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Review Article

ANTIOXIDANT AND ANTICANCER POTENTIAL OF CALOTROPIS GIGANTEA AND BAUHINIA VARIEGATA: A COMPREHENSIVE REVIEW

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Abstract

Background: *Calotropis gigantea* and *Bauhinia variegata* are medicinal plants reported to possess antioxidant and anticancer activities, but evidence has not been critically synthesized. **Objectives**: To systematically review and critically evaluate preclinical evidence on the phytochemistry, antioxidant potency, and anticancer mechanisms of *C. gigantea* and *B. variegata*, and to identify translational gaps and priorities. **Methods**: A narrative literature search (PubMed, Scopus, Google Scholar) was performed for articles published between 2000–2025 using the keywords "Calotropis gigantea", "Bauhinia variegata", "antioxidant", "anticancer", "phytochemical", and related terms. Inclusion criteria: original in vitro, in vivo, or clinical studies reporting antioxidant assays or anticancer outcomes for either species; English-language articles. Data extracted included phytochemical classes, assay types, reported IC_{50} values, molecular pathways, and model systems. **Results**: *C. gigantea* methanolic extracts show consistently potent antioxidant activity (DPPH/ABTS IC_{50} range ~6.7–21.4 µg/mL across leaves/flowers/latex) and induce apoptosis, caspase activation, mitochondrial dysfunction and cell-cycle arrest in multiple cancer cell lines. *B. variegata* demonstrates significant antioxidant and cytotoxic activity but quantitative potency is less consistently reported. Reported mechanisms for both species include ROS modulation, Bcl-2/Bax regulation, and inhibition of migration/invasion (MMP suppression). Major limitations include heterogeneous extraction methods, inconsistent quantitative reporting, toxicity concerns (cardenolides), and absence of clinical data. **Conclusions**: Preclinical data support the antioxidant and anticancer potential of both plants, particularly *C. gigantea*, but standardized phytochemical profiling, dose–response in vivo studies, toxicity assessment, and translational research are urgently needed.

Keywords: Calotropis Gigantea, Bauhinia Variegata, Antioxidant, Anticancer, Phytochemicals, Cardiac Glycosides, Flavonoids, ROS, Apoptosis.

1. Introduction

Cancer remains one of the leading causes of death globally, accounting for nearly 10 million deaths in 2020 alone, with projections indicating a continual rise in incidence[1]. Although conventional therapeutic approaches such as chemotherapy,

radiotherapy, and immunotherapy have improved cancer survival rates, their limitations—including drug resistance, adverse effects, and limited target specificity—have prompted researchers to explore alternative strategies[2,3]. Natural products derived from medicinal plants have long been recognized as a rich source of bioactive compounds with chemo preventive and therapeutic potential, particularly due to their antioxidant and cytotoxic properties[4-6].

Oxidative stress, characterized by an imbalance between reactive oxygen species (ROS) and endogenous antioxidant systems, plays a central role in the pathogenesis of cancer by inducing DNA damage, lipid peroxidation, and protein oxidation[7,8]. Antioxidants from plant sources are known to scavenge ROS, enhance antioxidant defence mechanisms, and interfere with carcinogenic processes at multiple levels[9,10]. In this context, *Calotropis gigantea* and *Bauhinia variegata* have attracted growing interest due to their traditional usage in folk medicine and reported pharmacological activities, including antioxidant and anticancer properties[11].

1.1 Botanical Overview of *Calotropis gigantea* and *Bauhinia variegata*

Calotropis gigantea (L.) R. Br., belonging to the family Apocynaceae, is a perennial shrub widely distributed in tropical Asia and Africa. Traditionally, it has been used to treat inflammation, skin ailments, respiratory conditions, and gastrointestinal disorders. Phytochemical studies have shown the presence of cardenolides, flavonoids, terpenoids, and alkaloids, many of which exhibit free radical scavenging and cytotoxic effects[12].

Bauhinia variegata L., a deciduous tree from the Fabaceae family, is widely used in Ayurveda and Unani medicine for the treatment of tumours, ulcers, and microbial infections[13]. Its bark, flowers, and leaves are rich in flavonoids, glycosides, saponins, and phenolic acids—compounds known for their antioxidant and anticancer potential[14,15] an anti-inflammatory agent used in traditional medicine, has been shown to suppress cellular transformation, proliferation, invasion, angiogenesis, and metastasis through a mechanism not fully understood. Because several genes that mediate these processes are regulated by nuclear factor-κB (NF-κB.

This review aims to compile and critically evaluate the available scientific literature on the antioxidant and anticancer activities of *Calotropis gigantea* and *Bauhinia variegata*, highlighting their bioactive constituents, proposed mechanisms of action, and therapeutic potential in cancer prevention and treatment.

2. Phytochemical Constituents

Phytochemicals are bioactive secondary metabolites that largely determine the therapeutic potential of medicinal plants. Both *Calotropis gigantea* (CG) and *Bauhinia variegata* (BV) contain diverse classes of compounds—including flavonoids, alkaloids, terpenoids, cardiac glycosides, phenolics, and saponins—that contribute to their reported antioxidant and anticancer activities.

In *C. gigantea*, cardenolides such as calotropin and uscharin, together with triterpenoids (lupeol, β-amyrin), have been frequently implicated in cytotoxicity and apoptosis induction. By contrast, *B. variegata* is particularly rich in flavonoids such as kaempferol, quercetin, and myricetin, which are strongly associated with free radical scavenging and modulation of cancer-related signaling pathways.

A comparative overview of the major phytochemical classes identified in both species, along with their reported plant parts and references, is presented in Table 1. This tabular summary highlights the overlap in common classes (flavonoids, phenolics, steroids) while also underscoring species-specific features—namely, the abundance of potent cardiac glycosides in *C. gigantea* and the dominance of flavonoids in *B. variegata*. These distinctions provide a biochemical basis for the differential antioxidant and anticancer activities discussed in subsequent sections.

Table 1: Comparative overview of the major phytochemical classes identified in CG, BV

Phytochemical Class	Calotropis gigantea (CG)	Bauhinia variegata (BV)	Key References
Flavonoids	Isorhamnetin derivatives; rutin, quercetin	Kaempferol, quercetin, myricetin	Ahmad 2020; Alafnan 2021; K. Sharma 2024
Alkaloids	Present in leaves, latex, roots (mudarine, others)	Present in leaves, bark, flowers (minor alkaloids reported)	Ahmad 2020; Bhargav 2019
Triterpenoids / Terpenoids	Lupeol, β-amyrin, taraxasterol (aerial parts, root bark)	Lupeol, β-sitosterol, phytosterols (bark, leaves)	Ghorpade 2025; Bhargav 2019
Cardiac Glycosides	Calotropin, calotoxin, uscharin (latex, roots, leaves)	Cardiac glycosides (less defined, bark extracts)	Saha 2022; Nair 2022
Phenolic Compounds	Gallic acid, tannins, catechols (leaves, bark)	Protocatechuic acid, gallic acid, polyphenols (bark, leaves)	Ahmad 2020; Nair 2022
Saponins	Latex and leaf extracts (antimicrobial, cytotoxic activity)	Bark and leaves; moderate levels	Ahmad 2020; K. Sharma 2024
Steroids	Stigmasterol, β-sitosterol (root bark, aerial parts)	Stigmasterol, β-sitosterol (bark, leaves)	Saha 2022; Bhargav 2019
Fatty acids / Esters	Palmitic, oleic acids (seeds, latex)	Stearic acid, hexadecenoic acid (leaves)	Saha 2022; Nair 2022
Coumarins	Not well reported	Moderate amounts in leaves	Nair 2022

3. Antioxidant Activities

3.1 Phytochemical Basis and Mechanisms

Both *Calotropis gigantea* (CG) and *Bauhinia variegata* (BV) contain abundant flavonoids, phenolics, terpenoids, and alkaloids that underpin their antioxidant activity. These compounds act via free radical scavenging, metal ion chelation, and inhibition of lipid peroxidation, thereby protecting cellular macromolecules from oxidative stress. Importantly, oxidative stress is closely linked to carcinogenesis, positioning antioxidant activity as a mechanistic bridge to anticancer potential.

3.2 Comparative Assay Results

Evidence indicates that CG generally demonstrates stronger and more consistently quantified antioxidant activity than BV across standard assays.

A. DPPH radical scavenging: CG methanolic extracts show IC_{50} values of 6.74 µg/mL (leaves), 14.44 µg/mL (latex), and 21.35 µg/mL (flowers), while another study reported a higher IC_{50} of 268.8 µg/mL (methanolic leaves), underscoring variability based on extraction methods[16,17]. For BV, ethanolic and aqueous leaf extracts exhibit significant DPPH scavenging, but no IC_{50} values have been reported to date[18,19].

B. FRAP assay: CG methanolic leaf extracts outperform aqueous and petroleum ether extracts, showing high ferric reducing capacity[20,21]. BV extracts demonstrate dose-dependent reducing power and metal ion chelation at 10–40 µg/mL, but again, quantitative IC_{50} values are missing[18].

C. ABTS assay: CG leaf extracts display potent ABTS scavenging (IC_{50} 6.74–21.25 µg/mL), while silver nanoparticles synthesized from CG show an IC_{50} of 137 µg/mL[22]. For BV, ABTS activity has been reported qualitatively as "significant," but no IC_{50} values are available[18].

D. Hydroxyl radical scavenging: CG-derived AgNPs achieved an IC_{50} of 52.12 µg/mL, comparable to quercetin[22]. No hydroxyl radical scavenging data have been published for BV.

E. Lipid peroxidation inhibition: CG methanolic flower extract inhibited lipid peroxidation in vitro[23]. BV extracts demonstrated antioxidant activity in the

β-carotene bleaching assay, but no TBARS-specific IC_{50} values were reported[18].

F. In vivo evidence: BV leaf extracts reduced lipid peroxidation (MDA levels) and enhanced glutathione (GSH) in mice, demonstrating systemic antioxidant effects[24] Passive evasion Paradigm, Morris water maze and Actophotometer; thus biochemical parameters of brain homogenate such as acetyl cholinesterase (AChE. Comparable in vivo antioxidant data for CG remain scarce.

3.3 Critical Evaluation

Overall, CG extracts consistently yield low IC_{50} values across DPPH and ABTS assays, confirming strong radical scavenging activity. BV shows reproducible antioxidant activity, but the lack of quantitative IC_{50} data limits direct comparison. The wide variability in CG IC_{50} values (6.7 vs. 268 µg/mL) highlights the urgent need for standardized extraction and assay protocols. Notably, BV provides stronger in vivo antioxidant evidence, whereas CG data are largely confined to in vitro assays.

A comparative summary of antioxidant activities of *C. gigantea* and *B. variegata* across standard assays is presented in Table 2. These findings highlight the consistently strong activity of *C. gigantea* in in vitro assays, contrasted with the less quantified but biologically significant activity of *B. variegata*, particularly in vivo.

3.4 Implications

Given the role of oxidative stress in carcinogenesis, the antioxidant properties of CG and BV likely contribute to their reported anticancer effects. Future work should emphasize direct correlation of antioxidant potency with cellular outcomes (e.g., ROS modulation, DNA damage prevention), employ standardized reporting of IC_{50} values, and extend in vivo validation.

Table 2: Comparative summary of antioxidant activities of C. gigantea and B. variegata.

Assay	C. gigantea (IC_{50} / activity)	B. variegata (IC_{50} / activity)	Model	Reference(s)
DPPH	6.74 µg/mL (leaves, methanol); 14.44 µg/mL (latex)	Data not available (reported as significant)	In vitro (extract assays)	Prabhu 2020; Mishra 2013
FRAP	Methanolic leaf extract > aqueous	Dose-dependent increase (no IC_{50})	In vitro	Venkatesan 2022; Mishra 2013
Hydroxyl radical	AgNPs: 52.12 µg/mL	Data not available	In vitro (nanoparticle assays)	Rengarajan 2024
Lipid peroxidation	Inhibition in methanolic flowers	β-carotene bleaching assay positive	In vitro	Kumar 2015; Mishra 2013
Antioxidant enzyme modulation	↑ GSH, ↓ MDA (murine brain tissue)	↑ GSH, ↓ MDA	In vivo (mice)	Khare 2021

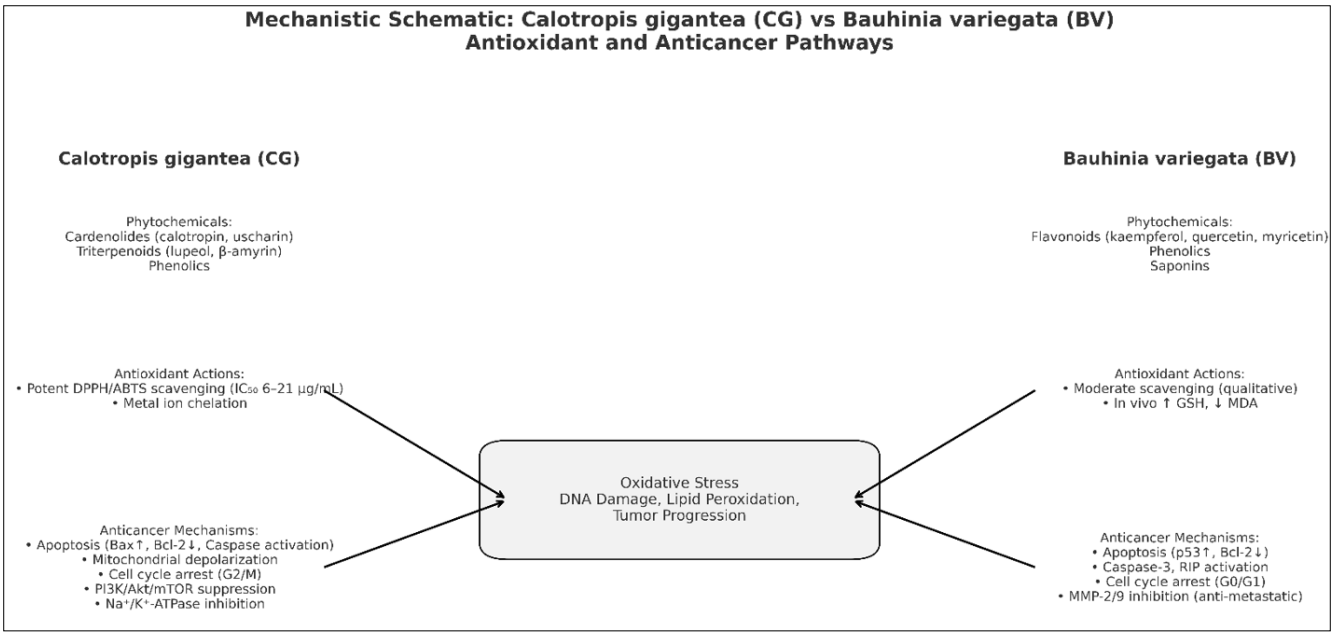

Figure 1: Map showing the State of Uttar Pradesh [Source: (1)]

4. Anticancer Activities

Evidence indicates that both *C. gigantea* and *B. variegata* exert anticancer effects through multiple, partially overlapping pathways. These include induction of apoptosis, activation of caspase cascades, cell cycle arrest, modulation of ROS and mitochondrial function, and inhibition of metastatic processes. Grouping the data by mechanistic pathway highlights where the two species share common targets (e.g., caspase activation) and where they diverge (e.g., CG's Na^+/K^+-ATPase inhibition vs. BV's MMP suppression).

4.1 Apoptosis Induction

A. C. gigantea: Methanolic extracts induce apoptosis in MCF-7 and HepG2 cells (TUNEL assay, phosphatidylserine externalization), accompanied by Bax/Bak upregulation and Bcl-2 downregulation[25,26].

B. B. variegata: Ethanolic bark extract induces apoptosis in HeLa cells with G0/G1 arrest; volatile oils from flowers trigger p53 upregulation and mitochondrial dysfunction in A549 cells[27,28].

4.2 Caspase Cascade Activation

A. C. gigantea: Poly-caspase activation (caspase-3, -8, Apaf-1) in a dose-dependent manner confirms engagement of both intrinsic and extrinsic pathways[25,26].

A. B. variegata: Stem fractions trigger caspase-3 and RIP activation, suggesting both apoptotic and necroptotic pathways[29].

4.3 Cell Cycle Arrest

A. C. gigantea: G2/M arrest in MCF-7 cells, resembling paclitaxel, with additional effects on glycolytic metabolism[30].

B. B. variegata: Bark extract produces G0/G1 arrest in HeLa cells, consistent with p53 upregulation[28].

4.4 ROS Modulation and Mitochondrial Dysfunction

A. C. gigantea: Cardenolides elevate ROS levels, disrupt mitochondrial membrane potential, and inhibit Na^+/K^+-ATPase, promoting selective cancer cell death[31,32].

B. B. variegata: Flavonoids (e.g., baicalin) induce mitochondrial depolarization, increase ROS, and downregulate Bcl-2 while upregulating p53[33].

4.5 Metastasis Inhibition

A. C. gigantea: Calotropin reduces migration and invasion by suppressing PI3K/Akt/mTOR and TGF-β/ERK signaling pathways[26,30].

B. B. variegata: Stem fractions inhibit MMP-2 and MMP-9 activity, reducing HeLa cell migration and invasion[29].

Table 3: Summary of principal pathways modulated by CG, BV

Pathway	C. gigantea	B. variegata	Model	Reference(s)
Apoptosis induction	TUNEL assay, Bax↑, Bcl-2↓	p53↑, mitochondrial depolarization	In vitro (MCF-7, HepG2, HeLa, A549 cells)	Kharat 2019; Awaed 2025
Caspase activation	Caspase-3, -8, Apaf-1 activation	Caspase-3, RIP activation	In vitro	Tian 2018; Santos 2018
Cell cycle arrest	G2/M arrest (MCF-7)	G0/G1 arrest (HeLa)	In vitro	Kharat 2019; Kumar 2014
ROS modulation	ROS↑, mitochondrial permeability changes	ROS↑, p53 upregulation	In vitro	Khosravi 2021; Sharma 2025
Antimetastatic effects	PI3K/Akt/mTOR and TGF-β/ERK suppression	MMP-2/9 inhibition	In vitro	Jayaraman 2023; Santos 2018

The anticancer activities of *Calotropis gigantea* and *Bauhinia variegata* have been reported across diverse models, targeting multiple pathways including apoptosis induction, caspase activation, cell cycle arrest, ROS modulation, and inhibition of metastatic processes. However, these findings are fragmented across studies and vary in methodological quality. To provide a clearer comparison, Table 3 summarizes the principal pathways modulated by both species, the experimental models used (in vitro or in vivo), and the associated phytoconstituents. This organization highlights overlapping mechanisms, such as caspase activation and ROS involvement, while also underscoring species-specific differences—for example, *C. gigantea*'s inhibition of Na^+/K^+-ATPase versus *B. variegata*'s suppression of MMP-2/9 activity.

5. Challenges and Research Gaps

5.1 Standardization of Phytochemical Profiles

One of the major challenges in advancing *Calotropis gigantea* and *Bauhinia variegata* into therapeutic use is the lack of phytochemical standardization. Both species exhibit wide variability in secondary metabolite content depending on geographic origin, seasonal factors, soil type, and extraction method. For example, cardenolide concentrations in *C. gigantea* and flavonoid levels in *B. variegata* differ significantly across reported studies, making reproducibility and comparative analysis difficult. Without universally accepted quality-control markers, standardization of extracts remains elusive.

5.2 Lack of Clinical Evidence

Although a substantial number of in vitro and a few in vivo studies have demonstrated antioxidant and anticancer potential, there are no clinical trials validating safety or efficacy in humans. The current evidence base remains entirely preclinical, limiting translational application. This gap highlights the urgent need for carefully designed pharmacokinetic and pharmacodynamic studies in humans.

5.3 Toxicity and Safety Concerns

The therapeutic use of *C. gigantea* is complicated by the presence of potent cardiac glycosides, including calotropin and uscharin, which can be cardiotoxic if not carefully dosed. Toxicity studies are sparse, with little information available on long-term safety, dose–response thresholds, or herb–drug interactions. Until systematic toxicological evaluations are performed, clinical adoption will remain risky.

5.4 Sustainability and Conservation Issues

Overharvesting, especially of roots and bark, poses a conservation threat to wild populations of both plants. At present, there are no large-scale cultivation protocols or conservation strategies to ensure sustainable use. Developing controlled cultivation practices and propagation methods is essential to prevent depletion of natural resources.

5.5 Unexplored Synergistic and Formulation Potentials

Most pharmacological investigations have focused on crude extracts or isolated compounds, while synergistic effects between phytoconstituents remain largely untested. Similarly, advanced formulation approaches such as nanoparticles, liposomes, or polyherbal combinations have received little attention. Exploring these strategies could enhance bioavailability and therapeutic efficacy.

5.6 Incomplete Mechanistic Understanding

Although antioxidant and apoptotic effects are frequently reported, detailed molecular targets and pathway interactions remain poorly defined. Few studies employ omics-based tools such as transcriptomics, proteomics, or metabolomics to comprehensively map mechanisms of action. Without such integrative approaches, it will be difficult to establish a robust mechanistic foundation for clinical translation.

6. Conclusion

This review highlights the complementary antioxidant and anticancer properties of *Calotropis gigantea* and *Bauhinia variegata*, supported by diverse preclinical studies. *C. gigantea*, rich in cardenolides and triterpenoids, consistently demonstrates strong in vitro antioxidant activity and potent pro-apoptotic and cell-cycle–modulating effects across cancer cell lines. *B. variegata*, characterized by high flavonoid and phenolic content, exhibits reproducible in vivo antioxidant activity and anti-metastatic mechanisms, including inhibition of MMP-2/9 and modulation of p53. Together, these findings suggest that both plants may contribute valuable leads for the development of natural product–based oncotherapeutics.

Despite encouraging evidence, translation remains limited by variability in extract preparation, lack of standardized phytochemical markers, incomplete mechanistic data, and the absence of clinical validation. Future research should prioritize standardized extract profiling, omics-based mechanistic investigations, advanced formulations such as nanoparticles, and rigorous in vivo efficacy–toxicity studies. Addressing these gaps will be critical to establish safety and therapeutic relevance.

In conclusion, *C. gigantea* and *B. variegata* represent promising but underexplored candidates for integrative oncology, warranting carefully designed translational studies to realize their clinical potential.

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8. Conflict of Interest: None

9. References

1. World Health Organization. Cancer [Internet]. [cited 2025 Jun 17]. Available from: https://www.who.int/news-room/fact-sheets/detail/cancer
2. Gottesman MM. Mechanisms of Cancer Drug Resistance | Annual Reviews [Internet]. 2002 [cited 2025 Jun 17]. Available from: https://www.annualreviews.org/content/journals/10.1146/annurev.med.53.082901.103929
3. Longley D, Johnston P. Molecular mechanisms of drug resistance - Longley - 2005 - The Journal of Pathology - Wiley Online Library [Internet]. 2005 [cited 2025 Jun 17]. Available from: https://pathsocjournals.onlinelibrary.wiley.com/doi/full/10.1002/path.1706
4. Fulda S. Modulation of Apoptosis by Natural Products for Cancer Therapy. Planta Med. 2010 May 19;76:1075–9.
5. Newman D, Cragg G. Natural Products as Sources of New Drugs over the Last 25 Years | Journal of Natural Products [Internet]. 2007 [cited 2025 Jun 17]. Available from: https://pubs.acs.org/doi/abs/10.1021/np068054v
6. Newman DJ, Cragg GM. Natural Products as Sources of New Drugs from 1981 to 2014. J Nat Prod. 2016 Mar 25;79(3):629–61.
7. Halliwell B. Oxidative stress and cancer: have we moved forward? Biochem J. 2006 Dec 11;401(1):1–11.
8. Reuter S, Gupta SC, Chaturvedi MM, Aggarwal BB. Oxidative stress, inflammation, and cancer: How are they linked? Free Radic Biol Med. 2010 Dec 1;49(11):1603–16.

9. Lobo V, Patil A, Phatak A, Chandra N. Free radicals, antioxidants and functional foods: Impact on human health. Pharmacogn Rev. 2010;4(8):118–26.
10. Valko M, Leibfritz D, Moncol J, Cronin MTD, Mazur M, Telser J. Free radicals and antioxidants in normal physiological functions and human disease. Int J Biochem Cell Biol. 2007 Jan;39(1):44–84.
11. Wagner H. Synergy research: Approaching a new generation of phytopharmaceuticals. Fitoterapia. 2011 Jan 1;82(1):34–7.
12. Lodhi G, Kumar Singh H, Pant KK, Hussain Z. Hepatoprotective effects of Calotropis gigantea extract against carbon tetrachloride induced liver injury in rats. Acta Pharm. 2009 Mar 1;59(1):89–96.
13. Nadkarni KM, Nadkarni AK. Dr. K. M. Nadkarni's Indian Materia Medica: With Ayurvedic, Unani-tibbi, Siddha, Allopathic, Homeopathic, Naturopathic & Home Remedies, Appendices & Indexes. Popular Prakashan; 2000. 1416 p.
14. Aggarwal S, Ichikawa H, Takada Y, Sandur SK, Shishodia S, Aggarwal BB. Curcumin (Diferuloylmethane) Down-Regulates Expression of Cell Proliferation and Antiapoptotic and Metastatic Gene Products through Suppression of IκBα Kinase and Akt Activation. Mol Pharmacol. 2006 Jan 1;69(1):195–206.
15. Al-Snafi AE. The Pharmacological Importance of Bauhinia variegata. A Review. 2013 Dec;
16. Prabhu V, Manjula V, Santhiya K, Tamileela Kanali GP, Saravanakumar P, Sibi G. Chemometric Profile of Calotropis gigantea and its Antioxidant Activity through Bioactive Compounds from Latex, Leaves and Flower Extracts. Asian J Chem. 2020;32(11):2865–72.
17. Gyawali R, Bhattarai B, Bajracharya S, Bhandari S, Bhetwal P, Bogati K, et al. α-Amylase Inhibition, Antioxidant Activity and Phytochemical Analysis of Calotropis gigantea (L.) Dryand. J Health Allied Sci. 2020 Jun 2;10(1):77–81.
18. Mishra A, Sharma AK, Kumar S, Saxena AK, Pandey AK. Bauhinia variegata Leaf Extracts Exhibit Considerable Antibacterial, Antioxidant, and Anticancer Activities. BioMed Res Int. 2013;915436.
19. Saxena S, Chakraborty D. Antioxidant activity and GC-MS Analysis of Bauhinia variegata L. (Fabaceae). Res J Pharm Technol. 2024 Jan 19;208–12.
20. Venkatesan V, Sivapalan S, Angappan M, Veeramuthu A, Dharmalingam S. Phytochemical analysis, anti-inflammatory, antioxidant activity of Calotropis gigantea and its therapeutic applications. J Ethnopharmacol [Internet]. 2022 [cited 2025 Jun 19]; Available from: https://consensus.app/papers/phytochemical-analysis-antiinflammatory-antioxidant-venkatesan-sivapalan/0f25b75420805ba89cc21901b131e013/
21. Alafnan A, Sridharagatta S, Saleem H, Khurshid U, Alamri A, Ansari SY, et al. Evaluation of the Phytochemical, Antioxidant, Enzyme Inhibition, and Wound Healing Potential of Calotropis gigantea (L.) Dryand: A Source of a Bioactive Medicinal Product. Front Pharmacol [Internet]. 2021 Aug 17 [cited 2025 Jun 18];12. Available from: https://www.frontiersin.org/journals/pharmacology/articles/10.3389/fphar.2021.701369/full
22. Rengarajan S, Sivalingam AM, Pandian A, Chaurasia PK. Nanomaterial (AgNPs) Synthesis Using Calotropis gigantea Extract, Characterization and Biological Application in Antioxidant and Antibacterial Activity. J Inorg Organomet Polym Mater. 2024 Sep;34(9):4005–21.
23. Kumar NS, Balamuruga V. In-vitro Antioxidant Activity, Total Phenolic and Total Flavonoid Contents of Flower Extract of Calotropis gigantea. Res J Phytochem. 2015 Mar 1;9(3):137–43.
24. Khare P, Kishore K, Sharma DK. Neuroprotective Effect of Bauhinia variegata Leaf Extract against Colchicine: An Experimental Study on Cognitive Dysfunction and Biochemical Alterations in

Mice. Indian J Pharm Educ Res. 2021 Nov 9;55(3s):S798–806.
25. Kharat KR, Kharat AS. The Calotropis Gigantea Methanolic Extract Induces Apoptosis in Human Breast Carcinoma Cells. Iran J Med Sci. 2019 Nov 1;44(6):483–92.
26. Tian L, Xie XH, Zhu ZH. Calotropin regulates the apoptosis of non-small cell cancer by regulating the cytotoxic T-lymphocyte associated antigen 4-mediated TGF-β/ERK signaling pathway. Mol Med Rep. 2018 Jun 1;17(6):7683–91.
27. Awaed AT, Habeeb HM. Evaluation The Effect Cytotoxicity and Program Cell Death of Bauhinia variegata Volatile Oil. J Neonatal Surg. 2025 Feb 12;14(4S):245–54.
28. KUMAR B S, BHAT KI. APOPTOSIS AND FLOWCYTOMETRIC STUDIES OF BAUHINIA VARIEGATA BARK EXTRACT. 2014;
29. Santos KM, Gomes INF, Silva-Oliveira RJ, Pinto FE, Oliveira BG, Chagas RCR, et al. Bauhinia variegata candida Fraction Induces Tumor Cell Death by Activation of Caspase-3, RIP, and TNF-R1 and Inhibits Cell Migration and Invasion In Vitro. BioMed Res Int. 2018;2018:4702481.
30. Jayaraman S, Natarajan SR, Veeraraghavan VP, Jasmine S. Unveiling the anti-cancer mechanisms of calotropin: Insights into cell growth inhibition, cell cycle arrest, and metabolic regulation in human oral squamous carcinoma cells (HSC-3). J Oral Biol Craniofacial Res. 2023;13(6):704–13.
31. Khosravi Z, S. Kumar A. Pharmacognosy and pharmacology of *Calotropis gigantea* for discovery of anticancer therapeutics. Pharmacogn Mag. 2021;17(6):123.
32. Mutiah R, Ramzi H, Bustami JA. Phytochemical and Pharmacology Effect of Calotropis gigantea as Anti-Cancer Therapy: Systematic Review. Proc Int Pharm Ulul Albab Conf Semin PLANAR. 2021 Dec 5;1:42.
33. Sharma V, Gupta A, Singh M, Singh A, Chaudhary AA, Ahmed ZH, et al. Phytochemical baicalin potentially inhibits Bcl-2 and VEGF: an in silico approach. Front Bioinforma [Internet]. 2025 Feb 19 [cited 2025 Jul 4];5. Available from: https://www.frontiersin.org/journals/bioinformatics/articles/10.3389/fbinf.2025.1545353/full

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