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REVIEW ARTICLE

# Ethnobotany, bioactive phytoconstituent and pharmacology of *Mikania micrantha* Kunth: A comprehensive review

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## Abstract

*Mikania micrantha* Kunth, a fast-growing invasive weed, has gained considerable scientific interest because of its diverse pharmacological properties. It is also referred to as Chinese creeper, American rope, bitter vine and climbing hemp vine and has traditionally been used in folk medicine across South America and Asia for treating wounds, fever, inflammation, skin infections and respiratory ailments. Phytochemical studies have identified a diverse range of bioactive compounds in plant, including flavonoids, phenolic acids, sesquiterpenes, alkaloids and essential oils. Recent studies have demonstrated that extracts from various parts of *Mikania micrantha* exhibit significant antimicrobial, antioxidant, anti-inflammatory, anticancer, wound healing, anti-fungal, cardioprotective, anti-depression, anti-helmintic and thrombolytic activities both *in vitro* and *in vivo* models. This review aimed to comprehensively evaluate the phytochemical constituents and therapeutic potential of *Mikania micrantha*, with a special focus on its bioactive compounds and their mechanisms of action. However, further studies are necessary to assess its toxicity, isolate active compounds and determine their clinical importance for therapeutic use. A comprehensive review was conducted using academic databases including PubMed, Google Scholar, ScienceDirect, Web of Science and Research Gate. Future investigations should emphasize comprehensive safety profiling and, formulation development to establish *Mikania micrantha* as a potential phytotherapeutic agent for therapeutic use.

**Keywords:** characterization; mechanistic pathway; *Mikania micrantha*; phytoconstituent; pharmacology; traditional medicine

## Introduction

Natural products have played a crucial role in the discovery and development of pharmaceuticals and therapeutics for centuries. They have served as a vital source of medicinal compounds, with traditional herbal medicine using a diverse array of plant materials for both preventive health and treatment (1).

*Mikania micrantha* Kunth, commonly known as "mile-a-minute" weed, is a fast-spreading perennial vine native to tropical America (2-4). Recent studies have shown growing scientific interest in the genus *Mikania*, as several of its species exhibit diverse and significant biological activities (5). *Mikania* grows prostrate in low vegetation and climbs in places with tall, woody plants. Its opposite leaves are 4-3 cm long, heart-shaped at the base, pointed at the tip and usually serrated. It produces clusters of tiny, fragrant, 4.5–6.0 mm long white or greenish flowers (6). The leaves of *M. micrantha* contain alkaloids, terpenoids and steroids and have traditionally been used to reduce inflammation and promote faster wound healing (7). Recent pharmacological research has identified a traditional claim, demonstrating that the plant exhibits antimicrobial (8), antioxidant (9), anti-inflammatory (10), anti-cancer (11, 12), wound healing (13) anti-fungal, cardioprotective (14) and other biological activities (15-17). These result supports its traditional uses and also provide a scientific basis for its therapeutic significance. The current literature provides limited insights, with significant gaps in the detailed characterization of its bioactive compounds, their mechanisms of action and toxicity (18).

This review aimed to present a comprehensive and critical overview of the phytochemistry and pharmacological activities of *M. micrantha*, with particular emphasis on its mechanisms of action, reported toxicities and the identification of knowledge gaps. By integrating traditional knowledge with modern scientific findings, this review supports the ethnomedicinal claims and examines the therapeutic potential of *M. micrantha* in drug discovery. Considering current health challenges such as antimicrobial resistance, chronic inflammation and the demand for natural wound healing agents, *M. micrantha* has been identified as a promising source of new therapeutic leads.

## Methodology

An extensive literature review was conducted to gather relevant information on *M. micrantha* from various peer-reviewed sources. The search was carried out across multiple academic databases, including PubMed, Google Scholar, Science Direct and Research Gate, covering publications from January 2013 to August 2025.

### Search strategy

The search focused on identifying viable therapeutic approaches using Boolean operators such as (*"Mikania"* OR *"Mikania*

*micrantha"*) OR("ethnobotany" and *Mikania micrantha* ), (traditional uses and *Mikania micrantha)* OR ("geographical distribution" and *Mikania micrantha"*) OR ("phytoconstituent" and *Mikania micrantha"*) *OR* ("pharmacology" and *"Mikania micrantha"*) OR ("Taxicological evaluation and *"Mikania micrantha"*) OR (modern biotechnology" and *Mikania micrantha)* and similar combinations of keywords like '*Mikania micrantha;*' 'ethnobotany', 'traditional uses', 'geographical distribution', 'phytoconstituent', 'pharmacology', taxicological evaluation and modern biotechnology were applied across all databases. A total 350 articles were screened, of which 100 were finally included as review articles.

**Inclusion criteria**

The inclusion criteria for this review encompassed studies published in the English language. Selected articles need to focus on *M.micrantha* concerning the following aspect:

→ Traditional uses and ethnobotanical applications

→ Geographical distribution and habitat specifics

→ Phytochemical constituents and pharmacological activities

→ The types of studies considered include *in vitro* experiments, *in vivo* investigations and comprehensive review articles.

**Exclusion criteria**

→ Studies not related to *Mikania micrantha*

→ Non-English Publication

→ Duplicate or inaccessible full-text articles

## Geographical distribution

*M. micrantha* is a perennial climbing vine from family *Asteraceae*, tribe Eupatorieae**.** *The genus Mikania* has about 430 species that grow mainly as twining vines, herbaceous plant and small shrubs in tropical and subtropical regions (19). *M. mikania* is native to Central and South America, including the Caribbean, from northern Argentina to Mexico (20-22, 17). It has subsequently spread as an invasive weed to tropical Asia, parts of Papua New Guinea, regions in the Indian Ocean, Pacific Ocean islands and Florida in the US (23-26) is illustrated in Fig. 1.

## Ethanobotany

*M. micrantha* has been widely used in traditional medicine for different therapeutic properties. The leaves are commonly applied to reduce inflammation, relieve pain and accelerate wound healing (27, 28). They are also used to manage skin bleeding, treat ulcers and promote the healing of sores (29). Due to its antimicrobial activity, the plant is often used to manage skin infections (30, 31).

In Bangladesh, the plant is known as "Libujilota" or "Germany lota," and is used in folk medicine for various health conditions (32-34). It is frequently used to reduce fever, treat rheumatism, alleviate colds and respiratory problems and as a dressing for wounds. The plant is also used as an antidote for snakebites (35, 36). In Malaysia, the plant serves as a cover crop in rubber plantations, but it also has medicinal uses in some communities (37, 38).

Among the Mizoram ethnic groups in India, the plant's juice is used as first aid to cuts and wounds to stop bleeding. Leaf decoctions are used as a hemostatic in cases of diarrhea (39, 40). Additionally, the leaves are traditionally used as an antidote, diuretic and cholagogue to treat heavy menstruation and fever (41). In African traditional medicine, *M. micrantha* is also used as a folk remedy, mainly for treating ulcers and promoting wound healing (42, 43). The diverse ethnomedicinal uses of the plant are summarized in Table 1.

## Phytochemistry

The phytochemical profile of *M. micrantha* reveals several bioactive compounds. This compound is found in various parts of the plant, such as leaves, stems, roots, flowers and whole plant extracts (44). A summary of these constituents are presented in Table 2. The major Phytochemical classes include polyphenols (tannins, flavonoids), steroidal compounds (triterpenoids, saponins), sesquiterpene lactones, diterpenes, phenolic acids and volatile oils (45). The aerial parts are rich in sesquiterpene lactones (e.g., deoxymikanolide, mikanolide and their hydroxylated derivatives) and diterpenoid glycosides such as β-D-glucopyranosyl esters of ent-kaurenoic acid (5).

**Fig. 1.** Geographical Distribution of *Mikania micrantha* across selected region . The Map has been illustrate the known locations where the species has been located, highlighting its presence in tropical and subtropical zones (18).

**Table1.** Ethnobotany uses of *M. micrantha*

| Country/State | Plant part | Local name | Ethnomedicinal uses | Route of Administration | References |
|---|---|---|---|---|---|
| India/Assam | Leaves | Japani lota | antidote for insect bites, and, also to control minor external bleeding | Topical application | (18) |
| India/Mizoram | Leaves | *Japan Hlo* | Use a topical wound for its antiseptic properties | Topical application | (40) |
| India/Odisha | Whole plant | Bahaman Lata | Antibacterial activity | Oral and topical application | (15) |
| India /Kerala | Arial part | Dhritarashtra Pacha | Antifungal, use juice from Mikania leaf as an antidote for skin diseases | Topical application | (17) |
| India/West Bengal | Leaves | Chhagalbati, Japanilata | Traditionally, it is used to manage conditions such as fever, jaundice, dysentery, rheumatism and colds, and is also effective as a Hemostatic agent. | Oral and tropical application | (32) |
| Nepal | Leaves and stems | Lahare Banmara | Anti-microbial and anti-inflammatory activities | Oral and topical application | (8) |
| China | Leaves | Guangzhou | Antibacterial activity and, cytotoxic activity. | Oral application | (13) |
| Papua New Guinea / Oceania) | Leaves | - | Apply as a medicinal herb to wounds and cuts. | Topical application | (27) |
| Philippines/Mandaue city, Basak | Leaves | Mile- a -minute weed | Anti-microbial, it is used to reduce inflammation | Oral and topical | (25) |
| Bangladesh | Leaves | Libujilota/Germany lota | treating fever, rheumatism, colds, respiratory illnesses, and Gastric ulcer | Oral and tropical application | (34) |
| Africa | Leaves | Mile- a -minute weed | It is traditionally used for treatment of various skin diseases. | Oral | (43) |
| South America/ Guyana Patanoma | Leaves | | skin diseases, wound dressings, chickenpox | Topical application | (29) |
| Malaysia/Selangor | Leaves, stem | Selaput tunggu | It is also used to reduce cholesterol, high blood pressure, and glucose levels. | Topical and oral | (37) |
| Indonesia /North Sumatera | Leaves | Sembung Rambat | Insect bites or scorpion stings, skin diseases such as rashes and, skin itch. Skin bleeding, wound healing, sores, antimicrobial, skin infection, and ulcers. | Topical application | (23) |
| Fiji /Oceania | Leaves | Wa- Masei | Use to accelerate the healing of cuts and minimize minor blood loss. | Topical application (poultice) | (12) |
| Jamaica/Caribbean | Leaves Stem | Guaco | Wound dressing and healing of sores, traditionally used to treat cough, cold, and asthma, skin itch, and athlete's foot. | Oral and topical application | (11) |
| Mexico | Leaves | Bitter vine | Skin diseases, Scorpion stings. | Topical Application | (30) |

**Table 2.** Isolated/ identified phytochemical constituents of *M. micrantha*

| Compound No. | Plant Part | Phytoconstituents | Compound Type | Reported activity/ associated bioactive | Reference |
|---|---|---|---|---|---|
| **(1-9)** | Aerial Part | 2*β*-hydroxyl-11*β*,13-dihydrodeoxymikanolide, 3*β*-hydroxyl-11*β*,13-dihydrodeoxymikanolide 1*α*,3*β*-dihydroxy-4,9-germacradiene-12,8:15,6-diolide, (11*β*,13-dihydrodeoxymikanolide-13-yl)-adenine 2*β*,3*β*-dihydroxy-11*β*,13-dihydroxydeoxymikanolide, 3*α*-hydroxy-11*β*,13-dihydroxydeoxymikanolide deoxymikanolide 3*β*-hydroxy-deoxymikanolide Mikanolide | Sesquiterpene lactose | Anti-inflammatory, Antidiabetic, Anticancer. | (50) |
| **(10-14)** | Aerial part | β-d-glucopyranosyl-15α-(3-hydroxy-3-methylbutanoyloxy)-9β-hydroxy-*ent*-16-kauren-19-oate, β-D-glucopyranosyl-15α-(3-hydroxy-3-methylbutanoyloxy)-9β-hydroxy-*ent*-16-kauren-19-oate, β-d-glucopyranosyl-15α-(2-methylbutanoyloxy)-9β-hydroxy-*ent*-16-kauren-19-oate, β-d-glucopyranosyl-15α-(3-methyl-2-butenoyloxy)-9β-hydroxy-*ent*-16-kauren-19-oate β-d-glucopyranosyl-15α-(3-hydroxy-3-methylbutanoyloxy)-*ent*-16-kauren-19-oate | Deterpines | Antibacterial, Cytotoxic | (51),(53) (59) |
| **(15-28)** | Aerial Part | benzyl5-*O*-β-d-glucopyranosyl-2,5-dihydroxybenzoate and (7*S*,8*R*)-*threo*-dihydroxydehydrodiconiferyl alcohol 9-acetate , benzyl 2-*O*-β-d-glucopyranosyl-2,6-dihydroxybenzoate, 4-allyl-2,6-dimethoxyphenol glucoside , (+)-isolariciresinol, icariol $A_2$ , 9,10-dihydroxythymol, 8,9,10-trihydroxythymol, caffeic acid, *p*-coumaric acid, ethyl protocatechuate, procatechuic aldehyde, 4-hydroxybenzoic acid, and hydroquinone. | Phenolic Compound | Antioxidant | (61) |
| **Essential oils** | Flowers, leaves and, stems | Isoledene, δ-cadinene, caryophyllene, germacrene-D, zingiberene | Sesquiterpene hydrocarbons | Antimicrobial, Antioxidant | (54), (56) |

Phenolic glycosides and lignan derivatives, including benzyl glucosides, caffeic acid and p-coumaric acid, have also been reported (46). To enhance clarity, the corresponding chemical structures of these compounds are illustrated in (Fig. 2-5), grouped according to their classes sesquiterpene lactones (Fig. 2), diterpenes (Fig. 3), phenolic compounds (Fig. 4) and essential oil constituents (Fig. 5).

**Sesquiterpene lactone**

Sesquiterpene lactones are predominantly found in the aerial parts and are known for their antibacterial, anticancer and cytotoxic activities.These compounds likely act by disrupting bacterial membranes, increasing ROS and MDA levels and inhibiting antioxidant enzymes, leading to cell death (47).The major active constituents of *M.micrantha* are sesquiterpene lactones, which contribute significantly to its antibacterial activity as well as other biological effects(48). The main sesquiterpene lactones identified include (49) 2 *β* - hydroxyl - 11 *β*,13 - dihydrodeoxymikanolide (1), 3 *β* - hydroxyl - 11 *β*, 13 -dihydrodeoxy-mikanolide (2), 1 *α*, 3 *β* - dihydroxy - 4 , 9 - germacradiene - 12, 8:15, 6 - diolide (3) and (11 *β*, 13 - dihydrodeoxymikanolide - 13 - yl) - adenine (4), 2 *β*, 3 *β* - dihydroxy - 11 *β*, 13- dihydroxyd-eoxymikanolide (5) 3*α*- hydroxy - 11 *β*, 13 - dihydroxydeoxy-mikanolide (6) deoxymikanolide (7) 3*β*-hydroxy-deoxymikanolide (8) and mikanolide (9). These compounds are considered the primary bioactive constituents responsible for the antimicrobial and anti-inflammatory effects (50).

**Diterpenes**

A phytochemical investigation of the aerial parts of *M. micrantha* collected in China resulted in the isolation of four new ent-kaurene diterpene glucosides, one of which was identified as β - D-glucopyranosyl - 15 α - ( 3 - hydroxy - 3 - methylbutanoyloxy) - 9 β - hydroxyent - 16 - kauren - 19 - oate (10), β - d - glucopyranosyl-15α - (3 - methylbutanoyloxy) - 9 β - hydroxy-*ent*-16-kauren - 19 oate (11) , β - d - glucopyranosyl-15α-(2-methylbutanoyloxy)- 9 β-hydroxy*ent* - 16 - kauren - 19 - oate (12), β - d - glucopyranosyl - 15 α - ( 3 - methyl - 2 - butenoyloxy) - 9 β - hydroxy - *ent* - 16 - kauren - 19 - oate (13), along with a known one, β - d -glucopyranosyl-15 α - (3 - hydroxy - 3 - methylbutanoyloxy) - *ent*-16-kauren-19-oate (14) (51). These four new diterpeneent-kaurene glucosides have no significant antibacterial or cytotoxic activities *in the vitro* models tested, which indicates a limited activity in these pharmacological area (51).

**Phenolic compound**

Two novel phenolic compounds, benzyl 5 - *O* - β - d-glucopyranosyl - 2, 5 - dihydroxybenzoate (15) and (7*S*, 8*R* ) - *threo*-dihydroxydehydrodiconiferyl alcohol 9 - acetate (16), together with 12 known compounds, benzyl 2-*O*-β-d-glucopyranosyl-2,6-dihydroxybenzoate (17), 4-allyl-2,6-dimethoxyphenolglucoside(18), (+) - isolariciresinol(19), icariol $A_2$ (20), 9,10-dihydroxythymol (21),8,9,10-trihydroxythymol(22),caffeic acid(23), *p*- coumaricacid

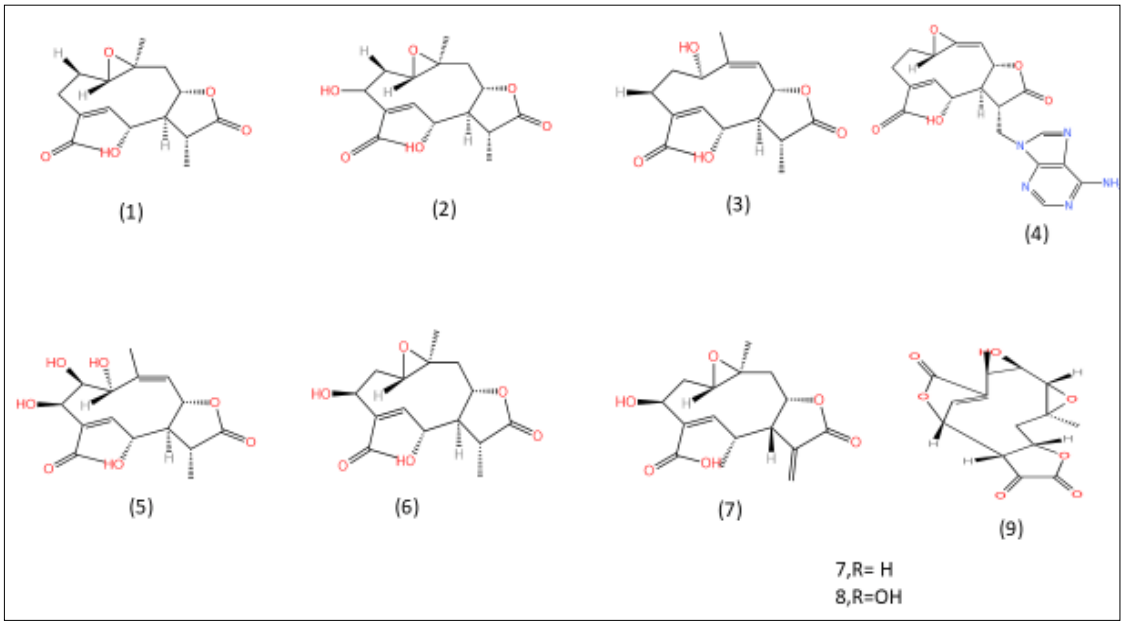


**Fig. 2**. Structural representation of germacrane-type sesquiterpene dilactones isolated from the aerial parts of the plant (53).

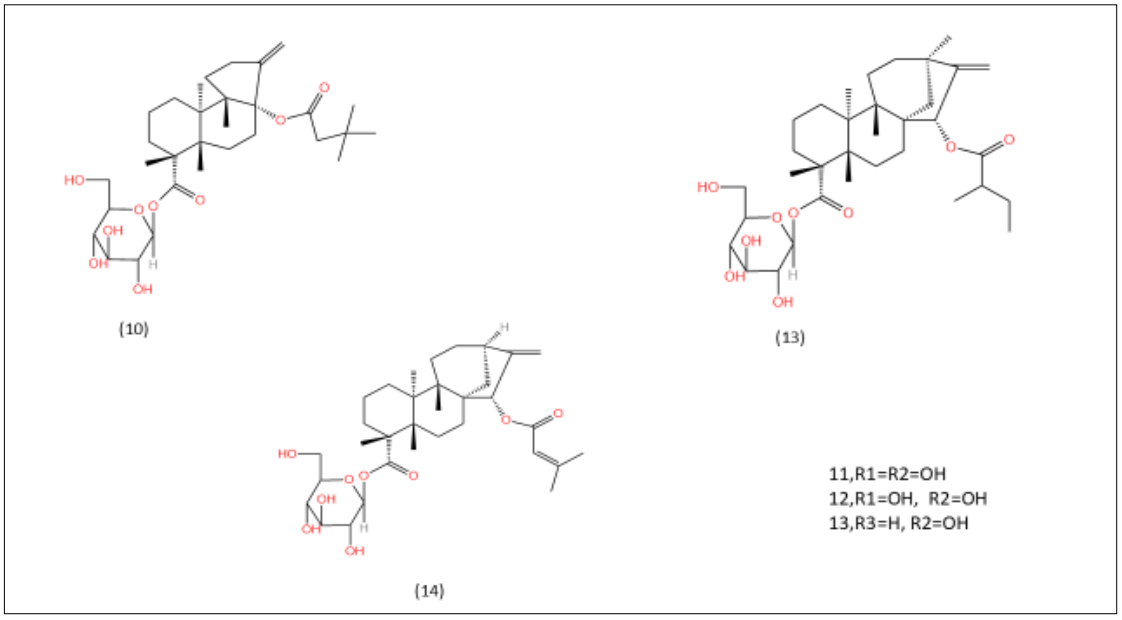


**Fig. 3**. Chemical structures of newly identified ent-kaurene diterpene glucosides derived from aerial plant parts (54).

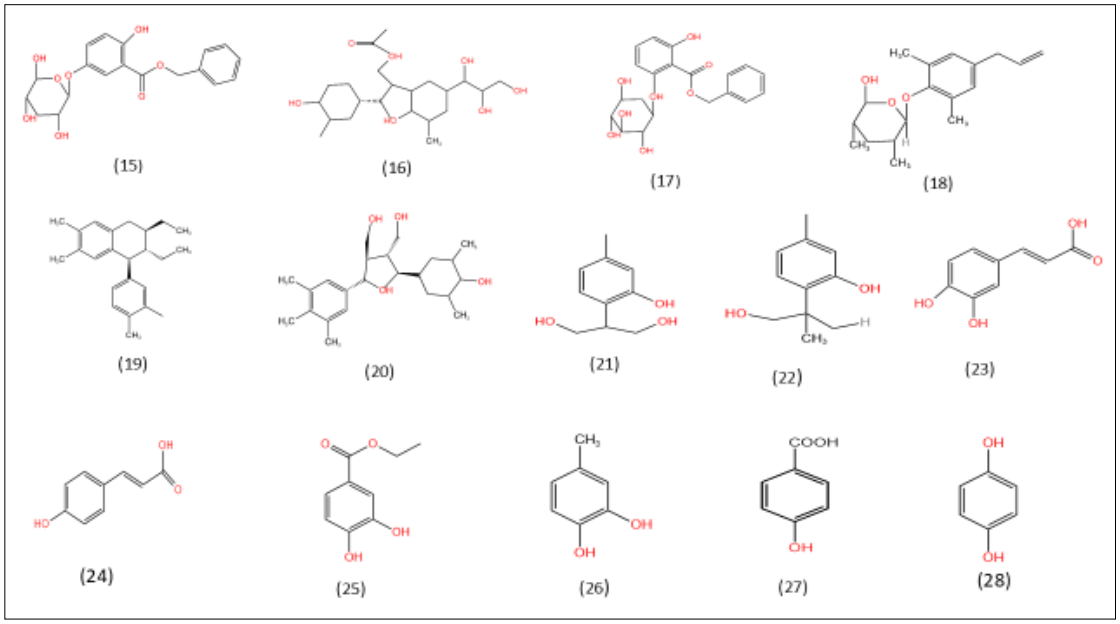


**Fig. 4**. Structure of a phenolic compound isolated from the aerial parts (55).

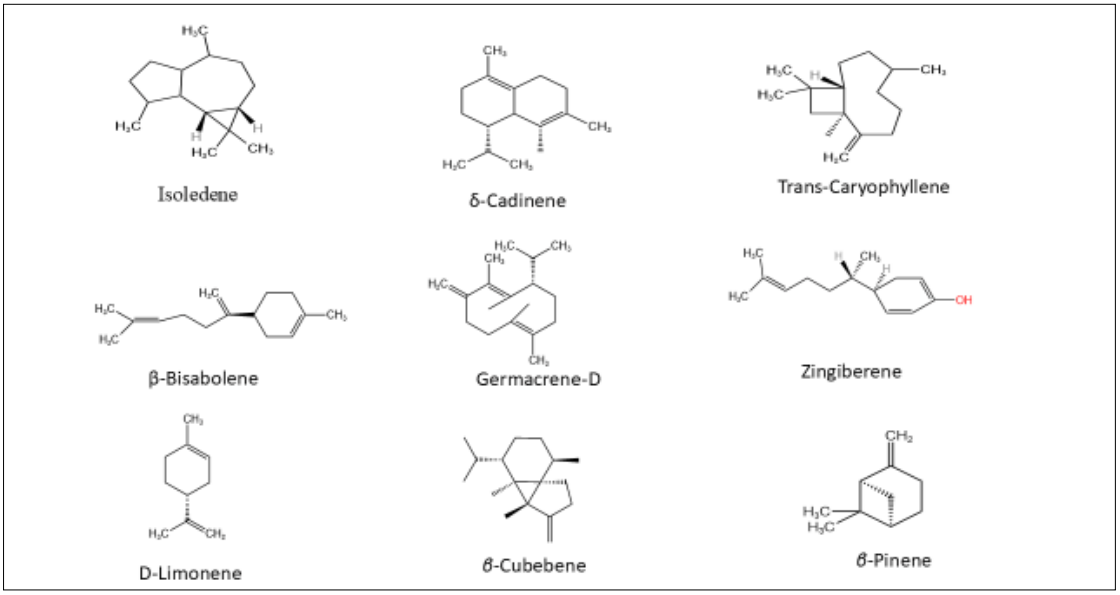


**Fig. 5**. Chemical structure of essential oil isolated from the flower, leaves and stem (58).

(24), ethyl protocatechuate (25), procatechuic aldehyde (26), 4-hydroxybenzoic acid (27) and hydroquinone (28) (52, 53) were isolated from the aqueous and ethanol extracts of *M. micrantha* roots (6). Certain phenolic compounds showing greater antioxidant capacity than L-ascorbic acid, *M. micrantha* emerges as a promising reservoir of potent natural antioxidants (53).

**Essential oil**

The analysis of flower essential oils often begins with identifying their chemical composition, typically using gas chromatography-mass spectrometry (GC/MS) (54). This essential oil of *M. micrantha* is abundant in sesquiterpene hydrocarbons and oxygenated sesquiterpenes. Gas chromatography-mass spectrometry analysis identified 66 compounds in the flower essential oil.The major components included isoledine (14.2 %), δ-cadinene (12.8 %), trans-caryophyllene (10.5 %), β-bisabolene (9.7 %), germacrene-D (8.4 %) and zingiberene (7.9 %) were the dominant constituent, which are observed the antimicrobial and cytotoxic activities(55). Leaf essential oil is rich in β-cubebene, germacrene-D and α-zingiberene, whereas the stem oil contains has high qualities of D-limonene and β-pinene (56) as illustrated in Fig. 5. The constituents of essential oils play a significant role in contributing to their antagonistic effects on various cell lines and pathogenic microorganisms. The essential oil extract from *M. micrantha* flower contains abundant sesquiterpene hydro-carbons and oxygenated sesquiterpenes and the combined action of these components plays a vital role in reducing the viability of both microbial pathogens and cancer cell lines (57). The essential oil derived from *M. micrantha* flowers has been demonstrated significant antioxidant activity, anticancer effectively scavenging free radicals and indicating potential as a natural antioxidant source (58-61).

## Chemical characterization

**GC-MS spectroscopy**

GC-MS is an analytical technique used to identify and quantify compounds in a sample, especially volatile and semi-volatile organic compounds (62). This research aimed to identify the phytochemicals in *M. micrantha* and explore their potential medicinal applications. Methanolic and petroleum ether extracts from the plant's leaves and stems were analyzed using gas chromatography-mass spectrometry to determine their biochemical constituents. The GC-MS analysis of the *M. micrantha* extracts revealed the presence of various compounds, including phenols, fatty acids, sesquiterpenes, diterpenes, alkane hydrocarbons and others, each with a range of potential uses. In this method, the column used was a Perkin Elmer Elite-5 capillary column measuring 30 m × 0.25 mm with a film thickness of 0.25 mm, composed of 95 %. Dimethyl polysiloxane is used as a stationary phase and helium is the carrier gas. The initial temperature of 110 °C for 4 min was then increased to 240 °C. Furthermore then programmed to increase to 280 °C at a rate of 20 °C, ending with a 5 min (63).

GC-MS analysis revealed 10 volatile compounds in the leaves and flowers of *M. micrantha*. The chromatographic separation was performed on an HP-5 MS column (30 m × 250 µm × 0.25 µm) and the carrier gas was helium and its flow rate was adjusted to 1 mL $min^{-1}$. The column's starting temperature was set at 50 °C and maintained for three minutes. It was then raised by 5 °C $min^{-1}$ to 100 °C and kept at that temperature for five minutes. Next, it was raised to 160 °C at a rate of 2 °C $min^{-1}$ and finally, it reached 250 °C by 10 °C $min^{-1}$(64).

**FTIR (Fourier transform infrared spectrophotometer)**

FTIR is the most powerful tool used to identify the types of chemical bonds (functional groups) present in the substance. All different extracts of the *M. micrantha* leaf were used for FTIR analysis. The sample of each extract was recorded in an FTIR spectrophotometer (Shimadzu Prestige 21). The spectrum was recorded in the frequency range between 500 and 4000 $cm^{-1}$(65).

The FT-IR analysis represents the functional groups involved in the synthesis and stabilization of AgNPs using the *M. micrantha* leaf extract was recorded using a Fourier transform infrared spectrometer (Perkin-Elmer Spectrum). The frequency range covered in the FT-IR spectrum analysis is approximately from 516 $cm^{-1}$ to 3175 $cm^{-1}$ (66). The FTIR spectra of the *M. micrantha* aqueous extract were recorded using an FTIR spectrophotometer (Perkin Elmer Spectrum II) within the wave number range of 4000 to 450 cm (67).

**UV-visible spectroscopy**

The UV-Visible spectrophotometric method for the synthesis of

silver nanoparticles (AgNPs) using *M. micrantha* leaf extract determination was carried out using the UV-Vis spectrum (Shimadzu UV-1900I). The absorbance measurements were recorded within the wavelength range of 300-600 nm. A characteristic surface plasmon resonance (SPR) peak was observed at 459 nm, confirming the formation of AgNPs (68).

The aqueous extract of *M. micrantha* was analyzed using a double-beam spectrophotometer (UV-1800, Shimadzu, Japan) within a detection range of 400-800 nm. The synthesis of gold nanoparticles (AuNPs) was confirmed through UV-visible spectrophotometry, which exhibited a surface plasmon resonance (SPR) peak at 534 nm, indicating the successful formation of AuNPs (69).

UV-Vis spectroscopy was employed to analyze and confirm the formation of zinc oxide nanoparticles (ZnONPs) from *M. micrantha* leaf extracts. The UV-Vis spectroscopic analysis revealed a distinctive surface plasmon resonance (SPR) band at 373 nm, indicating the successful formation of ZnONPs (70).

**LC/MS (liquid chromatography and mass spectrometry)**

The ethyl acetate extract of *M. micrantha* was analyzed using Liquid Chromatography-Mass Spectrometry (LC-MS). The results identified key bioactive compounds, including flavonoids such as quercetin and kaempferol, as well as phenolic acids such as caffeic acid and chlorogenic acid. The analysis was conducted with a gas flow rate of 5 L/min at 325 °C. The spectrum analysis was performed using Agilent Mass Hunter Qualitative Analysis software, followed by PEAKS Studio X software (71). The findings revealed that flavonoids and phenolic acids were the key differential metabolites contributing to flower bud differentiation.

## Pharmacological activities

The various pharmacological activities are summarized in Table 3 and the various corresponding mechanisms/pathways are illustrated in Fig. 6. While searching the pharmacological activities of *Mikania micrantha*, we found only a limited number of studies are available on this important medicinal plant.

**Antimicrobial activities**

The antimicrobial properties were evaluated using the ethanol extract of *M. micrantha* which showed a significant zone of inhibition against *Staphylococcus aureus*. The finding demonstrates that the extract showed impressive zones of inhibition at concentrations of 100 and 200 mg/mL, indicating its potential as an effective antimicrobial agent (72). The addition of *M. micrantha* leaf extracts to cotton textiles significantly reduced the antibacterial activity of *S. aureus* and *Propionibacterium acnes*, suggesting potential applications in antimicrobial textiles and wound management products (73).

*M. micrantha* flowers' essential oil showed antibacterial effectiveness against a greater range of pathogens, such as *Mycobacterium smegmatis, Pseudomonas aeruginosa, S. aureus and Candida albicans*. Furthermore, this essential oil had inhibitory effects on human cancer cell lines, including cervical, pancreatic and ovarian cancer, indicating potential both antibacterial and cytotoxic properties (74, 75).The antimicrobial efficacy of *M. micrantha* is attributed primarily to the presence of various bioactive compounds, particularly sesquiterpene lactones such as mikanolide and deoxymikanolide, which play a central role by the action of flavonoids and phenolic compounds (76). Previous studies have shown that methanolic and ethyl acetate leaf extracts of *M. micrantha* showed antibacterial activity against Methicillin-Resistant *Staphylococcus aureus* (MRSA). The extracts produced inhibition zones of 12-20 mm at doses of 50-200 µg/mL. These results suggest that *M. micrantha* has dose-dependent efficacy and may serve as a potential natural antimicrobial agent (77).

**Antioxidant activities**

Previous researchers reported that the ethyl acetate extract of *M. micrantha* had strong antioxidant activity in various assays, including DPPH radical scavenging. The extract exhibited significant radical scavenging potential, with an IC50 value of 35 µg/mL, showing its effectiveness in neutralizing free radicals. The ABTS radical scavenging assay further confirmed this activity, showing a dose-dependent response with an IC50 of 40 µg/mL (78). These effects are attributed to the high phenolic content, free radical scavenging and reducing power, suggesting potential in managing oxidative stress and in nutraceutical/ pharmaceutical applications (79, 80). The leaves of *M. micrantha* were extracted using methanol and the extract was evaluated for its antioxidant activity. The extract showed strong antioxidant activity in the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay, with an $IC_{50}$ value of 41.8 µg/mL. This indicates that *M. micrantha* leaves are a potent natural source of antioxidants (81, 82).

**Anti-inflammatory**

In former studies the leaves of *M. micrantha* using 70 % aqueous ethanol extract, which showed the strongest effect, with an $IC_{50}$ value of 89.27 ± 0.01 µg/mL. These findings scientifically support their traditional use against inflammation and suggest their potential as valuable natural sources for the development of anti -inflammatory therapeutics (83). The ethyl acetate extract and it significantly suppressed RAGE expression in a dose-dependent manner, with up to 65-70 % inhibition at higher concentrations ($p < 0.01$) by inhibiting the (NF-κB) signaling in RAW 264.7 cells was reported earlier. The extracts also showed significant inhibitory effects on enzymes linked to inflammation, such as cyclooxygenase (COX), lipoxygenase (LOX), nitric oxide synthase (NOS), myeloperoxidase (MPO) and protease, indicating strong anti-inflammatory potential (84, 85).

**Anticancer/Cytotoxic activities**

The flower essential oil of *M. micrantha* significantly reduced cancer cell growth in a dose-dependent manner when tested at concentrations of 10-200 µg/mL using the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide (MTT) assay. The $IC_{50}$ values were 5.44 ± 1.33 µg/mL for HeLa cervical cancer cells and 10.57 ± 1.44 µg/mL for PA1 ovarian cancer cells, both falling within the biologically active range. These findings confirm the strong cytotoxic potential of the oil and suggest its promise as a natural source of anticancer compounds (58). The anticancer activities of silver nanoparticles (AgNPs) made with *M. micrantha* aqueous leaf extract and the synthesized silver nanoparticles have shown, respectively, dose-dependent reduction in viability of lung adenocarcinoma cells (86). Previous researchers have studied that the ethanol extract has demonstrated cytotoxic effects against multiple human tumor cell lines. Their $IC_{50}$ values ranged from 8.97 to 27.39 µM. The study confirmed that germacrane sesquiterpene dilactone from *M. micrantha* has dose-dependent cytotoxic activities (50, 87, 88)

**Table 3**. Pharmacological activities of *M. micrantha* with extract type, experimental model, and outcome

| Pharmacological Activities | Extract Type | Dose | Outcomes | Model use | Reference |
|---|---|---|---|---|---|
| Anticancer | Essential oil, Flower extract | $IC_{50}$ values ranged from 8.97 to 27.39 µM. | It reduced colonies, caspase-mediated apoptosis. | *In vitro* | (86) |
| Anti-bacterial | Leave extract, methanolic and ethyl acetate. | At doses of 50–200 µg/mL | It exhibits dose-dependent antimicrobial activity and may be a potential natural antimicrobial agent | *In vivo* | (77) |
| Antibacterial | Leave part, ethanol extract. | Inhibition at concentrations of 100 and 200 mg/mL | The antibacterial effect was moderately strong. | *In vitro* | (70) |
| Wound healing | Leave part, Cold Methanolic | | Enhanced proliferation, angiogenesis | *In vitro* | (35) |
| Wound healing | Leaf part Methanolic extract | At a dose of 2mg/kg body weight | It accelerates wound closure and improves tensile strength | *In vivo* | (35) |
| Antioxidant activities | Ethyl acetate | IC50 value of 35 µg/mL and IC50 of 40 µg/mL | DPPH radical scavenging and, ABTS radical scavenging. | *In vitro* | (79) |
| Anti-oxidant activities | Leaves part, Ethanol extract | An $IC_{50}$ value of 41.8 µg/Ml. | DPPH radical scavenging. | *In vitro* | (81) |
| Anti-inflammatory | Leaves part, aqueous extract | $IC_{50}$ value of 89.27 ± 0.01 µg/mL. | Its suggest their potential as valuable natural sources for the development | *In vivo* | (83) |
| Anti-inflammatory | Leave part, Ethyl acetate | With up to 65–70% inhibition at higher | It indicates the (NF-κB) signaling in RAW 264.7 cells | *In vitro* | (84) |
| Anthelmintic | Leave part, methanolic extract | - | It showed significant anthelmintic activity, dose-dependently paralysis and death of earthworms | *In vitro* | (81) |
| Antidepression | Leave Part, methanol extract | At doses of 200 mg/kg and 400 mg/kg body weight | Dose-dependent increase in mobility and also significantly reduced immobility times. | *In vivo* | (99) |
| Anti-antidiarrheal | Leave part, methanol Extract | | At 400 mg/kg body weight, MEMM significantly reduced diarrhea. | *In vivo* | (99) |
| thrombolytic activities | Leave Part, methanol Extract | At doses of 200 and 400 mg/kg body weight. | At 400 mg/kg, achieved ~43.76% clot lysis, promising thrombolytic activity. | *Ex-vivo* | (99) |
| Antifungal | Culture filtrate (aqueous) | At 2.0 mg/mL | It indicates clear inhibition zones around the actinomycete colony, and also shows showing strong antagonism | *In vitro* | (95) |
| Anti-hypercholesterolemic) activity | Stem part, ethyl acetate | At doses of 50, 100, and 200 mg/kg | Improved lipid profile Significant reduction cholesterol. Enzyme inhibition, Highest inhibition of HMG-CoA and ACAT2 activities, Reducing cholesterol biosynthesis and esterification. | *In vivo* | (97) |

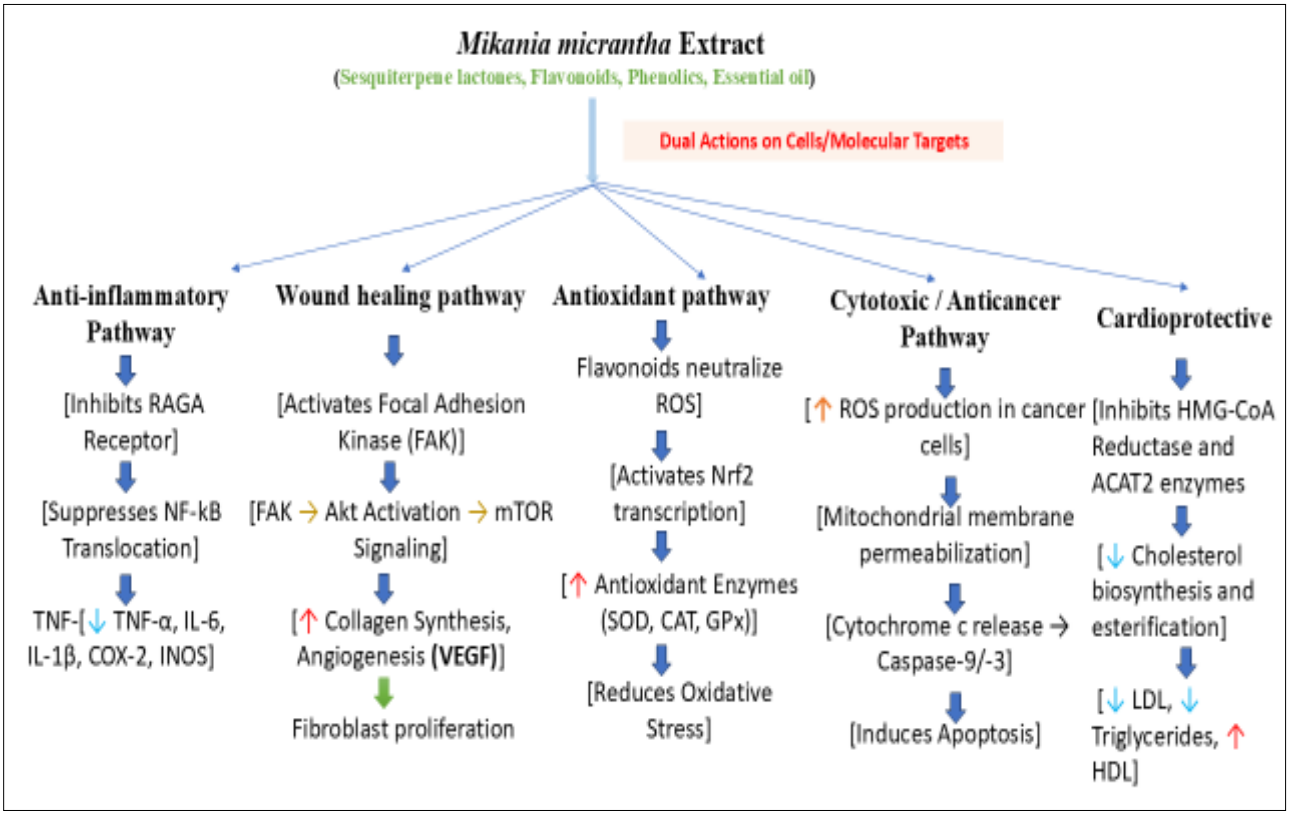


**Fig. 6**. Schematic representation of the mechanisms of action of *M. micrantha* extract (35).

**Wound healing activities**

The nanogel developed with *M. micrantha* leaf extract was evaluated in a hyperglycemic rat wound model, where diabetic wound rats were anesthetized through the intraperitoneal administration of ketamine at a dose of 2 mg/kg body weight. The treating wound closure was 93-95 % for 14 days, demonstrating strong diabetic wound healing potential (89). The wound- healing properties of the crude extract of *M. micrantha* were investigated, revealing a significant acceleration of wound healing even at lower doses (90). The mechanism involves the stimulation of collagen production, angiogenesis and modulation of the wound microenvironment. For instance, a self-adaptive hydrogel incorporating *M. micrantha* improved healing in chronic diabetic wounds by enhancing collagen synthesis and new blood vessel formation (91).

A study showed that the *M. micrantha* leaf juice extract indicates promising blood coagulation and good wound healing properties (92). According to a recent study, the focal adhesion kinase (FAK)/Akt/mTOR signaling pathway is activated by the cold methanolic extract of *M. micrantha extract* (MME), which improves cutaneous wound healing (35).

**Antifungal activities**

The atmosphere and surfaces always contain biological particles as well as inorganic gaseous and particulate contaminants. Among these particles are fungal species that inhabit nearly all ecosystems, including the human body (93).

In previous studies, the aerial parts of *M. micrantha* extract at 0.5-2.0 mg/mL and showed strong antifungal activity. At 2.0 mg/mL it completely inhibits the growth of *E. floccosum*, *M. canis*, *M. gypseum* and *T. rubrum* (15). The ethanolic extract of *M. micrantha* has been shown to exhibit antifungal activity, such as against *Candida albicans* and *Aspergillus niger*. Studies suggest that effective concentrations are generally higher, ranging between 100 µg/mL and 500 µg/mL. A minimum inhibitory concentration of around 250 µg/mL is frequently reported for fungal growth suppression (94, 95).

*Mikania micrantha* shows strong antifungal activity through its organic solvent extracts, especially the chloroform extract, which yielded active sesquiterpenes like mikanolide and deoxymikanolide, which inhibit the growth of pathogenic fungi such as *Fusarium*, *Rhizoctonia*, *Phytophthora* and *Pythium* while promoting beneficial biocontrol bacteria (*Pseudomonas*, *Catenulispora*, *Candidatus Entotheonella*) (6).

**Cardioprotective (Hypercholesterolemia)**

The primary symptom of hypercholesterolemia, a metabolic disease, is an increase in plasma- low density lipoprotein (LDL) cholesterol levels (96). Previous researchers studied that the ethyl acetate extract of *Mikania micrantha* stems (EAMMS) was administered to high-cholesterol-fed rats at doses of 50, 100 and 200 mg/kg. The extract significantly reduces cholesterol metabolism by inhibiting ACAT2 and HMGCR, resulting in decreased triglycerides (TG), total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C), along with an increase in high-density lipoprotein cholesterol (HDL-C). These effects are mediated through the inhibition of cholesterol biosynthesis, esterification and the antioxidant pathway (97).

**Neurological (Anti-depression)**

Depression can be defined as alterations of mood that might range from mild symptoms to severe mood disorders that can be expressed as delusions or hallucinations (98). The methanol extract of *M. micrantha* leaves significantly reduced the immobility time in the forced swim test (FST) and tail suspension test (TST). The extract was administered orally at doses of 200 mg/kg and 400 mg/kg body weight. The results demonstrated a dose-dependent reduction in immobility time, indicating significant antidepressant effects (99, 100). The underlying mechanisms may involve linalool, which can modulate the gamma-aminobutyric acid system (GABA) and quercetin, which may inhibit monoamine oxidase. Together, these effects may enhance serotonin, dopamine and noradrenaline signaling (101).

**Anti-helminthic**

Helminth infections are among the most prevalent in humans, impacting a significant portion of the global population. These parasitic diseases result in severe morbidity, particularly affecting individuals in endemic regions (102). The leaves *of M. micrantha* were extracted using methanol. The leaf decoction of *M. micrantha* exhibited significant anthelmintic effects against Indian earthworms (*Pheretima posthuma),* likely due to the presence of bioactive compounds such as flavonoids, tannins, alkaloids and glycosides. The time taken for the worms to become paralyzed and subsequently die was monitored (103, 81).

**Thrombolytic activity**

The methanolic leaf extract of *M. micrantha* exhibited significant *ex vivo* thrombolytic activity, effectively dissolving blood clots in a dose-dependent manner. The extract was administered orally to mice at doses of 200 mg/kg and 400 mg/kg body weight. It indicates that the thrombolytic potential was found to be comparable with that of streptokinase, suggesting that the extract may serve as a promising natural source for developing thrombolytic agents (99).

**Toxicological evaluation**

A study revealed that the acute oral toxicity study of the ethyl acetate fraction of *M. micrantha* was conducted in Swiss albino mice (*Mus musculus*). Based on the observations, the $LD_{50}$ was estimated to be approximately 2000 mg/kg. These findings suggest that the extract exhibits low acute toxicity and may cause mild to moderate adverse effects at higher doses (104). The toxicity test of the ethyl acetate fraction and volatile oil of *M. micrantha* was conducted on mouse skin to evaluate their safety for topical use. The results of the acute dermal toxicity study indicated that β-caryophyllene, a major constituent, did not exhibit any signs of acute toxicity, thereby supporting the potential safety of these compounds for external applications (105). The ethanol extract of *M. micrantha* leaves was orally administered to Swiss-Webster mice at doses of 250 mg/kg and 500 mg/kg body weight. The results showed no signs of acute toxicity at either dose, indicating the extract's safety at these tested levels (106). No signs of toxicity or mortality were observed in animals during the chronic toxicity study. The ethanolic extract of *Mikania micrantha* leaves is safe for long-term use. No signs of toxicity or mortality were observed in animals during the chronic toxicity study (101).

### Genetic diversity and modern biotechnology advancement

Previous studies using different genetic markers have shown that *M. micrantha* has a lot of genetic variation in southern China (28). More recent findings reveal that transposable elements (TEs) and epigenetic modifications, such as DNA methylation, play key roles in regulating gene activity and driving its rapid adaptation and invasiveness. These mechanisms highlight transposable elements and epigenetics as major contributors to the weed's adaptability and potential targets for biotechnological control (107). Modern biotechnology plays a significant role in understanding and mitigating the effects of *M. micrantha* on soil microbial communities (108). Functional genomics reveals how microbes adapt to the presence of *M. micrantha*, offering strategies to restore soil ecosystems (109). Genetic modification techniques hold promise for developing *M. micrantha*-resistant crops or for directly manipulating the weed's growth and reproduction (110).

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## Conclusion

In the present study, we have reviewed and analyzed the ethnopharmacological applications, phytochemical composition and pharmacological properties of *M. micrantha*. Extensive pharmacological investigation and traditional medicinal practices have revealed the presence of bioactive constituents such as flavonoids, phenolics, sesquiterpenoids and essential oils, which contribute to its wide range of therapeutic effects. However, clinical validation is required to translate laboratory findings into pharmacotherapeutic. Future research should focus on standardizing extracts, mechanisms of action and conducting in-depth toxicity and clinical trials. Clinical validation is urgently needed to translate *in vitro* potential into pharmacotherapeutics. Exploring developing novel formulations and investigating sustainable use strategies.

## Authors' contributions

DS carried out conceptualization, reviewing and editing. CN carried out original draft preparation and data collection. All authors read and approved the final manuscript.

## Compliance with ethical standards

**Conflict of interest:** Authors do not have any conflict of interest to declare.

**Ethical issues:** None

## References

1. Raka S, Mishu S, Rahman M, Rahman A. Assessment of phytochemical, cytotoxic, anthelmintic and thrombolytic activity of *Mikania micrantha* leaves: a new addition in phytomedicine. Pharmacologyonline. 2019;2019(1):246–55.
2. Liu B, Yan J, Li W, Yin L, Li P, Yu H, et al. *Mikania micrantha* genome provides insights into the molecular mechanism of rapid growth. Nat Commun. 2020;11:340. https://doi.org/10.1038/s41467-019-13926-4
3. Mai J, Liao L, Ling R, Guo X, Lin J, Mo B, et al. Study on RNAi-based herbicide for *Mikania micrantha*. Synth Syst Biotechnol. 2021;6 (4):437–45. https://doi.org/10.1016/j.synbio.2021.11.005
4. Pereira Feitosa LG, Monge M, Lopes NP, Rodrigues de Oliveira DC. Distribution of flavonoids and other phenolics in *Mikania* species (Compositae) of Brazil. Biochem Syst Ecol. 2021;97:104273. https://doi.org/10.1016/j.bse.2021.104273
5. Laurella LC, Cerny N, Bivona AE, Alberti AS, Giberti G, Malchiodi EL, et al. Assessment of sesquiterpene lactones isolated from *Mikania* species for their potential efficacy against *Trypanosoma cruzi* and *Leishmania* sp. PLoS Negl Trop Dis. 2017;11(9):e0005929. https://doi.org/10.1371/journal.pntd.0005929
6. Clements DR, Kato-Noguchi H. Defensive mechanisms of *Mikania micrantha* likely enhance its invasiveness as one of the world's worst alien species. Plants. 2025;14(2):269. https://doi.org/10.3390/plants14020269
7. Sheam M, Haque Z, Nain Z. Towards the antimicrobial, therapeutic and invasive properties of *Mikania micrantha* Knuth: a brief overview. J Adv Biotechnol Exp Ther. 2020;3(2):92–101. https://doi.org/10.5455/jabet.2020.d112
8. Astuti RI, Prastya ME, Batubara I, Budiarti E, Ilmiyawati A. Antiaging and antioxidant bioactivities of Asteraceae plant fractions on the cellular functions of the yeast *Schizosaccharomyces pombe*. Adv Pharmacol Pharm Sci. 2021;2021:2119634. https://doi.org/10.1155/2021/2119634
9. Della Pasqua CSP, Iwamoto RD, Antunes E, Borghi AA, Sawaya ACHF, Landucci ECT. Pharmacological study of anti-inflammatory activity of aqueous extracts of *Mikania glomerata* (Spreng.) and *Mikania laevigata* (Sch. Bip. ex Baker). J Ethnopharmacol. 2019;231:50–6. https://doi.org/10.1016/j.jep.2018.11.012
10. Bethu MS, Netala VR, Domdi L, Tartte V, Janapala VR. Potential anticancer activity of biogenic silver nanoparticles using leaf extract of *Rhynchosia suaveolens*: an insight into the mechanism. Artif Cells Nanomed Biotechnol. 2018;46(1):104–14. https://doi.org/10.1080/21691401.2017.1414824
11. Ghuman S, Ncube B, Finnie JF, McGaw LJ, Njoya EM, Coopoosamy RM, Van Staden J. Antioxidant, anti-inflammatory and wound healing properties of medicinal plant extracts used to treat wounds and dermatological disorders. S Afr J Bot. 2019;126:232–40. https://doi.org/10.1016/j.sajb.2019.07.013
12. Nawi SM, Misran MS, Maniyam MN. Effect of transforming growth factor-beta on excision wound healing process treated by *Mikania micrantha* extract cream. AIP Conf Proc. 2023;2625(1):020001. https://doi.org/10.1063/5.0129675
13. Baguingan SAB, Macadangdang RR, Bermejo JP, Bondoc PE, Cartina MLL, Liwa ANS, et al. Efficacy of *Mikania micrantha* extract against methicillin-resistant *Staphylococcus aureus*: a mini review. Asian J Biol Life Sci. 2021;10(2):281. https://doi.org/10.5530/ajbls.2021.10.40
14. Motaleb KZMA, Hasan MZ, Islam S, Karim FE, Mohasena, Islam MR, et al. A sustainable approach to develop antimicrobial composite film incorporating *Dalbergia reniformis* seed-derived microcrystalline cellulose and medicinal *Mikania micrantha* extract in PVA. Int J Biol Macromol. 2025;308(Pt 2):142580. https://doi.org/10.1016/j.ijbiomac.2025.142580
15. Swastini DA, Martien R, Fachiroh J, Nugroho AE. Ethnopharmacology and bioactive evidence of medicinal plants for wound healing in Indonesia: a scoping review. J Appl Pharm Sci. 2025;15(6):10–30. https://doi.org/10.7324/JAPS.2025.211952
16. Ishak AH, Shafie N, Me N, Bahari H, A I. From weed to medicinal plant: antioxidant capacities and phytochemicals of various

extracts of *Mikania micrantha*. Int J Agric Biol. 2018;20:561–8. https://doi.org/10.17957/IJAB/15.0522

17. Srivastav A, Srivastav Y, Hameed A, Ahmad MI. Prevention and cure of dermatology disorders using herbal medications: summary. Int J Indig Herbs Drugs. 2024;9(1):1–14. https://doi.org/10.46956/ijihd.v9i1.568
18. Ali Khan M, El-Kersh DM, Islam MS, Ara Khan S, Kamli H, Sarkar C, et al. *Mikania micrantha* Kunth: an ethnopharmacological treasure trove of therapeutic potential. Chem Biodivers. 2023;20 (11):e202300392. https://doi.org/10.1002/cbdv.202300392
19. Bora AR, Babu DS. Biology and distribution of the invasive alien weed *Mikania micrantha* – a review. Int J Curr Microbiol Appl Sci. 2021;10(3):2044–9.
20. Feng L, Hu L, Bo J, Ji M, Ze S, Ding Y, et al. Identification and biological characteristics of *Alternaria gossypina* as a promising biocontrol agent for the control of *Mikania micrantha*. J Fungi. 2024;10(10):691. https://doi.org/10.3390/jof10100691
21. Singh Yadav SP, Mehata DK, Pokhrel S, Ghimire NP, Gyawali P, Katel S, et al. Invasive alien plant species (Banmara): investigating its invasive potential, ecological consequences on biodiversity and management strategies. J Agric Food Res. 2024;15:101031. https://doi.org/10.1016/j.jafr.2024.101031
22. Chen L, Cai M, Chen M, Ke W, Pan Y, Huang J, et al. Genome-wide characterization of PIN auxin efflux carrier gene family in *Mikania micrantha*. Int J Mol Sci. 2022;23(17):10183. https://doi.org/10.3390/ijms231710183
23. Fadhilah RN, Koesdaryanto NS, Pribady TR, Restanta RAP, Nugroho GD, Yasa A. Ethnomedicinal knowledge of traditional healers on medicinal plants in Sukoharjo District, Central Java, Indonesia. Biodiversitas. 2023;24(8). https://doi.org/10.13057/biodiv/d240803
24. Day MD, Callander JT. The benefits and potential of pre-emptive weed biological control: three case studies in Queensland, Australia. Biol Control. 2024;198:105635. https://doi.org/10.1016/j.biocontrol.2024.105635
25. Day MD, Clements DR, Gile C, Senaratne WK, Shen S, Weston LA, Zhang F. Biology and impacts of Pacific Islands invasive species *Mikania micrantha* Kunth (Asteraceae). Pac Sci. 2016;70(3):257–85. https://doi.org/10.2984/70.3.1
26. Wang Z, Wang R, Sang Y, Wang T, Su Y, Liao W. Comparative analysis of mitochondrial genomes of invasive weed *Mikania micrantha* and its indigenous congener *Mikania cordata*. Int J Biol Macromol. 2024;281:136357. https://doi.org/10.1016/j.ijbiomac.2024.136357
27. Da Silva AB, Owiti A, Barbosa W. Pharmacology of *Mikania* genus: a systematic review. Pharmacogn Rev. 2018;12(24):230–7. https://doi.org/10.4103/phrev.phrev_10_18
28. Banerjee AK, Hou Z, Lin Y, Lan W, Tan F, Xing F, et al. Analysis of population structure reveals high gene flow shaping invasion pattern and inducing range expansion of *Mikania micrantha* in Asia. Ann Bot. 2020;125(7):1113–26. https://doi.org/10.1093/aob/mcaa044
29. Jivad N, Bahmani M, Asadi-Samani M. A review of the most important medicinal plants effective on wound healing on ethnobotany evidence of Iran. Pharm Lett. 2016;8(2):353–7.
30. Carrera-Fernández MC, Herrera-Martínez M, Ordaz-Hernández A, Arreaga-González HM. Medicinal plants from Mexico used in the treatment of scorpion sting. Toxicon. 2023;230:107172. https://doi.org/10.1016/j.toxicon.2023.107172
31. Tumpa NI, Chowdhury MHU, Asma AA. Deciphering the antimicrobial, antibiofilm and membrane stabilizing synergism of *Mikania scandens* (L.) Willd. leaves and stems: substantiation through *in vitro* and in silico studies. Biotechnol Rep. 2023;38:e00797. https://doi.org/10.1016/j.btre.2023.e00797
32. Bose D, Roy JG, Mahapatra SD, Datta T, Mahapatra SD, Biswas H. Medicinal plants used by tribals in Jalpaiguri district, West Bengal, India. J Med Plants Stud. 2015;3:15–21.
33. Khatun R, Rashid M, Alam A, Lee YI, Rahman MAA. Evaluation of comparative phenolic contents and antioxidant activity of *Mikania* species available in Bangladesh. Front Sci. 2020;10(1):1–6.
34. Khatun R, Nasrin L, Roy S, Tantry MA, Rahman MAA. Comparative antimicrobial evaluation of available *Mikania* species in Bangladesh. 2017;11(1):36–8.
35. Das G, Farhan M, Sinha S, Bora HK, Singh WR, Meeran SM. *Mikania micrantha* extract enhances cutaneous wound healing activity through the activation of FAK/Akt/mTOR cell signaling pathway. Injury. 2023;54(8):110856. https://doi.org/10.1016/j.injury.2023.110856
36. Lowe H, Steele B, Bryant J, Fouad E, Toyang N, Ngwa W. Antiviral activity of Jamaican medicinal plants and isolated bioactive compounds. Molecules. 2021;26(3):607. https://doi.org/10.3390/molecules26030607
37. Ishak AH, Shafie N, Me N, Bahari H. Nutritional, phytochemical and pharmacological properties of *Mikania micrantha* Kunth. Pertanika J Sch Res Rev. 2016;2:123–32.
38. Ishak AH, Shafie NH, Esa NM, Bahari H. Lipid and blood pressure lowering effects of *Mikania micrantha* through enzymatic inhibition. J Trop Life Sci. 2023;13(2):277–86. https://doi.org/10.11594/jtls.13.02.05
39. Zohmachhuana A, Tlaisun M, Vabeiryureilai M, Khawlhring L, Priya J. Suppression of the RAGE gene expression in RAW 264.7 murine leukemia cell line by ethyl acetate extract of *Mikania micrantha* (L.) Kunth. J Appl Biol Biotechnol. 2022;10(5):107–14. https://doi.org/10.7324/JABB.2022.100513
40. Kumar S, Kushari S, Gam S. Exploring ethnomedicinal plants for treating diverse skin ailments among tribal communities in Mizoram, India: insights from traditional healing practices. J Pharm Res Sci Technol. 2025;8(1):3332. https://doi.org/10.31531/jprst.1000177
41. Sharma HK, Chhangte L, Dolui AK. Traditional medicinal plants in Mizoram, India. Fitoterapia. 2001;72(2):146–61. https://doi.org/10.1016/S0367-326X(00)00278-1
42. Sheam M, Haque Z, Nain Z. Towards the antimicrobial, therapeutic and invasive properties of *Mikania micrantha* Knuth: a brief overview. J Adv Biotechnol Exp Ther. 2020;3(2):92. https://doi.org/10.5455/jabet.2020.d112
43. Maroyi A. Ethnopharmacology and therapeutic value of *Bridelia micrantha* (Hochst.) Baill. in tropical Africa: a comprehensive review. Molecules. 2017;22(9):1493. https://doi.org/10.3390/molecules22091493
44. James JM, Geethumol CU, Anilkumar A, Selvaraj G. Phytochemical screening, antibacterial and allelopathic effects of few invasive plants of Kerala. Plant Sci Today. 2018;5(4):175–81. https://doi.org/10.14719/pst.2018.5.4.408
45. Hashemian SMR, Farhadi T, Ganjparvar M. Linezolid: a review of its properties, function and use in critical care. Drug Des Devel Ther. 2018;12:1759–67. https://doi.org/10.2147/DDDT.S164515
46. Marchiosi R, dos Santos WD, Constantin RP, de Lima RB, Soares AR, Finger-Teixeira A, et al. Biosynthesis and metabolic actions of simple phenolic acids in plants. Phytochem Rev. 2020;19(4):865–906. https://doi.org/10.1007/s11101-020-09689-2
47. Li Y, Zeng YF, Wang ZY, Fan Y, Yang X, Wang Z, et al. Deoxymikanolide adversely alters physiology and ultrastructure of *Ralstonia solanacearum*. Pestic Biochem Physiol. 2021;174:104803. https://doi.org/10.1016/j.pestbp.2021.104803
48. Zhang LY, Ye WH, Cao HL, Feng HL. *Mikania micrantha* H.B.K. in China – an overview. Weed Res. 2004;44(1):42–9. https://doi.org/10.1111/j.1365-3180.2003.00371.x
49. Zhang Y, Zeng YM, Xu YK, Wu SQ, Li S, Tian HY, et al. New cadinane sesquiterpenoids from *Mikania micrantha*. Nat Prod Res. 2020;34 (19):2729–36. https://doi.org/10.1080/14786419.2019.1586691

50. Dong LM, Xu QL, Liu SB, Zhang SX, Liu MF, Duan JL, et al. Germacrane sesquiterpene dilactones from *Mikania micrantha* and their antibacterial and cytotoxic activity. Molecules. 2023;28(5):2119. https://doi.org/10.3390/molecules28052119

51. Dong LM, Jia XC, Luo QW, Peng YM, Zhang Q, Luo B, et al. Four new ent-kaurene diterpene glucosides from *Mikania micrantha*. Phytochem Lett. 2017;20:155–9. https://doi.org/10.1016/j.phytol.2017.04.029

52. Erenler R, Sen O, Aksit H, Demirtas I, Yaglioglu AS, Elmastas M, et al. Isolation and identification of chemical constituents from *Origanum majorana* and investigation of antiproliferative and antioxidant activities. J Sci Food Agric. 2016;96(3):822–36. https://doi.org/10.1002/jsfa.7155

53. Dong LM, Jia XC, Luo QW, Zhang Q, Luo B, Liu WB, et al. Phenolics from Mikania micrantha and their antioxidant activity. Molecules. 2017;22(7):1140. https://doi.org/10.3390/molecules22071140

54. Chen K, Zhang M, Bhandari B, Mujumdar AS. Edible flower essential oils: a review of chemical compositions, bioactivities, safety and applications in food preservation. Food Res Int. 2021;139:109809. https://doi.org/10.1016/j.foodres.2020.109809

55. Nguyen QT, Huynh Thi KL, Nguyen MP, Trinh T, Pham NT, Ho MN, et al. A comparative study on essential oils from the leaves and stems of Vietnamese *Mikania micrantha* Kunth. Nat Prod Res. 2025;39(1):66–72. https://doi.org/10.1080/14786419.2023.2251168

56. Saikia S, Tamuli KJ, Narzary B, Banik D, Bordoloi M. Chemical characterization, antimicrobial activity and cytotoxic activity of *Mikania micrantha* Kunth flower essential oil from North East India. Chem Pap. 2020;74(8):2515–28. https://doi.org/10.1007/s11696-020-01077-6

57. Vaglica A, Porrello A, Badalamenti N, Ilardi V, Bruno M. The chemical composition of the aerial parts essential oil of *Stachys ocymastrum* L. Briq. (Lamiaceae) growing in Sicily (Italy). Nat Prod Res. 2025;39(1):195–201. https://doi.org/10.1080/14786419.2023.2250515

58. Bouyahya A, Dakka N, Talbaoui A, Et-Touys A, El-Boury H, Abrini J, Bakri Y. Correlation between phenological changes, chemical composition and biological activities of the essential oil from Moroccan endemic oregano (*Origanum compactum* Benth). Ind Crops Prod. 2017;108:729–37. https://doi.org/10.1016/j.indcrop.2017.07.033

59. Yang Q, Cui W, Guan Z, Wang Z, Jahan I, Li P, et al. Influence of *Mikania micrantha* Kunth flavonoids on composition of soil microbial community. Int J Mol Sci. 2025;26(1):64. https://doi.org/10.3390/ijms26010064

60. Bordoloi M, Saikia S, Kolita B, Sarmah R, Roy S, Narzary B. Volatile inhibitors of phosphatidylinositol-3-kinase pathway: anticancer potential of aroma compounds of plant essential oils. Anti-Cancer Agents Med Chem. 2018;18(1):87–109. https://doi.org/10.2174/1871520617666170327105706

61. Pei L, Gao Y, Feng L, Zhang Z, Liu N, Yang B, et al. Phenolic acids and flavonoids play important roles in flower bud differentiation in *Mikania micrantha*: transcriptomics and metabolomics. Int J Mol Sci. 2023;24(23):16550. https://doi.org/10.3390/ijms242316550

62. Xu ML, Gao Y, Wang X, Han XX, Zhao B. Comprehensive strategy for sample preparation for the analysis of food contaminants and residues by GC–MS/MS: a review of recent research trends. Foods. 2021;10(10):2473. https://doi.org/10.3390/foods10102473

63. Singh G, Passari AK, Kumar NS, Kumar B, Nayak SC, Ram H, Singh BP. UPLC-ESI MS/MS- and GC–MS-based altitudinal variations in the bioactive potential of *Mikania micrantha* and *Ageratum houstonianum*. Appl Biochem Biotechnol. 2025;197(1):335–54. https://doi.org/10.1007/s12010-024-05005-2

64. Ma H, Chen Y, Chen J, Ji J, He H. Identification and comparison of allelopathic effects from leaf and flower volatiles of the invasive plant *Mikania micrantha*. Chemoecology. 2021;31(6):355–65. https://doi.org/10.1007/s00049-021-00356-2

65. Phom MC, Zhimomi BK, Imchen P, Sumi P, Sharma S, Yanthan K, et al. Biosynthesis of *Mikania micrantha* mediated silver nanoparticles: its application as a sustainable catalyst for Biginelli reaction and antioxidant capacity. J Organomet Chem. 2025;1025:123482. https://doi.org/10.1016/j.jorganchem.2024.123482

66. Sumantri I, Wahyuni H, Mustanti L, Mustanti L. Total phenolic, total flavonoid and phytochemical screening by FTIR spectroscopy of standardized extract of *Mikania micrantha* leaf. Pharmacogn J. 2020;12(6):1395–401. https://doi.org/10.5530/pj.2020.12.193

67. Das S, Dwivedi A, Tiwari V, Yadav V, Satpathy S, Mohapatra D, et al. Microwave-based rapid green synthesis of gold nanoparticles utilizing *Mikania micrantha* extract and evaluation of their biomedical properties. Waste Biomass Valor. 2025;16(4):1955–72. https://doi.org/10.1007/s12649-024-02787-8

68. Lalsangpuii F, Rokhum SL, Nghakliana F, Ruatpuia JVL, Tochhawng L, Trivedi AK, et al. *Mikania micrantha* silver nanoparticles exhibit anticancer activities against human lung adenocarcinoma via caspase-mediated apoptotic cell death. Artif Cells Nanomed Biotechnol. 2024;52(1):186–200. https://doi.org/10.1080/21691401.2024.2325942

69. Dalavi PA, V AJ, Thomas S, Prabhu A, Anil S, Seong GH, Venkatesan J. Microwave-assisted biosynthesized gold nanoparticles using *Saussurea obvallata*: biocompatibility and antioxidant activity assessment. BioNanoScience. 2022;12(3):741–51. https://doi.org/10.1007/s12668-022-00994-y

70. Kumar Pal P, Sarifujjaman M, Saha P, Rahman SM, Islam M, Ahmmad B, et al. Green synthesis of zinc oxide nanoparticles using Dillenia indica and *Mikania micrantha* leaf extracts: applications in photocatalysis and antibacterial activity. ChemistryOpen. 2024;13(12):e202400102. https://doi.org/10.1002/open.202400102

71. Li A, Hou X, Wei Y. Fast screening of flavonoids from switchgrass and *Mikania micrantha* by liquid chromatography hybrid-ion trap time-of-flight mass spectrometry. Anal Methods. 2018;10(1):109–22. https://doi.org/10.1039/C7AY02103H

72. Sarimah MN, Syahira JN, Hamidah AB, Maniyam MN, Rozila A. Antimicrobial activities of *Mikania micrantha* against *Propionibacterium acnes* and *Staphylococcus aureus*. AIP Conf Proc. 2023;2625(1):020002. https://doi.org/10.1063/5.0129676

73. Ali Khan M, El-Kersh DM, Islam MS, Ara Khan S, Kamli H, Sarkar C, et al. *Mikania micrantha* Kunth: an ethnopharmacological treasure trove of therapeutic potential. Chem Biodivers. 2023;20(11):e202300392. https://doi.org/10.1002/cbdv.202300392

74. Ghosh J, Hasan Z, Chakrabortty A. Development of antimicrobial and wound healing properties on cotton medical bandage by using the extract of eco-friendly herbs. J Inst Eng India Ser E. 2021;102(1):75–86. https://doi.org/10.1007/s40034-020-00199-6

75. Neog R, Kola N. *In vitro* antimicrobial screening of methanolic extract of *Mikania micrantha* and *Drymaria cordata* against Staphylococcus aureus and its textile application. Mater Today Proc. 2021;42:916–20. https://doi.org/10.1016/j.matpr.2020.11.835

76. Islam MA, Begum HA, Shahid MA, Ali A. Antibacterial electrospun nanofibers from poly (vinyl alcohol) and *Mikania micrantha* with augmented moisture properties: formation and evaluation. J Text Inst. 2021;112(10):1602–10. https://doi.org/10.1080/00405000.2020.1831167

77. Baguingan SAB, Macadangdang RR Jr, Bermejo JP, Bondoc PE, Cartina MLL, Liwa ANS, et al. Efficacy of *Mikania micrantha* extract against methicillin-resistant *Staphylococcus aureus*: a mini review. Asian J Biol Life Sci. 2021;10(2):281. https://doi.org/10.5530/ajbls.2021.10.40

78. Zohmachhuana A, Tlaisun M, Vabeiryureilai M, Khawlhring L, Priya J. Suppression of the RAGE gene expression in RAW 264.7 murine leukemia cell line by ethyl acetate extract of *Mikania micrantha* (L.) Kunth. J Appl Biol Biotechnol. 2022;10(5):107–14. https://doi.org/10.7324/JABB.2022.100513

79. Dong LM, Jia XC, Luo QW, Zhang Q, Luo B, Liu WB, et al. Phenolics from *Mikania micrantha* and their antioxidant activity. Molecules. 2017;22(7):1140. https://doi.org/10.3390/molecules22071140

80. Al-Hussaniy HA, Mohammed ZN, Alburghaif AH, Naji MA. Panax ginseng as antioxidant and anti-inflammatory to reduce the cardiotoxicity of doxorubicin on rat model. Res J Pharm Technol. 2022;15(10):4594–600. https://doi.org/10.52711/0974-360X.2022.00771

81. Dev UK, Hossain MT, Islam MZ. Phytochemical investigation, antioxidant activity and anthelmintic activity of *Mikania micrantha* leaves. World J Pharm Res. 2015;4(5):121–33.

82. Rana S, Sharma N, Dutt S, Patil RD. Hepatoprotective effects of *Carissa spinarum* extract on carbon tetrachloride-induced liver damage in zebrafish (*Danio rerio*). Med Pharm J. 2023;2(4):206–20. https://doi.org/10.55940/medphar202362

83. Datta S, Bhattacharjee S, Seal T. Anti-diabetic, anti-inflammatory and antioxidant properties of four underutilized ethnomedicinal plants of West Bengal, India: an *in vitro* approach. S Afr J Bot. 2022;149:768–80. https://doi.org/10.1016/j.sajb.2022.06.029

84. Zohmachhuana A, Tlaisun M, Vabeiryureilai M, Khawlhring L, Priya J. Suppression of the RAGE gene expression in RAW 264.7 murine leukemia cell line by ethyl acetate extract of *Mikania micrantha* (L.) Kunth. J Appl Biol Biotechnol. 2022;10(5):107–14. https://doi.org/10.7324/JABB.2022.100513

85. Kang E, Lee J, Seo S, Uddin S, Lee S, Han SB, et al. Regulation of anti-inflammatory and antioxidant responses by methanol extract of *Mikania cordata* (Burm. f.) B.L. Rob. leaves via inactivation of NF-κB and MAPK signaling pathways and activation of Nrf2 in LPS-induced RAW 264.7 macrophages. Biomed Pharmacother. 2023;168:115746. https://doi.org/10.1016/j.biopha.2023.115746

86. Lalsangpuii F, Rokhum SL, Nghakliana F, Ruatpuia JVL, Tochhawng L, Trivedi AK, et al. *Mikania micrantha* silver nanoparticles exhibit anticancer activities against human lung adenocarcinoma via caspase-mediated apoptotic cell death. Artif Cells Nanomed Biotechnol. 2024;52(1):186–200. https://doi.org/10.1080/21691401.2024.2325942

87. Al-hussaniy HA, Al-Shammari AH, Sameer HN, Oraibi AI. The relationship between statin therapy and adipocytokine/inflammatory mediators in dyslipidemic nondiabetic patients: a comparative study. Pharmacia. 2023;70:581–5. https://doi.org/10.3897/pharmacia.70.e109800

88. Al-Hussaniy HA, Al-Tameemi Z, Al-Zubaidi B, Oraibi AI, Naji FA, Kilani S. Pharmacological properties of *Spirulina* species: hepatoprotective, antioxidant and anticancer effects. Farmacia. 2023;71(4):670–8. https://doi.org/10.31925/farmacia.2023.4.2

89. Sumantri IB, Ismayadi N, Mustanti LF. The potency of wound healing of nanogel containing *Mikania micrantha* leaves extract in hyperglycemic rats. Pharm Nanotechnol. 2021;9(5):339–46. https://doi.org/10.2174/2211738509666211209164105

90. Mat Nawi S, Shareef SH, Maniyam MN, Anuar NK, Abdulla MA. Acceleration of wound healing potential of *Mikania micrantha* on experimentally induced excision wounds in rats. 2024;25. https://doi.org/10.2139/ssrn.4696818

91. Shao Z, Yin T, Jiang J, He Y, Xiang T, Zhou S. Wound microenvironment self-adaptive hydrogel with efficient angiogenesis for promoting diabetic wound healing. Bioact Mater. 2023;20:561–73. https://doi.org/10.1016/j.bioactmat.2022.06.018

92. Alam S, Akter S, Rahman L. *Mikania micrantha* mixed woven fabric for quick blood clotting and wound healing. J Text Eng Fash Technol. 2020;6. https://doi.org/10.15406/jteft.2020.06.00252

93. Oliveira M, Oliveira D, Lisboa C, Boechat JL, Delgado L. Clinical manifestations of human exposure to fungi. J Fungi. 2023;9(3):381. https://doi.org/10.3390/jof9030381

94. Sarimah MN, Syahira JN, Hamidah AB, Maniyam MN, Rozila A. Antimicrobial activities of *Mikania micrantha* against *Propionibacterium acnes* and *Staphylococcus aureus*. AIP Conf Proc. 2023;23(1):020002. https://doi.org/10.1063/5.0129676

95. Han D, Wang L, Luo Y. Isolation, identification and the growth-promoting effects of two antagonistic actinomycete strains from the rhizosphere of *Mikania micrantha* Kunth. Microbiol Res. 2018;208:1–11. https://doi.org/10.1016/j.micres.2018.01.003

96. Adekiya TA, Shodehinde SA, Aruleba RT. Anti-hypercholesterolemic effect of unripe Musa paradisiaca products on hypercholesterolemia-induced rats. J Appl Pharm Sci. 2018;8(10):90–7. https://doi.org/10.7324/JAPS.2018.81012

97. Ibrahim A, Shafie NH, Mohd Esa N, Shafie SR, Bahari H, Abdullah MA. Mikania micrantha extract inhibits HMG-CoA reductase and ACAT2 and ameliorates hypercholesterolemia and lipid peroxidation in high cholesterol-fed rats. Nutrients. 2020;12(10):3077. https://doi.org/10.3390/nu12103077

98. Perrotta G. Psychotic spectrum disorders: definitions, classifications, neural correlates and clinical profiles. Ann Psychiatry Treat. 2020;4(1):70–84.

99. Ali MH. A study of *in-vivo* antidepressant, antidiarrheal and ex-vivo thrombolytic activities of methanol extract of *Mikania micrantha* leaves. IIUC Stud. 2023;20(1):87–108. https://doi.org/10.3329/iiucs.v20i1.69051

100. Siciliano V, Nista EC, Rosà T, Brigida M, Franceschi F. Clinical management of infectious diarrhea. Rev Recent Clin Trials. 2020;15(4):298–308. https://doi.org/10.2174/1574887115666200628144128

101. Su'aida N, Hasniah H, Mardiana L. Anxiolytic and anti-depressant activities of ethanol extract of *Mikania micrantha* Kunth leaves in mice. Trop J Nat Prod Res. 2023;7(11):5216–20. https://doi.org/10.26538/tjnpr/v7i11.27

102. Mayer AMS, Guerrero AJ, Rodríguez AD, Taglialatela-Scafati O, Nakamura F, Fusetani N. Marine pharmacology in 2014–2015: marine compounds with antibacterial, antidiabetic, antifungal, anti-inflammatory, antiprotozoal, antituberculosis, antiviral and anthelmintic activities; affecting the immune and nervous systems and other miscellaneous mechanisms of action. Mar Drugs. 2020;18(1):5. https://doi.org/10.3390/md18010005

103. Ikbal AMA, Rajkhowa A, Singh PC, Choudhury PD, Sahu RK. Assessment of phytochemical and anthelmintic activity of some selected ethnomedicinal plants from Barak Valley region of Assam. Biomed Pharmacol J. 2020;13(4):1825–31. https://doi.org/10.13005/bpj/2057

104. Yulion R, Perawati S, Hartesi B, Anggresani L, Andriani L, Indriani L, et al. Acute toxicity LD50 fraction ethyl acetate *Aquilaria malaccensis*, *Ficus benjamina*, *Mikania micrantha* and fraction water *Cinnamomum burmanii* in *Mus musculus*. Biol Med Nat Prod Chem. 2023;12(1):55–60. https://doi.org/10.14421/biomedich.2023.121.55-60

105. Cheng Q, Lyu B, Hu J, Zhang Z, Huang Y, Wang Z. Research on the antipruritic active ingredients of *Mikania micrantha*. Fitoterapia. 2024;174:105837. https://doi.org/10.1016/j.fitote.2024.105837

106. Soares GA, Bhattacharya T, Chakrabarti T, Tagde P, Cavalu S. Exploring pharmacological mechanisms of essential oils on the central nervous system. Plants. 2021;11(1):21. https://doi.org/10.3390/plants11010021

107. Su Y, Huang Q, Wang Z, Wang T. High genetic and epigenetic variation of transposable elements: potential drivers to rapid adaptive evolution for the noxious invasive weed *Mikania micrantha*. Ecol Evol. 2021;11(19):13501–17. https://doi.org/10.1002/ece3.8075

108. Zhang D, Zhao M, Li Q, Guo J, Zhang H, Liu W, et al. *Mikania micrantha* stimulates microbial functional groups in soil: a mini-review. Rhizosphere. 2024;30:100919. https://doi.org/10.1016/j.rhisph.2024.100919

109. Yin L, Liu B, Wang H, Zhang Y, Wang S, Jiang F. The rhizosphere microbiome of *Mikania micrantha* provides insight into adaptation

and invasion. Front Microbiol. 2020;11:1462. https://doi.org/10.3389/fmicb.2020.01462

110. Jalil SU, Ansari MI. Role of nanomaterials in weed control and plant disease management. In: Nanomaterials for agriculture and forestry applications. Micro Nano Technol. 2020;421–34. https://doi.org/10.1016/B978-0-12-817852-2.00017-2

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