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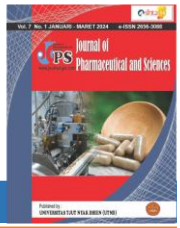

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Pharmacological Effects of *Cleome gynandra L.* Leaves Extract: A Systematic Review

Efek Farmakologis Ekstrak Daun *Cleome gynandra L.* : Sebuah Tinjauan Sistematis

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Abstract
Background: *Cleome gynandra* L. is a leafy medicinal plant widely used in traditional medicine across Asia and Africa. Although its rich phytochemical profile has attracted growing scientific interest, the existing evidence on its pharmacological effects remains fragmented and inconsistent across studies. **Objective:** This systematic review aims to synthesize and critically evaluate the pharmacological effects of *C. gynandra* leaf extract reported over the past decade. **Methods:** A systematic literature search was conducted in PubMed, ScienceDirect, and Medline for articles published between January 2016 and December 2025, following the PRISMA guidelines. Studies reporting the pharmacological activities of *C. gynandra* leaf extract using *in vitro* or *in vivo* approaches were included. Data extraction and quality assessment were performed independently by two reviewers. **Results:** A total of seven studies met the inclusion criteria. The findings consistently demonstrated that *C. gynandra* leaf extract possesses antioxidant, antibacterial, anticancer, hepatoprotective, and antimalarial activities, which are largely attributed to its diverse phytochemical constituents, including flavonoids, phenolic compounds, and triterpenoids. However, substantial heterogeneity was observed across studies in terms of extraction methods, experimental designs, dosage regimens, and outcome parameters. All available evidence remains at the preclinical stage, with no clinical trials identified. **Conclusion:** The current evidence suggests that *C. gynandra* leaf extract exhibits promising pharmacological potential. Nevertheless, the high degree of methodological variability and the absence of clinical studies preclude definitive conclusions regarding its therapeutic efficacy and safety. Future research should prioritize standardized methodologies, mechanistic investigations, and well-designed clinical trials to validate the medicinal value of this plant.

***Keywords*: Cleome gynandra L, Pharmacological Effect, Phytochemicals.**

Abstrak
Latar Belakang: *Cleome gynandra* L. merupakan tanaman obat berdaun yang banyak digunakan dalam pengobatan tradisional di Asia dan Afrika. Meskipun profil fitokimianya yang kaya telah menarik perhatian ilmiah, bukti mengenai efek farmakologisnya masih terfragmentasi dan tidak konsisten antarpenelitian. **Tujuan:** Tinjauan sistematis ini bertujuan untuk mensintesis dan mengevaluasi secara kritis efek farmakologis ekstrak daun *C. gynandra* yang dilaporkan dalam dekade terakhir. **Metode:** Pencarian literatur sistematis dilakukan melalui basis data PubMed, ScienceDirect, dan Medline untuk artikel yang diterbitkan antara Januari 2016 hingga Desember 2025, mengikuti pedoman PRISMA. Studi yang melaporkan aktivitas farmakologis ekstrak daun *C. gynandra* dengan pendekatan *in vitro* maupun *in vivo* disertakan. Ekstraksi data dan penilaian kualitas dilakukan secara independen oleh dua peninjau. **Hasil:** Sebanyak tujuh studi memenuhi kriteria inklusi. Hasil tinjauan menunjukkan bahwa ekstrak daun *C. gynandra* secara konsisten memiliki aktivitas antioksidan, antibakteri, antikanker, hepatoprotektif, dan antimalaria yang sebagian besar disebabkan oleh kandungan fitokimia seperti flavonoid, senyawa fenolik, dan triterpenoid. Namun, heterogenitas yang cukup tinggi ditemukan dalam hal metode ekstraksi, rancangan eksperimen, regimen dosis, maupun parameter luaran. Seluruh bukti yang ada masih berada pada tahap praklinis dan tidak ditemukan uji klinis. **Kesimpulan:** Bukti yang tersedia menunjukkan bahwa ekstrak daun *C. gynandra* memiliki potensi farmakologis yang menjanjikan. Kendati demikian, tingginya variabilitas metodologis dan tidak adanya studi klinis menyebabkan belum dapat ditarik kesimpulan yang definitif mengenai khasiat terapeutik dan keamanannya. Penelitian ke depan perlu memprioritaskan standardisasi metode, investigasi mekanisme kerja, serta uji klinis yang dirancang dengan baik untuk memvalidasi nilai medicinal tanaman ini.

***Kata Kunci:* Cleome gynandra L, Efek Farmakologis, Fitokimia.**

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Introduction

Medicinal plants have long played a central role in traditionasl healthcare systems across the world. Maman plant (*Cleome gynandra L*) commonly known as African spider plant is a leafy medicinal plant traditionally used in various regions of Asia and Africa. This plant has been widely used in traditional medicine to treat many conditions. The growing interest in this plant is closely tied to its rich and diverse phytochemical profile [1,2]. Previous studies have revealed that *C. gynandra leaves* contain multiple classes of bioactive compounds, including flavonoids, terpenoids, alkaloids, phenolic compounds, vitamins, and essential micronutrients. These phytochemicals are known to contribute to antioxidant, anti-inflammatory, antimicrobial, and other pharmacological activities, suggesting that *C. gynandra* may possess substantial therapeutic potential [3-5].

Despite its long history of traditional use, the scientific evidence supporting the pharmacological benefits of *C. gynandra* remains scattered across numerous primary studies employing different experimental models and methodologies. Moreover, most existing studies have been conducted in vitro or in animal models, with limited translational assessment toward clinical applicability. To date, no systematic review has been conducted to comprehensively evaluate the strength, consistency, and quality of the available evidence on the pharmacological effects of *C. gynandra* leaves. This gap highlights the need for a structured and methodologically rigorous assessment capable of synthesizing current knowledge, identifying limitations in the literature, and outlining potential directions for future research. Therefore, this systematic review is essential to clarify the therapeutic relevance of this plant, consolidate existing data, and provide a scientific basis for its possible development into evidence-based medicine.

Method

Search Strategy

A systematic search was conducted to identify all relevant studies reporting the pharmacological effects of *Cleome gynandra* L. leaves. The search strategy followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Using a combination of keywords and Boolean operators, the search employed the following string: *("Cleome gynandra L." OR "African spider plant" OR "Maman plant") AND ("pharmacological effects" OR "biological activity")*. The search was performed in PubMed, ScienceDirect, and Medline for publications published between January 2016 and December 2025, ensuring that the studies analyzed in this review reflect the most recent findings within the past decade.

Study Selection

The study selection process was conducted by three researchers who initially screened the titles, abstracts, and full-text articles. Subsequently, two additional researchers independently evaluated the full texts to complete the eligibility assessment. Any disagreements regarding the inclusion or exclusion of specific studies were resolved through discussion and consensus among all members of the research team. Inclusion standards were applied: 1) Research on the pharmacological effects of *Cleome gynandra* L. leaf extract on in vitro and in vivo methods; 2) Full-text accessibility. Articles published more than ten years ago were included

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in the exclusion criteria. After analyzing each reference of the selected articles, additional papers were added to this analysis.

Data Extraction

One reviewer used a standardized form to extract data, while another verified the results. The extracted information included details such as study characteristics, study design, phytochemical components, measured pharmacological outcomes, dosage and duration of treatment, and key findings related to the biological activity of *Cleome gynandra L.* leaf extract. Following data extraction, each included article underwent a quality assessment. The purpose of this appraisal was to evaluate the methodological rigor of each study and determine how effectively potential sources of bias were addressed in the study design, execution, and analysis. The quality assessment was carried out independently by two investigators, and any discrepancies in the evaluation or study selection were resolved through further discussion until consensus was reached.

Results

The initial search identified a total of 87 articles from PubMed, ScienceDirect, and Medline. The first step was to identify the articles and input them into the reference manager. Any duplicate articles that appeared were subsequently removed. Furthermore, articles with irrelevant titles, abstracts, or publication years were removed. Next, the selected articles were eliminated by thoroughly reading the full text and assessing their eligibility. Additional articles from the manual screening were added, and the final 7 articles were discussed. The study selection flowchart is presented in Figure 1.

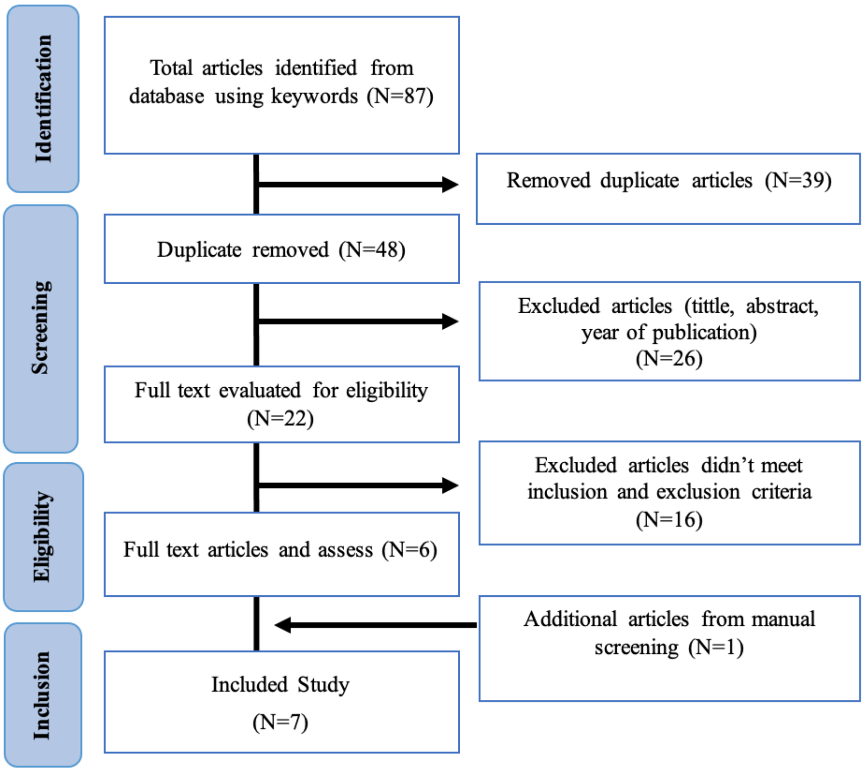

Figure 1. PRISMA Flowchart

The Phytochemical Compounds

The therapeutic relevance of plant-derived compounds has gained growing global attention. Phytochemical screening of *Cleome gynandra* leaf extract revealed the presence of multiple bioactive constituents dominated by terpenoids, flavonoids, phenolic acids, and alkaloids. Using chromatographic and spectrometric techniques, the leaf extracts consistently demonstrated a complex phytochemical profile rich in antioxidant and anti-inflammatory compounds. As summarized in Table 1, various analytical methods have been employed to identify and characterize the phytochemicals present in *Cleome gynandra* leaves extract.

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Table 1. The Phytochemical Compounds of C*leome gynandra L.* Leaves Extract

Authors (Year)	Analytical Technique	Phytochemical Compounds
Kumar et al. (2025) [6]	Qualitative phytochemical analysis	Alkaloids, flavonoids, phenols, tannins, cardiac glycosides, saponins, anthraquinones, and terpenoids.
Oluremi et al. (2025) [7]	Harboune 1998 protocols	Alkaloids, Saponins, flavonoids, tannins, terpernoids, phenols, and glycosides
Abitharani et al. (2022) [8]	Qualitative phytochemical analysis, DPPH	Alkaloids, saponins, glycosides, tannins, phenolics, flavonoids, and steroids
Chandradevan et al. (2020) [9]	DPPH assay, Folin–Ciocalteu method, UHPLC-ESI-Orbitrap-MS.	Phenolic compounds (hydroxycinnamic acids, hydroxybenzoic acids, and flavonoid derivatives) and their metabolite
Widodo & Pratiwi (2018) [10]	Spectrophotometric UV-Vis, DPPH	Flavonoids, saponins, steroids, and tannins
Moyo et al. (2018) [11]	HPLC-PDA, UHPLC-MS	Β-carotene; Vitamin C, Protocatechuic acid, p-Hydroxybenzoic acid, Salicylic acid, Caffeic acid, p-Coumaric acid, Sinapic acid, Ferulic acid
Omondi et al. (2017) [12]	UHPLC-DAD	3-Hydroxypropyl glucosinolate, 3-Indolylmethyl glucosinolate, 4-Hydroxy-3-indolylmethyl glucosinolate
Neugart et al. (2017) [13]	HPLC-DAD-ESI-MS	Caffeoylglucaric, Coumaroylglucaric, Feruloylglucaric, Quercetin-3-diglucoside, Quercetin-3-rutinoside-7-glucoside, Aglycone-3-rutinoside, Quercetin-3-rutinoside, Kaempferol-3-diglucoside, Isorhamnetin-3-diglucoside, Quercetin-3-neohesperidoside, Kaempferol-3-rutinoside, Isorhamnetin-3-rutinoside, Isorhamnetin-3-glucoside

Abbreviations: UV–Vis (Ultraviolet–Visible Spectrophotometry), DPPH (2,2-Diphenyl-1-picrylhydrazyl), HPLC-PDA (High-Performance Liquid Chromatography–Photodiode Array Detector), UHPLC-MS (Ultra-High-Performance Liquid Chromatography–Mass Spectrometry), UHPLC-DAD (Ultra-High-Performance Liquid Chromatography–Diode Array Detector), and HPLC-DAD-ESI-MS (High-Performance Liquid Chromatography–Diode Array Detector–Electrospray Ionization Mass Spectrometry), UHPLC-ESI-Orbitrap-MS (Ultra-High-Performance Liquid Chromatography–Electrospray Ionization–Orbitrap Mass Spectrometry)

Pharmacological Effect

Several Cleome species are widely recognized for their diverse pharmacological activities, including wound-healing, analgesic, and anti-inflammatory effects. These reported properties highlight the importance of further exploring particularly *Cleome gynandra L.*, to evaluate and establish their biological potential. As summarized in Table 2, the pharmacological effects of *Cleome gynandra* have been investigated both in vitro and in vivo approaches. Notably, the leaf extract has received the greatest research attention, as it consistently exhibits strong biological activities attributed to its rich composition of flavonoids, phenolics, and other bioactive constituents.

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Table 2. Pharmacological Effect of *Cleome gynandra L.* Leaves Extract

Author (Year)	Study	Pharmacological Effect	Results	Limitation
Kumar et al., (2025) [6]	In vitro study	Antibacterial	The extract exhibits significant antibacterial activity, particularly the ethanol and chloroform extracts, showing the largest inhibition zones against bacteria such as *Staphylococcus aureus*, *Bacillus cereus*, and *Klebsiella oxytoca.*	The use of crude extracts whose specific active components have not been identified.
Rotich & Mwafaida (2024) [14]	In vitro study	Antibacterial	The extract inhibits the growth of Salmonella typhi, with an average inhibition zone of approximately 8.33 mm at 100% concentration, which decreases at lower concentrations.	• The effectiveness of *Cleome gynandra* extract is still lower than standard antimicrobial agents, and it may be less effective for direct therapeutic use without further modification. • Testing was conducted using crude extracts, so the impact of cooking on the antibacterial activity of the plant's active compounds remains unknown.
Mzondo et al. (2021) [15]	In vitro study	Anticancer	• The isolated compounds from *Cleome gynandra*, particularly the dammarane-type triterpenoids, demonstrated moderate anticancer activity against various cancer cell lines, including breast (MDA-MB-468), lung (A549), and colorectal (HCT-116 and HCT-15). • Compound 2 showed the highest inhibition against lung cancer (up to 51% at 24 hours) and significant activity against breast and colorectal cancers, with inhibition rates reaching approximately 80% at 25 µg/mL concentration	• The study showed only moderate cytotoxic activity, indicating the need for further optimization and in vivo testing to confirm therapeutic potential. • The mechanisms of action of the isolated compounds remain unclear and require more detailed pharmacological investigation. • The research was limited to in vitro assays, without evaluation of bioavailability or toxicity in vivo.
Abitharani et al. (2022) [8]	In vitro study	Antioxidant Antibacterial Anticancer	• The extract effectively scavenges free radicals with an IC_{50} of approximately 65.67 µg/mL, inhibits the growth of bacteria such as E. coli and Salmonella in a dose-dependent manner, and exhibits strong cytotoxicity against A549 lung cancer cells by inducing apoptosis.	• Did not assess long-term effects or potential toxicity of the extract in whole organisms. • The specific active compounds responsible for the bioactivities were not fully identified
Chandradevan et al. (2020) [9]	In vitro study	Antioxidant	• The antioxidants consist of phenolic compounds (hydroxycinnamic acids, hydroxybenzoic acids, and flavonoid derivatives). • UHPLC-ESI-Orbitrap-MS analysis also identified 24 potential phenolic metabolites that further contribute to the strong antioxidant activity.	• Measurements such as DPPH radical scavenging and total phenolic content provide only a general indication of antioxidant potential and do not necessarily represent actual effectiveness in the body.
Dash et al. (2017) [16]	In vivo study	Hepatoprotective	• Treatment with the 70% ethanolic extract of Cleome gynandra, particularly at a dose of 300 mg/kg, significantly improved liver health in mice bearing Ehrlich ascites carcinoma.	• Lack of detailed mechanistic explanations on how the phytochemicals in *Cleome gynandra* exert their hepatoprotective effects. • Absence of long-term toxicity or efficacy data, as the study covered only a 10-day treatment period.
Igoli et al. (2016) [17]	In vivo study	Antimalaria	• The plant extracts demonstrated significant ($P < 0.05$) schizont activity in mice infected with P. *berghei* that were not significantly different from that induced by the positive control, Halofantrine ($p<0.05$). • This study has shown that *Cleome gynandra* possess immune-inhibitory effect probably because of the secondary metabolites present.	• The use of animal models may not accurately mirror human biological responses to malaria or its treatment. • The relatively short study period restricted the ability to evaluate any long-term outcomes.

Abbreviations: UHPLC-MS (Ultra-High-Performance Liquid Chromatography–Mass Spectrometry); MDA-MB-468 (MD Anderson – Metastatic Breast 468); HCT (Human Colon Tumor)

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Antibacterial

Antibacterial studies consistently report that *Cleome gynandra* exhibits inhibitory effects against a variety of pathogenic bacteria. The ethanol and chloroform extracts demonstrated the strongest activity, producing substantial zones of inhibition against *Staphylococcus aureus*, *Bacillus cereus*, and *Klebsiella oxytoca*. These findings point toward the presence of moderately active antimicrobial phytochemicals, possibly phenolics, alkaloids, or terpenoids, which are common secondary metabolites in Cleome species. The inhibition of *Salmonella typhi*, was relatively low (8.33 mm at 100% extract concentration), and activity declined sharply upon dilution. This indicates that the antibacterial potency is concentration-dependent and may require purification or enrichment to achieve meaningful therapeutic effects [6,14]. Study by Abitharani et al. (2022) further reinforce the antibacterial potential of C. gynandra. Their study demonstrated that the plant extract inhibits the growth of *Escherichia coli* and *Salmonella spp.* in a dose-dependent manner [8]. This means that antibacterial activity increases with higher extract concentrations, suggesting that the plant contains compounds capable of suppressing a broad range of bacterial pathogens.

Antioxidant

Studies by Chandradevan et al. (2020) and Abitharani et al. (2022) provide detailed insights into the plant's antioxidant properties. Advanced analytical techniques such as UHPLC-ESI-Orbitrap-MS identified a diverse array of phenolic compounds, including hydroxycinnamic acids, hydroxybenzoic acids, and various flavonoid derivatives. The identification of 24 distinct phenolic metabolites demonstrates that *C. gynandra* possesses a rich and complex phytochemical profile. The extracts also exhibited substantial radical-scavenging activity with IC_{50} values ~65 μg/mL, signifying moderate-to-strong antioxidant potential. These results are consistent with the known ability of phenolic compounds to neutralize reactive oxygen species (ROS). Given the established connection between oxidative stress and chronic diseases, the antioxidant capacity of *C. gynandra* may partially explain its broad therapeutic potential [8,9].

Anticancer

The anticancer potential of *Cleome gynandra* has been highlighted in studies by Mzondo et al. (2021) and Abitharani et al. (2022), both of which present compelling evidence for the plant's cytotoxic effects. Central to these findings is the identification of dammarane-type triterpenoids, suggesting a sophisticated phytochemical basis for the plant's bioactivity. These isolated compounds demonstrated notable inhibitory effects against several human cancer cell lines, including breast cancer (MDA-MB-468), lung cancer (A549), and colorectal cancer (HCT-116 and HCT-15). Some triterpenoids exhibited strong cytotoxicity, achieving up to 80% inhibition of cancer cell growth, while one compound selectively reduced the viability of A549 lung cancer cells by approximately 51% within 24 hours. Complementing these findings, Abitharani et al. (2022) reported that ethanol extracts of *C. gynandra* could induce apoptosis in A549 cells, providing preliminary evidence that the plant may interact with programmed cell death pathways [8,15].

Hepatoprotective

The investigation by Dash et al. (2017) provides an early yet valuable contribution to understanding the hepatoprotective capacity of *Cleome gynandra.* In this study, the administration of a 70% ethanolic extract to mice bearing Ehrlich Ascites Carcinoma (EAC) resulted in significant improvement in liver function biomarkers, along with noticeable restoration of hepatic histoarchitecture. These outcomes suggest that *C. gynandra* may confer protection against liver damage, potentially through mechanisms related to oxidative stress reduction or modulation of inflammatory processes. While several hypothetical pathways have been proposed, the study did not conduct mechanistic assays to confirm these possibilities. Consequently, the underlying biochemical processes responsible for hepatoprotection remain speculative. Thee relatively short 10-day treatment duration limits the ability to evaluate long-term safety, chronic efficacy, or potential cumulative toxicity [16]. These factors underscore the need for extended-duration studies and mechanistic investigations before the hepatoprotective properties of *C. gynandra* can be considered robust or therapeutically meaningful.

Antimalaria

The antimalarial activity of *Cleome gynandra* has been demonstrated convincingly in the study by Igoli et al. (2016), which reported significant schizonticidal effects in mice infected with Plasmodium berghei.

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Notably, the plant extract produced outcomes that were not significantly different from those achieved with Halofantrine, a well-established antimalarial drug, indicating substantial pharmacological potential. The authors suggested that these effects may be partly attributable to the immunomodulatory influence of secondary metabolites present in the plant. This hypothesis opens the possibility that *C. gynandra* may enhance macrophage or T-cell responses, interfere with key stages of the parasite's life cycle, or provide antioxidant protection to infected erythrocytes [17].

Discussions

Cleome gynandra has increasingly gained scientific interest due to its diverse phytochemical profile and longstanding use in traditional medicine throughout Asia and Africa. Over recent years, bioactive compounds isolated from this plant have been investigated for their antioxidant, antimicrobial, and anti-inflammatory effects [3-5]. Early comparative phytochemical research positioned *C. gynandra* among plant species rich in secondary metabolites, encouraging more detailed characterization of its therapeutic potential. With the advancement of analytical platforms such as HPLC-DAD, UHPLC-MS, and UV-Vis spectrophotometry, studies have demonstrated that flavonoids and phenolic groups are consistently the most abundant constituents detected across different plant parts [9,10,12,18-20]. These compounds have long been associated with significant radical-scavenging activity, mitochondrial protection, and modulation of inflammatory pathways. his robust phytochemical foundation has stimulated a series of pharmacological investigations aimed at determining the therapeutic relevance of *C. gynandra.*

Across the literature reviewed, five investigations have been conducted in vitro, while two studies have examined in vivo effects [6,8,9,14-17]. This distribution shows that most evidence remains at an early experimental level, with only limited translational data from animal models. In vitro studies provide most current insights into the biological activity of *C. gynandra*. These works consistently demonstrate that extracts of the plant exhibit measurable antioxidant, antibacterial, and anticancer properties. For instance, ethanol and chloroform extracts have shown broad antibacterial activity, particularly against *Staphylococcus aureus, Bacillus cereus,* and *Klebsiella oxytoca.* Other in vitro findings further confirm inhibitory effects against Salmonella typhi, although the magnitude of activity remains lower than that of standard antimicrobial agents. Antioxidant analyses illustrate that phenolic compounds play a central role in reducing oxidative stress. These findings align with chemical analyses identifying hydroxycinnamic acids, hydroxybenzoic acids, and flavonoid derivatives as major contributors to antioxidant capacity. Moreover, in vitro anticancer experiments have revealed moderate but notable cytotoxic effects, especially against A549 lung cancer cells and several other human cancer lines. The isolation of dammarane-type triterpenoids in particular highlights the potential of *C. gynandra* to exert targeted anticancer effects, possibly through apoptosis induction and disruption of cancer cell proliferation [6,8,9,14,15]. Despite these promising outcomes, in vitro studies inherently offer limited ecological and physiological relevance. The reliance on crude extracts obscures the specific roles of individual compounds, and the absence of mechanistic investigations leaves unclear how the plant's constituents act on cellular pathways. Additionally, the effects of traditional processing or cooking, which may alter the stability of phenolic and triterpenoid constituents, remain unexplored. These methodological gaps restrict a deeper understanding of the plant's functional biology.

Only two in vivo studies have attempted to extend these findings. Study of Dash et al. (2017) reported hepatoprotective effects in EAC-bearing mice, demonstrating improvements in liver biomarkers and tissue structure following administration of a 70% ethanolic extract. Similarly, Igoli et al. (2016) observed significant antimalarial activity in mice infected with *Plasmodium berghei*, with responses comparable to the antimalarial drug halofantrine. Together, these in vivo results suggest that the bioactive compounds of *C. gynandra* remain active within physiological systems and may exert systemic benefits related to oxidative balance and immune modulation [16,17]. However, neither study provides detailed insight into pharmacokinetics, bioavailability, long-term safety, or precise mechanisms of action. The short duration of treatment and the exclusive use of rodent models further limit generalizability to human populations.

Several important research gaps are evident across the current literature. First, the predominance of in vitro studies leaves unanswered critical questions regarding absorption, metabolism, distribution, and elimination of the plant's bioactive compounds. Without pharmacokinetic data, it is difficult to determine whether the observed biological effects can realistically occur in the human body. Second, few studies isolate or test purified compounds, making it unclear which phytochemicals are primarily responsible for therapeutic

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actions. Third, the lack of standardized extraction techniques and varying assay protocols creates heterogeneity that complicates comparison across studies. Another key gap involves the absence of research on the impact of cooking or traditional preparation methods, despite the plant's frequent dietary use. Finally, no studies have addressed potential drug–plant interactions, an important consideration for populations that consume *C. gynandra* alongside conventional medications.

Limitations across the existing body of research include short experimental durations, small sample sizes, the use of crude extracts, and limited mechanistic exploration. Limitations across the existing body of research include short experimental durations, small sample sizes, the use of crude extracts, and limited mechanistic exploration. In vitro models cannot replicate complex physiological interactions and may overestimate or underestimate biological potency. The two available in vivo studies are constrained by brief treatment periods and lack of toxicity assessments, leaving safety profiles largely uncharacterized.

Conclusions and Future Directions

Based on this systematic review of seven studies that met the inclusion criteria, it can be concluded that the leaf extract of *Cleome gynandra* L. exhibits a range of pharmacological activities, including antioxidant, antibacterial, anticancer, hepatoprotective, and antimalarial effects. These diverse activities are strongly associated with the presence of bioactive phytochemicals such as flavonoids, phenolic compounds, and triterpenoids, which have been consistently identified across the included studies. However, all available evidence remains at the preclinical stage, with considerable heterogeneity observed in extraction methods, experimental designs, dosage regimens, and outcome measurements. This variability hampers direct comparison across studies and limits the ability to draw robust conclusions regarding the overall therapeutic efficacy of this plant.

Future research should therefore be directed toward addressing these methodological gaps to facilitate the translation of laboratory findings into clinical applications. A critical first step is the development and adoption of standardized extraction protocols and phytochemical characterization methods, as the current diversity in approaches poses a major obstacle to reproducibility and cross-study synthesis. In parallel, well-designed *in vivo* studies with extended observation periods and comprehensive safety evaluations are urgently needed, as most existing animal studies are of short duration and lack thorough toxicity assessments. Mechanistic studies also remain largely unexplored, particularly for specific compounds such as dammarane-type triterpenoids and various phenolic derivatives that have been isolated but whose molecular targets and pathways of action have yet to be elucidated. Furthermore, pharmacokinetic investigations including absorption, distribution, metabolism, and excretion profiles are essential to determine whether the bioactive compounds can reach sufficient concentrations *in vivo* to reproduce the effects observed *in vitro*. Ultimately, well-structured clinical trials in human subjects will be required if *C. gynandra* is to be developed into an evidence-based therapeutic agent. By strengthening the scientific foundation through rigorous and systematic research across these areas, this traditional leafy vegetable holds considerable promise for future development as a source of standardized bioactive compounds with validated pharmacological properties.

Conflict of Interest

The authors declare no conflict of interest in the preparation of this manuscript. This systematic review was conducted independently, without any financial or personal relationships that could have influenced the findings or interpretations presented herein.

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