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"Therapeutic Potentials Of Curcuma Longa And Carica Papaya: A Review Of Phytochemistry And Pharmacological Applications"

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Abstract

Medicinal plants have played an essential role in healthcare systems across the world for centuries, serving as the foundation of both traditional and modern medicine.(1) Among these, *Curcuma longa* (commonly known as turmeric) and *Carica papaya* (papaya) have emerged as two highly regarded botanicals due to their rich phytochemical profiles and broad spectrum of pharmacological activities. This review explores the therapeutic potential of these two plants by examining their phytochemical constituents, mechanisms of action, and evidence-based pharmacological properties. The aim is to bridge the gap between traditional knowledge and scientific validation, providing a comprehensive understanding of their medicinal relevance. *Curcuma longa*, a rhizomatous herb of the Zingiberaceae family, is native to South and Southeast Asia and is widely cultivated for its culinary, cosmetic, and medicinal properties. Its key bioactive constituent, **curcumin**, along with demethoxycurcumin and bisdemethoxycurcumin, are collectively referred to as curcuminoids. These compounds have been extensively studied for their potent **anti-inflammatory**, **antioxidant**, **antimicrobial**, and **anticancer** effects. Curcumin, in particular, acts by inhibiting nuclear factor-kappa B (NF-κB), downregulating pro-inflammatory cytokines, and scavenging reactive oxygen species (ROS).(2) Despite its promising therapeutic efficacy, curcumin's clinical utility is limited by its low bioavailability, leading to research into improved delivery systems and synthetic analogues.(3) *Carica papaya*, a fast-growing tropical plant belonging to the Caricaceae family, is commonly cultivated in tropical and subtropical regions for its nutritional and medicinal value. Various parts of the plant—including the fruit, seeds, leaves, and latex—have been used in traditional medicine to treat conditions such as digestive issues, fever, skin infections, and inflammatory diseases.(4) The primary bioactive compounds in papaya include **papain**, **chymopapain**, **carpaine**, **flavonoids** (such as quercetin and kaempferol), **phenolic acids**, and **carotenoids** (like lycopene and β-carotene). These compounds exert **antioxidant**, **antiviral**,

immunomodulatory, **antidiabetic**, and **anticancer** effects through multiple mechanisms, including free radical scavenging, inhibition of lipid peroxidation, and modulation of immune responses.(5) This review compares the **mechanisms of action** of the antioxidant properties of both plants. *Curcuma longa* primarily enhances the body's endogenous antioxidant defence by upregulating enzymes like superoxide dismutase (SOD), catalase, and glutathione peroxidase (GPx), and by chelating metal ions that catalyse free radical production. In contrast, *Carica papaya* offers a wide range of **direct antioxidant activities** through its vitamins and carotenoids, which protect cellular structures such as DNA, lipids, and proteins from oxidative stress. The identification and authentication of both plants are critical in ensuring quality control in medicinal applications. Techniques such as morphological and microscopic analysis, phytochemical screening, and molecular authentication

KEYWORDS: Curcumin, Carica papaya, morphological, microscopic, phytochemical, antioxidant, Medicinal.

Introduction

Medicinal plants have served as vital sources of therapeutic agents for centuries, playing a central role in traditional and modern healthcare systems worldwide. Among the vast array of botanicals studied for their health-promoting properties, Curcuma longa (turmeric) and Carica papaya (papaya) stand out due to their diverse phytochemical profiles and broad-spectrum pharmacological activities. These plants are not only valued for their nutritional attributes but also revered in various traditional medicinal systems, including Ayurveda, Unani, and folk medicine.(6) Curcuma longa, a rhizomatous herbaceous plant of the ginger family (Zingiberaceae), is best known for its bioactive compound curcumin, which exhibits potent antioxidant, anti-inflammatory, antimicrobial, and anticancer properties. Widely used as a spice and coloring agent, turmeric has garnered increasing scientific attention for its therapeutic efficacy in managing chronic diseases such as cancer, diabetes, arthritis, and neurodegenerative disorders.(7) Carica papaya, a tropical fruit-bearing plant from the family Caricaceae, is traditionally employed to treat a wide range of ailments, including digestive disorders, infections, and inflammatory conditions. Both its fruit and leaves are rich in bioactive compounds like papain, flavonoids, alkaloids, and phenolics, which contribute to its antimicrobial, anti-inflammatory, and immunomodulatory effects.(8) The use of medicinal plants in healthcare dates back thousands of years and continues to be a cornerstone of both traditional and modern medicine. With increasing global interest in natural and plant-based remedies, the scientific community has intensified efforts to validate traditional claims and explore the therapeutic potential of botanicals. (9)Among these, Curcuma longa (commonly known as turmeric) and Carica papaya (commonly known as papaya) have emerged as two botanicals of significant medicinal value. Both plants are widely cultivated and consumed in tropical and subtropical regions, not only as food sources but also as traditional remedies for numerous health conditions.(10) Curcuma longa is a perennial herbaceous plant of the Zingiberaceae family, native to South and Southeast Asia. The primary bioactive component of turmeric is curcumin, a polyphenolic compound known for its vibrant yellow colour and a wide spectrum of therapeutic effects.

Extensive research has demonstrated that curcumin possesses anti-inflammatory, antioxidant, antimicrobial, anticancer, antidiabetic, and neuroprotective properties. However, despite its potent bioactivity, curcumin suffers from poor bioavailability, which has led to the development of novel delivery systems and synthetic analogues to enhance its clinical applicability.(11) Carica papaya, a member of the Caricaceae family, is a tropical fruit-bearing plant native to Central America but now cultivated in many parts of the world.(12) Despite the long-standing use of these plants in traditional medicine, scientific validation of their bioactive constituents and therapeutic mechanisms is still evolving. An in-depth understanding of the phytochemical composition and pharmacological actions of Curcuma longa and Carica papaya can help bridge the gap between traditional knowledge and modern biomedical science.(13) This review aims to comprehensively analyse the phytochemistry and pharmacological activities of Curcuma longa and Carica papaya, emphasizing their therapeutic potentials based on traditional use and contemporary research. By evaluating the current literature, this paper also identifies knowledge gaps and future research directions needed to fully harness the medicinal value of these plants.

Methodology: This detailed review was conducted through a systematic study of data analysis from the previous literature review on "Therapeutic Potentials of Curcuma longa and Carica papaya: A Review of Phytochemistry and Pharmacological Applications". PubMed and Google Scholar were used to source plant studies from the period of 2015 to 2025 of its research publication. Articles with the inclusion criteria of 'Peer-reviewed original research articles, review papers, clinical trials, in vitro and in vivo studies,' 'Research emphasizing the phytochemistry, pharmacological properties, or therapeutic applications of either or both *Curcuma longa* and Carica papaya,' 'key active constituents such as curcumin, demethoxycurcumin, papain, chymopapain, flavonoids, carotenoids, phenolic acids, and vitamins,' 'demonstrating antioxidant, anti-inflammatory, anticancer, antimicrobial, immunomodulatory, neuroprotective, or antidiabetic,' other than that all were excluded.

Review points.

1. **Identification and authentication of Curcuma longa and Carica papaya.**

Accurate identification and authentication of medicinal plants are crucial to ensure the safety, efficacy, and quality of herbal products.(14) Curcuma longa (Turmeric) and Carica papaya (Papaya) are widely used in traditional medicine and pharmaceutical applications due to their broad range of bioactive compounds.(15) The process of authentication involves morphological, microscopic, phytochemical, and molecular assessments.(16) Curcuma longa (Turmeric): curcuma longa is a rhizome of genus (curcuma) and species (curcuma longa L) belonging to family Zingiberaceae. Morphological Identification consisted of it is a perennial herb with a characteristic underground rhizome that is aromatic and deep yellow to orange

Fig no 1. Curcuma longa.

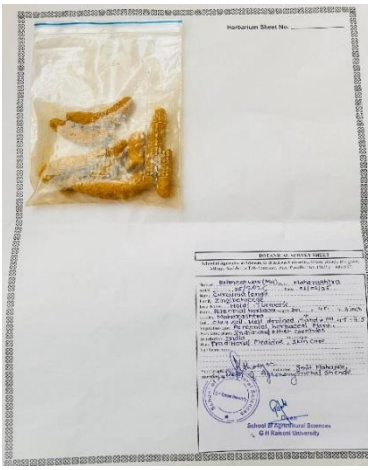

Fig no. 2. Herbarium sheet of curcuma longa.

in colour.(17) The plant grows to about 1 meter tall with large, oblong leaves and pale-yellow flowers arranged in spikes. The rhizomes, which are the main medicinal part, are tuberous with a brownish skin and bright orange interior.(18) Microscopic Identification consisted of analysis of turmeric powder reveals parenchyma cells filled with starch grains, oleoresin cells, and vascular tissue. Starch grains are ovate or spherical, and the presence of yellow-coloured curcumin pigment in oil cells is characteristic.(19) Phytochemical Authentication consisted of Curcumin is the principal bioactive marker compound. Techniques such as Thin Layer Chromatography (TLC) and High-Performance Liquid Chromatography (HPLC) are used for curcuminoid profiling.(20) UV-Visible spectroscopy and Fourier-transform infrared spectroscopy (FTIR) further confirm the presence of characteristic functional groups. The curcumin content helps assess purity and potency.(21)Molecular Authentication consisted of DNA barcoding using chloroplast genes ensures genetic-level identification, especially in powdered or processed forms where morphological characteristics are lost.(22) Carica papaya (Papaya) it is a part of leave consisted of genus (carica) and species (carica papaya L) belonging to family caricaceae.(23) Morphological Identification consisted of Carica papaya is a fast-growing, short-lived tropical tree with a hollow, soft trunk. The leaves are large, lobed, and spirally arranged.(24) It produces large, fleshy fruits that are yellow-orange when ripe. The plant is either dioecious or hermaphroditic, bearing unisexual or bisexual flowers.(25) Microscopic Identification consisted of Papaya leaves exhibit the presence of latex-containing laticifers, calcium oxalate crystals, and amniocytic stomata. The seeds are enveloped in a gelatinous layer and contain proteolytic enzymes like papain and chymopapain.(18) Phytochemical Authentication consisted of Key bioactive markers include papain, caprine, flavonoids, and phenolic acids. Enzyme activity assays confirm the presence of papain, while TLC and HPLC are used to profile flavonoids and alkaloids. Lycopene and carotenoids, important for antioxidant properties, are quantified using spectroscopic techniques.(19) Molecular Authentication consisted of DNA fingerprinting genetic of nutraceutical products. The both plant is authenticated by the school of agricultural science, G H Raisoni University, identified by department of agriculture, Dist Pandhurna M. P.

Fig no. 3. Carica papaya.

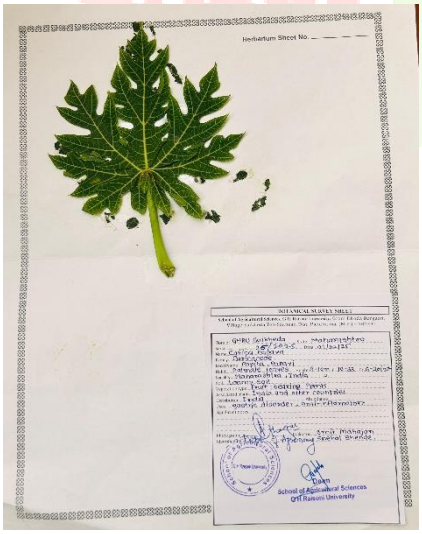

Fig no. 4. Herbarium sheet of carica papaya

2. Classification and drug profile of plant Curcuma longa and Carica papaya(26,27)

Plant Name	Scientific Classification	Botanical Description	Phytochemical Constituents:	Pharmacological Activities:	Parts Used Medicinally
Carica papaya	**Scientific Name:** Carica papaya L **Family:** Caricaceae **Common Names**: Papaya **Native Range**: Southern Mexico **Distribution**: **Widely** cultivated in tropical	**Plant Type:** Fast-growing **Height:** 2–10 meters **Trunk**: Soft, green, cylindrical **Leaves**: 60–70 cm **Flowers**: Small, yellow-white, unisexual **Fruits:** Large, pear-shaped	**Enzymes:** *Papain*, *Chymopapain*. **Alkaloids:** *Carpaine*, *Pseudocarpaine* **Flavonoids:** *Quercetin*, *Kaempferol*. **Other Compounds:** Saponins, Tannins, Phenolic acids, Vitamins, Minerals	Antioxidant, Anti-inflammatory Antimicrobial Antiviral Antimalarial Hepatoprotective Immunomodulatory Antidiabetic Antitumor and anticancer potentials	**Leaves:** Used to treat fever, malaria, dengue fever, Anti-inflammatory, antioxidant, and immune-boosting effects **Fruit (ripe and unripe):** Ripe fruit used as a digestive aid and for constipation, Unripe fruit used in culinary and medicinal contexts to promote digestion and menstruation **Seeds:** Anthelmintic, Hepatoprotective and nephroprotective activities **Latex:** Applied topically for skin infections, corns, and wound healing, Used as a meat tenderizer due to papain content
Curcuma longa	**Scientific Name**:*Curcuma longa* L. **Family:** Zingiberaceae **Common Names:** Turmeric **Native Range:** South and Southeast Asia	**Plant Type:** Perennial herbaceous plant with a rhizome-based root system **Height:** 1–1.5 meters tall **Leaves:** Large, oblong, bright green leaves **Rhizome:** Aromatic, yellow to orange in colour **Flowers:** Yellow-white or reddish,	**Curcuminoids: Curcumin,** Demethoxycurcumin, Bisdemethoxycurcumin **Volatile Oils**: Turmerone, Atlanton, Zingiberene, Cineole **Other Compounds**: Tumerone (α and β), Eugenol, Camphene, Limonene, Sesquiterpenes, Steroids, Polysaccharides, Proteins, Resins	Anti-inflammatory Antioxidant Antimicrobial Anticancer Hepatoprotective Neuroprotective Antidiabetic Anticoagulant Anti-arthritic Wound healing Cardioprotective Gastroprotective Immunomodulatory Anti-depressant and anxiolytic Detoxifying	**Rhizome** (underground stem): Dried rhizome is typically powdered and used in herbal medicine; Fresh rhizome can also be used in various preparations.

Table no. 1. Classification and drug profile of plant Curcuma longa and Carica papaya

3. **Key bioactive compounds found in Curcuma longa and Carica papaya, and their contribution in medicinal properties with its mechanism of action.**

Key Bioactive Compounds of curcuma longa are Curcumin, Demethoxycurcumin, Bisdemethoxycurcumin, Turmerone (α- and β-turmerones), Zingiberene.(28) Key bioactive compounds of carica papaya are Papain, Chymopapain, Flavonoids (e.g., quercetin, kaempferol) Alkaloids (e.g., carpaine), Phenolic acids, Lycopene and β-carotene, Vitamin C and E.(29) Its Contributions to Medicinal Properties are as mentioned below in the **Table no. 2.**

Plant name	Compound	Medicinal Properties	Mechanism of Action
Curcuma longa	Curcumin:	Anti-inflammatory, antioxidant, anticancer, antimicrobial, neuroprotective	Inhibits NF-κB, COX-2; scavenges ROS; induces apoptosis; modulates cytokines
	Demethoxycurcumin & Bisdemethoxycurcumin:	Anti-inflammatory, antioxidant	Similar to curcumin, with slight variation in potency
	Turmerone:	Neuroprotective, anti-inflammatory	Enhances neural stem cell proliferation, modulates microglial activation.
	Zingiberene:	Antioxidant, antimicrobial	Disrupts microbial membranes, neutralizes oxidative stress
Carica papaya	Papain & Chymopapain:	Anti-inflammatory, wound healing, digestive aid	Proteolytic enzymes that break down proteins and reduce inflammation
	Flavonoids:	Antioxidant, anti-inflammatory, antidiabetic	Scavenge free radicals; modulate glucose metabolism and cytokine production
	Alkaloids (Carpaine):	Antihypertensive, antimicrobial	Reduces heart rate and blood pressure; disrupts microbial growth
	Phenolic acids:	Antioxidant, anti-inflammatory	Inhibit lipid peroxidation; enhance antioxidant enzyme activity
	Lycopene & β-carotene:	Antioxidant, anticancer	Neutralize singlet oxygen; protect DNA from oxidative damage
	Vitamins C & E:	Immune-boosting, antioxidant	Support immune defence; regenerate other antioxidants

Table no. 2. Contributions to Medicinal Properties

4. Compare the antioxidant mechanisms of Curcuma longa and Carica papaya.

Both Curcuma longa (turmeric) and Carica papaya (papaya) possess strong antioxidant properties, but they act through different bioactive compounds and mechanisms.(30,31) Source of Antioxidant Activity in the Table no. 3.

Plant	Main Antioxidant Compounds
Curcuma longa	Curcumin, demethoxycurcumin, bisdemethoxycurcumin
Carica papaya	Papain, flavonoids (quercetin, kaempferol), vitamin C, β-carotene, lycopene

Table no. 3. Source of Antioxidant Activity

Mechanisms of Action of antioxidant compounds in Curcuma longa are in Free Radical Scavenging: Curcumin donates hydrogen atoms and electrons to neutralize reactive oxygen species (ROS) and reactive nitrogen species (RNS), Enhancement of Antioxidant Enzymes: It upregulates endogenous antioxidant enzymes such as superoxide dismutase (SOD), catalase, and glutathione peroxidase (GPx), Inhibition of Oxidative Stress Pathways: Curcumin suppresses oxidative stress-related pathways, reducing the generation of ROS at the cellular level, Metal Chelation: Curcumin can bind transition metals (like Fe^{2+} and Cu^{2+}), which catalyse free radical production.(32) Mechanisms of action of antioxidant compound in Carica papaya are in Direct Antioxidant Activity: Flavonoids, vitamin C, and carotenoids in papaya directly neutralize free radicals and prevent lipid peroxidation, Enzymatic Support: Papaya enzymes (like papain) may indirectly reduce oxidative damage by modulating inflammation and clearing damaged proteins, Cellular Protection: Lycopene and β-carotene protect cellular membranes and DNA from oxidative stress, especially in skin, liver, and cardiovascular tissues, Immune Modulation: Antioxidants in papaya also support immune function by protecting immune cells from oxidative damage.(33) Target Systems and Applications of both the plant are represented in Table no. 4

Aspect	Curcuma longa	Carica papaya
Cellular targets	Mitochondria, inflammatory signalling pathways	Cell membranes, DNA, immune cells
Clinical relevance	Neuroprotection, cancer prevention, inflammation	Skin health, liver protection, viral infections
Stability	Less stable, limited bioavailability	More stable (especially vitamin C, carotenoids)

Table no. 4 Target Systems and Applications.

Conclusion

Comprehensive identification and authentication of Curcuma longa and Carica papaya involve a combination of classical and modern techniques. These ensure the correct plant species are used in herbal medicine, preventing adulteration and maintaining therapeutic efficacy. While both plants exhibit strong antioxidant activity, Curcuma longa mainly acts by modulating oxidative stress pathways and enhancing enzyme systems, whereas Carica papaya provides a broader range of direct antioxidants, especially through vitamins and carotenoids. Their combined use may offer synergistic antioxidant protection in therapeutic applications. Figer no. 1, 2, 3, 4 Represented the authenticated herbarium sheet of curcuma longa and carica papaya with its parts of plant having highest medicinal properties. At the same time, we can conclude its medicinal use, therapeutic properties from table no. 1 Classification and drug profile of plant Curcuma longa and Carica papaya. On the other hand, from the table no 2. Represented their contribution in medicinal properties with its mechanism of action. Also, Source of Antioxidant Activity in the Table no. 3 and Target Systems and Applications of both the plant are represented in Table no. 4 clarify Therapeutic Potentials of Curcuma longa and Carica papaya

Reference:

1. Nutritional and phytochemical potential of Diospyros Kaki L. fruit from the foothills of hindukush ranges, district dir upper, Khyber Pakhtunkhwa, Pakistan | Genetic Resources and Crop Evolution [Internet]. [cited 2025 Apr 12]. Available from: https://link.springer.com/article/10.1007/s10722-025-02398-9

2. Effect of Lactobacillus plantarum IS-10506 on blood lipopolysaccharide level and immune response in HIV-infected children - PMC [Internet]. [cited 2025 Apr 12]. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6635306/

3. Edible Medicinal and Non-Medicinal Plants: Volume 1, Fruits | SpringerLink [Internet]. [cited 2025 Apr 12]. Available from: https://link.springer.com/book/10.1007/978-90-481-8661-7

4. Medicinal Plants and their Bioactive Compounds in Human Health: Volume 1 | SpringerLink [Internet]. [cited 2025 Apr 12]. Available from: https://link.springer.com/book/10.1007/978-981-97-6895-0

5. Deciphering Oxidative Stress in Cardiovascular Disease Progression: A Blueprint for Mechanistic Understanding and Therapeutic Innovation [Internet]. [cited 2025 Apr 12]. Available from: https://www.mdpi.com/2076-3921/14/1/38

6. Phytochemical test and optimization of transdermal patches of Carica papaya extract: Formulation design of candidate drug for wound healing | Biodiversitas Journal of Biological Diversity [Internet]. [cited 2025 Apr 11]. Available from: https://smujo.id/biodiv/article/view/10922

7. Wound Healing Activity of Transdermal Patches of Carica Papaya, Chromolaena Odorata, and Averrhoa Bilimbi Leaves on Incision Wounds of Hyperglycemic Rat | Trends in Sciences [Internet]. [cited 2025 Apr 11]. Available from: https://tis.wu.ac.th/index.php/tis/article/view/6944

8. International Journal of Ayurveda Research [Internet]. [cited 2025 Apr 11]. Available from: https://journals.lww.com/ijar/fulltext/2024/05020/preparation,_evaluation,_and_in_vitro_studies_of.5.aspx

9. Digital Library Home: Preparation of Herbal Face Pack Cum Scrub using Papaya and Neem Extracts [Internet]. [cited 2025 Apr 11]. Available from: http://www.ir.juit.ac.in:8080/jspui/handle/123456789/10165

10. A systematic review of the effects of Curcuma longa topical formulations on wound healing | Asian Journal of Pharmaceutical Research and Development [Internet]. [cited 2025 Apr 11]. Available from: https://ajprd.com/index.php/journal/article/view/1192

11. Experimental and clinical reports on anti-inflammatory, antioxidant, and immunomodulatory effects of Curcuma longa and curcumin, an updated and comprehensive review - Memarzia - 2021 - BioFactors - Wiley Online Library [Internet]. [cited 2025 Apr 11]. Available from: https://iubmb.onlinelibrary.wiley.com/doi/abs/10.1002/biof.1716

12. Cassia alata, Coriandrum sativum, Curcuma longa and Azadirachta indica: Food Ingredients as Complementary and Alternative Therapies for Atopic Dermatitis-A Comprehensive Review [Internet]. [cited 2025 Apr 11]. Available from: https://www.mdpi.com/1420-3049/27/17/5475

13. Frontiers | A Comprehensive Review on the Therapeutic Potential of Curcuma longa Linn. in Relation to its Major Active Constituent Curcumin [Internet]. [cited 2025 Apr 11]. Available from: https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2022.820806/full

14. Kumar N, Sakhya SK. ETHNOPHARMACOLOGICAL PROPERTIES OF CURCUMA LONGA: A REVIEW. 4.

15. Phytotherapy Research | Medicinal Chemistry Journal | Wiley Online Library [Internet]. [cited 2025 Apr 11]. Available from: https://onlinelibrary.wiley.com/doi/abs/10.1002/ptr.5640

16. Dermatological effects of Curcuma species: a systematic review | Clinical and Experimental Dermatology | Oxford Academic [Internet]. [cited 2025 Apr 11]. Available from: https://academic.oup.com/ced/article-abstract/46/5/825/6598316

17. Cassia alata, Coriandrum sativum, Curcuma longa and Azadirachta indica: Food Ingredients as Complementary and Alternative Therapies for Atopic Dermatitis-A Comprehensive Review [Internet]. [cited 2025 Apr 11]. Available from: https://www.mdpi.com/1420-3049/27/17/5475

18. Burley V, Biyani DrD, Umekar DrM, Naidu N. Medicinal plants for treatment of ulcer: A review. J Med Plants Stud. 2021 Jul 1;9(4):51–9.

19. Ande SN, Dhandar KM, Bakal RL. Medicinal herbs: Why to include in diabetic foot ulcer therapy? A review.

20. Potential therapeutic effects of curcumin, the anti-inflammatory agent, against neurodegenerative, cardiovascular, pulmonary, metabolic, autoimmune and neoplastic diseases - PubMed [Internet]. [cited 2025 Apr 11]. Available from: https://pubmed.ncbi.nlm.nih.gov/18662800/

21. Potential therapeutic effects of curcumin, the anti-inflammatory agent, against neurodegenerative, cardiovascular, pulmonary, metabolic, autoimmune and neoplastic diseases - ScienceDirect [Internet]. [cited 2025 Apr 11]. Available from: https://www.sciencedirect.com/science/article/abs/pii/S1357272508002550?via%3Dihub

22. Therapeutic roles of curcumin: lessons learned from clinical trials - PubMed [Internet]. [cited 2025 Apr 11]. Available from: https://pubmed.ncbi.nlm.nih.gov/23143785/

23. Prevention and cure of dermatology disorders using herbal medications: summary | International Journal of Indigenous Herbs and Drugs [Internet]. [cited 2025 Apr 11]. Available from: https://saapjournals.org/index.php/herbsanddrugs/article/view/568

24. Miracles of Herbal Phytomedicines in Treatment of Skin Disorders: Natural Healthcare Perspective | Bentham Science Publishers [Internet]. [cited 2025 Apr 11]. Available from: https://www.benthamdirect.com/content/journals/iddt/10.2174/1871526520666200622142710

25. A Comprehensive Review On Role Of Different Medicinal Plants In The Management Of Dermatological Disorders. | EBSCOhost [Internet]. [cited 2025 Apr 11]. Available from: https://openurl.ebsco.com/EPDB%3Agcd%3A9%3A18174729/detailv2?sid=ebsco%3Aplink%3Ascholar&id=ebsco%3Agcd%3A183218507&crl=c&link_origin=scholar.google.com

26. Aqueous extract of Carica papaya leaves exhibits anti-tumor activity and immunomodulatory effects - PubMed [Internet]. [cited 2025 Apr 11]. Available from: https://pubmed.ncbi.nlm.nih.gov/19961915/

27. Turmeric, the Golden Spice - Herbal Medicine - NCBI Bookshelf [Internet]. [cited 2025 Apr 12]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK92752/

28. A review of therapeutic potentials of turmeric (Curcuma longa) and its active constituent, curcumin, on inflammatory disorders, pain, and their related patents - PubMed [Internet]. [cited 2025 Apr 12]. Available from: https://pubmed.ncbi.nlm.nih.gov/34312922/

29. Otsuki, N., Dang, N.H., Kumagai, E., Kondo, A., Iwata, S., et al. (2010) Aqueous Extract of Carica papaya Leaves Exhibits Anti-Tumor Activity and Immunomodulatory Effects. Journal of Ethnopharmacology, 127, 760-767. - References - Scientific Research Publishing [Internet]. [cited 2025 Apr 12]. Available from: https://www.scirp.org/reference/referencespapers?referenceid=1575059

30. Research Journal of Pharmacognosy and Phytochemistry [Internet]. [cited 2025 Apr 12]. Available from: https://rjpponline.org/AbstractView.aspx?PID=2021-13-4-9

31. A Comprehensive Review on the Therapeutic Potential of Curcuma longa Linn. in Relation to its Major Active Constituent Curcumin - PubMed [Internet]. [cited 2025 Apr 12]. Available from: https://pubmed.ncbi.nlm.nih.gov/35401176/

32. Effects of Turmeric (Curcuma longa) on Skin Health: A Systematic Review of the Clinical Evidence - PubMed [Internet]. [cited 2025 Apr 12]. Available from: https://pubmed.ncbi.nlm.nih.gov/27213821/

33. Full article: Anti-inflammatory and immunomodulatory properties of Carica papaya [Internet]. [cited 2025 Apr 12]. Available from: https://www.tandfonline.com/doi/full/10.3109/1547691X.2016.1149528