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Review Article

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Exploring the Therapeutic Promise of *Ampelocissus latifolia*: A Review

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Abstract: *Ampelocissus latifolia* (Roxb.) (*A. latifolia*) belongs to the Grape family and subfamily of Vitoideae, and it has several pharmacological activities. This study aims to review the future perspective of the pharmacological potentiality of *A. latifolia* due to its distinct chemical constituents and functions. *In vitro* and *in vivo* study data were compiled from reputable sources, including PubMed, Springer Link, Scopus, Web of Science, ScienceDirect, and Google Scholar. Studies have revealed that the extract of *A. latifolia* lowered inflammation by inhibiting prostaglandin (PGs) and kinin synthesis. It has also demonstrated antimicrobial activity by disrupting bacterial protein synthesis. Additionally, it has antioxidant properties of this plant by lowering the reactive oxygen species (ROS) formation in the DPPH assay and FRAP assay. However, several studies also suggest that it showed cytotoxicity, antiproliferative, and apoptotic activity. This review underscores that *A. latifolia* has pharmacological promise using different cell lines, cell assays, and animal models.

Keywords: *Ampelocissus latifolia*; Cytotoxicity; Herbal medicine; Inflammation; Literature review; Pharmacological activity

1. Introduction

In this decade, natural compounds in drug design and discovery have reduced side effects and enhanced biological functions compared to traditional chemical drugs (Zhang et al., 2020; Sharma et al., 2025). As plant-derived compounds, ginseng (Kim, 2018), resveratrol (Cheng et al., 2020), aspirin (Paez Espinosa et al., 2012), digoxin (Patocka et al., 2020), taxol (Bocci et al., 2013), and morphine (Listos et al., 2019) are used in several pharmacological and medical applications. As herbal plants are comprised of a cocktail of natural compounds, metabolites can act as the lead approach for different biological abnormalities that cause various diseases (Chaudhuri & Ray, 2020a). Besides, the current interest of biologists and researchers is to find out how we can get the maximum efficacy, fewer side effects, and minimum costs where plant derivatives can be promising targets (Najmi et al., 2022; Yana et al., 2025). So, it has made the task easier to replace natural compounds in the pharmaceutical fields for treating different chronic and acute diseases. The safety profile of *A. latifolia* has made it a current interest and its wide use to treat numerous medical conditions (Bekoe et al., 2024; Rahman et al., 2025).

Different parts, for instance root, bark, leaves, stem, and branches of the *A. latifolia*, are used to treat gout (Patil & Patil, 2005), tuberculosis (Prusti & Behera, 2007), dysentery, wound healing (Patil & Patil, 2005), poisonous bites, headaches (Ayyanar & Ignacimuthu, 2011), colds, fevers, and labor pain (Chaudhuri & Ray, 2020b). Furthermore, the stem ash of this plant aids delivery in pregnancy (Tamilarasi et al., 2000); muscle pain, sores, and fractures in Bihar locals use it (Kishore & Hanumantha Rao, 2018). Plants with ethnomedicinal importance hold significant drug resources; thus, chemical characterization is essential for herbal

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formulation development and quality control (Mitra et al., 2017).

However, this study aims to outline the summary and review the pharmacological activity, including anti-inflammatory, analgesic, antimicrobial, antibacterial, and antioxidant properties of *A. latifolia*.

2. Methodology

2.1. Literature search strategy

The information regarding the *A. latifolia* plant was collected from the recent study and datasets using various platforms are available online including the Web of Science, PubMed, Scholarly, Willy, Medline, Elsevier, Springer Nature, ResearchGate, and MDPI by using different keywords such as *A. latifolia* Roxb., and pair with inflammation, cytotoxicity, anti-inflammatory, antimicrobial, hyperglycemic, antidiabetic, proliferation, anti-proliferative effect, antioxidant effect, Apoptotic effect. While collecting this information, we considered peer-reviewed journals and articles maintaining different terminology when writing their papers.

2.2. Study inclusion criteria

1. For this paper review, the inclusion criteria were those papers that described and summarized the pharmacological properties of *A. latifolia*;
2. *In silico*, *in vitro*, *in vivo*, and their combination studies were used to collect information on *A. latifolia*;
3. Studies that have tabulated the bioactive component of *A. latifolia* in preclinical investigations of plant extracts;
4. Studies that were conducted by utilizing the extract of *A. latifolia* to understand the bacteriostatic mechanism.

2.3. Study exclusion criteria

1. On the other hand, the exclusion criteria include those studies that didn't meet the keywords;
2. Duplicated data, results, titles, and/or abstracts that did not meet the inclusion criteria;
3. Studies without full text available.

3. Results and discussion

3.1. Phytochemical of *A. latifolia*

Plant phytochemicals are vital for their medicinal properties, providing antioxidant, antimicrobial, and anti-inflammatory benefits for human health and industrial applications (Nwozo et al., 2023). *A. latifolia*, a plant belonging to the Vitaceae family, is rich in diverse phytochemicals. Phytochemical investigations of this plant have revealed the presence of various bioactive compounds including flavonoids, tannins, saponins, alkaloids, steroids, glycosides, and phenolic compounds (Chaudhuri & Ray, 2020a; Das et al., 2014). *A. latifolia* is a rich source of various phytoconstituents like hexadecanoic acid, squalene, chalcone, stigmasterol, betulin, longifolene, daidzein, and lupeol etc (Pettit et al., 2008; Mitra et al., 2017; Chaudhuri et al., 2020). The chemical structures of the identified phytochemicals from *A. latifolia* are presented in **Fig. 1**.

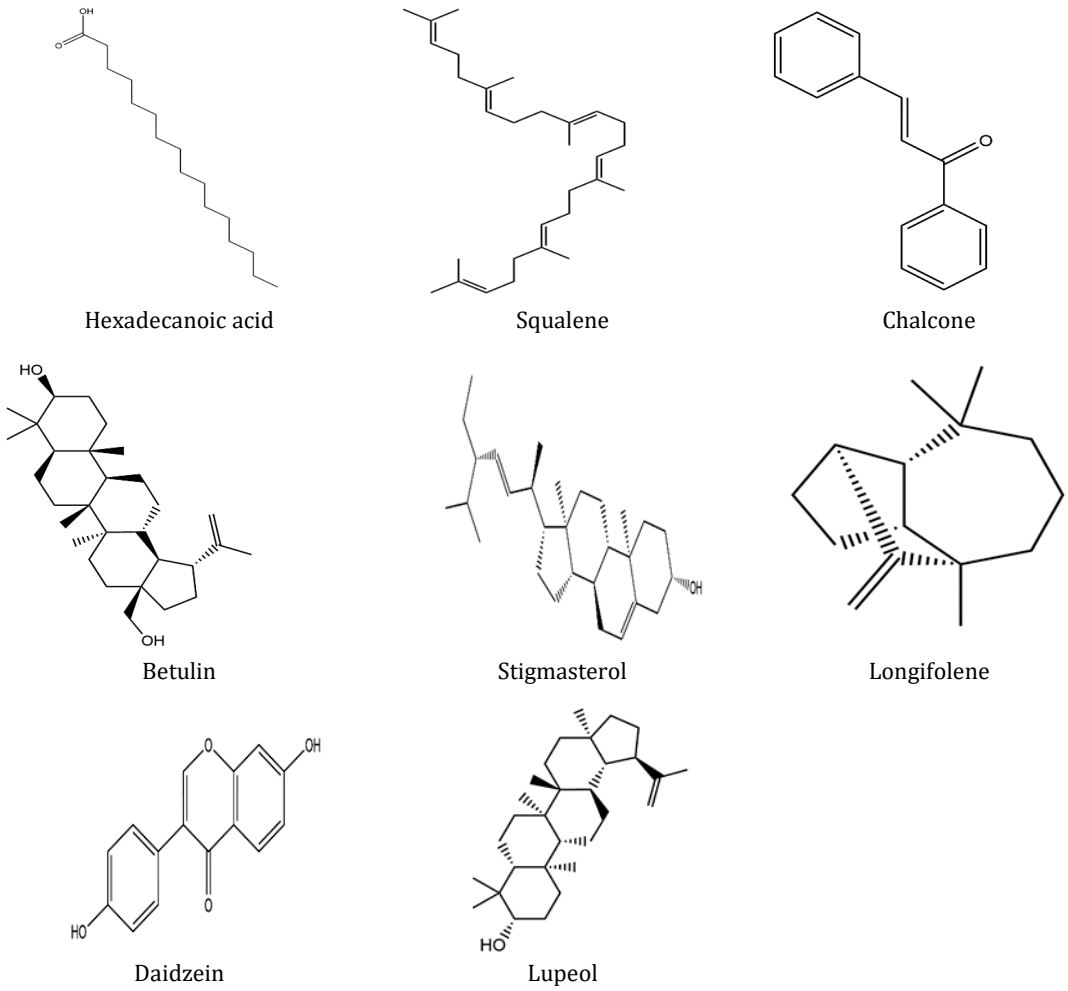

Fig. 1. The two-dimensional chemical structure of the phytochemical from *Ampelocissus latifolia*.

3.2. Pharmacological activity with underlying mechanisms of A. latifolia

3.2.1. Analgesic activity

An analgesic is a drug that reduces pain without knocking a person out. These medications either prevent pain signals from entering the brain or obstruct how the brain processes those signals (Madubuike et al., 2024). A previous study reported that fruit extract of *A. latifolia* (250 and 500 mg/kg) showed analgesic activity through reducing inflammation, abdominal writhes in carrageenan-induced paw edema model in Young *Swiss* albino mice and Long-Evans Rats using hot plate test, acetic acid induced writhing method (Das et al.., 2014). This study suggests that *A. latifolia* showed analgesic activity, primarily due to its rich phytochemical composition, which includes flavonoids, alkaloids, and tannins; more studies are needed to confirm it as an analgesic agent.

3.2.2. Anti-inflammatory

Anti-inflammatory refers to drugs that lessen the body's inflammatory response. Although inflammation is the body's normal response to damage, infection, or negative stimuli, persistent inflammation can lead to several illnesses, including autoimmune disorders, heart disease, and arthritis (Rokonuzzman et al., 2025). A previous study by Tamilarasi et al. (2000) evaluated the *A. latifolia* plant's anti-inflammatory activity using a carrageenan-induced paw edema model. The acetone extract showed edema inhibition comparable to indomethacin, suggesting significant anti-inflammatory properties. These effects may relate to its influence on inflammatory mediators like histamine and PGs, supporting its traditional medicinal use (Tamilarasi et al., 2000). Also, additional research was published, demonstrating that A. latifolia fruit extract significantly reduced inflammation in the carrageenan-induced paw edema model in long-Evans rats at oral doses of 250 and 500 mg/kg (Das et al, 2014). Another *in vivo* study by Patel et al reported that root extract of *A. latifolia* exhibits anti-inflammatory properties by reducing inflammation in albino rats (500 and 750 mg/kg) (Patel et al., 2013).

3.2.3. Antimicrobial activity

Antimicrobial activity refers to the ability of a substance to inhibit the growth of or kill microorganisms, including bacteria, fungi, viruses, and parasites (Pednekar & Raman, 2013). According to a prior *in vivo* study by Ganorkar & Deshmukh, the root extract of *A. latifolia* contained certain active compounds that inhibited the colonies of *Salmonella typhi*, *Escherichia coli*, and *Staphylococcus aureus* in the lab using the disc diffusion method, resulting in an antimicrobial effect (Ganorkar & Deshmukh, 2025). The disc diffusion assay is a standard method to test antimicrobial activity, where antibiotic-impregnated discs are placed on an agar plate inoculated with bacteria (Skusa et al., 2022). The zone of inhibition around each disc indicates the antimicrobial's effectiveness against the bacterial growth (Hindler & Munro, 2010). Another study found that the tuber root extract halted the *M. luteus, E. faecium* (DR), *S. epidermidis*, *S. aureus*, *Enterococcus* spp., *K. pneumoniae* (DR), *S. maltophilia, E. coli*, *Pseudomonas* spp., and acid-fast bacteria: *M. smegmatis* soaring antimicrobial effect. The leaf extract of *A. latifolia* shows antimicrobial activity by disrupting microbial membranes, inhibiting enzymes, and interfering with bacterial communication (Rajak et al., 2023).

3.2.4. Antioxidant activity

The ability of a substance to scavenge or neutralize free radicals and reactive oxygen species (ROS) that might harm cells is known as antioxidant activity (Aktar et al., 2024). The phytochemical analysis of *A. latifolia* fruit extracts showed abundant amounts of phenolics and flavonoids with antioxidant activities, including free radical scavenging, ferric reducing, anti-elastase, anti-collagenase, anti-tyrosinase, and anti-inflammatory effects (Singh et al., 2015). Another study by Chaudhuri et al., (2020a) mentioned in their findings that the Creeper stem and leaf of *A. latifolia* (5–100 µg/mL) showed antioxidant activity by increasing free radical scavenging properties by DPPH and ABTS assays**.** This study suggests that *A. latifolia* has antioxidant properties however, more studies are required to show its potential (Chaudhuri et al., 2020a).

3.2.5. Cytotoxic activity and antiproliferative activity

The term "cytotoxic activity" refers to the ability of substances to kill or damage cells. Antiproliferative drugs, on the other hand, reduce or stop the growth of tumors without destroying the cancer cells (Mizan et al., 2025). A past study highlighted that *A. latifolia* contributed to cytotoxic and antiproliferative activity. Among them, the ethanolic extract of its roots has shown significant cytotoxic effects on MCF-7 breast cancer cells (7.8–1000 µg/mL) by decreasing cell viability. This suggests that the compounds in the extract showed antiproliferative activity by interfering with cellular processes responsible for the growth and survival of cancer cells. DNA fragmentation assays and fluorescent staining (DAPI and PI) were for cell death confirmation, suggesting apoptosis (Viswanathan et al., 2023). Moreover, the previous study reported by Chaudhuri et al. (2020a) demonstrated that the aqueous extract from its aerial parts had substantial growth retardation on Dalton's lymphoma cells (0–4 mg mL–1) (Chaudhuri et al., 2020). The aqueous extract of *A. latifolia* induces cytotoxic and antiproliferative effects on Dalton's lymphoma cells by promoting apoptosis, causing DNA fragmentation, arresting the cell cycle (especially in the sub-G1 phase), and reducing cell viability in a dose-dependent manner (Chaudhuri & Ray, 2020a).

3.2.6. Apoptotic activity

Apoptosis is a process in which cells undergo programmed cell death. This function is critical for maintaining cellular health and equilibrium in multicellular organisms (Viswanathan et al., 2023). A previous study demonstrated that aerial parts of *A. latifolia* showed apoptotic activity in Dalton's lymphoma (DL) cells by lowering survivability and surging apoptotic cells, sub-G1 populations. The apoptotic and cytotoxic activity was evaluated using 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT), trypan blue, fluorescence-activated cell sorting (FACS), and live/dead assay (Chaudhuri & Ray, 2020b).

Overall, *A. latifolia* exhibits diverse pharmacological activities, including analgesic, anti-inflammatory, antimicrobial, antioxidant, cytotoxic, antiproliferative, and apoptotic effects. These properties, demonstrated through *in vivo* and *in vitro* studies, involve mechanisms like inflammation reduction, microbial membrane disruption, free radical scavenging, and induction of apoptosis in cancer cells (**Table 1** and **Fig. 2**). While promising, further research is needed to validate and elucidate the precise molecular mechanisms and clinical potential of *A. latifolia* for therapeutic applications.

4. Conclusion with future perspective

Ampelocissus latifolia exhibits versatile pharmacological activities, including antimicrobial, anti-inflammatory, analgesic, antiproliferative, and apoptotic effects, driven by its phytochemicals like flavonoids, acetogenins, and alkaloids. Extracts from its roots, fruits, stems, and leaves reduce inflammation, microbial growth, and cancer cell proliferation while inducing apoptosis. *In vivo* and *in vitro* studies demonstrate reduced edema, pain, and cell viability in models like MCF-7 and Dalton's lymphoma cells. These findings suggest its potential in drug development, agriculture, and biopharmaceuticals. Further research, including

Table 1. Source, testing system, dose, concentration, minimum inhibitory concentration, and mechanism of *Ampelocissus latifolia*

Sources/ types of extract	Test systems	Dose/ Concentration (R/A)	IC_{50}/ MIC/ ZOI	Results/ mechanisms	References
		Antioxidant activity			
Creeper stem and leaf	DPPH assay, FRAP assay, *in vitro*	5–100 µg/mL	0–70 µg/mL	↑Antioxidant activity	Chaudhuri & Ray, 2020a
		Anti-inflammatory			
Fruit	Young Swiss albino mice and Long-Evans Rats, *in vivo* (n=5)	250 and 500 mg/kg (p.o.)	-	↓Inflammation, ↓paw edema	Das et al., 2014
Root	Albino rats, *in vivo* (n=4)	500 and 750 mg/kg (p.o.)	-	↓Inflammation	Patel et al., 2013
Root, stem, and leaves	Carrageenan-induced paw edema model in rats, *in vivo*	100 mg/kg	-	↓Inflammation, prostaglandins, histamine, kinin	Tamilarasi et al., 2000
		Antimicrobial activity			
Root	Disc Diffusion Method, *in vitro*	-	18 and 16 mm	↑Antimicrobial activity	Ganorkar & Deshmukh, 2025
Tuber root	Disc diffusion assay, *in vitro*	-	6 to 18 mm	↑Antimicrobial activity	Rajak et al., 2023
		Cytotoxic activity			
Aerial parts	Dalton's lymphoma cells, *in vitro*	0–4 mg. mL–1	0.99 mg/mL and 1.82 mg/ mL	↓Survivability, ↓propagation ↑apoptotic cells, ↑sub-G1 cell populations, ↓proliferation, ↑cytotoxicity	Chaudhuri et al., 2020
		Antiproliferative activity			
Root	MCF-7 cell line, *in vitro*	7.8–1000 µg/ mL	62.5 µg/mL	↑Antiproliferative activity	Viswanathan et al., 2023
		Analgesic activity			
Fruit	Young *Swiss albino* mice and Long-Evans rats (Hot plate test, Acetic acid induced writhing method), *in vivo* (n=6)	250 and 500 mg/kg (orally)	-	↑reaction time of heat sensation, latency time ↓Inflammation, abdominal writhes,	Das et al., 2014
		Apoptotic activity			
Aerial parts'	Dalton's lymphoma (DL) cells, (MTT, trypan blue, FACS and live/dead assay), *in vitro*	0–4 mg. mL–1	0.99 mg/mL and 1.82 mg/ mL	↓Survivability, ↓propagation ↑apoptotic cells, ↑sub-G1 cell populations	Chaudhuri & Ray, 2020b

Abbreviation: ↑: Increase; ↓: Decrease; DPPH: 2,2-Diphenyl-1-picrylhydrazyl; FACS: Fluorescence-Activated Cell Sorting; FRAP: Ferric Reducing Antioxidant Power; IC_{50}: Half-maximal Inhibitory Concentration; MIC: Minimum Inhibitory Concentration; MTT: 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide; p.o.: Per Oral; ZOI: Zone of Inhibition

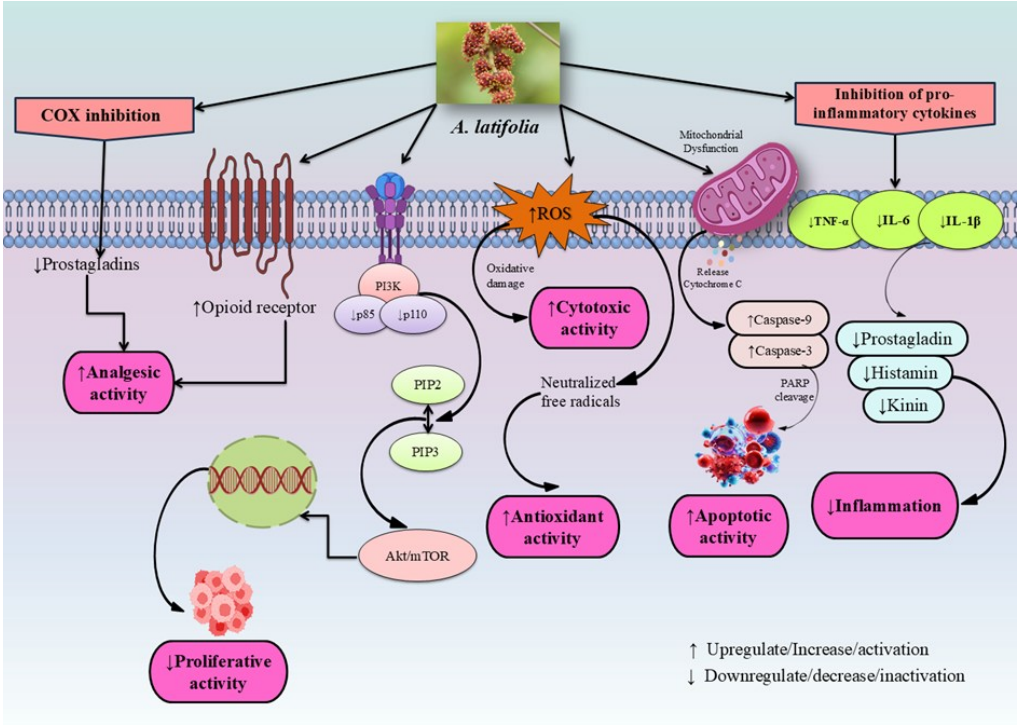

Fig. 2. Possible mechanism of pharmacological activity of *Ampelocissus latifolia*. [*A. latifolia* exhibits anti-inflammatory and analgesic properties, likely through cyclooxygenase (COX) inhibition, reducing prostaglandin synthesis. Its analgesic effect may involve opioid receptor pathways e.g., phosphoinositide 3-kinase (PI3K), protein kinase B (Akt)/ mammalian target of rapamycin (mTOR) and suppression of inflammatory mediators (histamine, kinins). The plant also demonstrates antioxidant activity by scavenging free radicals and mitigating oxidative damage. Additionally, it may induce apoptosis via caspase-3/9 activation and poly ADP-ribose polymerase (PARP) cleavage, suggesting cytotoxic potential. Further, it modulates pro-inflammatory cytokines and exhibits regulatory effects on cell proliferation (upregulation/downregulation of signaling molecules). These mechanisms collectively support its therapeutic potential in inflammation, pain, and oxidative stress-related disorders.]

preclinical and clinical trials, is needed to explore its anticancer and antifungal properties and develop eco-friendly botanical pesticides for sustainable medicinal and agricultural applications.

Conflict of interest

The authors declared no conflict.

Data availability

Data will be made available on request.

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Author's contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis, and interpretation, or in all these areas, that is, revising or critically reviewing the article; giving final approval of the version to be published; agreeing on the journal to which the article has been submitted; and confirming to be accountable for all aspects of the work. All authors have read and agreed to the published version of the manuscript.

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