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A comprehensive Review on *Tecoma Stans* Its Phytochemical & Pharmacological activity

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ABSTRACT:

Since ancient times, people used plants especially herbs as medicines. The perennial flowering shrub species *Tecoma Stans* is a member of the Bignoniaceae family. It is used to treat stomach pain, diabetes, yeast infections, and other conditions. It has antibacterial, anticancer, anti-inflammatory, anti-diabetic, and antioxidant effects. Due to the flower's appearance as a bright yellow bell-shaped flower, it is frequently referred to as yellow bells. It has a variety of medical and pharmaceutical uses. All plant parts, including the leaves, roots, flowers, seeds, and bark, have therapeutic uses. Extract of the plant revealed different chemical constituents like tannins, flavonoids, phenols, glycosides, alkaloids, quinones, and amino acids. In this review we focus on the pharmacological and phytochemical constituents of this plant.

Keywords: *Tecoma Stans*, medicinal use, phytochemistry and pharmacological use, toxicity.

Introduction:

Tecoma Stans is a tiny tree that is an evergreen shrub. It is an American-native species of the Bignoniaceae family of flowering shrubs. Yellow bells, yellow elder, and ginger Thomas are examples of common names. Tecoma stans is fast growing ornamental plant which grows throughout India. It is traditionally used in Mexico to control diabetics, hepatic, dysenteric, anorexia problems. It was reported that Tecoma stans possessing anti-inflammatory activity. It has many active constituents in leaves, barks, pods and flowers like Tecostatin, Tecomine. It also constitutes other chemical constituents like alkaloids, phenols, flavonoids, monoterpenes etc. It is found all over India because it needs humid environments to develop [1,2,3].

Local names:

- [4]. English (Ginger Thomas, Tecoma, Trumpet flower, yellow bells, yellow bignonia, yellow cedar, yellow elder, yellow trumpet tree)
- French (Tecoma jaune, herb de st Nicholas, fleur de st Pierre, chevalier)
- Arabic (Tacoma)
- Creole (chevalye, flesenpie, zebsennikola)
- Italian (Tecomagiallo)
- Spanish (Saucoamarillo, roble Amarillo)
- Tamil (Sonapatti)
- Hindi (Piliya)
- Marathi (Ghantiful)
- Nepali (Ghata pushpa, saawari)
- Kannada (Koranekelar)

Geographical distribution:

[5]. Native: Argentina, Bolivia, Brazil, Colombia, Cuba, French, Guina, Mexico, Panama, Guyana, Haiti, Peru, Puerto Rico, Venezuela.

Exotic: Benin, Cameroon, Chad, Cote Dlvoire, Gambia, Ghana, India Kenya, Liberia, Mali, Nniger, Pakistan, Togo, Senegal, US of America, Sudan**.**

Taxonomical Classification:

Domain:	Eukayiota
Kingdom:	Plantae-plant
Subkingdom:	Angiosperm-seeds are cover.
Phylum:	Trachiobionta-vascular plant.
Subphylum:	Euphyllophytina
Super division:	Spermatophyte
Division:	Mangnoliophyta (eudicots)
Class:	Mangnoliopsida-dicotyledons
Subclass:	Asteridae
Order:	Scrophularials
Family:	Bignoniaceae

Table No. 1: taxonomy of plant

Morphology of plant:

- Height: 10-30 feet.
- Spread: 8-30 feet Crown
- Uniformity: Irregular.
- Crown Shape: Oval.
- Crown Density: Moderate.
- Growth Rate: Moderate.
- Texture: medium[6].

- **Foliage-**

Fig. 1 – Foliage

- Leaf arrangements: opposite/subopposite
- Leaf type: odd-pinnately compound, made up of 5-13 leaflets.
- Leaf margin: Serrate
- Leaf shape: lanceolate to elliptic
- Leaf venation: pinnate, brachidodrome.
- Leaf type and persistence: semievergreen, evergreen.
- Leaf colour: yellowish green to dark green.
- Fall colour: no colour change
- Fall characteristics: not showy .

- **Flower**: -

Fig.2 - Flowers of plant

- Flower colour: bright yellow with thin, red vertical lines along the inner throat.
- Flower characteristics: very showy, trumpet-shaped, fragnant, emerges in clusters on racemes.
- Flowering: primarily spring & fall, but also year-round.

- **Fruit**: -

Fig. 3 – Fruit of Tecoma stan plant

- Fruit shape: elongated, long slender capsule
- Fruit length :4-10 inches
- Fruit covering: dry or hard
- Fruit colour: turns forms bright green to brown when mature
- Fruit characteristics: does not attract wild life showy, fruit leaves not a little problems Fruiting: primarily spring & fall, but also year – round.

- **Trunk & Branches:**

Fig. 4 – Trunk of plant

- Trunk & branches: branches droop, not showy, typically multi –trunked, no thorns.
- Bark: light grey to brown, with white lenticels when young, then becomes fissured with age.
- Breakage: resistant.
- Current year twing colour: green.
- Wood specific gravity: unknown.
- Current year twing thickness – thin.

PHYTOCHEMICAL STUDIES: -

Experimental research on Tecoma stans L. leaves and callus callus induction, active ingredients, and antioxidant activity. Depending on the solvent employed to extract the leaves from the Tecoma stans plants, different phytochemical screenings were performed on those plants. All of the secondary metabolites investigated, including saponins, flavonoids, tannins, phenols, anthraquinones, alkaloids, and glycosides which would be the plant's active ingredients—were present in the methanol and ethanol extracts of the leaves.[7]

Bioactive compounds -

It revealed the presence of many (Bioactive compounds) which are Showing as follows –

1. Tecostatin
2. Boschiakine
3. Luteolin
4. Caffeic acid
5. Chlorogenic acid
6. Gallic acid

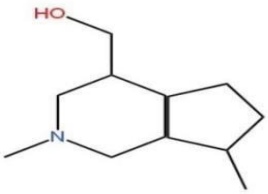
Phytochemical/ phytoconstituents of plant parts:

Plant part	**Chemical constituents**	**Pharmacological activity**
Flowers Leaves	Volatile oils	Antimicrobial activity or anti-oral activity.
	Monoterpene alkaloids	Anti- diabetic activity. (Type -II)
Fruits	7-hydroxy-5,6 – dehydrosky-tanthine & 4-hydroxytecoman-ine, tecomine	In vivo In vitro assay. Lowered glucose uptake in white adipocytes.
Roots	Chloroform	Shows smooth muscle relaxant , mild cardiotonic & chloertic activity. Anti-inflammatory, diuretic activity, vermifuge &tonic.[8]

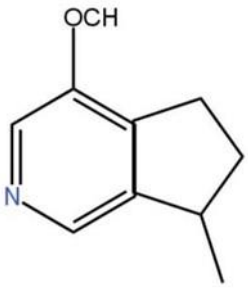
Table No. 2: Phytochemical constituents of plant

Structures of phytoconstituents-

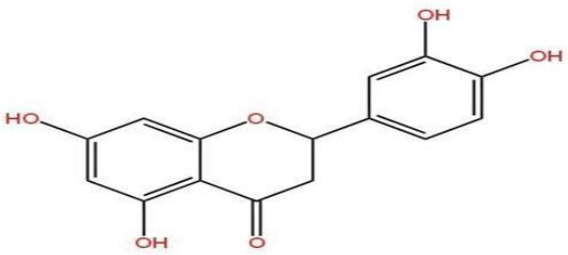
1. Tecostatin-



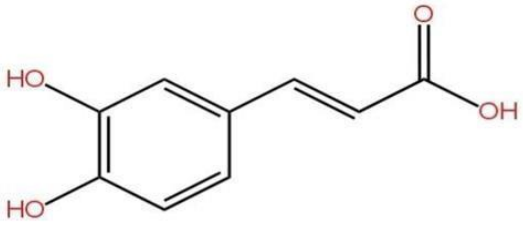
2.Boschiakine -



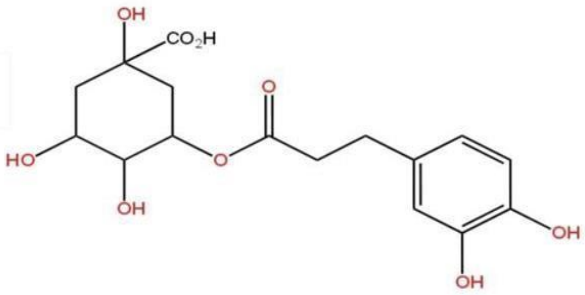
3.Luteolin-



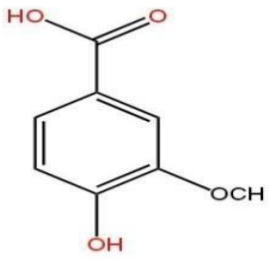
4. Caffeic Acid



5. Chlorogenic Acid



6. Gallic acid



Pharmacological Activity:

T. stans has been utilised as an anti-diabetic from ancient times since it is thought to have therapeutic characteristics. Tecomine contains additional chemical components in the form of alkaloids, phenols, flavonoids, monoterpenes, etc. This belief prompted several in vivo and invitro experiments using a variety of techniques, which produced promising results for a number of activities. ethanolic extract of T.
stans fruits included two brand-new monoterpenoid alkaloids that were isolated. The following
are a few of the pharmacological effects that T. stans has demonstrated. [9-13]

Plant Parts	**Chemical Constituents**	**Activity**	**Use**
Root	chloroform	Anti- inflammatory	Paw edema
Leaves	methanol	Anti- diabetic	Candida albicans
Stem bark	methanol	Anti -microbial	Wound healing

Table No. 3: Pharmacological Activity

1. Anti-Diabetic activity-

In both healthy and streptozotocin (STZ)-induced diabetic male Sprague-Dawley rats, the aqueous extract of T. stans reduced hyperglycaemic peak values in a magnitude comparable to that of acarbose (500mg/kg). A sub-chronic aqueous extract of T. stans was found to lower triglycerides and cholesterol while leaving fasting glucose unchanged, according to a study. The effects seen on blood parameters appear to be connected to the hepatic metabolism of glycogen, which involves activating glycogenolysis. Tecoma stans infusion's late hypoglycaemic effect could be viewed as secondary to the

measured hepatic glucose production. The study is an effort to clarify the antidiabetic benefits of this Mexican medicinal plant that have been widely reported.[14]

2. Anti-Bacterial activity-

T. stans crude leaf extracts were tested in vitro for their ability to inhibit the growth of a variety of bacteria, including Staphylococcus aureus, Staphylococcus epidermidis, Salmonella typhi, Klebsiella pneumoniae, and Vibrio parahaemolyticus. For the aforementioned strains, in vitro studies revealed a variety of Zone of Inhibition outcomes. [15]

3.Anti-Cancer Activity-

Breast cancer MCF-7 cell line culture was used to test the anti-cancer activity of T. stans leaf extract and conducted in-vitro studies that demonstrated the anticancer activity of MCF-7 Cell Line Culture at increasing concentrations. The inhibitory concentration (IC50) was discovered to be 64.5 g/ml. [15]

4. Anti-Microbial activity-

The "Paper disc method" was used to test the anti-microbial activity of methanolic and ethanolic extracts of Tecoma stans plant parts against a variety of microbes, including Alternaria helianthi, Cercosporacarthami, Staphylococcus aureus, Pseudomonas fluorescens, and Fusarium solani and Fusarium oxysporum. Strong antimicrobial action with a wide range of Zones of Inhibition against different species. Only Candida albicans was shown to be resistant to Tecoma stans leaf extracts in methanol. It was found that some organisms were more sensitive to the extracts than others, and that stem bark extracts generally had better antimicrobial activity than leaf extracts. [16-23]

5. Antioxidant activity-

The antioxidant properties of Tecoma stans plant sections' methanolic and ethanolic extracts was determined by comparing the ability of DPPH to scavenge free radicals to the reference standards of ascorbic acid and butylated hydroxytoluene. According to research, methanolic extract had a scavenging activity of 58.99% and ethanolic extract had a scavenging activity of 56.88% at a dosage of 0.1 mg/ml. [24,25]

6. Anti-Ulcer activity-

According to studies by a 500 mg/kg body weight dose of an ethanolic extract of Tecoma stans leaves had gastroprotective effects against acetone-induced ulcers and pylorus ligation-induced ulcers in rats.[25]

7. Analgesic Activity-

T stans extracts proved to possess anti-Microbial and analgesic potential as well as Being useful for inhibition of induced-platelets Aggregation and reduction of diabetes mellitus. [26,27]

8. Anti-Inflammatory Activity-

The anti-inflammatory activity of chloroform root extract of Tecoma stan Chloroform extract was analysed for anti-inflammatory activity against carrageenan-induced paw edema method in Wistar albino rats. In control group simple distilled water, in standard group Aspirin (100 mg/kg) and in test groups chloroform extract (100mg/kg, 200mg/kg) were administered orally. After 30 minutes, 1% w/v carrageenan solution was injected intraperitoneally, and the paw volume of control, standards and test groups were noted at 1hr, 2hr, 3hr and 4hr time interval. Anti-inflammatory effects of the extracts showed significant anti-inflammatory activity at 200mg/kg (% of inhibition of paw edema 50.93 at 4 hrs.) as compared to control.[28]

9. Cardio-protective effect-

In many nations, cardiovascular disorders are the leading cause of death. Myocardial infarction is the result of an imbalance in the oxygen supply to the myocardium, which is then followed by the onset of myocardial necrosis. As a result, there is an increase in hazardous reactive oxygen species including O2, H2O2, OH, and others. These species put simple oxidative pressure on the myocardium, which causes cardiovascular illnesses such ischemic heart disease, atherosclerosis, and congestive heart failure. The animal model used to test the Tecoma Stans' cardioprotective effects provides an estimate of the myocardium's antioxidant activities.[29]

10. Cytotoxicity study-

Cells become poisonous due to cytotoxicity. Tecomastans' cytotoxicity was assessed in human hepatoblastoma cells by incubating the cells for up to 72 hours while varying the concentration of herbal extracts. Tecomastans' toxic effects were initially found to be time- and attention-dependent in both the presence and absence of foetal bovine serum.[29]

11. G. Antispasmodic Activity-

Tecoma stans leaf extracts' impact on the contractility of the rat ileum and the mechanisms involved were studied. Tecoma stans leaf extract causes its antispasmodic actions without involving NO generation, opioid receptors, adrenoceptors, or potassium channels. This spasmolytic action appears to be caused by the calcium channels.[30]

12. Wound healing activity-

Tecoma stan Linn bark extract in methanol for albino rat wound healing activities. Practices for treating wounds effectively and cellular processes that promote the growth and regeneration of wound tissue in a unique way. A complicated network of blood cells, cytokines, and growth factors work together during the healing process to bring the injured skin or tissue back to its pre-injury state. Wound care must take place in a physiological setting that supports repair and regeneration in order to promote wound healing in the shortest amount of time with the least amount of pain, discomfort, and scarring to the patient. Tecoma stans was studied for its potential to treat wounds, and the findings support the widespread use of the plant to open wounds in traditional medicine. Local application and systemic administration of a methanol extract of the bark has shown more significant wound healing activity in excision and incision wound models.[31]

Conclusion:

Tecoma stans is a lovely decorative plant that has historically been used as a carcinogen, antimicrobial, antioxidant, anti-ulcer, anti-inflammatory, anti-plasmodic, analgesic, and antidiabetic, among other things. Research on this plant is expanding constantly as a result of its potent medicinal applications. The isolation of several potent chemical components that form the foundation of its specific pharmacological activities was made possible by numerous phytochemical research. Reviews of the phytochemical and pharmacological properties of plants will provide useful data that will help scientists learn more in-depth information about a particular plant species. Because this plant is widely dispersed throughout tropical and subtropical areas including America, Mexico, the West Indies, and India, more research is currently being done on it. In order to serve as a springboard for future work, the aim of this review was to compile the research that has been conducted by a variety of scientists at various locations to date.

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