



A review on Phytochemistry and Pharmacological uses of *Tecoma stans* Linn

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Abstract:

Tecoma stans Linn. is a potential herbal therapy used to cure a variety of diseases. It is also known as yellow bells, yellow trumpet bush, yellow elder, and other names. It is a member of the Bignoniaceae family. *Tecoma stans* is widespread in tropical and subtropical areas. It is found mostly in southern America, specifically in southern Texas, New Mexico, and northern Argentina. The components found in each portion of the plant have a variety of therapeutic applications. For instance, the bark contains phytosterol, alkaloids, amino acids, monoterpenes, triterpenes, phenols, tannins, flavonoids, and other compounds. Linalool is present in the stem, 1-octane-3-ol is present in the leaves, and 54-hydroxy-skytanthine hydrochloride is present in the flowers and fruits. *Tecoma stans* has traditionally been used to treat almost all illnesses due to its pharmacological activity, which includes anti-diabetic, anti-microbial, anti-oxidant, anti-inflammatory, cytotoxic, anti-fungal, anti-spasmodic, anti-diuretic etc. *Tecoma stans* is primarily used for its antimicrobial activity, which is performed on leaves and flowers. The crushing of leaves and lemon juice is supposedly used topically or orally in tiny amounts for snake bite. An ethanolic extract of flowers was discovered to have antibacterial action.

Key words: *Tecoma stans*, Pharmacological activity.

Introduction:

Tecoma stans is a shrub, upto the height of 8m, and having stem diameters upto 25cm. It is perennial in humid and warmer regions. Bark is pale brown to grey & roughness with age. The opposing compound imparipinnate leaves have 2to5pairs of leaflets that are 2to 5times as large as the larger single terminal leaflet. Leaflets are lanceolate, up to 10cm long, with serrated marging, mid-green above & soft to touch. Calyx is green, 5to7mm long. The capsules measure 15to20cm in length, are linear, and contain the pointy end is upto 8mm wide, hanging from the limbs. There are many seeds, but fewer than 7mm diameter, 2cm long & equipped with open wing^[1]. Majority of world's population depends on medicinal plants for their health care. In many countries there are variety of plants which are used for therapeutic purposes. India is the world's largest producer of medicinal plants^[2].

Since ancient times, nature has served as a source of therapeutic agents. A staggering number of contemporary drugs have been isolated from natural sources, many of which were based on their traditional medicinal applications. Higher plants have continued to be used as source of therapeutic chemicals play a significant part in preserving human health ever since the dawn of mankind^[3]. Since ancient times, people in India have treated a variety of illnesses with herbs and natural remedies. Around 80% of people worldwide rely on conventional medicine^[4]. *Tecoma stans* belongs to family Bignoniaceae. It is commonly known as philia[H], yellow trumpet busy, there are 14 species of tiny trees or shrubs in the genus *Tecoma*. 12 of the 14 species are

native to America, and two are native to Africa. Historically used in Mexico to treat anorexia, hepatitis and diabetes. Reports stated that *Tecoma stans* with anti-inflammatory characteristics. *Tecoma stans* is an important medicinal plant. The alkaloids, phenols, glycosides, terpenoids, flavonoids & saponins among other important bioactive chemicals had been from this plant alone. Extracts from leaves, and roots are used in traditional folk medicine because they contain physiologically active compounds.

The first description of this plant appeared in a work, by Hernandez, a royal physician in 1570, later small group of scientists from Mexico began to study this plant, investigated its therapeutic potential & suggested utilizing leaf infusion to treat hyperglycaemia. Americans used plant components to treat variety of illness & problems like hyperglycaemia, gastrointestinal issues, kidney issues, jaundice, headaches, joint pains, sore eyes. It is also one of the often-employed treatments for snake, scorpion and rat bites. It was reported that *Tecoma stans* possessing anti-inflammatory activity. It is found all over India because it needs humid environments to develop. Standardization of a plant is first for its using herbal medicines.



PLANT PROFILE:

Plant description: *Tecoma stans* is the spreading, fast growing evergreen shrub or small tree can grow to a height of [10 to 30 feet] tall and is noted for its brilliant, bell shaped, fragrant yellow flowers. It features opposite odd-pinnate green leaves, with 3 to 13 serrated margins 8 to 10cm long leaflets. *Tecoma stans* belongs to species of trumpet vine family Bignoniaceae, which is native to Americans with many synonyms and common names.^[5]

Scientific classification:

Botanical Name	<i>Tecoma stans</i>
Family	Bignoniaceae
Sub Family	Asteriidae

Taxonomical classification:

Kingdom	Plantae
Division	Tracheophyta
Sub division	Spermatophytina
Class	Magnoliopsida
Order	Lamiales
Family	Bignoniaceae
Genus	<i>Tecoma</i>
Species	<i>Stans</i>

Binomial name	<i>Tecoma stans</i> [L] Juss. ex Kunth.
Common name	Yellow trumpet bush Yellow Bell, Yellow elder

Distribution:

Tecoma stans thrives in warm regions and is a drought-tolerant ornamental plant. In tropical and subtropical it is extensively distributed^[6]. Although its natural ecosystem spans all of India and south America, it is primarily found in southern Texas, New Mexico, and Arizona to northern Argentina and Bolivia travel from the Bahamas and Florida to Trinidad, a Caribbean Island. It is found all over India because it requires humid environments to develop.^[7,8]

Ecological Information:

Tecoma stans is a weed of roadsides, riparian zones, open woodlands, grasslands, forest margins, waste areas, rocky places, sandy lake shores and distributed sites in tropical and subtropical environments. Ecological plasticity is high in dry to moderately dry areas.

Leaves: The Leaves are opposite, stalked, compound leaves are pinnate, bearing 3-7 elliptic to elliptic-ovate leaflets with toothed margins shape of the leaves are narrowly egg-shaped [i.e., ovate-lanceolate] [25-100mm long 80-30mm wide. Leaf margins are serrate in nature, leaf persistence is evergreen.

**Flowers:**

The flowers are fragrant bright yellow masters of larger trumpeted shaped tubular flowers are borne on a short, upright, terminal, inflorescence. Each flower of *Tecoma stans* measures about 3cm long. Presence of several faint reddish lines in the throat of the flower, which is slightly ridged and hairy.



Fruits: The fruits are green before mature large and flattened linear capsules, brown when mature and it split into open to release numerous papery winged seeds. It is a simple fruit



Seeds:

The seeds are very flat, oblong in shape [7-8mm long and about 4mm wide], and have a transparent wing at each end [The size of entire seed including wing is about 20x6mm]. Seeds are dispersed by wind. They may also be spread by flood water and in dumped garden waste. Seedlings mostly germinate in spring and summer.



Bark:

The bark on the main stem is light brown to pale grey in colour, fissured and relatively rough in texture. Covered in light greyish to brown barks.



Synonyms for *Tecoma stans*:

Bignonia stans L.;

Stenolobium stans (L.) Seem.;

Tecoma stans (L.) Kunth var. *stans*;

Tecoma stans (L.) Kunth var. *velutina* DC

Tecoma cochabambensis (Herzog) sandwich3

Tecoma fulva(cavanilles)D. Don

Vernacular names:

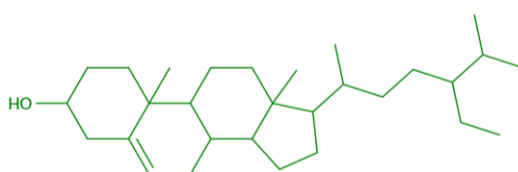
Telugu	Pachagotla
Bengali	Chanda Prabha
English	Trumpet flower, Yellow Bells
Hindi	Pilea
Kannada	Koranekele
Marathi	Ghanti

CHEMICAL CONSTITUENTS:

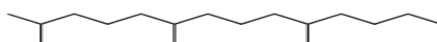
Numerous physiologically active compounds can be found in the leaves, bark, and roots of *Tecoma stans*, and extracts from these tissues have been utilized in traditional folk medicine to treat numerous illnesses and ailments. Tecomine is the therapeutically significant active ingredient in *Tecoma Stans*.^[9] The chemicals responsible for the hypoglycemic activity were found to include (the alkaloids) identified from the plant gathered in Egypt. The fascination with drugs that can reverse type II diabetes. In both *in vitro* and *in vivo* tests, the alkaloids boschniakine and 5 β hydroxyskitanthine—previously referred to as Base C—were inactive. Additional chemical components include alkaloids, phytosterols, and amino acids, triterpenes, monoterpenes, and quinones tannins, glycosides, phenols, flavonoids, and saponins^[10]. *Tecoma stans*' callus tissues have been used to study the biosynthesis of monoterpene alkaloids and to identify the presence of various primary and secondary plants, including lapachol metabolites including sugars (glucose, fructose, sucrose etc) triterpenoids (ursolic and oleanolic acids), p-sitosterol and phenolics (cholinergic, caffeic, vanillic). 5-hydroxy-skytanthine hydrochloride, along with eleven known compounds in the fruits and flowers was established in *Tecoma stans*^[11,12,13].

Chemical structures :

Phytosterol:



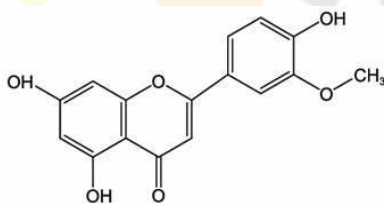
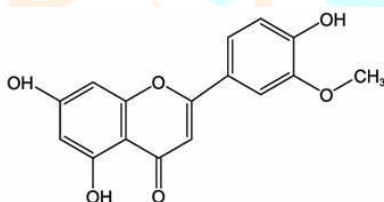
2,6,10-trimethylpentadecane:



1-octen-3-ol:

Bark	phytosterols, alkaloids, quinines, amino acids, monoterpenes, triterpene, glycosides, phenols, flavonoids, saponins, and tannins.
Stem	linalool (11.4%) and 2,6,10-trimethylpentadecane (10.7%)
Leaves	1-octen-3-ol (24.8%) and 2,6,10-trimethylpentadecane (10.4%)
Flowers and fruits	5-hydroxy-skytanthine hydrochloride
Crude extract of whole plant	Chrysoeriol, apigenin and other polyphenols

Chrysoeriol:



Properties:

Morphological parameters	Observation
Colour	Pale brown
Fracture	Hard and woody
Odour	Odourless
Taste	Characteristics
Type	Tap root

Medicinal uses :

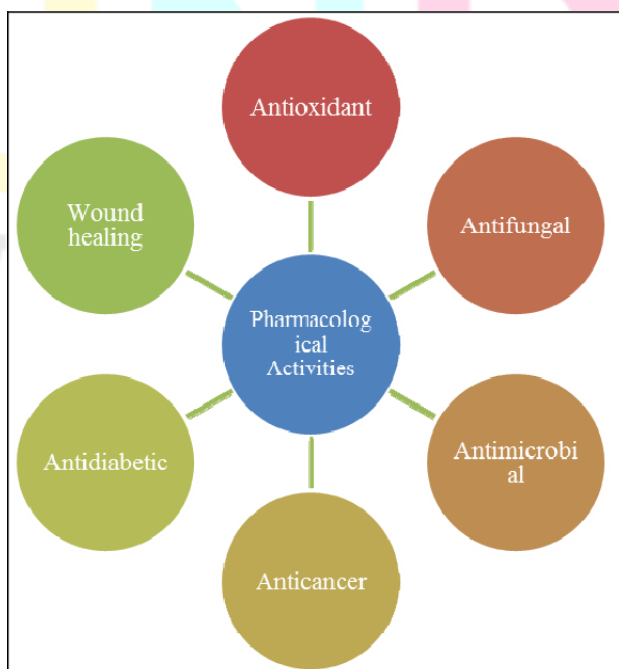
- Traditionally, *Tecoma stans* have been utilized to treat almost all of their medicinally significant sections diverse illnesses. South and Latin America has historically utilized to decrease blood sugar.
- The plant's root is said to have strong diuretic, vermifuge, and tonic properties. Herbal medicine has made use of the leaves, bark, and roots of *Tecoma stans* for a number of purposes. Bark exhibits a modest smooth muscle relaxant both chloretic and cardiotoxic action.

- The plant is widely used in traditional Mexican medicine to cure intestinal, liver, and skin ailments as well as to relieve cold, headache, toothache, and joint pain. It also lowers increased blood glucose levels.
- All parts of the plant especially it contains more amount of compounds such as alkaloids i.e., tecomine and tecoshamine.
- These flowers contains beta carotene and zeaxanthin to treat eye disorder.
- Traditionally flowers and bark are used for treatment of various cancer.
- It is used in horticulture industry because it will grow in drought and it can tolerate semi- salt areas.
- At the same time it can also act as antidiabetic,antispasmodic,antiproliferative,antioxidant,wound healing,cytotoxic,antimicrobial/antifungal.
- A grinding of *Tecoma stans* and lemon juice is reportedly used as external application and also taken internally in small quantities as a remedy for Snake and rat bites.
- At the same time it can also be used as anti-spasmodic, anti-proliferative, anti-diabetic, anti-diuretic activity.
- A grinding of *Tecoma stans* and lemon juice is reportedly used as external application and also taken internally in small quantities as a remedy for snake bite.
- Flowers used for many alignment including cancer, daibetes and arthritis.

Part	Uses	Action
Bark	smooth muscle relaxant, mild cardiotoxic and chloretic activity	Anti-oxidant ,anti-cancer agents
Leaves	Inhibit the growth of the fungal infection, candida albicans	Anti-microbial Anti fungal Wound healing
Root	Treatment of diabetes, It is reported for powerful diuretic,vermifuge and tonic	Anti diabetic Anti diuretic

Pharmacological activity:

Tecoma stans have various pharmacological activities like anti-diabetic, anti-inflammatory, anti-microbial, anti-oxidant, cytotoxic, anti-fungal.



Anti-diabetic:

The aqueous extract of *Tecoma stans* (500mg/kg) showed decrease hyperglycaemic peak values in magnitude similar to that of a carbose (500mg/kg) in both healthy and streptozotocin induced diabetic male Sprague-Dawley rats. An aqueous leaf extract from *Tecoma stans* promotes glucose absorption in both insulin-sensitive and insulin-resistant mouse and human. Adipocytes from humans without strong procardiogenic or adverse effects of antiadipogenesis^[14]. *Tecoma stans* stem ethanolic extract demonstrated statistically more substantial blood glucose level reduction at 200mg/kg^[15].

Anti-inflammatory:

Tecoma stans extracts in methanol, ethanol, and water demonstrated anti-inflammatory activity by preventing heat-induced albumin denaturation and red blood cell destruction stability of membrane^[16]. In another study, the injection of alcohol extract at 250 and 500 mg/kg reduced the edema from 3 hours after carrageenan challenge, and aqueous extract at doses of 250 and 500 mg/kg reduced edema starting 4 hours after the carrageenan challenge, which most likely reduces the many components and chemical mediators of inflammation^[17]. When paw edema was inhibited by the extracts at 200 mg/kg (% of inhibition of paw edema 50.93 at 4 hours), the anti-inflammatory effects were significantly greater than the control^[18].

Anti-microbial:

The "Paper disc method" was used to test the anti-microbial activity of methanolic and ethanolic extracts of *Tecoma stans* plant sections against a variety of bacteria, including *Clavibacter michiganensis* subsp. *Michiganians*, several fungi such as *cercosporacaratham*, *alternariahelianthi*^[19].

A phytochemical examination found alkaloids, flavonoids, saponins, phenols, steroids, anthraquinones, and tannins in the plant material. Most total phenolic content (177–216 mg gallic acid) was found in the three extract fractions. equivalent/g) that its antibacterial activity. Both the alcoholic and aqueous extract of *T. stans* displayed antibacterial activity, and at various doses, both *E. coli* and *B. subtilis* growth were suppressed. The *Tecoma stans* leaves, stem bark, and extracts in methanol was investigated for its antibacterial properties utilizing a broad a variety of Gram-positive and Gram-negative microorganisms, as well as fungi.

Anti-oxidant:

Antioxidants like carotenes, phenolic acids, etc. are mostly found in plants. *Tecoma stans*' phytochemical research revealed that the plant contains alkaloids, carbs, glycosides, and steroids. Flavonoids can operate as scavengers of free radicals and neutralize the radical chain reactions that happen when oxygen is added to food systems' triglycerides^[23-24].

The ability of *Tecoma stans* plant sections' methanolic and ethanolic extracts to scavenge DPPH free radicals in comparison to the standards, ascorbic acid and butylated hydroxytoluene, was used to test their antioxidant activity.^[25]

Anti -fungal:

Drop diffusion was used to investigate the antifungal properties. *Tecoma stans* exhibit notable variations in their responses to the microorganisms under investigation, with the majority of the extracts demonstrated *Candida*-fighting antifungal properties. *Microsporum*, *Cryptococcus neoformans*, and *albicans* Greece. The optimal zone of support for *Tecoma stans* is found to be suppression of the fungal activity^[26]. Using the agar dilution method, the organic extract of *Tecoma stans* was evaluated at a concentration of 100 µ/mL against two species of subcutaneous fungi: *Fonsecaea pedrosoi* and *Sporothrix schenckii*. The *Tecoma* cult, shown MIC of 12.5 µg/mL of effective activity against *F. pedrosoi*. In additional research, the drop

diffusion method was used to test the antifungal and antiyeast properties. *Tecoma stans* were discovered to provide the best zone of inhibition against all investigated fungus species. Of *Alternaria* and *aspergillus*.^[27]

Conclusion:

Tecoma stans, sometimes known as Yellow Bells or Esperanza, is a lovely and multipurpose plant. It is valued for its bright yellow trumpet-shaped flowers, tolerance to a variety of soil conditions, and capacity to attract pollinators such as humming birds. *Tecoma stans* can grow in a variety of climates and is a low-maintenance option for gardeners and landscaping. Whether planted as a shrub, small tree, or hedge, this plant can give colour and charm to gardens and landscapes, making it a popular choice for anyone looking for a visually pleasing and hardy plant. Scientific research on the plant *Tecoma Stans* has revealed that the raw extracts have antibacterial, free radical scavenging, and anti-diabetic characteristics. Cytotoxic, wound-healing, anti-inflammatory and anticancer properties. Triterpenes, monoterpenes, and quinones, as well as alkaloids, phytosterols, and amino acids Flavonoids, glycosides, phenols, saponins, and tannins are known for their biological properties, and despite the fact that a group of compounds in this class. Although several phytochemicals have been found, only a few number have been subjected to pharmacological testing. The goal of this review was to assemble relevant data about the unique therapeutic properties of this species, indicating future research priorities.

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