WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.63
Volume 15, Issue 7, 489-504. Review Article ISSN 2277–7105

COSMECEUTICAL POTENTIAL OF *CARICA PAPAYA*, *BACOPA MONNIERI*, AND *PSORALEA CORYLIFOLIA* IN POLYHERBAL CREAM FORMULATION: A REVIEW

Shraddha Ekhande[a]*, Satyam D. Ghagare[a], Sushant[b], Manish[c], Rinku, Dr. Shrutika Patil[e]

[a,b,c,d,e]Department of Pharmacy/ Lokmanya Tilak Institute of Pharmacy/ Dr. Babasaheb Ambedkar Technological University/ Sector 14, Kharghar Navi Mumbai, Maharashtra-India.

Article Received on 02 March 2026,
Article Revised on 23 March 2026,
Article Published on 01 April 2026,

https://doi.org/10.5281/zenodo.19327399

***Corresponding Author**
Shraddha Ekhande
Department of Pharmacy/ Lokmanya Tilak Institute of Pharmacy/ Dr. Babasaheb Ambedkar Technological University/ Sector 14, Kharghar Navi Mumbai, Maharashtra-India.

How to cite this Article: Shraddha Ekhandea*, Satyam D. Ghagarea, Sushantb, Manishc, Rinku, Dr. Shrutika Patile. (2026). Cosmeceutical Potential of Carica Papaya, Bacopa Monnieri, And Psoralea Corylifolia In Polyherbal Cream Formulation: A Review. World Journal of Pharmaceutical Research, 15(7), 489–504.

ABSTRACT

The growing demand for safer and naturally derived cosmetic products has increased interest in herbal ingredients for dermatological formulations. Medicinal plants contain a variety of bioactive phytochemicals that exhibit antioxidant, anti-inflammatory, and skin-protective properties. Among these, *Carica papaya*, *Bacopa monnieri*, and *Psoralea corylifolia* have gained considerable attention due to their potential applications in cosmetic and cosmeceutical preparations. Papaya contains the proteolytic enzyme papain along with phenolic compounds that contribute to exfoliation and antioxida nt activity. *Bacopa monnieri* is rich in bacosides, which possess antioxidant and protective effects against oxidative stress. *Psoralea corylifolia* contains bakuchiol, a plant-derived compound reported to exhibit retinol-like activity and potential benefits in improving skin appearance and pigmentation. The combination of these plant extracts in a polyherbal cream formulation may provide synergistic dermatological benefits including exfoliation, antioxidant protection, and improvement of skin texture. This review highlights the phytochemical composition and cosmeceutical potential of these plants.

KEYWORDS: Polyherbal cream, Cosmeceuticals, Carica papaya, Bacopa monnieri,

Psoralea corylifolia.

INTRODUCTION

Ayurveda, the traditional system of medicine in India, has long utilized plant -derived bioactive compounds in formulations intended to maintain skin health and enhance external appearance. Herbal ingredients are generally considered safer alternatives to synthetic chemicals and are widely used in cosmetic and dermatological preparations. Medicinal plants contain a variety of phytochemicals such as alkaloids, flavonoids, terpenoids, tannins, saponins, and steroids, which contribute to their therapeutic and cosmetic properties and are commonly identified through phytochemical screening.[1,24] Carica papaya (papaya) is a tropical plant widely used in cosmetic preparations due to its rich enzymatic and antioxidant composition. Papaya contains the proteolytic enz yme papain, which is predominantly present in unripe green fruits. Papain facilitates enzymatic exfoliation by breaking down keratinized dead skin cells, thereby improving skin texture and promoting a brighter appearance.[4,6] In traditional practices, latex obtained from unripe papaya fruits has also been applied to lighten freckles and hyperpigmented lesions.[2] Bacopa monnieri (Brahmi), a well-known medhya rasayana herb described in classical Ayurvedic texts such as the Charaka Samhita and Sushruta Samhita, is recognized for its neuroprotective and antioxidant properties. Recent studies suggest that extracts of Bacopa monnieri may enhance collagen production, reduce oxidative stress, and modulate inflammatory responses in the skin, indicating potential ap plications in anti- aging cosmeceutical formulations. Bakuchiol, a bioactive compound derived from Psoralea corylifolia (Bakuchi), has gained significant attention in cosmetic science as a plant-based alternative to retinol. Studies have reported that bakuchiol exhibits antioxidant and anti-inflammatory activities and can stimulate collagen synthesis while reducing photodamage markers with significantly lower irritation compared to synthetic retinoids.[15] Therefore, the combination of these herbal ingredients in polyherbal cosmetic formulations may provide synergistic dermatological benefits. This review aims to summarize the phytochemical composition and cosmeceutical potential of Carica papaya, Bacopa monnieri, and Psoralea corylifolia.

1. PAPAYA (CARICA PAPAYA)

1.1 Botanical description

Carica papaya L. is a tropical herbaceous plant belonging to the family Caricaceae and widely cultivated in tropical and subtropical regions. The plant grows as a soft, hollow-

stemmed tree reaching approximately 6–10 m in height with large palmately lobed leaves arranged spirally around the trunk. Papaya plants may produce ma le, female, or hermaphroditic flowers depending on genetic and environmental factors. The fruits are large berries containing numerous seeds and are rich in enzymes and carotenoids with nutritional and medicinal significance.[6]

Table 1: Taxonomical Classification.[2]

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Brassicales
Family	Caricaceae
Genus	*Carica*
Species	*Carica papaya* L.

Fig 1: Papaya Fruit.

Fig 2: Carica Papaya Tree

1.2 Morphology

Carica papaya is a small, fast-growing tropical plant characterized by a soft, hollow trunk and large palmately lobed leaves arranged spirally around the stem. The plant produces male, female, or hermaphroditic flowers depending on genetic and environmental conditions. Its fruits are large, oval to spherical berries with soft orange pulp and numerous black seeds. Papaya fruits are rich in enzymes and bioactive compounds that contribute to their nutritional and medicinal value,[3,25]

Fig. 3: Leaves.[3]

Fig. 4: Typical Female Flowers.[3]

Fig. 5: Hermaphrodite elongateflower.[3]

1.3 Phytoconstituents

Carica papaya contains a wide range of phytochemicals distributed in different parts of the plant including fruits, leaves, seeds, and latex. Carica papaya has many active compounds, some volatile and some non -volatile, that give the plant its healing and skin-benefitting properties. The leaves are rich in tannins, saponins, alkaloids, flavonoids, and glycosides. Young shoots are also a good source of essential minerals, including calcium, iron, magnesium, potassium, zinc, and manganese. The green, under-ripe fruits contain some very useful enzymes, namely papain, chymopapain, and carotenoids, including β-carotene and cryptoxanthin. The seeds yield papaya oil that is rich in flavonoids, such as kaempferol and myricetin, and include quite a number of aromatic compounds, including linalool, 4-terpineol, and monoterpenoids. The latex and other parts also contain the enzymes papain, chymopapain, and caricain. With its flavonoids, phenolic acids, and carotenoids, papaya functions extremely well in tanning prevention and skin care products.[3]

Table no. 2: Phytochemical constituents present in different parts of *Carica papaya*.[3],[4]

Plant Part	Major Phytochemical Constituents
Fruit	Carotenoids (cryptoxanthin, violaxanthin, zeaxanthin, β-carotene), citric acid, malic acid, alkaloids, proteins, fats, fiber, calcium, phosphorus, iron, vitamin C, thiamine, riboflavin, niacin
Juice	n-butyric acid, n-hexanoic acid, n-octanoic acid, myristic acid, palmitic acid, stearic acid, linoleic acid, linolenic acid, oleic acid
Seeds	Carpaine, benzyl isothiocyanate, benzyl thiourea, β-sitosterol, caricain, papaya oil
Root	Caproside, myrosinase enzyme
Leaves	Carpaine, pseudocarpaine, dehydrocarpaine I & II, choline, caproside, vitamins C and E
Bark	β-sitosterol, glucose, fructose, galactose, xylitol
Latex	Papain, chymopapain, glutamine cyclotransferase, peptidases

1.4 Extraction

Maceration is the method for the conventional extraction of papaya. Coarsely powdered plant material is immersed in an appropriate solvent and allowed to stand for some time. Gentle agitation during this time aids in the diffusion of compounds into solution. After extraction, the mixture is filtered (say through Wh atman No. 42 filter paper), and the solvent is then evaporated at reduced pressure to obtain the concentrated extract.[5]

1.5 Mechanism of Action

Papain and Collagen Modulation

Papain, a proteolytic enzyme present in *Carica papaya*, contributes to skin rejuvenation by promoting the breakdown of damaged proteins and stimulating cellular turnover. Studies suggest that papain may enhance collagen synthesis and improve dermal structure, thereby supporting skin elasticity and firmness. These effects contribute to the anti-aging potential of papaya in cosmetic formulations.[38,39]

Skin Rejuvenation and Exfoliation

Papain acts as a natural enzymatic exfoliant by degrading keratinized dead skin cells on the epidermal surface. This enzymatic activity promotes the removal of damaged cells and facilitates the regeneration of new skin cells. As a result, papaya extracts help improve skin texture, brightness, and overall appearance.[38,40]

Skin Hydration and Barrier Protection

Papaya extracts may enhance the water-holding capacity of the skin and help maintain hydration within the stratum corneum. Improved hydration contributes to smoother skin texture and prevents dryness by supporting the natural moisture balance of the skin barrier.[38,41,42]

Table 3: Mechanism Of Action of carica papaya.

Actions	Mechanism of Action	Reference
Lightens Dark Spots and Discolouration:	Papaya's natural enzymes and beta -carotene work in brightening scars, dark patches, and uneven pigmentation to result in a much fairer and glowing skin complexion	[4,30]
Keeps Skin Hydrated:	Papaya acts as a natural, mild hydrator that restores moisture and softness to dry and rough areas on the skin.	[4,30]

Encourages healing of the skin	The fruit's natural enzymes remove impurities, exfoliate dead skin tissues, and soothe inflammatory skin conditions such as eczema and psoriasis. Removes dead skin cells and gives a radiant skin glow	[4,30]
Thoroughly cleanses the skin:	Papaya enzymes unclog pores, wash away dirt and excess oil, leaving fresh and glowing skin.	[4,30]
Treating Acne:	The papain and chymopapain ingredients help resolve inflammation, free blocked pores, and stop new pimples from forming	[4,30]
Wrinkles Reduction	Lycopene present in papaya protects the skin from the oxidative harm of free radicals and increases its elasticity.	[4,30,31,32]
Anti-Aging	The papaya seeds have lycopene and vitamin A, which reduce fine lines and maintain skin freshness and youthfulness.	[4]

2. Brahmi (Bacopa monnieri)

1.1 Botanical Description

Bacopa monnieri (L.) Pennell is a perennial creeping herb belonging to the family Plantaginaceae and widely distributed in tropical and subtropical regions.[9,11] The plant commonly grows in marshy areas, wetlands, and riverbanks across India and other Asian countries.[90] It is popularly known as Brahmi or water hyssop and is recognized in Ayurveda as a *Medhya Rasayana* used for improving cognitive function and managing stress-related disorders.[12] The plant is characterized by succulent creeping stems, small oblong leaves, and solitary white flowers that grow well in moist environments.[8,10]

1.2 Morphology description

Bacopa monnieri is a small creeping herb with succulent stems that root at the nodes when in contact with moist soil.[9] The leaves are simple, opposite, and oblanceolate in shape with entire margins and a rounded apex.[9,28] The flowers arise singly in the leaf axils on slender peduncles and possess five petals with four stamens arranged in unequal pairs.[9]

This morphological structure allows the plant to grow efficiently in moist and aquatic environments.[10]

Fig. 6: Fresh Bacopa monnieri leaves.[8]

Fig. 7: Harvested Bacopa monnieri leaves.[8]

Fig. 8: Flowering stage of Bacopa monnieri.[8]

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fabales
Family	Fabaceae (Leguminosae)
Genus	*Psoralea*
Species	*Psoralea corylifolia* L.

1.4 Phytochemical constituents

Bacopa monnieri contains many triterpenoid saponins, alkaloids, flavonoids, sterols, phenolic compounds, and amino acids, some of which are responsible for the pharmacological activities. About 6% of the dry weight of this herb consists of the bacosides, with Bacoside A being the major bioactive marker that stabilises membrane cells and promotes cellular repair.[14] The combined actions of these secondary metabolites are to provide defence against free radicals, decrease lipid peroxidation, protect proteins, and protect the cell.[14]

Table 5: Major phytochemical constituents of *Bacopa monnieri.*

Phytochemical Class	Major Compounds	Biological Activity	Reference
Triterpenoid saponins	Bacoside A, Bacoside B	Antioxidant, neuroprotective	[14,41,43]
Alkaloids	Brahmine, Herpestine	Anti-inflammatory	[41]
Flavonoids	Luteolin, Apigenin	Antioxidant activity	[42]
Phenolic compounds	Caffeic acid, Ferulic acid	Free radical scavenging	[42]
Sterols	β-sitosterol, Stigmasterol	Anti-inflammatory	[14]

1.5 Extraction method

Extraction of *Bacopa monnieri* is commonly carried out using conventional solvent extraction techniques such as maceration or Soxhlet extraction.[13] In these methods, the dried plant material is first powdered to increase the surface area for efficient extraction of

phytochemicals.[9] The powdered material is then extracted using suitable solvents such as ethanol, methanol, or hydroalcoholic mixtures to obtain extracts rich in bioactive compounds, particularly bacosides.[9,13] The solvent is subsequently removed under reduced pressure to obtain a concentrated extract that can be used for further pharmaceutical or cosmetic applications.[13]

1.6 Mechanism of Action

Antioxidant Activity: *Bacopa monnieri* contains bioactive compounds such as bacosides, flavonoids, and phenolic constituents that exhibit significant antioxidant activity. These compounds help neutralize reactive oxygen species and protect skin cells from oxidative stress, thereby preventing p remature ageing and cellular damage.[42,43]

Anti-Inflammatory Activity: The anti-inflammatory properties of *Bacopa monnieri* are mainly attributed to triterpenoid saponins and bacosides. These compounds inhibit the production of pro -inflammatory mediators such as tumor necrosis factor-α and interleukin-6, thereby reducing skin inflammation and irritation.[41,44]

Collagen Protection: Bacosides present in *Bacopa monnieri* have been reported to protect cellular membranes and support tissue repair mechanisms. This activity may help maintain skin structure and contribute to improved elasticity and protection against environmental stress.[14,41,43]

Table 6: Mechanism of Action.

Actions	Mechanism of Action	Reference
Helps Reduce Premature Ageing & Wrinkles	The production of fibroblasts has been increased, the natural generation of collagen has been stimulated, and thereby collagen provides the required support for maintaining skin elasticity. Fine lines are reduced, and skin is firmed and renewed.	[8]
Restores Hydration & Prevents Dryness	It synergises with humectants such as glycerin to enhance skin hydration and maintain its moisture reservoir, resulting in the skin's softness and suppleness	[8]
Reduces Acne & Skin Inflammation	Antimicrobial and anti-inflammatory activity is shown by reducing bacterial growth and inflammatory response; hence, it helps control acne breakouts and minimize swelling and redness.	[8]
Soothes UV Damage & Skin Sensitivity	Flavonoids and bacosides are strong antioxidants, combating free radicals and mitigating inflammation. They help in repairing UV-induced damage and alleviating redness and irritation.	[8]

3 Bakuchiol(Psoralea corylifolia)

3.1 Botanical description

Psoralea corylifolia Linn., popularly known as Bakuchi or Babchi, is a member of the Leguminosae family and has gained wide acceptance in Ayurvedic, Traditional Chinese medicine for its dermatological uses and therapeutic properties.[23] This erect and annual herb grows by 60–150 cm in height and covers its grooved stems and branches, which are rather rigid, with fine hairs and glandular dots. The leaves of this plant are simple, ovate to oblong, 4.5–9 cm long, with serrated margins and a leathery texture. The plant bears axillary inflorescences that are compact with pale yellow to bluish-purple flowers. The fruit is a small oblong pod enclosing one black kidney-shaped seed.[16,17]

The Psoralea family comprises almost 120 species, most of which are found in Africa, the Americas, and Australia. One species is reported from China, and these plants thrive in warm, bright, and damp environments like cultivated fields and hillsides.[16,29]

3.2 Morphology

Psoralea corylifolia is an erect annual herb belonging to the family Fabaceae that typically grows up to 0.6 –1.2 m in height.[17] The plant has simple ovate leaves with glandular dots and produces clusters of small bluish -purple flowers in the leaf axils.[17,18] The fruits are small pods containing dark brown to black aromatic seeds that are rich in bioactive compounds such as bakuchiol.[17,18]

Fig. 9: leaves, flower and fruits of Bakuchiol.[17,26]

Fig. 10: Seeds of Bakuchiol.[17,27]

3.3 Taxonomy

Table 7: Taxonomical classification.[19]

Rank	Classification
Kingdom	Plantae
Division	Magnoliophyta

Class	Magnoliopsida
Order	Fabales
Family	Fabaceae (Leguminosae)
Genus	*Psoralea*
Species	*Psoralea corylifolia* L.

3.4 Phytoconstituents

Scientists have discovered more than 163 different compounds in P. corylifolia, with the main groups being coumarins, flavonoids, monoterpene phenols, benzofurans, and several other smaller components. The coumarins, flavonoids, and monoterpene phenols stand out as the key active ingredients that create most of the plant's medicinal benefits.[16]

Table 8: Phytoconstituents and their uses.[16,19,26]

Class	Major Compounds	Activity
Coumarins	Psoralen, Isopsoralen	Pigmentation regulation
Flavonoids	Bavachinin	Antioxidant
Monoterpene phenols	Bakuchiol	Anti-aging
Benzofurans	Psoralidin	Antimicrobial

3.5 Extraction

Extraction of *Psoralea corylifolia* seeds is commonly performed using solvent extraction techniques such as Soxhlet extraction or ultrasonic-assisted extraction.[20] In these methods, the dried seeds are powdered and extracted using suitable organic solvents such as ethanol, methanol, or a cetone to isolate bioactive compounds, particularly bakuchiol.[20] The obtained extract is then concentrated by removing the solvent under reduced pressure to obtain a crude extract rich in active phytochemicals.[20]

3.6 Mechanism Of Action

Anti – Acne

Acne vulgaris is a complex inflammatory condition resulting from conditions such as hyperseborrhea, follicular hyperkeratinization, hormonal changes, and colonization by Propionibacterium acnes. A dermo -cosmetic product containing Bakuchiol, Ginkgo biloba extract, and Mannitol (BGM complex) has proved to be valuable in terms of anti-acne action. Bakuchiol is said to be responsible for acting as a regulator to sebum, as well as being an antibacterial and anti-inflammatory substance that specifically targets P. acnes seeded strains that are resistant to antibiotics. According to clinical observations, the BGM complex may enhance the anti-inflammatory potency of adapalene and reduce the overall number of both inflammatory and non -inflammatory lesions, further improving skin condition overall

and quality of life. On the contrary, bakuchiol does not induce antibiotic resistance like topical antibiotics do, making the formulation a bright area of opportunity, especially for patients who cannot tolerate benzoyl peroxide.[21,45,46,47,48]

Anti – Hyperpigmentation

Bakuchiol is the natural alternative to retinol, boasting similar efficacies against the concerns of aging and pigmentation, while being less irritating on the skin. Bakuchiol acts as an analogue to retinol as it promotes the expression of genes involved in retinoid activation, maintenance of epidermal integrity, and repair of the extracellular matrix, albeit with a structure different from retinol. Clinical studies established that twice -a-day application of bakuchiol provides substantial improvements in hyperpigmentation, fine lines, and overall skin texture, with better tolerability than retinol. In addition to its potency as a melanin synthesis inhibitor-a possible factor in preventing and clearing dark spots and patchy skin-bakuchiol shows significant a ntioxidant activities by activating the Nrf2 pathway and combating oxidative stresses that cause skin aging.[21,33,49]

Table 9: Mechanism of Action.

Action	Mechanism of Action	Reference
Anti-aging	Regulation of anti-ageing genes and proteins like retinol, stimulation of collagen synthesis in fibroblasts, inhibition and reduction of IL-8 and p16 expression in ageing skin.	[21, 32]
Anti-hyperpigmentation	As it inhibits tyrosinase and the activity of α-melanocyte, it interferes with melanin synthesis and thus reduces the intensity of pigmentation on the skin surface.	[21,33]
Anti-oxidant	Prevention and protection against oxidation with antioxidant effects that are double that of vitamin E, which is present in natural skin in acne-prone skin, is for restoring sebum balance	[21,34]
Anti-inflammatory	Blocks the inflammatory response via inhibition of the STAT1/3/interferon inflammatory signalling pathway, thus reducing the sensitization of keratinocytes to cytokines	[21,35]
Anti-acne	Bakuchiol has the potential to regulate seborrhea, has antibacterial activity. and anti-acne activity.	[21,36]
Anti-melanogenesis	The activity of inhibiting melanogenesis is derived from the inhibition of melanin biosynthesis and the inhibition of the formation of primary cilia and dendrites, which involves Rho-dependent signalling and the regulation of tyrosinase expression.	[21,37]

4. Comparative Cosmeceutical Potential

Medicinal plants such as *Carica papaya*, *Bacopa monnieri*, and *Psoralea corylifolia* contain diverse bioactive compounds that contribute to their dermatological and cosmetic applications. These plants exhibit several beneficial activities including antioxidant, anti-inflammatory, skin-rejuvenating, and anti-aging effects. The combination of these herbal ingredients in a polyherbal formulation may provide synergistic benefits for improving skin health and appearance. The major bioactive compounds and their dermatological benefits are summarized in Table 10.[1,4,14,22]

Table 10: Comparative cosmeceutical potential of selected medicinal plants.

Plant	Major Bioactive Compound	Cosmeceutical Benefit	Reference
Carica papaya	Papain	Enzymatic exfoliation, skin brightening	[4,38]
Bacopa monnieri	Bacosides	Antioxidant protection, anti-inflammatory activity	[14,41]
Psoralea corylifolia	Bakuchiol	Anti-aging, collagen stimulation	[22,33]

5. CONCLUSION

The present review highlights the significant cosmeceutical potential of *Carica papaya*, *Bacopa monnieri*, and *Psoralea corylifolia*. These medicinal plants contain bioactive compounds such as papain, bacosides, and bakuchiol that exhibit antioxidant, anti-infla mmatory, and skin-rejuvenating properties. These phytochemicals contribute to important dermatological activities including exfoliation, collagen stimulation, pigmentation regulation, and protection against oxidative stress. The incorporation of these h erbal ingredients in polyherbal cosmetic formulations may provide synergistic benefits for improving skin texture, reducing hyperpigmentation, and preventing premature ageing. Therefore, these plants represent promising natural alternatives for the development of safe and effective cosmeceutical products.

REFERENCE

1. Pal RS, Pal Y, Saraswat N, Wal P, Wal A. Current review on herbs for derma care. The Open Dermatology Journal, Aug. 31, 2019; 13(1).
2. Karunamoorthi K, Kim HM, Jegajeevanram K, Xavier J, Vijayalakshmi J. Papaya: A gifted nutraceutical plant-a critical review of recent human health research. Cellmed, Feb. 28, 2014; 4(1): 21 -7.

3. Wadekar AB, Nimbalwar MG, Panchale WA, Gudalwar BR, Manwar JV, Bakal RL. Morphology, phytochemistry and pharmacological aspects of Carica papaya, an. GSC Biological and Pharmaceutical Sciences, 2021; 14(3): 234-48.
4. Thulasiayyah MS, Arthanari S, Palanivel A, Rameshkumar H, Sivakumar H. A gifted cosmetic potential of papaya: A review. Int J Pharmacognosy Pharm Sci., 2025; 7(1): 11 –9.
5. Jagtap PS, Nikam AV, Jagtap BT. Extraction, characterisation and formulation of Carica papaya leaves Extract. Int J Pharm Res Appl., 2023; 8(3): 1703 –17.
6. Yadav PK, Adhikari A, Patil SM. Formulation and evaluation of Carica papaya cream. World J Pharm Med Res., 2023; 9(6): 129–36.
7. Priyadharshana M. Eco-Friendly Beauty: A Review of Herbal Cosmetics.
8. Bhawane BS, Kharane KL, Korde PP, Pawane M. Restoring radiance: Brahmi face mist for skin rejuvenation and protection. Int J Multidiscip Res (IJFMR), 2025; 7(2): 1 –
9. Pandey AK. Bacopa monnieri (Linn.) Pennell-A Possible Plant for Impossible Diseases (A Review). Advances in Pharmacology and Pharmacy, 2022; 10(1): 35 -53.
10. Gubbannavar JS, Chandola HM, Harisha CR, Khanpara K, Shukla VJ. A comparative pharmacognostical and preliminary physico-chemical analysis of stem and leaf of Bacopa monnieri (L.) Pennel and Bacopa floribunda (R. BR.) Wettst. AYU (An International Quarterly Journal of Research in Ayurveda), Jan. 1, 2013; 34(1): 95-102.
11. Roy A. A review on pharmaceutically important medicinal plant: Bacopa monnieri. J. Nat. Prod. Plant Resour, 2017; 7(4): 11-7.
12. Rai K, Gupta N, Dharamdasani L, Nair P, Bodhankar P. Bacopa monnieri: a wonder drug changing fortune of people. International Journal of Applied Sciences and Biotechnology, Jun. 29, 2017; 5(2): 127- 32.
13. Phrompittayarat W, Putalun W, Tanaka H, Jetiyanon K, Wittaya -areekul S, Ingkaninan K. Comparison of various extraction methods of Bacopa monnieri. Asian Health, Science and Technology Reports, Apr. 5, 2007; 15(1): 29-34.
14. Gościniak A, Stasiłowicz-Krzemień A, Szeląg M, Pawlak J, Skiera I, Kwiatkowska H, Nowak N, Bernady K, Trzaskoma P, Zimak-Krótkopad O, Cielecka-Piontek J. Bacopa monnieri: Preclinical and Clinical Evidence of Neuroactive Effects, Sa fety of Use and the Search for Improved Bioavailability. Nutrients, Jun. 5, 2025; 17(11): 1939.
15. Priyanto OJ, Sugiyanto YF, Salim DS. The effect of bakuchiol in the skin aging process: A systematic review. Journal of General-Procedural Dermatology & Venereology Indonesia, Dec. 1, 2023; 7(2): 9.

16. Chen L, Chen S, Sun P, Liu X, Zhan Z, Wang J. P soralea corylifolia L.: a comprehensive review of its botany, traditional uses, phytochemistry, pharmacology, toxicology, quality control and pharmacokinetics. Chinese medicine, Jan. 10, 2023; 18(1): 4.
17. Belge DA, Jeurkar MM. Morphological, pharmacological and toxicological profile of psora lea corylifolia L: A review. IJRAR, 2023; 10(2): 146-53.
18. Shrestha S, Jadav HR, Bedarkar P, Patgiri BJ, Harisha CR, Chaudhari SY, Prajapati PK. Pharmacognostical evaluation of Psoralea corylifolia Linn. Seed. Journal of Ayurveda and integrative medicine, Jul. 1, 2018; 9(3): 209-12.
19. Mahajan N, Koul B, Gupta P, Shah BA, Singh J. Psoralea corylifolia L.: Panacea to several maladies. South African Journal of Bota ny., Sep. 1, 2022; 149: 963-93.
20. Khuranna D, Sharma S, Mir SR, Aqil M, Ahmad A, Rehman MU, Ahmad P, Alwahibi MS, Elshikh MS, Mujeeb M. Extraction, Quantification, and Cytokine Inhibitory Response of Bakuchiol in Psoralea coryfolia Linn. Separations, Sep. 11, 2020; 7(3): 48.
21. Putriana NA, Husni P, Mita SR. Recent Advance Bakuchiol Application as a Potential Alternative to Retinol in Skincare and Cosmetics.
22. Mascarenhas-Melo F, Ribeiro MM, Kahkesh KH, Parida S, Pawar KD, Velsankar K, Jha NK, Damiri F, Costa G, Veiga F, Paiva-Santos AC. Comprehensive review of the skin use of bakuchiol: physicochemical properties, sources, bioactivities, nanotechnology delivery systems, regulatory and toxicological concerns. Phytochemistry Reviews, Oct. 2024; 23(5): 1377 -413.
23. Park SJ. A comprehensive review of topical bakuchiol for the treatment of photoaging. Journal of Integrative Dermatology, 2022 Sep 16.
24. Sankholkar DS. Current Indian Cosmetic Regulations & Suggested Way Forward.
25. Vijay Yogiraj VY, Goyal PK, Chauhan CS, Anju Goyal AG, Bhupendra Vyas BV. Carica papaya Linn: an overview.
26. Alam F, Khan GN, Asad MH. Psoralea corylifolia L: Ethnobotanical, biological, and chemical aspects: A review. Phytotherapy Research, Apr. 2018; 32(4): 597-615.
27. Ma X, Meredith J. Herbal medicine for the treatment of andrological diseases: Traditional Chinese medicine. InHerbal medicine in andrology, Jan. 1, 2021; 147 -163. Academic Press.
28. Sudhakaran MV. Botanical Pharmacognosy of Bacopa monnieri (Linn.) Pennell. Pharmacognosy Journal, Nov. 2, 2020; 12(6).
29. Flora of China Editorial Committee. Flora of the People's Republic of China, Part 41.

Beijing Science Press, 1995; 344.

30. Chen YY, Lu YH, Ma CH, Tao WW, Zhu JJ, Zhang X. A novel elastic liposome for skin delivery of papain and its application on hypertrophic scar. Biomedicine & Pharmacotherapy, Mar. 1, 2017; 87: 82-91.
31. Fujita Y, Tsuno H, Nakayama J. Fermented papaya preparation restores age-related reductions in peripheral blood mononuclear cell cytolytic activity in tube-fed patients. PLoS One, Jan. 6, 2017; 12(1): e0169240.
32. Draelos ZD, Gunt H, Zeichner J, Levy S. Clinical Evaluation of a Nature-Based Bakuchiol Anti-Aging Moisturizer for Sensitive Skin. Journal of drugs in dermatology: JDD, Dec. 1, 2020; 19(12): 1181 -3.
33. Dhaliwal S, Rybak I, Ellis SR, Notay M, Trivedi M, Burney W, Vaughn AR, Nguyen M, Reiter P, Bosanac S, Yan H. Prospective, randomized, double-blind assessment of topical b akuchiol and retinol for facial photoageing. British Journal of Dermatology, Feb. 1, 2019; 180(2): 289 -96.
34. Trompezinski S, Weber S, Cadars B, Larue F, Ardiet N, Chavagnac-Bonneville M, Sayag M, Jourdan E. Assessment of a new biological complex efficacy on dysseborrhea, inflammation, and Propionibacterium acnes proliferation. Clinical, cosmetic and investigational dermatology, Aug. 31, 2016; 233-9.
35. Lyons AB, Kohli I, Nahhas AF, Braunberger TL, Mohammad TF, Nicholson CL, Nartker NT, Modi K, Matsui MS, Lim HW, Hamzavi IH. Trichloroacetic acid model to accurately capture the efficacy of treatments for postinflammatory hyperpigmentation. Archives of dermatological research, Dec. 2020; 312(10): 725-30.
36. Poláková K, Fauger A, Sayag M, Jourdan E. A dermocosmetic containing bak uchiol, Ginkgo biloba extract and mannitol improves the efficacy of adapalene in patients with acne vulgaris: result from a controlled randomized trial. Clinical, cosmetic and investigational dermatology, Apr. 10, 2015: 187 -91.
37. Kang MC, Lee JW, Lee TH, Subedi L, Wahedi HM, Do SG, Shin E, Moon EY, Kim SY. UP256 inhibits hyperpigmentation by tyrosinase expression/dendrite formation via rho -dependent signaling and by primary cilium formation in melanocytes. International journal of molecular sciences, Jul. 28, 2020; 21(15): 5341.
38. Banchhor M, Saraf S. Potentiality of papain as an antiaging agent in cosmetic formulation. Pharmacognosy Reviews, Jul. 1, 2008; 2(4): 266.
39. Jung EunSun JE, Lee JongSung LJ, Baek JiHoon BJ, Jung KwangSun JK, Lee JiYoung LJ, Huh SungRan HS, Kim SaeBom KS, Koh JaeSook KJ, Park DeokHoon PD. Effect

of Camellia japonica oil on human type I procollagen production and skin barrier function.

40. Schaller A. A cut above the rest: the regulatory function of plant proteases. Planta., Dec. 2004; 220(2): 183- 97.
41. Al-Sna fi AE. The pharmacology of Bacopa monniera. A review. International Journal of Pharma Sciences and Research, Dec. 2013; 4(12): 154 -9.
42. Prasad MS, Manoranjan S, Venkateshwarlu G, Madhu CH, Sambasivarao A, Patro SK. Estimation of total phenolic content and in vitro antioxidant activity of Bacopa monnieri. International Journal of Phytotherapy Research, 2012; 2(2): 21-5.
43. Chowdhuri DK, Parmar D, Kakkar P, Shukla R, Seth PK, Srimal RC. Antistress effects of bacosides of Bacopa monnieri: modulation of Hsp70 expression, superoxide dismutase and cytochrome P450 activity in rat brain. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natura l Product Derivatives, Nov. 2002; 16(7): 639 -45.
44. Viji V, Helen A. Inhibition of pro-inflammatory mediators: role of Bacopa monniera (L.) Wettst. Inflammopharmacology, Oct. 2011; 19(5): 283 -91.
45. Poláková K, Fauger A, Sayag M, Jourdan E. A dermocosmetic containing bakuchiol, Ginkgo biloba extract and mannitol improves the efficacy of adapalene in patients with acne vulgaris: result from a controlled randomized trial. Clinical, cosmetic and investigational dermatology, Apr. 10, 2015; 187-91.
46. Beauséjour CM, Krtolica A, Galimi F, Narita M, Lowe SW, Yaswen P, Campisi J. Reversal of human cellular senescence: roles of the p53 and p16 pathways. The EMBO journal, 2003 Aug 15.
47. Kurokawa I, Danby FW, Ju Q, Wang X, Xiang LF, Xia L, Chen W, Nagy I, Picardo M, Suh DH, Ganceviciene R. New developments in our understanding of acne pathogenesis and treatment. Experimental dermatology, Oct. 2009; 18(10): 821-32.
48. Zouboulis C, Eady A, Philpott M, Goldsmith LA, Orfanos C, Cunliffe WC, Rosenfield R. What is the pathogenesis of acne?. Experimental dermatology, Feb. 2005; 14(2): 143.
49. Chaudhuri RK, Bojanowski K. Bakuchiol: a retinol-like functional compound revealed by gene expression profiling and clinically proven to have anti-aging effects. International journal of cosmetic science, Jun. 2014; 36(3): 221-30.