IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

In Vitro Evaluation of Specialised Anti-Acne Gel: Targeting Cutibacterium Acnes and Lipase Activity

Dr. Ajay S. Dongarwar, Dr. Sanjay K. Bais, Mrunali Dhanaji Sapate
Fabtech College of Pharmacy, Sangola

Abstract : *Acne vulgaris is a skin disorder marked by excessive sebum production, inflammation, and microbial proliferation. Lipases play an essential role in the pathogenesis of acne, as they hydrolyze triglycerides in sebum to produce free fatty acids causing irritation and inflammation of hair follicles. A herbal formulation of an anti-acne gel containing patharchatta leaf extract. Patharchatta is a therapeutic plant used to treat various skin ailments. The leaves contain a variety of bioactive components such as flavonoids, phenolics, and tannins, which could improve its health benefits. Physical properties were investigated to determine the appearance, homogeneity, PH value, viscosity, spreadability, extrudability, and stability of the gel. We also investigated the potential of the gel to inhibit lipase activity using an appropriate laboratory method and comparing it to a standard reference. The purpose of this study was to examine the potential for using patharchatta (bryophyllum pinnatum) leaf extract as a natural component to formulate an anti-acne topical gel to inhibit lipase activity.*

Keywords: acne vulgaris, cutibacterium acnes, anti-acne gel, lipase inhibition, antimicrobial activity, sebum, topical formulation

I. INTRODUCTION

Bryophyllum Pinnatum is an herbal plant of the Crassulaceae family that is commonly used in traditional medicine. The name bryophyllum is formed from two Greek words , namely, bryo meaning to sprout and phyllon meaning leaf. The name reflects the plant's ability to develop tiny plantlets along its leaf margins. [1]. *Bryophyllum pinnatum* is a well-known medicinal plant that is commonly called the life plant. It is indigenous to Madagascar and has been introduced to many regions of the world. These include Asia, Australia and new Zealand. It is popularly known in India as patharchatta or panfuti and is used for various purposes in herbal medicine[2]. The leaves and juice of patharchatta have traditionally used for medicinal purposes to address various health concerns. They have been utilized to help relieve coughs and fever, combat microbial infections, and reduce inflammation. The plant has also been found to possess antioxidant, antitumor, diuretic, antiulcer, antiseptic, astringent, styptic, and antiurolithic properties[3,4].

The phytochemical screening of this plant has revealed the occurrence of biologically active components such as alkaloids, saponins, tannins, flavonoid s and terpenes [5,6]. Among the various constituents, bufadienolides are of interest due to their reported biological activities, including antitumor, antibacterial, anticancer and insecticidal activity [7,8]. Pharmacological studies have shown that this plant possesses various biological activities such as antioxidant, anticancer, immunomodulatory, antibacterial, anthelmintic, antiprotozoal activities. It also showed neurological activities, anti-inflammatory activity, analgesic activity, diuretic activity, antiurolithic activity, nephroprotective activity, hepatoprotective activity, antiulcer activity, hypotensive activity, antidiabetic activity, wound healing activity, CNS depressant property, anticonvulsant property and insecticide activity [9,10,11].

Copyright to IJARSCT
www.ijarsct.co.in
DOI: 10.48175/IJARSCT-40544

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2



Figure 1 : Bryophyllum Pinnatum

CULTIVATION AND COLLECTION

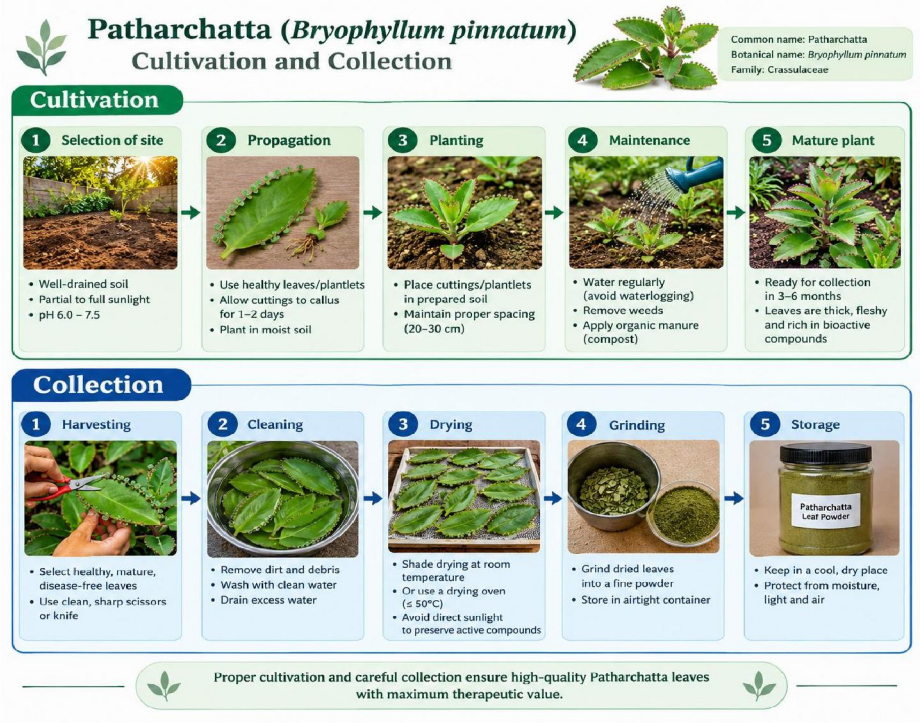


Figure 2 : Cultivation and Collection of Bryophyllum Pinnatum

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 1, November 2026 Impact Factor: 8.2

These plants are commonly grown indoors and have also become well established in tropical and subtropical regions, where they grow naturally.(B.D, 2003) *Kalanchoe pinnata* leaves are harvest using customary methods in the area. The dried leaves are crushed using a blender until they form a fine, uniform powder. To reduce losses of volatile chemical compound , at a temperature of around 28°c[12].

II. METHOD AND PREPARATION

Preparation :

1. Juice : Good leaves are squeezed to elicit the succus which is old to work different ailments such as arsenic wound burns and hide conditions.

2. Infusion : Dried or fresh leaves are steeped in hot water to make tea which is used to treat digestive problems fever and respiratory problems.

3. Decoction : Leaves and stems are poached inch sweat to get amp decoction which is old to work further difficult conditions such as arsenic rheumatoid arthritis and arthritis.

4. Tincture : A concentrated liquid remove is made by soaking the plant species in a solvent such as ethanol or glycerin which is used for the treatment for various health problems.

5. Ointment : AMP current cream is successful away mix the set elicit with amp bearer anoint or pick which is old to work hide conditions wounds and burns.

6. Gel : A gel is made by mixing the plant remove with a gelling agent which is used to manage various skin problems[13,14,15].

Methods :

1. Current use : The succus cream or mousse is practical flat to the smitten field to work hide conditions wounds and burns.

2. Oral administration : The infusion decoction or tincture is taken orally to treat digestive problems fever respiratory problems and other internal health problems.

3. Steam clean inhalation : The leaves are cooked to problem the dynamic compounds which are indrawn to work respiratory problems 1. Allergic reactions: it may cause allergic reactions in certain people , so it is advisable to perform a patch test before using the preparation.

4. Interactions with medications : *Kalanchoe pinnata* may affect the action of some medicine , such as blood thinners, diabetes medications, and blood pressure medications, therefore, it is advisable to seek guidance from a qualified healthcare professional before using any preparation made from this plant[16].

BOTANICAL CLASSIFICATION :

1. kingdom : Plantae
2. subkingdom : Tracheobionta
3. division : Spermatophyta
4. subdivision : Magnoloiphyta
5. class : Mangnoliopsida (dicotyledonous plants)
6. subclass : Rosidae
7. order : Saxifragales
8. family : Crassulaceae[17].

III. MORPHOLOGY

Plant :

Bryophyllum Pinnatum, popularly identified as the “life plant,” it is a medicinal herb characterized by its smooth, thick, and fleshy leaves. The plant usually reaches a height of about 0.3–1.2 metres. Its most remarkable feature is its

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

natural ability to reproduce through tiny plantlets that grow along the margins of its leaves. This unique method of vegetative propagation makes the plant easy to cultivate and highlights its importance as a traditional medicinal herb.



Figure 3 : Bryophyllum Pinnatum Plant

Leaves :

The leaves obtained from *Bryophyllum Pinnatum* are thick, fleshy, oval-shaped, and possess smooth,shiny appearance . Young leaves may have a reddish tint, while older, fully developed leaves can gradually turn yellowish or purplish in colour. One of the most distinctive features of this plant is the edges of the leaves have small notches from which tiny new plantlets can grow and develop into new plants. When these plantlets detach and fall onto the soil where they can develop new plants under suitable conditions. This natural method of reproduction makes bryophyllum pinnatum easy to propagate. The leaves also contain a high amount of water, which helps the plant survive in dry environments.



Figure 4 : Bryophyllum Pinnatum leaves

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

Flower :

The flowers of *Bryophyllum Pinnatum* are typically drooping and bell-shaped. They grow in clusters at the tips of the stems, forming large, spreading panicles with thick branches arranged in opposite pairs. The flower stalks (pedicels) are short. The sepals are prominent and usually pale green to yellowish-green in colour. The plant generally flowers during the winter and spring seasons.



Figure 5 : Bryophyllum Pinnatum Flower

Stem:

The young stems of *Bryophyllum Pinnatum* tum are usually reddish in colour and may have small white spots. As the plant matures, the stems gradually become paler. They are generally upright, thick, smooth, and have a distinct four-sided shape.

Seed and fruit:

Seed:

The seeds of *Bryophyllum Pinnatum* tum are very small, smooth, and oblong-ellipsoid in shape. They are produced within the fruit and have a characteristic elongated appearance.



Figure 6 : Seeds of Bryophyllum Pinnatum

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

Fruit:

The fruit of *Bryophyllum Pinnatum* um is enclosed by a persistent, papery calyx and corolla, which provide protection. It is generally smooth, oblong-ellipsoid in shape, and divided internally into four sections by septa. Each fruit consists of follicles containing numerous small seeds. The seeds may also exhibit fine, lengthwise ridges on their surfaces[18,19,20,21,22].



Figure 7 : Bryophyllum pinnatum Fruits

PHARMACOLOGICAL ACTIVITY :

Antidiabetic activity :

The plant contains zinc which can help in diabetes management. Studies the aqueous extract of leaves has shown promising anti-inflammatory and antiidiabetic activity, reduces blood sugar level and inhibits pain response in animal models[23].

Anticancer activity :

Compounds obtained from bryophyllum pinnatum particularly bryophyllins, exhibit notable anticancer activity against different cancer cell lines ,highlighting its therapeutic potential. In summary bryophyllum pinnatum demonstrates a wide array of pharmacological activities, supporting its traditional uses and warranting for the scientific investigation into its therapeutic potential[24].

Antihypertensive activity :

Used for hypertension b. Pinnatum has hypertensive activity hence it's folkloric use in the blood pressure management[25].

Antibacterial activity :

Finally phenolic molecules are missing that the plant has antibacterial properties typhoid fever and other bacterial illnesses especially those brought on by S.aureus, e. Coli, b. Subtilis, p. Aeruginosa, k. Aerogenes, k. Pneumoniae, and s. Typhi can be fit you literally treated with plants according to Ofokansi et al. (2005). These results validated its uses to read the newborn babies placenta enabled which not only heals quickly but also stops the creation[26].

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

Activity against ulcer :

Research shows bryophyllum pinnatum can reduce ulcer incidents and gastric acid secretion hence used as ant-ulcer remedy[27].

Neuropharmacological activity :

B.pinnatum has been utilized as antipsychotic since 1921. The aqueous leaf extract has been reported to possess CNS depressant properties , reduces locomotor activity and coordination in animal models. Aqueous extract shows these effects, methanolic extract may have stronger CNS depressant activity. Other studies suggest it's sedative effect may be due to increased GABA levels in the brain[28].

Diuretic and antiurolithic activity :

Male wistar rats were administered orally and intraperitoneal injections obtained from a hydroalcoholic extract of *Kalanchoe Pinnatum* (*Crassulaceae*) leaves at doses of 100, 300, 500, and 800 mg/kg. Comparing the volume of urine was collected individually from each animal housed in a metabolic cage allowed researchers to examine the impact of urine output. Urinary electrolyte levels, biochemical markers, and kidney histological finding were compared with the those of control groups and standard drug-treated mice to assess the antiurolithiatic impact. It was observed that the plant extract has strong antiurolithiatic and diuretic effects[29,30].

CHEMICAL CONSTITUENTS :

Flavonoids :

the detection of flavonoids in this plant it may contribute to eliminating free radicals and reducing oxidative damage in cells. These antioxidant effects may help protect the body from oxidative damage linked to long-term health conditions, including cancer , dysmenorrhea, and other related disorders[31].

Tannins :

Tannins are naturally occurring polyphenolic compounds found in plants, often in response to different environmental stresses. They are known for their ability to combat free radicals and exhibit antioxidant activity [32]. Their phenolic structure contributes to various biological activities, making them useful in nutraceutical, pharmaceutical, and food-related applications [33]. Tannins have been observed in bryophyllum pinnatum extracts and play a role in plant's medicinal effects . However, further phytochemical studies are required to identify specific tannin compounds and understand their biosynthesis and individual roles in the plant's biological activities[34].

Triterpenoids :

Triterpenoids are important phytochemical compounds that have been examined for their potential antitumour activities. Certain triterpenoid compounds obtained from bryophyllum pinnatum extracts have also demonstrated antitumour effects in animal studies.These compounds are of suitable for further investigation of potential therapeutic properties of the plant[35].

Bufadienolides :

Bufadienolides belongs to a group of naturally occurring steroidal compounds structurally related to cardiac glycosides. They are considered among the most pharmacologically significant classes of compounds identified in bryophyllum pinnatum . Further studies are needed to determine their specific biological roles and therapeutic potential. As some bufadienolides can affect cardiac function and may be toxic, their safety and dosage require careful scientific evaluation[36].

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 6, Issue 1, November 2026 Impact Factor: 8.2

POTENTIAL HEALTH BENEFITS OF PATHARCHATTA (BRYOPHYLLUM PINNATUM) :

Potential anti-inflammatory and analgesic activity :

A study conducted in 2013 using albino rats suggested that *Bryophyllum Pinnatum* may possess anti-inflammatory and analgesic properties. The findings indicated that the plant's stem extract could help reduce inflammation and relieve pain. However, further research, particularly clinical studies in humans, is necessary to establish its effectiveness and safety for these purposes[37].

Potential role in kidney stone management :

Research conducted in 2015 suggested that *Bryophyllum Pinnatum* may have potential for use in kidney stone management. Calcium oxalate crystals are commonly found in the kidney stone , and certain plant constituents, including saponins, have been investigated for their possible effects on crystal formation and dissolution. However, the capacity of patharchatta to dissolve or eliminate kidney stones this has not been conclusively proven in humans. Further experimental and clinical investigations are required to confirm these findings[38].

Potential antidiabetic activity :

A study conducted in 2013 indicated that *Bryophyllum Pinnatum* may possess potential antidiabetic properties. Certain bioactive compounds, including derivatives of phenylalkyl ethers, have been studied for it's possible effects on insulin secretion and blood glucose regulation. These findings suggest that the plant may contain constituents deserve further investigating for their potential role in diabetes management. Nevertheless, more investigation required to establish its effectiveness and safety in humans[39].

Potential antimicrobial activity :

Research published in 2022 suggested that *Bryophyllum Pinnatum* may show antimicrobial effects against certain microorganisms. Phenolic compounds found in the plant may contribute to these effects by interfering with bacterial cell structures and potentially affecting the production of harmful substances. These effects have increased interest in investigating the plant's possible applications against bacterial infections. However, its effectiveness against specific infections, including typhoid and respiratory tract infections, requires further scientific validation[40].

Gastroprotective and anti-ulcer activity :

A study conducted in 2018 suggested that *Bryophyllum Pinnatum* may have potential gastroprotective and anti-ulcer properties. Flavonoids present in the plant may contribute to these effects through their potential anti-inflammatory activity and their influence on processes associated with gastric acid secretion. These compounds could provide a protective effects the gastric lining under certain experimental conditions. However, further studies are needed to whether the plant can effectively prevent or treat stomach ulcers in humans[41].

Potential wound-healing activity :

Experimental studies conducted research in rats have shown that certain constituents of *Bryophyllum Pinnatum*, including cardenolides and bufadienolides, may contribute to wound-healing activity. The observed effects indicate that the plant may help reduce some signs of inflammation, such as redness, and may support the wound-healing process. Nevertheless, more studies should be conducted to understand the mechanisms involved and establish the safety and effectiveness of patharchatta-based preparations for wound care[42].

Potential antileishmanial activity :

Certain bioactive compounds associated with *Bryophyllum Pinnatum*, including coumarin and quercetin, have been studied for their potential biological activity against this parasite. However, the specific antileishmanial effects of Patharchatta require further investigation, and therapeutic potential against leishmaniasis remains unconfirmed[43].

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

Potential anticancer activity :

Researchers have evaluated the possible antitumor activity of *Bryophyllum Pinnatum*. Additionally, a study by UEDA et al. In 2022 reportedly investigated the effects of patharchatta extracts on cancer cell growth. These findings indicate that the plant may be of interest for further anticancer research. However, laboratory findings do not establish effectiveness in humans, and additional studies are needed to determine its mechanisms, safety, and therapeutic potential[44,45].

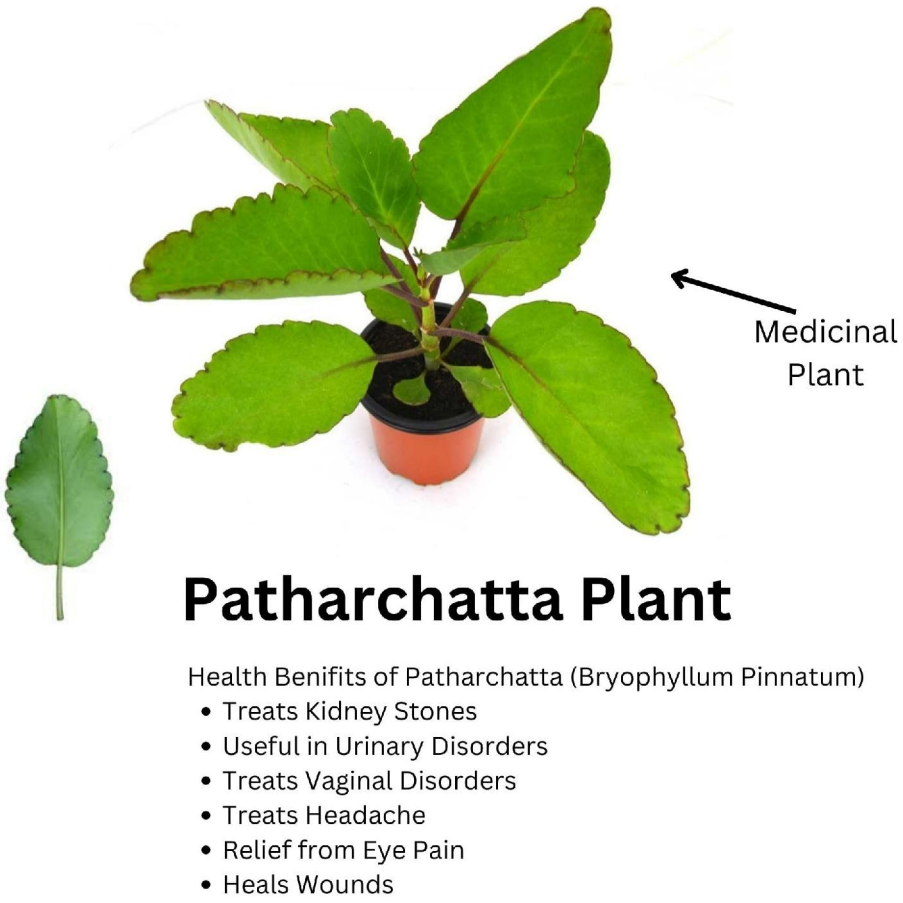


Figure 8 : Health benefits of Bryophyllum Pinnatum Plant

IV. DISCUSSION

Acne vulgaris is one of the most prevalent skin conditions, affecting people of different age groups, particularly adolescents and young adults. Its development is related to increased sebum production, blockage of hair follicles, inflammation, and the activity of cutibacterium acnes. This bacterium plays an important role in acne development by promoting inflammation and producing lipase enzymes. These enzymes act on triglycerides in sebum and convert them into free fatty acids , which may contribute to skin irritation and inflammatory acne lesions. Therefore, developing an anti-acne gel which may prevent the growth of bacterial and lipase activity it may be a useful approach to managing acne.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

V. FUTURE PERSPECTIVE

1. Preparation of herbal formulations: future research may focus on preparing herbal anti-acne gels using medicinal plants such as patharchatta (bryophyllum pinnatum). This research can help evaluate the plant's potential benefits in acne management.
2. Evaluation of antibacterial activity: additional research is needed to evaluate whether the prepared gel can inhibit the growth against cutibacterium acnes and assess its potential role in controlling acne-associated bacterial activity.
3. Assessment of lipase inhibition: future investigations can examine the ability of the gel to reduce bacterial lipase activity.
4. Formulation Optimisation: further work can aim to improve the gel's spreadability, consistency, skin absorption, and delivery of active ingredients while maintaining good patient acceptability.
5. Stability studies: accelerated and long-term stability testing can help determine the formulation's shelf life and ensure that its quality and properties remain consistent under different storage conditions.
6. Safety and skin irritation assessment: future studies should evaluate the formulation's skin compatibility, irritation potential, and possible allergic reactions before it is considered for human application.
7. Advanced drug delivery systems: new delivery approaches, including nanoemulsions and liposomes, may be investigated to improve the delivery of active constituents to the targeted skin area.
8. Clinical evaluation: following satisfactory laboratory testing and safety assessments, controlled clinical studies may be conducted to determine the gel's effectiveness and tolerability in people with acne vulgaris.
9. Comparison with standard treatments: the antibacterial and lipase-inhibitory activities of the formulated gel may be compared with those of suitable standard treatments to assess its relative effectiveness.
10. Potential for commercial development: if future studies demonstrate satisfactory safety, efficacy, stability, and quality, the formulation may offer opportunities for development into a herbal topical anti-acne product.

VI. CONCLUSION

In summary, this research could help to the development of a suitable topical anti-acne gel. The formulation's effectiveness will depend on the experimental findings obtained during evaluation. Further research, including safety studies and clinical trials, will be necessary to establish its overall safety and effectiveness for acne management. The prepared formulation can be evaluated through a range of tests, such as PH, viscosity, spreadability, homogeneity, and stability, to determine its quality and suitability for application to the skin. Furthermore, antimicrobial testing and lipase inhibition studies can help assess the formulation's potential effectiveness in addressing acne-related problems.

REFERENCES

1. Gaind K, Gupta R (1972) Alkanes, alkanols, triterpenes and sterols of *Kalanchoe Pinnatum*. phytochemistry 11(4):1500-1502.
2. Priyanka M, Mohini U, Poonam T, Shashikant D (2020) A Review on *Bryophyllum Pinnatum (*Lam.) Oken. Res J Pharmacognosy and Phytochem 11(2): 111-113.
3. Ali Esmail Al-Snati . The chemical constituents and Pharmacological effect of *Bryophyllum Pinnatum* Calycinum .A review. (IJPSR).12 Dec 2013, (4).
4. Ada Francesca Nneoyi-Egbe, Eridiong Onyenweaku, Andyno Akpanukoh, Hepatoprotective, Activity of *Bryophyllum Pinnatum* Leaves (Boiled extract) on Albino wistar Rats in vitro study,. Int. J. Biochem.Res.Rev , (2023), 3(32), 10-15.
5. Aprioku and Ighodaro, Toxicity Profile of *Bryophyllum Pinnatum* leaf extract, Indian Journal of pharmaceutical Sciences. (2017), 79(4) ; 521-526.
6. Imaobong E.Daniel, Ekemini I. Akpan, Edidiong C. Utam. Phytochemical Evaluation, Antioxidant and Antimicrobial Activities of various extract from Leaves and steams of *Bryophyllum Pinnatum*, Nepal Journal of Biotechnology: 2020 july, 8(1), 17-28.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

7. O.M Mac-Kalunta, A.A Ahamefula, C.Odii, B. Ibe, Comparative Studies of the yeid and chemical constituents of *Bryophyllum Pinnatum* By cold maceration and soxhlet extraction methods , J.Chem.Soc.Nigeria, (2022), 47, 807-817.
8. B.V.Nwali, A.N.C okaka, V.A.Ibium and P.M.Aja. Composition of *Bryophyllum Pinnatum* Leaves. I.J.A.B.R. (2012), 2(4); 614-616.
9. Dr.Ramesh D, Ingole 1, Avinash B, Thalkari3, Pawan N. Karwa 2, Krushna K, Zambare 4, Pallavi S, Shinde 2. *Bryophyllum Pinnatum*: A Magical Herb, J.Pharmacognocy and Phytochem. 2020, 12(3), 162-167.
10. Priyanka Mule, Mohini Upadhye, Poonam Taru, Shashikant Dhole, A review on *Bryophyllum Pinnatum* (Lam).Oken, Research Journal of Pharmacognosy and Phytochemistry, April-June 2020, 02(12).
11. Nnaebue Ndirika D, Anaukwu Chikodili G, Anyaoha Victoria N.,Soludo Charwoman O, Isiaka Amarachukwu B, Ajogwu Tobechukwu .M.C, Onuorah Samuel C. Comparative Phytochemical Constituents of extract of *Bryophyllum Pinnatum*, Grown in Anambra State Nigeria.; Int.J.Appl.Sci.Biotechnol ,(2024), 12(1), 1-7.
12. Jaiswal C.V, A.D. The diverse range of activities associated with the traditional medicinal claims of Patharchatta. International Journal of Creative Research Thoughts (IJCRT), 2024; A-172–A-174.
13. Rahman, Rafia, et al. "Phytochemical, morphological, botanical, and pharmacological aspects of a medicinal plant: *Kalanchoe Pinnata*–A review 17 article." International Journal of Chemical and Biochemical Sciences 16 (2019): 5-10.of a Medicinal Plant: *Kalanchoe Pinnata*–A Review Article. Int. J. Chem. And Biochemical Sci. 2019, 16, 5–10.
14. Sharma, Tanu, Shaily Mishra, and Shamim Ahmad. "Quality Standardisation and Comparative Study of Leaf and Root of Kalanchoe pinnata in the Treatment of Wound Healing on Albino Rats." (2023).
15. Luckman, Gbati, et al. "Evaluation of the Antioxidant and Healing Properties of the Hydroethanolic Extract of Kalanchoe pinnata (Lam) Pers of the Togolese Flora." Journal of Drug Delivery & Therapeutics 14.10 (2024).
16. A Review of the Popular Uses, Anatomical and Biological Aspects of *Kalanchoe* (Crassulaceae): A Genus of Plants Known as "Miracle Leaf" – [v1] [Internet]. Preprints.org. 2023 [cited 2024 Dec 9].
17. Quazi Majaz A., A.U. Tatiya, Molvi Khurshid, Sayyed Nazim, Shaikh Siraj Ali-Allana College of Pharmacy, Akkalkuwa, Dist- Nandurbar, MS, India.
18. Chaithra SR, Bijesh Vatakkeel, Siju EN.A Review On Pharmacological activities of *Bryophyllum Pinnatum* Linn. American Journal of Pharmacy and Health research. (2020) ,2(8).
19. Swati Pirdhankar, Om Thorve, dr Rupali tasgonkar. *Bryophyllum Pinnatum*: Traditional Remedies, Growth, and Future prospect in Medicine. International journal of Research publication and review, November (2024),11 (5), 2942-2948.
20. Shailendra Salauniyan, Raghuvir Irchhaiya, Nandlal Singh, Shashi Alok, Dilip Kumar Chanchal and Rohit Kumar Bijauliya. IJLSR, (2019), 7(5), 97-103.
21. Dr.Ramesh D, Ingole 1, Avinash B, Thalkari3, Pawan N. Karwa 2, Krushna K, Zambare 4, Pallavi S, Shinde 2. *Bryophyllum Pinnatum*: A Magical Herb, J.Pharmacognocy and Phytochem. 2020, 12(3), 162-167.
22. Pawar Divya Pandit, Mr.Abhijit Rode Sir, Mr Akshay Jadhav Sir, Pharmacological Activity of *Bryophyllum Pinnatum*, IJPRA, Jan- Feb 2025, 01(10).
23. Matthew, Shashank, et al. "Analgesic and anti-inflammatory activity of *Kalanchoe pinnata* (lam.) pers." Journal of Medicinal Plants 1.2 (2013): 24-28.
24. Habib, Md Razibul, et al. "Evaluation of the analgesic, sedative-anxiolytic, cytotoxic and thrombolytic potentials of the different extracts of *Kalanchoe pinnata* leaves." Journal of Coastal Life Medicine 3.12 (2015): 982-986.
25. Stefanowicz-Hajduk J, Hering A, Kowalczyk M, Halasa R, Gucwa M, Ochocka JR. Kalanchoe sp. Extracts-Phytochemistry, Cytotoxic, and Antimicrobial Activities. Plants (Basel). 2023 Jun 10;12(12):2268. Doi: 10.3390/plants12122268. PMID: 37375893; PMCID: PMC10305294.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

26. Joshi B, Panda SK, Jouneghani RS, Liu M, Parajuli N, Leyssen P, Neyts J, Luyten W. Antibacterial, Antifungal, Antiviral, and Anthelmintic Activities of Medicinal Plants of Nepal Selected Based on Ethnobotanical Evidence. Evid Based Complement Alternat Med. 2020 Apr 22;2020:1043471. Doi: 10.1155/2020/1043471. PMID: 32382275; PMCID: PMC7193273.
27. Raj, V. I. N. I. T., et al. "In vitro antimicrobial activity of *Kalanchoe pinnata* leaf." Int J Curr Pharm Res 2 (2012): 3-5.
28. Sohgaura, Atul, Papiya Bigoniya, and Birendra Shrivastava. "Diuretic potential of Cynodondactylon, Emblica officinalis, *Kalanchoe pinnata* and *Bambusa nutans*." Journal of Pharmacognosy and Phytochemistry 7.3 (2018): 2895-2900.
29. Wadhwa, Sapna; Boora, Sanjit; Soniya, Kumari; Yadav, Suman; Kaushik, Sulochana; Kumar, Ramesh; Kaushik, SamanderSupratman, Unang, et al. "New insecticidal bufadienolide, bryophyllin C, from *Kalanchoe pinnata*." Bioscience, biotechnology, and biochemistry 64.6 (2000): 1310-1312.
30. Fürer K, Simões-Wüst AP, von Mandach U, Hamburger M, Potterat O. *Bryophyllum pinnatum* and related species used in anthroposophic medicine: constituents; pharmacological activities; and clinical efficacy. Planta Med. 2016; 82(11/12):930–941.
31. Samec D, Karalija E, Šola I, Vujčić Bok V, Salopek-Sondi B. The role of polyphenols in abiotic stress response: the influence of molecular structure. Plants. 2021;10(1):118. https://doi.org/10.3390/plants10010118.
32. Ozogul Y, Ucar Y, Tadesse EE, Rathod N, Kulawik P, Trif M, Esatbeyoglu T, Ozogul F. Tannins for food preservation and human health: A review of current knowledge. Appl Food Res. 2025;5(1):100738.
33. Mora J, Pott DM, Osorio S. Vallarino JG. Regulation of plant tannin synthesis in crop species. Front Genet. 2022;13:870976.
34. Chandraker SK, Lal M, Dhruve P, Singh RP, Shukla R. Ravindra Shukla. Cytotoxic, antimitotic, DNA binding, photocatalytic, H2O2 sensing, and antioxidant properties of biofabricated silver nanoparticles using leaf extract of *Bryophyllum pinnatum*(Lam.) Oken. Front Mol Biosci. 2021;7:593040.
35. Zeng LR, Pan BW, Cai J, Liu LJ, Dong ZC, Zhou Y, Feng TT. Shi Y. Construction, structural modification, and bioactivity evaluation of pentacyclic triterpenoid privileged scaffolds in active natural products. RSC Adv. 2024;14:53, 39436–61. 2046–2069.
36. Uchegbu RI, Ahuchaogu AA, Amanze KO, Ibe CO. Chemical constituents' analysis of the leaves of *Bryophyllum pinnatum* by GC-MS. AASCIT J Chem. 2017;3(3):19–22.
37. Wei W-L, Hou J-J, Wang X, Yu Y, Li H-J, Li Z-W, Feng Z-J, Qu H, Wu W-Y, Guo D-A. Venenum bufonis: an overview of its traditional use; natural product chemistry; pharmacology; pharmacokinetics and toxicology. J Ethnopharmacol. 2019;237:215–235.
38. Matthew S, Jain AK, James M, Matthew C, Bhowmik D. Analgesic and anti-inflammatory activity of *Kalanchoe pinnata* (lam.) pers. Journal of Medicinal Plants. 2013;1(2):24-8.
39. Pathak RS, Hendre AS. In-vitro antiurolithiatic activity of Kalanchoe pinnata extract. International Journal of Pharmacognosy and Phytochemical Research. 2015;7(2):275-9.
40. Patil SB, Dongare VR, Kulkarni CR, Joglekar MM, Arvindekar AU. Antidiabetic activity of *Kalanchoe pinnata* in streptozotocin-induced diabetic rats by glucose independent insulin secretagogue action. Pharmaceutical biology. 2013 Nov 1;51(11):1411-8.
41. Tajudin NNJ, Ismail INA. Antimicrobial activity of *Kalanchoe pinnata*: a review. Malaysian Journal of Science Health & Technology. 2022 Feb 1 [cited 2025 Apr 25].
42. Pawar SM, Jadhav RK, Kulkarni PN, Kasar SR, Shirsath MR. A review article on potential uses and pharmacological activity of *Bryophyllum pinnatum*. International Journal of Creative Research Thoughts (IJCRT). 2025 Feb [cited 2025 Apr 25];13(2):i258–60.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 6, Issue 1, November 2026
Impact Factor: 8.2

43. Rajsekhar P, Bharani R, Ramachandran M, Angel K, Rajsekhar S. The and ldquo;Wonder Plant and rdquo; Kalanchoe pinnata (Linn.) Pers.: A Review. Journal of Applied Pharmaceutical Science [Internet]. 2016 Jan 1;151–8.
44. Muzitano MF, Tinoco LW, Guette C, Kaiser CR, Rossi-Bergmann B, Costa SS. The antileishmanial activity assessment of unusual flavonoids from Kalanchoe pinnata. Phytochemistry. 2006 Aug 24 [cited 2025 Apr 25];67(18):2071–7.
45. Quazi Majaz A, Tatiya AU, Khurshid M, Nazim S, Siraj S. The miracle plant (Kalanchoe pinnata): a phytochemical and pharmacological review. Int J Res Ayurveda Pharm. 2011;2(5):1478-82.