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TECOMA STANS (L.) JUSS. EX KUNTH: AN INTEGRATIVE REVIEW OF PHYTOCHEMISTRY, PHARMACOLOGICAL ACTIVITIES, AND THERAPEUTIC PROSPECTS

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ABSTRACT
Tecoma stans (L.) Juss. ex Kunth, commonly known as yellow trumpet flower, is a medicinal plant widely distributed in tropical and subtropical regions. It has been traditionally used for the treatment of various ailments, including diabetes, infections, and inflammatory disorders. The plant contains a wide range of bioactive phytochemicals such as alkaloids, flavonoids, phenolic compounds, and terpenoids that contribute to its diverse pharmacological properties. Several experimental studies have demonstrated significant biological activities of *Tecoma stans*, including antidiabetic, antimicrobial, anti-inflammatory, hepatoprotective, anticancer, antioxidant, and anti-arthritic effects. These pharmacological activities have been investigated through both in vitro and in vivo models, supporting the traditional uses of the plant. The present review aims to summarize the available literature on the phytochemical composition and pharmacological activities of *Tecoma stans*. Understanding the therapeutic potential of this plant may contribute to the development of novel plant-based drugs. However, further studies, particularly clinical trials, are necessary to confirm its safety and efficacy in humans.

KEYWORDS: *Tecoma stans*, Phytochemicals, Hypoglycemic Agents, Anti-Inflammatory Agents, Pharmacology.

INTRODUCTION

Medicinal plants have long been used in traditional medicine, and they continue to be a source of new drugs, particularly as researchers explore their potential to address chronic illnesses and provide alternatives to synthetic medications. Globally, herbal remedies are still frequently used for primary healthcare. The use of herbal remedies has become more popular due to the prevalence of chronic illnesses, the cost of synthetic medications, and their side effects.[1] In this review, we aim to consolidate existing research on *Tecoma stans* and capture its botanical properties, traditional uses, chemical composition, and pharmacological properties to provide a comprehensive reference for researchers. *Tecoma stans* (L.) Juss. ex Kunth is a flowering shrub or small tree in the Bignoniaceae family that also goes by the names yellow trumpet bush and yellow bells. It is easily distinguished by its bright yellow trumpet-shaped flowers and pinnately compound leaves. *Tecoma stans* is a native species of Central and South America but has been distributed and naturalized in tropical and subtropical areas around the world, including India.[2,3] However, *Tecoma stans* is well-known for its traditional medicinal uses, regardless of its aesthetic value. Several plant parts, including the leaves, flowers, bark, and roots, are used in traditional medicine to treat diabetes, digestive issues, infections, inflammation, and pain. The plant's traditional medicinal uses demonstrate its therapeutic value and motivate researchers to look into its potential benefits.[4] *Tecoma stans* phytochemical analysis reveals the presence of abundant secondary metabolites, including alkaloids, flavonoids, phenolics, terpenoids, and fatty acids. Compounds identified in plants are believed to be responsible for the plant's various biological activities[5] . As we search for the scientific evidence, it supports the traditional use of the plant and also confirms its antioxidant, antimicrobial, antidiabetic, anti-inflammatory, and hepatoprotective properties.[6] Even though several studies have reported the pharmacological activities and phytochemical

constituents of *Tecoma stans*, the available information is scattered across different scientific reports. A comprehensive review compiling the phytochemistry and therapeutic potential of this plant is therefore essential. The present review aims to summarize the botanical description, phytochemical constituents, and various pharmacological activities of *Tecoma stans* based on available scientific literature.

TAXONOMICAL CLASSIFICATION[7]

Kingdom : Plantae
Division : Tracheophyta
Class : Magnoliopsida
Order : Lamiales
Family : Bignoniaceae
Genus : *Tecoma*
Species : *stans*
Scientific name : *Tecoma stans* (L.) Juss. ex Kunth

Vernacular name
Hindi – Piliya/ Pila kaner
English – Yellow bells
Kannada – Koranekelar
Tamil – Sonnapatti
Telugu – Pachagotla
Bengali – Chandaprabha
Marathi – Ghanti ful

MORPHOLOGICAL CHARACTERS[4]

Tecoma stans is a medium-growing shrub that remains green or occasionally drops its leaves. It normally grows 1.5-7.5 m tall and 1-2.6 m wide. It initially has smooth, light-colored stems at the base, which eventually turn into light-gray, grooved bark. The leaves are compound with 5-13 leaflets that have teeth along the margins. The leaflets are positioned in opposition to one another (except for the last one) and measure 5-8 cm long and 4 cm wide on short petioles. The flowers are yellow and tubular, 4-5 cm long, with orange to red stripes on the inside. They occur in dense clusters (racemes) of up to 50 flowers, which can sometimes weigh down the branches. In the Indian subcontinent, *Tecoma stans* flowers mostly during autumn and briefly during spring. It is a key source of nectar for bees, hummingbirds, and butterflies. The fruit is a bean-shaped capsule with two parts, measuring 10-25 cm long. It has 10–20 seeds per locule and is initially green before turning brown as it ripens. The capsules open, allowing papery, winged seeds to be carried away by the wind (Figure 1).


[A]


[B]


[C]


[D]

Figure 1: Morphological features of *Tecoma stans* (L.) Juss. ex Kunth (Bignoniaceae): [A] plant, [B] flower, [C] leaves, [D] seed pods. Source: iNaturalist (CC0 public domain license).

GEOGRAPHICAL DISTRIBUTION[8]

Tecoma stans, also known as Yellow Bells, has a broad geographic range that includes several introduced regions worldwide as well as its main native habitats in the Americas. As a native plant of the Western Hemisphere's tropical and subtropical regions, its geographical distribution ranges from the southern United States (Arizona, Florida, New Mexico, and Texas) to Mexico, Central America, and the Caribbean Islands. It is also found in South America, specifically in Colombia, Venezuela, Peru, Bolivia, and the northern part of Argentina. *Tecoma stans* is native to wet tropical environments; however, the plant is adaptable to a wide range of ecological zones.

Apart from its native regions, *Tecoma stans* has spread globally, owing to its ornamental value and a variety of medicinal applications. *Tecoma stans*, an introduced species, is found throughout Africa, with a strong presence ranging from Ethiopia and Eritrea in the east to Gambia and Guinea in the west. It can also be found in many South African provinces. *Tecoma stans* was introduced to Asia and has since become naturalized in India, Pakistan, Bangladesh, and Myanmar. The plant is also widely distributed throughout the Pacific region, including island chains such as Hawaii, the Cook Islands, and French Polynesia.

While reviewing the geographical spread of *Tecoma stans*, it is important to note that the plant's key characteristics that allow it to thrive and be quite resilient have also contributed to the plant's status as an invasive species in a number of regions where it has been introduced. As a result, *Tecoma stans'* geographical profile is no longer determined by its native Neotropical regions; instead, the plant is regarded as a cosmopolitan invasive species with significant ornamental value and ecological problems all over the world (Figure 2).

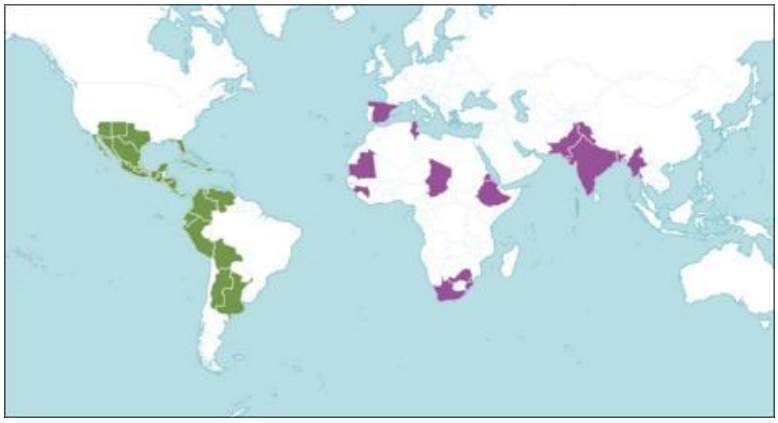

Figure 2: Global distribution of *Tecoma stans*. Green: Native range. Purple: Introduced and naturalized regions. Source: POWO/Kew Science.

ETHNOMEDICINAL USES

Traditional and folk medicine have long made use of *Tecoma stans*. Notably, one of the traditional uses of *T. stans* is the treatment of diabetes mellitus. In many cultures, various plant parts—such as leaves, flowers, bark, and roots—have been used either by themselves or in combination with other plant parts to treat a variety of medical conditions.[4,9,10]

The tea or infusion prepared from the leaves of *T. stans* has been used in traditional medicine in Mexico and Central America to treat diabetes and reduce the symptoms associated with diabetes. *T. stans* has also been used in traditional medicine in India to treat diabetes, inflammation, gastrointestinal disorders, skin diseases, and wounds. The leaves and flowers have been used to make aqueous or alcohol-based extracts that are ingested to treat various health conditions.[4,11]

Ethnomedicinal studies from Bangladesh and other parts of South Asia have documented *T. stans'* traditional use in the treatment of liver diseases, pain, and infections. *T. stans* has traditionally been used to treat various health conditions due to its anti-inflammatory, analgesic, antimicrobial, and wound-healing properties, which have been supported by the results of scientific studies.[10,12] *T. stans* has been supported by science due to its ethnomedicinal uses (Table 1)

Table 1: Ethnomedicinal Uses of *Tecoma stans.*

Plant part	Traditional uses	Region/Community	References
Leaves	Diabetes mellitus, Hypoglycemic agent	Mexico, India	[4,9]
Leaves	Anti-inflammatory, Analgesic	India	[11]
Flowers	Diabetes, wound healing	India	[4,13]
Bark	Wound healing, skin diseases	India	[14]
Root	Gastrointestinal disorders	Central America	[9,10]
Whole plant	Antimicrobial, liver disorders	Bangladesh	[10,12]

CHEMICAL CONSTITUENTS

Phytochemical investigations of *Tecoma stans* have revealed the presence of several bioactive compounds including alkaloids, flavonoids, phenolic compounds, glycosides, tannins, and terpenoids, which are responsible for its diverse pharmacological activities (Table 2).

Table 2: Chemical constituents of *Tecoma stans*.

Class of compound	Identified compound(s)	Plant part	Extraction method	Reference
Alkaloids	Tecomine	Fruits/flowers	Aqueous/methanol	[15,16]
	5-Hydroxyskytanthine	Fruits/fruits	Ethanol/aqueous	[16,17]
	Tecostanine	Leaves	diethyl ether	[18]
	*Tecoma*nine	Fruits	ethanol	[19,20]
	Tecostidine	Root, leaves, and twigs	methanol or ethanol	[21]
Phenolic compounds	Ferulic acid	Flowers/Leaves	methanol/methanol	[16,19]
	Chlorogenic acid	Leaves/Leaves	hydroethanolic/methanol	[19,20]
	Cinnamic acid	Leaves/Leaves	hydroethanolic/methanol	[20,21]
	Gallic acid	Leaves/Leaves	hydroethanolic/methanol	[19,20]
	Caffeic acid	Leaves/Leaves	hydroethanolic/methanol	[19,20]
Flavonoids	7-Hydroxyflavone	Leaves	methanol	[19]
	Luteolin	Leaves	hydroethanolic	[20]
	Apigenin	Leaves/Leaves	hydroethanolic/methanol	[15,19]
	Kaempferol	Leaves/Leaves	hydroethanolic/methanol	[19,20]
	Quercetin	Leaves/Leaves	hydroethanolic/methanol	[19,20]
	Rutin	Flowers/Fruits/ Leaves	alcohol/ethanol/methanol	[15,19,22]
Glycosides	Verbascoside	Leaves/Flower, fruit	Hydroethanolic/ethanol	[15,20]
	Hesperetin	Leaves	methanol	[19]
	Plantarenaloside	Leaves	chloroform, methanol	[23]
	5-Deoxy*stans*ioside	Leaves	chloroform, methanol	[23]
carotenoids	β-carotene	Flowers	ethanol	[24]
	Zeaxanthin	Flowers	aqueous	[25]
Steroids	β-Sitosterols	Leaves	Hydroethanolic	[20]

PHARMACOLOGICAL PROPERTIES

Scientific studies have confirmed some of the traditional claims about *Tecoma stans*. The pharmacological properties of *Tecoma stans* can be explained based on the diverse phytochemical content, such as alkaloids, flavonoids, and phenolic compounds.

Anti-diabetic activity

Tecoma stans aqueous extract (TAE) antidiabetic and antihyperlipidemic properties have been systematically studied using both in vitro and in vivo models; the plant extract's mechanism of action has been determined to be the inhibition of α-glucosidase. The oral administration of TAE dramatically decreased the hyperglycemic peaks in starch tolerance tests in both normal and streptozotocin-induced diabetic male Sprague-Dawley rats. This effect was similar to that of acarbose, an inhibitor of α-glucosidase. *TAE*, on the other hand, did not significantly alter glucose tolerance tests or fasting blood glucose levels. This implies that insulin and glucose absorption are not necessary for the aqueous extract of *Tecoma stans* to have an antihyperglycemic effect. In vitro studies using rat intestinal brush border membrane preparations displayed a dose-dependent inhibition of glucose release from starch. α-glucosidase inhibition was the cause of this effect. In a different study, streptozotocin-induced diabetic rats' serum triglyceride and cholesterol levels were lowered by sub-chronic oral administration of TAE (500 mg/kg/day for 21 days). Blood glucose levels during fasting were unaffected. A high concentration of phenolic compounds, particularly chlorogenic acid, which is known to contribute to α-glucosidase inhibition and hyperlipidemia, was found in the aqueous extract of *Tecoma stans*, according to phytochemical analysis.

These results imply that *Tecoma stans* is helpful in the treatment of type 2 diabetes mellitus and that the antidiabetic effect of its aqueous extract is mediated through the inhibition of α-glucosidase, which is in charge of the attenuation of postprandial hyperglycemia.[9]

Tecoma stans' anti-diabetic properties have been shown to improve fat cells' utilization of glucose, both with and without insulin. To assess *Tecoma stans'* function in glucose uptake and fat cell formation, researchers examined its effects on human preadipocytes and mouse 3T3-F442A adipocytes. Using the fluorescent glucose analog 2-NBDG, the results showed that *Tecoma stans* significantly increased glucose uptake in both insulin-sensitive and insulin-resistant adipocytes, indicating improved glucose utilization in fat cells. *Tecoma stans* may use insulin-sensitizing action rather than forcing the

release of insulin, as evidenced by the increase in glucose uptake seen in the absence of insulin.

Increased lipid accumulation and levels of adipogenic markers, which are linked to glucose metabolism in fat cells, indicate that *Tecoma stans* stimulated adipocyte differentiation. *Tecoma stans* has a significant influence on glucose metabolism in fat cells, as evidenced by instances where its effect on glucose uptake was similar to that of insulin. The impact of *Tecoma stans* was observed in both normal and insulin-resistant fat cells, indicating its potential to treat insulin resistance and type 2 diabetes. The extract is safe to use in the suggested dosages because the results were not linked to toxicity.

According to the current study, *Tecoma stans* has anti-diabetic activity that increases the uptake of glucose in fat cells. This mechanism differs from intestinal α-glucosidase enzyme inhibition, which is a common mechanism in anti-diabetic medications. *Tecoma stans* may act as a multitarget anti-diabetic medication additionally to its conventional use in the treatment of diabetes, according to this additional mechanism of action.[26]

The ethanolic extract of *Tecoma stans* demonstrated major protective effects against diabetic cardiomyopathy and apoptosis in diabetic rats, demonstrating the cardioprotective potential of *Tecoma stans* in diabetes in a streptozotocin-induced diabetic cardiomyopathy model.

Male Wistar rats were given streptozotocin (45 mg/kg) intraperitoneally to induce diabetes, and the water-soluble fraction of the ethanolic extract of *Tecoma stans* was given orally to diabetic rats at a dose of 120 mg/kg body weight. Increased blood pressure, heart rate, blood glucose, triglycerides, cholesterol, apolipoprotein B, lactate dehydrogenase, lipid peroxidation, caspase-3 activity, and DNA fragmentation, as well as decreased Na+/K+ ATPase and superoxide dismutase activity in the diabetic rats' hearts, demonstrated significant changes in hemodynamics, lipid metabolism, blood glucose, oxidative stress, and apoptosis in the heart. Blood pressure, heart rate, blood glucose, triglycerides, cholesterol, apolipoprotein-B, lactate dehydrogenase, lipid peroxidation, caspase-3 activity, and DNA fragmentation were all considerably reduced in diabetic rats treated with the ethanolic extract of *Tecoma stans*.

Additionally, the rats' hearts showed increased activity of Na+/K+ ATPase and superoxide dismutase. Reduced caspase-3 activity and the lack of DNA laddering in the diabetic rats' hearts demonstrated that the ethanolic extract of *Tecoma stans* significantly inhibited apoptosis in the diabetic rats' hearts, suggesting a potent anti-apoptotic effect of *Tecoma stans* in diabetic cardiomyopathy. *Tecoma stans'* cardioprotective effect in diabetic cardiomyopathy was further supported by elevated Na+/K+ ATPase activity in the hearts of diabetic rats. In diabetic rats, the ethanolic extract of *Tecoma stans*, which contains a variety of phytoconstituents like alkaloids, glycosides, saponins, steroids, and phenolic compounds, showed notable protective effects against diabetic cardiomyopathy. This suggests that *Tecoma stans* significantly protects against diabetic cardiomyopathy by inhibiting oxidative stress and metabolic abnormalities.[27]

Tecoma stans' antihyperlipidemic and hypoglycemic properties were thoroughly examined in lean and obese rat models to determine its capability for treating metabolic disorders. *Tecoma stans* ethanolic extract was given orally to lean and obese fatty rats at doses of 125 and 250 mg/kg for both short-term and long-term treatment regimens (up to 5 weeks). Triglyceride, total cholesterol, and LDL cholesterol levels were found to be significantly higher in obese rats than in lean rats. When *Tecoma stans* was given orally to obese rats at a dose of 250 mg/kg, serum triglyceride, total cholesterol, and LDL cholesterol levels were significantly reduced by 39%, 25%, and 45%, respectively, while HDL cholesterol levels remained unchanged. Chronic administration also showed a marked reduction in postprandial hypertriglyceridemia and olive oil-induced hyperglycemia. *Tecoma stans* dramatically lowered blood glucose levels in obese rats 120 minutes after a glucose challenge, according to oral glucose tolerance tests, but had no effect on lean rats. These findings imply that in insulin-resistant obese rats, *Tecoma stans* enhances insulin receptor sensitivity. In vitro tests were also used to confirm the α-glucosidase inhibitory activity, and *Tecoma stans* extract showed a lower IC50 than acarbose. Additionally, histopathological analyses of rats given *Tecoma stans* extract showed no significant toxicological effects on critical organs. *Tecoma stans* extract-treated obese rats also exhibited improved hepatic and vascular histopathology. These findings imply that *Tecoma stans* has significant hypoglycemic and antihyperlipidemic properties that could be advantageous in the treatment of type 2 diabetes.[28]

Anticancer activity

The highly metastatic and triple-negative human breast cancer cell line MDA-MB-231 was employed to examine the anticancer activity of *Tecoma stans* using methanolic extracts of the leaves and flowers. Gas chromatography-mass spectrometry (GC-MS), which demonstrated the existence of bioactive compounds with the potential for pharmacological activity, was employed to determine the bioactive substances found in the methanolic extracts.

The trypan blue exclusion assay was used to determine the methanolic extracts' cytotoxicity. At 800 µg/mL, the methanolic leaf extract was significantly more cytotoxic than the methanolic flower extract. However, using the MTT assay, the flower's methanolic extract demonstrated strong antiproliferative activity on the breast cancer cells at concentrations of 100 and 200 µg/mL. Using the wound healing assay, both methanolic extracts demonstrated strong anti-migratory activity on the breast

cancer cells at 24 and 48 hours. Additionally, the breast cancer cells' morphology changed, suggesting apoptosis..

The thickness of the processes, field diameter, and cell body diameter were all significantly impacted by the methanolic extracts. It was demonstrated that the bioactive substances found in the methanolic extracts could either work alone or in concert to produce pharmacological effects on the breast cancer cells. The findings demonstrated the anticancer activity of *Tecoma stans* on breast cancer cells and the necessity of additional research on the methanolic extracts' therapeutic effects on breast cancer cells.[29]

The green synthesis of silver nanoparticles using the plant's leaf and flower extracts, which demonstrated encouraging antiproliferative effects on colorectal cancer cell lines, further supported *Tecoma stans'* anticancer qualities. In this study, the environmentally friendly synthesis of silver nanoparticles was carried out using methanolic extracts of *Tecoma stans* leaves and flowers.

A UV-visible spectrophotometer, particle size analyser, zeta potential analyser, and FTIR spectrophotometer were used to characterize the produced nanoparticles.

The anticancer properties were attributed to bioactive compounds such as flavonoids, alkaloids, tannins, terpenoids, glycosides, phenols, and saponins, which were identified through phytochemical screening. The human colorectal carcinoma cell lines HCT-116 and SW-480, in addition to the normal human embryonic kidney cell line HEK-293, were used in the MTT assay to assess the anticancer properties of the synthesized nanoparticles. The results demonstrated significant dose-dependent antiproliferative effects on the colorectal carcinoma cell lines, with low IC50 values for the nanoparticles compared to the crude extracts. The morphology also revealed apoptotic effects on the colorectal carcinoma cells; additionally, the wound-healing assay demonstrated significant inhibitory effects on the migration of colorectal carcinoma cells. Using the DPPH assay, the nanoparticles also demonstrated strong antioxidant qualities and antibacterial activity against both Gram-positive and Gram-negative bacteria. In contrast to the crude extracts, the nanoparticles exhibited minimal toxicity on normal cells. The synthesis of silver nanoparticles using the methanolic extracts of *Tecoma stans* leaves and flowers demonstrated significant antiproliferative and antioxidant effects on colorectal carcinoma cells, suggesting the potential usage of the nanoparticles for the treatment of colorectal carcinoma, according to the study's findings. The findings supported the traditional usage of *Tecoma stans'* anti-cancer properties.[30]

Natural peptides from *Tecoma stans* flowers have additionally been utilised to evaluate the anticancer activity of *Tecoma stans* on human lung adenocarcinoma A549 cells. Pressurized hot water extraction, size exclusion chromatography, and C-18 solid-phase extraction were used to separate natural peptides. The MTT assay was used to measure the cytotoxicity of the natural peptides, which demonstrated significant cell toxicity at concentrations less than 1 ng/mL. Additionally, the Transwell chamber assay was utilised to measure antimetastatic activity, and the results showed a significant decrease in motility with a migration rate of less than 10%. In order to verify antioxidative activity in relation to recognized antioxidants, antioxidative potential was also evaluated using the ABTS, DPPH, and FRAP assays. Additionally, following pre-treatment with the IC50 concentration on A549 cells, the natural peptides decreased intracellular reactive oxygen species (ROS) in lipopolysaccharide (LPS)-stimulated cells.

Additionally, 1,604 differentially expressed proteins were used in proteomic studies to evaluate protein expression. Eleven clusters were created based on the expression levels, according to clustering analysis using the SOTA method. Notably, antioxidative defense proteins like A1BG and ASB6 were upregulated while cancer-promoting proteins like NCBP2, AMD, MER34, ENC1, and COA4 were downregulated. These findings imply that the downregulation of cancer-promoting proteins and the upregulation of antioxidative proteins could be the reason of the antiproliferative and anti-metastatic activity of natural peptides from *Tecoma stans.*[31]

Human lung cancer cells A549 were used to test the antioxidant and anticancer potential of *Tecoma stans* using methanolic extracts of fresh and dried leaves and flowers. Cytotoxicity and free radical scavenging activity were discovered to be significantly correlated.

Antioxidant activity was measured using the DPPH free radical scavenging assay. When compared to the common antioxidant L-ascorbic acid at higher concentrations, *Tecoma stans* extracts demonstrated strong antioxidant activity in a concentration-dependent manner. The plant's abundance of polyphenols and flavonoids was confirmed by the extraordinarily high free radical scavenging activity of both fresh and dried extracts. Encouraged by the antioxidant activity results, the MTT assay was employed to assess *Tecoma stans'* cytotoxic activity on human lung cancer cells A549. Cell viability was significantly reduced by methanolic extracts in a concentration-dependent manner. The extracts nearly totally stopped the growth of cancer cells at higher concentrations (100 µg/mL). Methanolic extract-treated cancer cells showed morphological characteristics of apoptosis. These characteristics include loss of cellular integrity, membrane blebbing, and cell shrinkage. These findings verify that *Tecoma stans* causes cancer cells to undergo apoptosis. The evaluation of *Tecoma stans* extracts' cytotoxic activity yielded results that were similar to individuals of the common medication vincristine. The presence of alkaloids, flavonoids, phenolic compounds, glycosides, steroids,

and carbohydrates was verified by phytochemical analyses of the plant extracts. These substances have demonstrated a significant impact on the induction of apoptosis and antioxidant activity in cancer cells.

Additionally, the findings imply that *Tecoma stans'* strong ability to scavenge free radicals is essential to its anticancer properties. The findings demonstrate that *Tecoma stans* has anticancer and antioxidant properties against human lung cancer cells A549. These results validate the notion that *Tecoma stans* could be used to create anticancer medications.[32]

Neuroprotective activity

Methanolic extract of *Tecoma stans* flower (METSF) treatment reduced the transfer latency considerably and escape latency times in the scopolamine-induced memory impairment model, suggesting improved memory acquisition and retention that were comparable to the conventional medication donepezil. METSF treatment significantly decreased lipid peroxidation and nitrite levels while raising endogenous antioxidant markers like reduced glutathione and total protein content, according to biochemical analysis of the animal models' brains. Furthermore, METSF treatment dramatically decreased the elevated acetylcholinesterase activity in the brains of animals given scopolamine, suggesting improved neurotransmission—a crucial component of cognitive function. Alkaloids, flavonoids, phenolic compounds, tannins, and saponins—all of which are known to have antioxidant and enzyme-modulating qualities—were among the bioactive components of METSF that contributed to its neuroprotective activity. METSF is safe to use at doses up to 2000 mg/kg, according to acute toxicity tests. In summary, this study offers solid scientific proof that *Tecoma stans* flower extract has substantial neuroprotective activity, which is mediated through acetylcholinesterase inhibition, antioxidant defense, and improvement of cognitive and motor impairments. This implies that the plant has great potential in the treatment of neurodegenerative diseases like Parkinson's and Alzheimer's.[33]

Tecoma stans leaf extract's neuroprotective properties have been assessed in a model of diabetic neuropathy induced by streptozotocin. The extract successfully reduces the behavioral and biochemical changes linked to diabetic neuropathy, based on the findings. In this investigation, streptozotocin was used to induce diabetes in rats. The rats were given varying doses of *Tecoma stans* leaf extract following the induction of diabetes.

Significant changes were observed in the motor and sensory functions of diabetic neuropathic rats, including elevated blood glucose levels, reduced pain threshold, motor coordination, and nerve conduction velocity.

When compared to diabetic control rats, the rats' motor and sensory abilities significantly improved following treatment with *Tecoma stans* leaf extract. Additionally, biochemical research showed that giving *Tecoma stans* leaf extract to diabetic rats dramatically reduced the levels of oxidative stress markers like malondialdehyde.

At the same time, the rats' brain tissues showed an increase in endogenous antioxidant enzymes like reduced glutathione, catalase, and superoxide dismutase.

Additionally, following treatment with *Tecoma stans* leaf extract, the rats' levels of nitric oxide and pro-inflammatory cytokines were also markedly reduced.

The findings of this investigation were corroborated by histopathological analyses of the sciatic nerve tissues.

The administration of *Tecoma stans* leaf extract to diabetic rats considerably enhanced the structural integrity of the nerve tissues, according to histopathological investigations. The presence of bioactive substances like flavonoids, phenolic compounds, alkaloids, and glycosides in *Tecoma stans* leaf extract was responsible for its neuroprotective properties. These compounds have neuroprotective, anti-inflammatory, and antioxidant properties. In diabetic rats, *Tecoma stans* leaf extract also lowered blood glucose levels. Reduced blood glucose levels may indirectly shield the nerves from neural damage brought on by diabetes. Therefore, the study's findings strongly imply that *Tecoma stans* leaf extract has important neuroprotective effects on diabetic neuropathy.[34]

The methanolic leaf extract of *Tecoma stans* has been clearly demonstrated to have neuroprotective and anti-amnesic properties in rodent models of memory impairment brought on by diazepam and aluminum chloride. Using behavioral models like the actophotometer, rotarod, Cook's pole-climbing, and elevated plus maze, the anti-amnesic potential of the methanolic extract of *Tecoma stans* leaves (METS) was investigated in order to assess its capacity to prevent cognitive dysfunction. In both acute diazepam-induced and chronic aluminum chloride-induced models of memory impairment, METS at doses of 200 and 400 mg/kg markedly improved learning and memory performance, as demonstrated by improved baseline activity scores, fall-off times, decreased transfer latency, and increased passive avoidance responses. Based on biochemical parameters, METS normalized endogenous antioxidant status, including superoxide dismutase and reduced glutathione, while significantly lowering elevated acetylcholinesterase activity, lipid peroxidation, and oxidative stress. A cholinergic modulation mechanism was indicated by the extract's moderate but significant inhibition of acetylcholinesterase in the in vitro Ellman's assay. When hippocampal tissue was examined via histopathology, the extract-treated groups showed less neuronal apoptosis and preservation of pyramidal neuronal layers than the aluminum chloride-treated groups. Alkaloids that contribute to the plant's

antioxidant, anti-amyloidogenic, and neuroprotective properties include indole alkaloids, flavonoids, phenolics, sterols, terpenoids, tannins, saponins, iridoid glycosides, and long-chain fatty acids, according to phytochemical and GC-MS analysis. The extract is safe at a dose of 2000 mg/kg, according to an acute toxicity study. In summary, The findings of this investigation firmly demonstrate that *Tecoma stans* methanolic leaf extract has important neuroprotective and anti-amnesic qualities through acetylcholinesterase inhibition, anti-oxidative stress, and neuronal architecture preservation, suggesting its therapeutic potential in the treatment of neurodegenerative diseases like Alzheimer's disease.[35]

Hepatoprotective activity

Tecoma stans's hepatoprotective effect was evaluated in experimental rats with liver damage caused by acetaminophen and carbon tetrachloride (CCl_4) using a hydroethanolic extract. Rats treated with acetaminophen (500 mg/kg body weight) and CCl_4 (1 mL/kg body weight in olive oil) developed hepatotoxicity. The treated groups were given hydroethanolic extract of *Tecoma stans* (TSE) at 100 and 250 mg/kg body weight for seven days. The standard reference medication was silymarin (100 mg/kg). Alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), total and indirect bilirubin, total cholesterol, triglycerides, creatinine, and urea toxin-treated animals were found to have significantly higher serum hepatic markers than normal controls. Hepatotoxic animals also had lower levels of globulin, albumin, and total protein. The altered biochemical parameters were significantly restored to nearly normal levels by oral administration of TSE, particularly 250 mg/kg body weight. To evaluate liver damage, liver histopathology was also performed. Animal liver tissues treated with *Tecoma stans* hydroethanolic extract demonstrated notable improvements in liver structure and decreased cell damage. Significant antioxidant activity was also demonstrated by the reduction of indicators of oxidative stress. Thus, the study showed that *Tecoma stans* hydroethanolic extract had hepatoprotective and antioxidant properties against chemically induced liver damage. This study offers proof of the plant's possible therapeutic utilisation in the management of drug-induced liver damage.[36]

Tecoma stans leaves' hepatoprotective activity has been confirmed through extensive pharmacognostic, phytochemical, antioxidant, and in vivo studies. The ethanolic extract of the leaves was administered to Wistar rats at doses of 200 and 400 mg/kg, and its protective activity against carbon tetrachloride (CCl_4)-induced liver toxicity was assessed. When *Tecoma stans* leaf ethanolic extract was given orally to Wistar rats at doses of 200 and 400 mg/kg, the hepatic antioxidant status improved, serum biochemical parameters were restored, and liver weight significantly decreased in comparison to toxic controls. The extract's strong protective effects on the treated animals' livers were also supported by histopathological investigations, which showed hepatocellular regeneration, minimal fatty changes, minimal inflammatory cell infiltration, and no necrosis. This effect was similar to that of silymarin, a common hepatoprotectant.

Numerous bioactive substances, such as alkaloids, flavonoids, phenolic compounds, tannins, saponins, glycosides, and terpenoids, were found in the extract according to the phytochemical screening. When compared to other organic and aqueous solvents, ethanol was found to have the highest extractive value. The extract's strong antioxidant activity was positively correlated with its total phenolic content (9.56 mg/g) and total flavonoid content (45.31 mg/g). Polyphenolic compounds, which are known to stabilize liver cell membranes and guard against lipid peroxidation-mediated liver toxicity, were identified as the cause of this effect. This study supported the use of *Tecoma stans* leaves in the conventional treatment of liver disorders and their potential as a hepatoprotectant agent by offering strong experimental evidence for the hepatoprotective activity of the ethanolic extract against chemically induced liver toxicity.[37]

Anti-hyperlipidemic activity

Tecoma stans's potential as an anti-hyperlipidemic medication has been extensively examined using lean and obese rat models. Serum triglyceride, total cholesterol, and LDL cholesterol levels significantly decreased after oral administration of *Tecoma stans* ethanolic leaf extract at 125 and 250 mg/kg, according to an in vivo study conducted on obese fatty rats. After giving 250 mg/kg of *Tecoma stans* ethanolic extract, significant reductions in triglyceride levels up to 39%, total cholesterol levels by approximately 25%, and LDL cholesterol levels up to 45% were noted.

Additionally, it was discovered that HDL levels remained constant. Additionally, hypertriglyceridemia induced by an olive oil load was discovered to be greatly reduced by *Tecoma stans* extract, indicating a potential inhibitory role in lipid absorption and chylomicron secretion. This leaf extract has also been shown to lower blood glucose levels selectively in obese rats by a significant decrease at 120 minutes after administering a glucose load. This indicates an enhanced insulin receptor sensitivity rather than a direct hypoglycemic activity on normoglycemic rats. Moreover, *Tecoma stans* showed a high potential α-glucosidase inhibitory activity, with an IC50 value comparable to that of acarbose. *Tecoma stans* extract did not cause any negative effects after long-term administration, according to histopathological studies on important organs like the liver, heart, aorta, kidney, and pancreas. *Tecoma stans* reduces triglyceride levels, increases lipoprotein lipase activity, and decreases the liver's production of very-low-density lipoproteins.

These results imply that plant extract has great potential as an anti-hyperlipidemic medication and may be

employed as a therapeutic agent for the treatment of hyperlipidemia brought on by type 2 diabetes and obesity.[28]

Tecoma stans flowers have been shown to have anti-lipidemic properties in rat models of hyperlipidemia caused by diet and chemicals. In this study, the anti-lipidemic potential of a hydroalcoholic extract of *Tecoma stans* flowers was assessed in hyperlipidemic Wistar albino rats induced by Triton WR-1339 and a high-fat diet after the extract was given orally at doses of 125 and 250 mg/kg. Following the administration of Triton WR-1339, the rats' serum levels of total cholesterol and triglycerides increased noticeably. These levels were considerably lowered by the extract in a dose-dependent manner. Resulting in a reduction of 31.98% for total cholesterol and 41.46% for triglycerides, which was comparable to the standard medication atorvastatin. The extract demonstrated a significant decrease in serum total cholesterol and triglyceride levels in the high-fat diet-induced hyperlipidemic rat model, along with an increase in high-density lipoprotein cholesterol (HDL-C) levels, leading to a marked reduction in the atherogenic index. This anti-lipidemic effect was comparable to gemfibrozil, suggesting its potential to improve lipid utilization and clearance. The presence of bioactive compounds such as flavonoids, tannins, saponins, polyphenols, and β-carotene may have contributed to the extract's anti-hyperlipidemic potential by interfering with hepatic cholesterol biosynthesis and affecting lipid metabolism. The extract's protective effect on atherogenesis demonstrated a notable rise in the total cholesterol to HDL-C ratio, acting as a crucial indicator of cardiovascular risk—and also supported its anti-lipidemic potential. Therefore, the present research provides significant evidence of the hydroalcoholic extract of *Tecoma stans* flowers' anti-hyperlipidemic potential, which could be beneficial for the treatment of hyperlipidemia and the prevention of cardiovascular diseases.[38]

Anti-inflammatory activity

An in vitro study design and protein denaturation inhibition assay were used to compare and assess *Tecoma stans's* hydroethanolic extracts from different plant parts, such as leaves, stems, and roots, in order to scientifically validate the plant's anti-inflammatory potential. The potential of hydroethanolic extracts from various *Tecoma stans* parts to inhibit heat-induced albumin denaturation, a crucial pathway involved in inflammatory responses, was assessed in this study at concentrations ranging from 100 to 500 µg/mL and compared with a common medication like aspirin. The potential for all three extracts to demonstrate anti-inflammatory activity increased in a concentration-dependent manner; however, the extract derived from the stems exhibited a greater inhibitory potential than the extracts derived from the leaves and roots. The extract from the stems demonstrated a greater percentage inhibition of protein denaturation at higher concentrations than the extracts from the leaves and roots, according to statistical analysis using one-way ANOVA and Duncan's multiple range tests. Bioactive substances that are known to stabilize proteins, prevent prostaglandin synthesis, and lessen the release of inflammatory mediators include flavonoids, phenolic compounds, alkaloids, saponins, terpenoids, and glycosides. Because denatured proteins can cause autoantigen formation and chronic inflammation, the inhibition of protein denaturation seen in this study suggests a protective role against inflammatory tissue damage. This study confirms that *Tecoma stans* has potential anti-inflammatory activity and can be used as a potential herbal remedy for inflammatory diseases. It also offers preliminary evidence for the observed activity. Furthermore, it suggests that *Tecoma stans*, particularly the extract derived from its stems, may have anti-inflammatory properties and be utilized as a possible herbal treatment for inflammatory conditions.[39]

Tecoma stans flower extract's anti-inflammatory properties were thoroughly assessed in experimental animals using a variety of well-established models of acute, subacute, and chronic inflammation. In this study, Wistar rats were given methanolic extract of *Tecoma stans* flower orally at doses ranging from 100 to 1000 mg/kg. The anti-inflammatory activity of the extract was assessed against carrageenan-induced paw edema, formalin-induced paw edema, and cotton pellet-induced granuloma using diclofenac sodium and indomethacin as standard drug references. Rats' carrageenan-induced paw edema was considerably reduced over time by the methanolic extract of *Tecoma stans* flower. The third and fourth hours showed the greatest level of inhibition.

Similarly, repeated doses of methanolic flower extract considerably decreased paw thickness in rats with formalin-induced chronic inflammation on the third and seventh days. Additionally, continuous doses of *Tecoma stans* flower methanolic extract significantly decreased the wet and dry weights of granuloma tissues in rats with cotton pellet-induced granuloma, demonstrating roughly 59% granuloma inhibition in a manner comparable to that of indomethacin. The flower extract is thought to possess a broad range of anti-inflammatory properties because of its capacity to inhibit granulation tissue formation, vascular permeability, and inflammatory mediators. Most significantly, even at effective dosages, the methanolic extract did not result in any gastric irritation during the present investigation. . Thus, in animal models of acute, subacute, and chronic inflammation, *Tecoma stans* flower extract is a strong anti-inflammatory agent.[40]

Anti-microbial activity

The antimicrobial activity of *Tecoma stans* leaves has been thoroughly investigated against a range of Gram-positive, Gram-negative, and mycobacterial pathogens, demonstrating strong antibacterial and antimycobacterial potential.

Using the agar diffusion technique and minimum inhibitory concentration assays, the current study examined the antimicrobial activities of *Tecoma stans* leaf extracts obtained by using solvents of increasing polarity, such as hexane, dichloromethane, ethyl acetate, and methanol, against Staphylococcus aureus, Enterococcus faecalis, Bacillus spp., Salmonella spp., Pseudomonas aeruginosa, Mycobacterium aurum, and Mycobacterium smegmatis. *Tecoma stans* ethyl acetate extract demonstrated strong antimicrobial activity among the tested leaf extracts, displaying notable zones of inhibition, particularly against Mycobacterium aurum and M. smegmatis. The minimum inhibitory concentration values for M. smegmatis were as low as 10 mg/mL, indicating high pathogen sensitivity. According to the study, Pseudomonas aeruginosa showed relative resistance to the tested leaf extracts of *Tecoma stans*, whereas Gram-positive pathogens showed greater sensitivity than Gram-negative pathogens. *Tecoma stans* extracts from Namakkal showed greater antibacterial potency than those from Madurai, according to a comparative study of plant material from various geographical locations. This implies that the composition of phytochemicals is influenced by environmental factors.

High concentrations of total polyphenols and flavonoids were identified by quantitative analysis of phytochemicals, particularly in ethyl acetate and methanol extracts, which demonstrated a strong correlation with antimicrobial potency.

The combined action of polyphenols, flavonoids, tannins, and other secondary metabolites, which can obstruct microbial cell membranes, prevent enzymatic activity, and interfere with nucleic acid synthesis, might be accountable for the antimicrobial activity of *Tecoma stans* leaf extracts. The current study's results offer strong scientific proof that *Tecoma stans* leaf extracts have strong antibacterial and antimycobacterial properties, confirming their traditional use in the management of a variety of illnesses and demonstrating their enormous potential for the creation of substitute treatments for microbial infections that are resistant.[41]

Nephroprotective activity

Nephroprotective potential of *Tecoma stans* flowers have been demonstrated. in a model of gentamicin-induced nephrotoxicity in albino rats. In this in vivo study, Rats received gentamicin (80 mg/kg/day) intraperitoneally for eight days in a row to induce nephrotoxicity. This resulted in severe renal dysfunction, as shown by marked increases in serum creatinine, serum urea, blood urea nitrogen, and uric acid levels, in addition to severe histopathological changes in the kidneys, such as tubular epithelial cell necrosis, glomerular congestion, tubular casts, and inflammatory cell infiltration. When given orally in doses of 100, 200, and 300 mg/kg/day, the ethyl acetate extract of *Tecoma stans* flowers demonstrated a dose-dependent nephroprotective effect in rats with gentamicin-induced nephrotoxicity. This was demonstrated by a notable improvement in renal histoarchitecture, including tubular and glomerular structures, as well as a significant normalization of serum creatinine, serum urea, blood urea nitrogen, and uric acid levels. The acute toxicity study of the ethyl acetate extract of *Tecoma stans* flowers demonstrated the extract's safety because, even at doses of 5000 mg/kg, no mortality or behavioral abnormalities were observed.

Given that gentamicin-induced nephrotoxicity has been linked to oxidative stress and the depletion of endogenous antioxidant reserves, the nephroprotective effect of *Tecoma stans* flowers was attributed to the antioxidant and free radical scavenging potential of the floral extract. *Tecoma stans* flowers were found to contain flavonoids, tannins, saponins, glycosides, and additional polyphenolic substances that have been demonstrated to improve mitochondrial antioxidant status and stabilize cell membranes. This study has produced strong experimental evidence for the nephroprotective potential of *Tecoma stans* flowers in preventing drug-induced nephrotoxicity, validating its potential therapeutic value in preventing nephrotoxin-induced renal damage.[42]

Antioxidant and anti-aging activity

Tecoma stans' antioxidant and anti-aging properties have been scientifically validated through a series of free radical scavenging activity and cellular aging studies.

The antioxidant potential of *Tecoma stans* leaves and flowers was examined in this study using a range of techniques, including DPPH, ABTS, nitric oxide, hydroxyl radical scavenging activity, ferric reducing antioxidant power, and lipid peroxidation inhibition assays. In comparison to common antioxidants like ascorbic acid and butylated hydroxytoluene, methanolic and extracts of ethyl acetate were discovered to have high scavenging activity on free radicals. The findings showed that the antioxidant potential of *Tecoma stans* extracts increased with concentration. High concentrations of phenolic and flavonoid compounds have been linked to plants' strong antioxidant potential.

This study undeniably showed that *Tecoma stans* has strong antioxidant potential and may be utilized as a therapeutic agent to slow down aging and stop oxidative damage. Furthermore, *Tecoma stans* has demonstrated anti-aging potential by preventing lipid peroxidation, protein oxidation, and cellular damage—all of which cause cellular aging and age-related degenerative disorders. Furthermore, by blocking skin-aging enzymes like collagenase and elastase, the extracts have demonstrated potential therapeutic value for postponing skin aging and preventing skin damage. Flavonoids, phenolic acids, tannins, as well as additional secondary metabolites that can alter antioxidant enzyme activity and reduce oxidative damage have been linked to *Tecoma stans'* antioxidant and anti-aging properties.

These findings suggest that *Tecoma stans* has strong antioxidant and anti-aging properties and may be employed as a therapeutic agent to slow down aging and stop oxidative damage.[43]

Anti-arthritic activity

The anti-arthritic potential of *Tecoma stans* has been demonstrated in an in vivo study that uses a Complete Freund's Adjuvant (FCA)-induced rheumatoid arthritis model in Wistar rats to examine the anti-arthritic potential of gallic acid (GA) isolated from *Tecoma stans* leaf extract and its novel gallic acid phytosome (GAP) preparation. For 21 days, GA (50 and 100 mg/kg), GAP (50 and 100 mg/kg), and their combinations with methotrexate (0.75 mg/kg) were given orally to the experimental models of arthritis. When compared to arthritic control rats, GA and GAP significantly improved body weight and demonstrated dose-dependent anti-arthritic potential, lowering arthritic score, paw volume, and pain latency. The notable normalization of arthritis-induced hematological disorders, such as elevated haemoglobin levels and decreased white blood cell counts combined with red blood cell counts, platelet counts, and erythrocyte sedimentation rate, further supported the anti-arthritic potential of GA and GAP.

GAP was discovered to have a stronger anti-arthritic potential than GA alone, suggesting that it is more bioavailable and effective than GA in its free form. The interactions of stable hydrogen bonds between GA and important residues of the NLR family pyrin domain-containing 3 (NLRP3) inflammasome were revealed by molecular dynamic simulation results, indicating that GA may be able to prevent the activation of this inflammatory mediator in the anti-arthritic effect. Strong evidence for *Tecoma stans'* anti-arthritic potential has been presented by the study, underscoring the benefits of phytosome technology in boosting the medication's effectiveness.[44]

Wound healing activity

Tecoma stans bark's ability to heal wounds was confirmed using albino rat excision and incision wound models. The current study used a series of Soxhlet extraction techniques to prepare petroleum ether, chloroform, and methanolic extracts of *Tecoma stans* bark and assessed their ability to heal wounds. It was found that the methanolic extract had the strongest wound-healing impact of the three extracts. Topical application of 5% methanolic extract ointment was discovered to significantly shorten the epithelization period and accelerate wound contraction in excision wound models in contrast to the control group.

Compared to animals treated with petroleum ether and chloroform extract, methanolic extract-treated animals displayed an 82.63% wound contraction on day 18.

When compared to animals treated with petroleum ether and chloroform extract in incision wound models, animals treated with methanolic extract demonstrated a significant increase in tensile strength. It was discovered that the wound tissues' tensile strength significantly increase when methanolic extract (250 mg/kg) was administered orally. Flavonoids, phenolic compounds, glycosides, saponins, tannins, phytosterols, and triterpenes were discovered in the methanolic extract of *Tecoma stans* bark after phytochemical screening.

Through collagen synthesis, fibroblast proliferation, and antimicrobial defense, these compounds are known to significantly enhance the healing process of wounds.

Together with the antimicrobial activity of *Tecoma stans* barks, Each of these substances was found to produce enhanced wound-healing activity. Therefore, using excision and incision wound models in albino rats, the current study offers experimental proof of *Tecoma stans* bark's ability to heal wounds.[14]

Antispasmodic activity

It has been demonstrated that *Tecoma stans* hydroalcoholic leaf extract have significant antispasmodic activity on rat ileum, lowering the muscle contraction brought on by carbachol and high potassium in a dose-dependent manner, indicating its direct relaxing effect on smooth muscle. Given that nothing changed in response observed after the preparation was incubated with propranolol, naloxone, L-NAME, glibenclamide, and tetraethylammonium, the mechanistic study of the plant extract's antispasmodic effect on rat ileum has shown that its spasmolytic effect is mediated independently of β-adrenoceptors, opioid receptors, nitric oxide, and potassium channels. Furthermore, the extract has been discovered to display a marked inhibitory effect on $CaCl_2$-induced contractions of rat ileum under calcium-free depolarization, demonstrating that its antispasmodic effect is mediated by blockade of voltage-dependent calcium channels. *T. stans* antispasmodic effect on rat ileum is consistent with its proven application in the management of gastrointestinal disorders. This plant has demonstrated the capacity to be studied for the advancement of calcium antagonist compounds to treat intestinal hypermotility.[45]

Anti-urolithic activity

Tecoma stans flowers were tested for their anti-urolithiatic properties in Wistar rats using an ethylene glycol-induced model. *Tecoma stans* flower extracts, both aqueous (AETSF) and methanolic (METSF), were given orally in both therapeutic and preventive models for the development of calcium oxalate stones in the current study. When compared to stone-induced control groups, AETSF and METSF dramatically decreased renal retention and urinary excretion of stone-forming elements like oxalate, calcium, and phosphate. Furthermore, AETSF and METSF considerably decreased elevated serum blood urea nitrogen, creatinine, and uric acid levels in the stone-induced control groups.

In the stone-induced control groups, AETSF and METSF also raised levels of common stone inhibitors like magnesium, citrate, and total protein Furthermore, AETSF and METSF considerably decreased elevated urine volume and pH levels in the stone-induced control groups. Reduced stone deposition and congestion in treated groups compared to untreated stone-induced groups were also confirmed by histopathological analysis of kidney tissues. In stone-induced groups, AETSF and METSF showed anti-urolithiatic activity similar to that of the standard medication, Cystone. As a result, AETSF and METSF can stop kidney stones from forming. Flavonoids, tannins, phenolics, alkaloids, steroids, triterpenes, and other bioactive substances found in *Tecoma stans* flowers can lessen the development of kidney stones.[46]

Anti-zika virus activity

Ethanolic extracts of *Tecoma* species' leaves and trunks were used in an in vitro antiviral study on Vero cell cultures infected with the Zika virus to determine *Tecoma stans'* anti-Zika virus activity. With EC50 values ranging from 61.25 to 149.90 µg/mL, the study's results show that *Tecoma stans* leaf extracts have greater antiviral activity than trunk extracts. Additionally, the study demonstrated the leaf extracts' favorable cytotoxicity profiles. Crenatoside, a phenylethanoid glycoside, was isolated from *Tecoma stans* var. *stans* by bio-guided fractionation. With an EC50 of 21.64 µg/mL (34.78 µM) and a better selectivity index than both the reference medication ribavirin and the ethanolic extracts of *Tecoma stans*, the compound was discovered to have greater antiviral activity. The cytopathic effect inhibition assay was employed to ascertain the anti-Zika virus activity of the ethanolic extracts of *Tecoma stans*. The findings showed that the compound was successful in preventing the Zika virus from destroying host cells.

Tecoma stans ethanolic extracts were discovered to have anti-Zika virus activity due to their interference with the replication cycle of the virus. *Tecoma stans* has the potential to produce anti-Zika virus compounds, according to the study's findings.[47]

Antifungal activity

Tecoma stans organic extracts have demonstrated promising antifungal activity against important clinical isolates of fungi, including Candida albicans, Cryptococcus neoformans, and Microsporum gypseum, when tested using the drop diffusion and minimum inhibitory concentration methods. *T. stans* demonstrated the strongest antifungal activity in a study of nine medicinal plants, and its petroleum ether and chloroform extracts were more effective than ethanol extract. Using thin-layer chromatography, the antifungal properties of *T. stans* chloroform extract were found to contain several bioactive fractions. Human red blood cells from blood groups A, B, and O were not lysed by *T. stans* extracts in haemolytic tests, suggesting that *T. stans* may be used to create antifungal medications.[48]

CONCLUSION

Tecoma stans (L.) Juss. ex Kunth is a significant medicinal plant. that has gained considerable attention due to its diverse pharmacological activities. Various experimental studies have supported its traditional medicinal uses and demonstrated that various plant parts, including leaves, flowers, bark, and roots, include a variety of bioactive phytochemicals such as flavonoids, phenolic acids, alkaloids, terpenoids, and glycosides.

These compounds contribute to several biological activities, including antidiabetic, antihyperlipidemic, anti-inflammatory, antimicrobial, antifungal, antioxidant, anticancer, neuroprotective, hepatoprotective, nephroprotective, anti-arthritic, wound-healing, antispasmodic, anti-urolithiatic, and antiviral effects.

Despite the promising potential pharmacological effects of *Tecoma stans*, most of the available studies are limited to in vitro experiments and animal models. Therefore, further investigations involving advanced phytochemical analyses, toxicity evaluation, and well-designed clinical trials are necessary to confirm its safety and therapeutic efficacy in humans. Future research may aid in the creation of safe, effective, and affordable plant-based therapeutic agents derived from *Tecoma stans*.

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CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest regarding the publication of this review article.

REFERENCES

1. World Health Organization. Global traditional medicine strategy 2025–2034. World Health Organization: Geneva, 2025.
2. CABI. *Tecoma stans* (yellow bells). In: CABI Compendium. Wallingford, UK: CABI, 2022. doi: 10.1079/cabicompendium.52951.
3. Plants of the World Online. *Tecoma stans* (L.) Juss. ex Kunth. https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:111284-1 (Accessed January 16, 2026).
4. Anand M, Basavaraju R. A review on phytochemistry and pharmacological uses of *Tecoma stans* (L.) Juss. ex Kunth. J Ethnopharmacol, 2021; 265: 113270.
5. Mohammed HA et al. Anti-oral pathogens of *Tecoma stans* (L.) and *Cassia javanica* (L.) flower volatile oils in comparison with chlorhexidine in accordance with their folk medicinal uses. Medicina (Kaunas), 2019; 55(6): 301.

6. Khattab A et al. Reviewing the reported pharmacognostic and pharmacological investigations on *Tecoma stans* Juss. ex Kunth. J Herbmed Pharmacol, 2023; 12(1): 25-40.
7. Singh A et al. *Tecoma stans*: an important medicinal plant. Int J Pharm Erudition, 2013; 3(2): 13-21.
8. Plants of the World Online. *Tecoma stans* (L.) Juss. ex Kunth. https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:111284-1 (Accessed March 12, 2026).
9. Aguilar-Santamaría L et al. Antidiabetic activities of *Tecoma stans* (L.) Juss. ex Kunth. J Ethnopharmacol, 2009; 124(2): 284-8.
10. Rahmatullah M et al. An ethnomedicinal, pharmacological and phytochemical review of some Bignoniaceae family plants and their folk medicinal uses in Bangladesh. Adv Nat Appl Sci, 2010; 4(3): 236-53.
11. Dash S et al. Phytochemical composition, anti-inflammatory and analgesic activities of *Tecoma stans* Linn. (Bignoniaceae). Drug Invent Today, 2010; 2(8): 373-5.
12. Singh S et al. A comprehensive review on ecology, life cycle and use of *Tecoma stans* (Bignoniaceae). Bot Stud, 2024; 65(1): 6.
13. Kameshwara S et al. Evaluation of hepatoprotective activity of *Tecoma stans* flowers. Pharmacologia, 2013; 4(3): 236-42.
14. Das C et al. Evaluation of methanolic bark extract of *Tecoma stans* Linn. for wound healing in albino rats. Drug Invent Today, 2010; 2(8): 373-5..
15. Marzouk M et al. Anti-proliferative and antioxidant constituents from *Tecoma stans*. Z Naturforsch C J Biosci, 2006; 61(11-12): 783-91.
16. Ha KN et al. Alpha-glucosidase inhibitors from *Nervilia concolor*, *Tecoma stans*, and *Bouea macrophylla*. Saudi J Biol Sci, 2022; 29(2): 1029-42.
17. Lins AP, Felicio JD. Monoterpene alkaloids from *Tecoma stans*. Phytochemistry, 1993; 34(3): 876-8.
18. Costantino L et al. Characterization and pharmacological actions of tecostanine, an alkaloid of *Tecoma stans*. Pharmazie, 2003; 58(2): 140-2.
19. Taher MA et al. Searching for anti-hyperglycemic phytomolecules of *Tecoma stans*. Eur J Chem, 2016; 7(4): 397-404.
20. Ramirez G et al. Chrysoeriol and other polyphenols from *Tecoma stans* with lipase inhibitory activity. J Ethnopharmacol 2016; 185: 1-8.
21. Dickinson EM, Jones G. Pyrindane alkaloids from *Tecoma stans*. Tetrahedron, 1969; 25(7): 1523-9.
22. Rajendran A. Isolation, characterization, pharmacological and corrosion inhibition studies of flavonoids obtained from *Nerium oleander* and *Tecoma stans*. Int J PharmTech Res, 2011; 3(2): 1005-13.
23. Bianco A et al. 5-deoxystansioside, an iridoid glucoside from *Tecoma stans*. Phytochemistry, 1981; 20(8): 1871-2.
24. Rajamurugan R et al. Phytochemical screening, antioxidant and antimicrobial activities of ethanolic extract of *Tecoma stans* flowers. Int J Pharma Bio Sci, 2013; 4(2): 124-30.
25. Singh S et al. Effect of dye extraction solvent on the photovoltaic performance of *Tecoma stans*-sensitized solar cells. J Electron Mater, 2020; 49(7): 4355-63.
26. Alonso-Castro AJ et al. The antidiabetic plants *Tecoma stans* (L.) Juss. ex Kunth (Bignoniaceae) and *Teucrium cubense* Jacq (Lamiaceae) induce the incorporation of glucose in insulin-sensitive and insulin-resistant murine and human adipocytes. J Ethnopharmacol, 2010; 127(1): 1-6..
27. Kameshwaran S et al. Ameliorative effect of *Tecoma stans* extract on diabetic cardiomyopathy against streptozotocin-induced diabetes in Wistar rats. J Pharm Pharmacol, 2013; 1(1): 55-62.
28. Dholi SK et al. Anti-hyperlipidemic and hypoglycemic effects of *Tecoma stans* in rats. World J Pharm Res, 2019; 8(9): 1802-16.
29. Tchabewu Mbianda SW et al. Assessment of cytotoxic, anti-proliferative, anti-metastatic, and morphometric effects of *Tecoma stans* extracts against MDA-MB-231 human breast cancer cell line. BMC Complement Med Ther, 2025; 25: 261.
30. Lavudi K et al. Green synthesis of *Tecoma stans* flower and leaf extracts: characterization and anti-proliferative activity in colorectal cancer cell lines. Lett Appl NanoBioSci, 2023; 12(3): 61.
31. Krobthong S et al. Evaluation of potential anti-metastatic and antioxidative abilities of natural peptides derived from *Tecoma stans* (L.) Juss. ex Kunth in A549 cells. Peer J, 2022; 10: e13693.
32. Robinson JP et al. Antioxidant and cytotoxic activity of *Tecoma stans* against lung cancer cell line (A549). Braz J Pharm Sci, 2017; 53(3): e00204.
33. Nanjappaiah HM et al. Neuroprotective property of *Tecoma stans* flower extract in scopolamine-induced amnesia and chlorpromazine-induced rigidity in laboratory animals. Res J Pharm Sci, 2023; 13(2): 41-7.
34. Gupta A et al. Elucidating the neuroprotective effect of *Tecoma stans* leaf extract in STZ-induced diabetic neuropathy. Evid Based Complement Alternat Med, 2022; 2022: 3833392.
35. Ganga Raju M et al. Anti-amnesic effect of methanolic leaf extract of *Tecoma stans*: an experimental study in rodents. J Young Pharm, 2020; 12(2 Suppl): S91-6.
36. Larbie C et al. Ameliorative effect of extract of *Tecoma stans* (L.) Juss. ex Kunth leaves against CCl_4- and acetaminophen-induced liver damage in rats. Adv Tradit Med, 2020; 20(4): 555-62.
37. Singh A et al. Phytochemical, pharmacognostic and hepatoprotective activity of the leaves of *Tecoma stans*. J Med Pharm Allied Sci, 2021; 10(5): 3564-8..
38. Giri RK et al. Lipid lowering activity of the hydro-alcoholic extract of *Tecoma stans* L. flowers in

hyperlipidemic models of wistar albino rats. Der Pharmacia Lettre, 2012; 4(5): 1386-9.
39. Prateek et al. A comparative study on anti-inflammatory activity of hydroethanolic of leaf, stem and root extracts of *Tecoma stans*. J Pharm Res Int, 2021; 33(57A): 214-21.
40. Dholi SK. Evaluation of anti-inflammatory effect of *Tecoma stans* in carrageenan, formalin and cotton pellet induced granuloma. World J Pharm Res, 2019; 8(9): 1470-83.
41. Ganapathy RS et al. Estimation of polyphenols and flavonoids contents and exploration of antimicrobial nature of *Tecoma stans* extracts. Int J Phytopharm Res, 2015; 6(3): 129-34.
42. Raju S et al. Floral extract of *Tecoma stans*: A potent inhibitor of gentamicin-induced nephrotoxicity in vivo. Asian Pac J Trop Med, 2011; 4(9): 680-5.
43. Wichayapreechar P et al. The potential of *Tecoma stans* (Linn.) flower extract as a natural antioxidant and anti-aging agent for skin care products. Cosmetics, 2024; 11(6): 214..
44. Makkar R et al. Investigating the anti-arthritic potential of gallic acid from *Tecoma stans* leaves via phytosome based formulation and examining physical, hematological effects, and molecular dynamics simulations. J Biol Regul Homeost Agents, 2024; 38(4): 3177-87.
45. Gharib Naseri MK et al. Antispasmodic effect of *Tecoma stans* (L.) Juss leaf extract on rat ileum. DARU, 2007; 15(3): 123-8.
46. Kameshwaran S et al. Antiurolithiatic activity of aqueous and methanolic extracts of *Tecoma stans* flowers in rats. Int J Pharm Biol Arch 2013; 4(3): 446-50.
47. Reis ACC et al. Anti-Zika virus activity and chemical characterization by ultra-high performance liquid chromatography (UPLC-DAD-UV-MS) of ethanol extracts in *Tecoma* species. BMC Complement Med Ther, 2020; 20: 246.
48. Gandhi MI, Ramesh S. Antifungal and haemolytic activities of organic extracts of *Tecoma stans* (Bignoniaceae). J Ecobiotechnol, 2010; 2(2): 26-32.