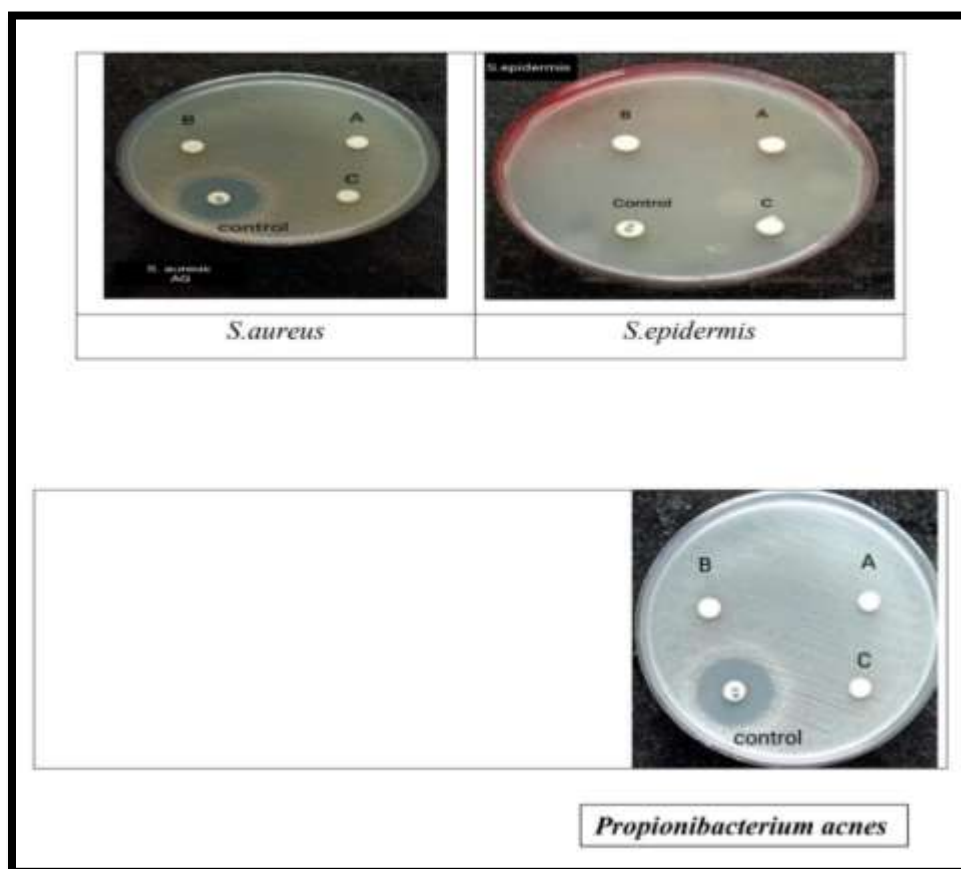


Figure No.8: Antibacterial activity against *S. aureus*, *S. epidermis* and *Propionibacterium acnes*

RESULT AND DISCUSSION:

In the research study conducted our team has formulated medicinal herbal anti-acne cream by using the natural ingredients such as betel leaf extract, jackfruit seed extract, aloe vera, glycerine, lavender oil. The formulation is used to treat various skin related diseases such as acne, psoriasis and eczema. It also possesses properties like anti-fungal, anti-inflammatory and antibacterial because of betel leaf which is included in the formulation. Along with betel leaf there are other ingredients also included in the formulation such as jackfruit seed which possesses antioxidant property, aloe vera used in the formulation provides cooling effect, lavender oil helps in keeping the skin moisturized and glycerine used in the formulation helps restore the

skin barrier, promoting faster healing of cracks to treat pimples, edema.

CONCLUSION:

Herbal creams include anti-inflammatory, antibacterial, and sebum-regulating characteristics, making them an effective natural treatment for acne and other skin disorders. The manufacturing of such creams entails selecting suitable herbal constituents that can minimize acne lesions, skin irritation, and promote skin healing while limiting side effects. Despite certain issues with standardization and potency, herbal anti-acne creams can be beneficial when used with a full skincare treatment that includes lifestyle changes and expert supervision. More clinical trials are needed to ensure safety, efficacy, and optimize formulations for widespread usage.

REFERENCES

1. Lalita, C. and Shalini, G., 2020. Creams: A review on classification, preparation methods, evaluation and its applications. *JDDT*, 10, pp.281-289.
2. Sharma, Y., Sharma, S. and Ohri, R., 2024. Formulation and Evaluation of Herbal Antiacne Cream. *Journal of Advancement in Pharmacognosy*, 4(2).
3. Vaishnavi Madewad, Sarika Alhat. "Formulation and Evaluation of Anti-Acne Herbal Cream." *International Journal of Pharmaceutics & Pharmaceutical Research (IJPPR.Human)*, vol. 27, no. 2, May 2023, pp. 845-862.
4. Choudhari, N.N., Dudhe, A.R., Tatte, S.P., Zile, T.S., Nandeshwar, Y.K., Dhawale, T.P. and Nashine, A.M., 2023. Formulation and evaluation of anti-acne face cream. *World Journal of Advanced Research and Reviews*, 19(1), pp.1181-1188.
5. Akshay Choudhary, Sneha Sohal, Kapil Kumar Verma, 2024. Formulation and evaluation of anti- acne face cream. *IJNRD*, 9(10), pp. 2456.
6. Shivsharan, U., Patil, M.R., Panpat, P.S. and Pardeshimath, V.S., 2022. Formulation and Evaluation of the Cream containing Piper Betle Leaves Extract. *Research Journal of Topical and Cosmetic Sciences*, 13(2), pp.67-70.
7. Saikat Mazumder, S.M., Aditi Roychowdhury, A.R. and Soumitra Banerjee, S.B., 2016. An overview of betel leaf (*Piper betle* L.): a review.
8. Kazi Kazeema, N., Borana Pravin, H. and Ikale Vijay, H., 2021. Formulation and Evaluation of An Anti-Oxidant Product From Betel Leaf Extract.
9. Prakash, O., Kumar, R., Mishra, A. and Gupta, R., 2009. *Artocarpus heterophyllus* (Jackfruit): an overview. *Pharmacognosy reviews*, 3(6), p.353.
10. LD, T.C.T., 2017. ATR-FTIR spectra fingerprinting of medicinal herbs extracts prepared using microwave extraction. *Arabian Journal of Medicinal and Aromatic Plants*, 3(1), pp.1-9.

HOW TO CITE: Divya Gharde*, Atharva Galbale, Ameya Gangane, Rutuja Gahukar, Prajakta Gadling, Tushar Dhote, Sachin Dighade, Formulation and Evaluation of Betel Leaves (*Piper Betel* L.) and Jackfruit (*Artocarpus Heterophyllus* Lam.) Extract as Antiacne Cream, *Int. J. of Pharm. Sci.*, 2025, Vol 3, Issue 6, 5332-5342. <https://doi.org/10.5281/zenodo.15756469>

