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Review Article

Exploring the Therapeutic Potential of *Cassia Tora* Linn: An in-depth Review of its Phytochemistry, Traditional Uses and Pharmacology

Spoorthi*, Ashoka Shenoy M.

Department of Pharmacology, Srinivas College of Pharmacy, Valachil, Mangalore- 574143.

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ABSTRACT

Cassia tora, locally called "Tojank" on the coasts of Karnataka, is a herbaceous plant from the Fabaceae family found in the tropical regions of Asia and Africa. It is commonly seen as a weed in India. Considered an integral part of a traditional system of medicine, it is widely used in Ayurvedic medicine due to its varied therapeutic capabilities. Phytochemical analysis has established the presence of a spectrum of bioactive compounds, including flavonoids, alkaloids, saponins, glycosides, and anthraquinones, which are reputed to be accountable for their medicinal properties. Traditional practitioners use Cassia Tora to treat a multitude of health disorders, including diabetes, skin disorders, liver complications, and gastrointestinal problems. Bioactive molecules like anthraquinones (emodin, Rhein, and chrysophanol), glycosides (quercetin), and amino acids, as well as other prominent phytochemicals such as chrysophanic acid, cassiaside, and beta-sitosterol, have been established to be accountable for these useful activities, vindicating the plant of significant interest in drug development and therapeutic application. This review provides a critical account of Cassia tora, including its botanical description, phytochemical features, traditional uses, and modern pharmacological reports, establishing its therapeutic significance in traditional and modern medicine.

INTRODUCTION

Nature has bestowed us with reservoirs of plants to cure human ailments. A large part of the rural, tribal community and conventional practitioners utilize traditional herbal medicines for their primary healthcare system [1]. The ancient Indian system of medicine relies predominantly on plant-based drugs [2]. *Cassia tora* L. (CT), a member of the Fabaceae family, is commonly known by names such as Charota, Chakvad, and Chakramarda. It is well-documented in key Ayurvedic texts. It is available in all regions of India, especially during rainy seasons, and

***Corresponding Author:** Spoorthi
Address: *Department of Pharmacology, Srinivas College of Pharmacy, Valachil, Mangalore- 574143.*
Email ✉: spoorthir53@gmail.com
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commonly grows on roadsides. Due to its ability to balance the Pitta and Vata doshas, this plant is well-known for its Vata-Pitta shamaka qualities. Because of its Laghu (~light) and Ruksha (~dry) properties, it is especially effective in treating conditions like Jwara (~fever), Kasa (~cough), as well as skin disorders like Dadru (~ringworm) and Kandu (~itching). The seeds of Chakramarda contain several derivatives of anthraquinones, while leaf extracts yield compounds such as Sennosides and Naphthopyrone. These plant extracts are claimed to cure various skin diseases and rheumatic complaints and are known for their purgative effects. Furthermore, *Cassia tora* has been reported to exhibit hepatoprotective and anti-inflammatory activities. Overall, Cassia tora is a powerful ally in promoting health and vitality, effectively bridging traditional wisdom with modern therapeutic applications [3].

Fig No.1: Whole plant of *Cassia Tora*

Fig No. 2: Adaxial and Abaxial surfaces of leaflets of *Cassia Tora*.

Fig No. 3: Morphology of *Cassia Tora* a) Flowers b) Seeds c) Roots

Botanical Classification [4,5]

Table No. 1: Botanical classification of *Cassia Tora Linn*

Taxonomic Rank	Classification
Family Name	Caesalpiniaceae
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Fabales
Family	Fabaceae
Subfamily	Caesalpinioideae
Tribe	Cassieae
Sub-tribe	Cassiinae
Genus	*Cassia*
Species	*Tora*
Botanical Name	*Cassia Tora* Linn.

Vernacular Names [6]

Table No. 2: Regional names of *Cassia tora* in different languages

Language	Regional Name(s)
English	Foetid cassia, ringworm plant, Sickle Senna, Wild Senna
Tamil	Tagarai, Senavu, vindu, ushittagarai
Kannada	Tagace, taragasi, gandutogache
Malayalam	Chakramandarakam, takara
Gujarati	Kawario, konariya, kunvadio
Sanskrit	Chakramarda & Dadmari
Hindi	Chakunda, chakavat, panevar, chakvad, pavaad, pavaar
Konkani	Tojank

Geographical Distribution

Cassia tora Linn (Family: Leguminosae) is an annual shrub that grows all over tropical countries (throughout India, Pakistan, Bangladesh, and western China) and grows well in wasteland as a rainy season weed [7,8]. Although the plant is present throughout the rainy season, it bears flowers and fruit from August to November [9]. In India, there are 45 known species of *Cassia*. It spreads widely across waste areas, riverbanks, roadside ditches, low-lying hills, agricultural fields up to 1000–1800 meters, plains, and low-lying coastal regions. It thrives in moist, arid regions of India's uncultivated tropical fields, especially in the country's center and south [10].

Description Of the Plant

The annual fetid herb *Cassia tora* grows between 30 and 90 cm tall. Leaves are green; pinnate, up to 6-8 cm long, leaflets are in 3 pairs, distinctly petioled, opposite, conical at one end, ovate, oblong, and base oblique [7]. Rachis has a conical gland between the two lowest pairs of leaflets and is grooved with more or less pubescence. The stipules are linear-subulate and measure 1.3-2 cm in length. Three pairs of opposite-facing leaflets, measuring 2.5–4.5 cm in length and 1.3–2.5 cm in width, are oblong-elliptic in shape, membrane-bound, glabrous, or somewhat pubescent. The

leaflet's smallest pair is the lowest pair. Petiolules are 2.5 mm long and pubescent. In the leaf axils, flowers are typically found in subsessile pairs. Glabrous calyxes are separated into ovate spreading segments 5 mm long at the base. There are five pale yellow petals, each measuring 8 mm in length and 2.5 mm in width. There are ten stamens; three upper ones have been reduced to minute staminodes, while the other seven are flawless and of subequal size. Pods are obliquely septate, 12.5–20 cm long, and 4-5 mm wide. When they are young, they are significantly curved. There are 25–30 seeds, each rhombohedral in shape, green in color, and oriented with its long axis toward the pod [11].

Phytoconstituents:

Several phytochemicals have been reported from this plant, belonging to different classes such as glycosides, tannins, flavonoids, steroids, resins, mucilage, and sugars. Numerous medicinal applications of *C. tora* have been confirmed by scientific methods [12].

Leaves: Preliminary phytochemical tests of the leaves showed the presence of polyphenols, which drove researchers to estimate their antioxidant and antiproliferative potential [2]. It showed mainly the presence of anthraquinone glycosides and flavonoids such as Rhein, emodin, physcion, chrysophanol (marker), obtusin, chryso-obtusin-2-Oβ-D-glucoside, obtusifolin, and chrysoobtusin-2-O-β-D-glucoside. Emodin, triacontan-1-ol; Stigmasterol; Sennosides and Aloe emodin; 1,6,8-trihydroxy-3-methyl anthraquinone [7]. Ononitol monohydrate, structurally similar to a glycoside, was isolated from *Cassia tora* leaves [13].

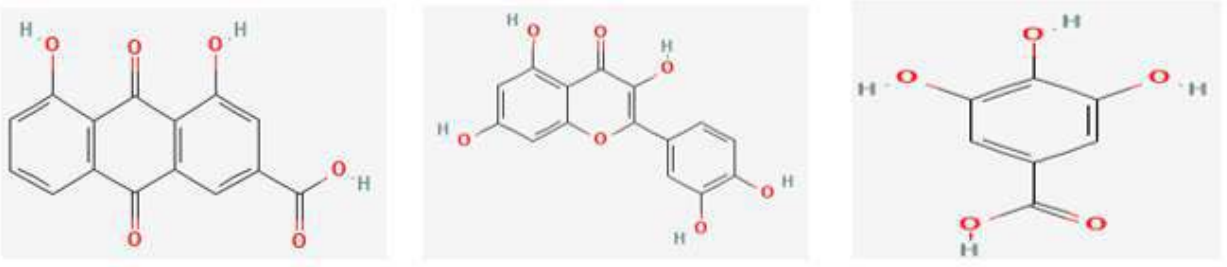
Seeds: The BuOH-soluble extract of *Cassia tora* seeds yielded three naphthopyrone glucosides as active constituents: cassiaside, rubrofusarin-6-O-ß-D-gentiobioside, and toralactone-9-O-ß-D-gentiobioside [14]. Besides this emodin, subrofusarin, chrysophanic acid, 1,8-dihydroxy anthraquinone, β-sitosterol, rein-like aglycones, cassiaside, rubrofusarin, torosachrysone, quercetin, and its analog were also detected [15]**.**

Seed oil contains different percentages of oleic, linoleic, palmitic, stearic, and lignoceric acids. It is a neutral heteropolysaccharide of galactose and mannose.

Pods are rich in sennosides. Flowers are reported to contain kaempferol and leucopelargonidine.

Roots of *C. tora* showed the presence of 1, 3, 5 trihydroxy 6, 7 dimethoxy-2-methyl anthraquinone [7]. Besides this, choline, leucopelargonidin-3-O-α-L-rhamnopyranoside, and β-sitosterol were also detected.

Stem bark contains arachidic acid, isosteric acid, linoleic acid, palmitic acid, behenic acid, phenolics like Rhein, emodin, hexahydroxy flavones, and a hydroxycoumarin [16].



Rhein | Quercetin | Gallic acid

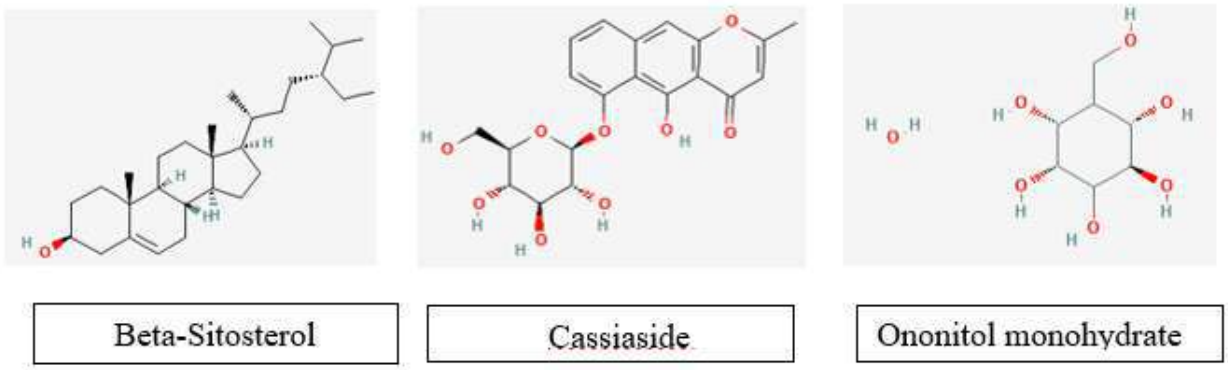


Fig. No. 4: Representative Chemical Structures of Phytoconstituents in *Cassia tora.*

Medicinal And Traditional Uses:

Various parts of the plant, such as leaves, seeds, and roots, are known for their medicinal properties. The leaves of *Cassia tora* are traditionally recognized for their antirheumatic activity. A decoction of the leaves is commonly used as a laxative. In Chinese medicine, the seeds of *Cassia tora* are utilized as aperients and diuretics, and they are believed to enhance visual acuity and treat liver disorders. The leaves are known to have antiparasitic, alterative, and aperient properties, and are often given to children suffering from intestinal disorders. Additionally, the leaves, roots, and even the entire plant are used to treat conditions such as impetigo, ulcers, helminthiasis, and as a purgative. In Korea, a hot extract of the seeds is taken in the form of a decoction to protect the liver. Both the leaves and seeds are also used to treat skin disorders like ringworm and itching. The extract of the stem bark is applied for various skin ailments and rheumatic diseases, and as a laxative. In Ayurveda, the plant is included in formulations such as 'Dadrughani Vati' and 'Pamari Taila' [17]. These seeds are an excellent alternative to coffee, offering a natural way to help lower high blood pressure. Boiling the seeds can effectively treat hypogalactia in animals, making them a valuable resource for livestock care [18]. Leaves are not only valued for their medicinal properties but also consumed as a vegetable delicacy in some parts of the world, particularly in Asia. In coastal belts of India, like in districts of Dakshina Kannada known as "Tulunad" during Aati/Aadi/ monsoon season, this edible weed is often consumed in many different ways (mainly as a savory) as it grows in lush. They're often used in traditional dishes like curries, Stir-fries, and vadas (fried lentil dumplings), chutney, cutlets, and leaves are considered nutritious and are valued for their potential health benefits.

Pharmacological Activities

Renoprotective activity:

The study assessed the renoprotective effects of *Cassia tora* in Sprague-Dawley rats after inducing renal ischemia by bilateral renal pedicle occlusion for 30 minutes, followed by reperfusion. Rats were divided into three groups: sham, I/R, and I/R-C. *C. tora* treatment (100 mg/kg/d) resulted in improved renal function and increased the expression of antioxidant enzymes, specifically catalase, superoxide dismutase (SOD), and glutathione peroxidase. These constituents help mitigate oxidative stress and inflammation during renal ischemia/reperfusion injury, contributing to improved renal function as evidenced by lower serum levels of blood urea

nitrogen (BUN) and creatinine in the I/R- C. Tora group compared to the I/R group [19].

Anti-Inflammatory Activity:

Rat hind paw edema caused by serotonin, histamine, carrageenin, and dextran was effectively inhibited by the methanolic extract of *C. tora* leaves in a dose-dependent manner [20].

Antitumor Activity:

Emodin, an anthraquinone present in the root and bark of *C. tora*, possesses anti-tumor activity. It exhibits an inhibitory effect on angiogenic and metastasis regulatory processes. Because of its quinine-like structure, emodin may interfere with the electron transport process and change cellular redox status, which may affect its cytotoxic property [21].

Antiulcer activity:

In an experimental model of ulcerative colitis induced by dextran sulfate sodium, the methanol extract of *C. tora* leaf was tested for its antiulcer activity using BALB/c mice. The test medicine was reported to treat the symptoms of bleeding, diarrhea, loss of body weight, and restoration of damaged colon tissues when administered for 14 days at a dose of 400 mg/kg of body weight [10].

Hepatoprotective Activity:

Hydro-alcoholic extracts of *Cassia* species, whole plant, showed a significant decrease in the levels of serum markers, indicating the protection of hepatic cells and significant dose-dependent protection against paracetamol-induced hepatocellular injury. Methanolic extract of Cassia species leaves at a dose of 400 mg/kg showed significant hepatoprotective effect by lowering the serum levels of transaminase (SGOT and SGPT), bilirubin, and alkaline phosphatase (ALP) [22].

Antifungal Activity:

Different studies have shown that the plant has antifungal activity. The major antifungal compound isolated was Chrysophanic acid-9-anthrone. The compound has inhibited the growth of *Trichophyton rubrum*, *T. mentagrophytes*, *Microsporum canis*, *M. gypseum*, and *Geotrichum candidum* in broth culture when combined with the antioxidant L-Ascorbic acid at a concentration of 95.5 µg/ml [23].

Anthelmintic Activity:

Anthelmintic activity of alcoholic and aqueous extracts of the seed against *Ascaridia galli* and *Pheretima posthuma* was studied. With pure water and the standard piperazine citrate as control, the extracts were found to exhibit good anthelmintic activity at the highest concentration of 100 mg/ml [24].

Purgative Effect:

The methanolic extract from the leaves of *C. tora* showed purgative activity. The seeds have been used as a purgative, mainly on account of the presence of aloe-emodin, emodin, and anthraquinone glycosides [20].

Nitric Oxide Scavenging Activity:

Methanolic leaf extract of *Cassia tora* was screened for its nitric oxide scavenging activity and reducing power tests using Rutin and BHT as standards. The extract was studied for lipid peroxidation inhibition assay by rat liver and brain [25].

Antibacterial activity:

Torachrysone, toralactone, aloe-emodin, rhein and emodin compounds isolated from seeds exhibited strong antibacterial activity towards four

methicillin-resistant strains of *Staphylococcus aureus* by having minimum inhibitory concentration ranges of 2-64 mg/ml. On the contrary, certain phenolic glycosides were also identified from seeds without strong antibacterial activity towards Escherichia coli and P. aeruginosa [26].

Antidiabetic action:

Male albino rats with alloxan-induced experimental diabetes had decreased blood sugar levels after a dose of 1000 mg/kg body weight of methanol extract of *Cassia tora* leaf. The postprandial blood glucose effect of the butanol fraction of *Cassia tora* leaf was investigated in normal and diabetic rats, particularly in streptozotocin-induced experimental diabetic rats. During the maltose loading test, the given medicine in a dose of 200 mg/kg body weight significantly decreased the blood glucose levels 30-80 minutes after administration in normal rats, but in diabetic rats, a decrease was noted 30 minutes after administration compared to the control [27].

Antiparkinsonian Activity:

The oxidative stress induced by oxotremorine is acknowledged as a common mechanism that leads to the emergence of Parkinsonian symptoms, such as tremors, excessive salivation, and body temperature instability. Researchers tested *Cassia tora* extracts (petroleum ether, methanolic, and ethyl acetate) at 200 mg/kg orally on oxotremorine-induced Parkinson's in mice. Procyclidine (5 mg/kg, oral) is an anticholinergic drug and was given as a reference treatment, one hour before receiving oxotremorine (0.5mg/kg) via subcutaneous injection. The methanolic extract significantly reduced symptoms ($p<0.05$), while petroleum ether and ethyl acetate showed moderate benefits, suggesting that *Cassia tora* has potential therapeutic effects for Parkinson's disease [28].

CONCLUSION

The scientific research on *Cassia tora* presents a promising natural resource with a wide array of bioactive compounds that exhibit notable pharmacological activities. The phytochemical variations and efficacy of the medicinal values of *C. tora* are dependent on geographical locations and seasons. The detailed overview of the aspects of its botanical, phytochemical, and pharmacological properties provides obvious evidence that it may be well incorporated into modern healthcare systems. Despite its extensive traditional use, scientific research has begun to uncover deeper insights into its pharmacological actions, which hold great promise for drug discovery and development. Future research should focus on the isolation of specific bioactive compounds, clinical trials, and the development of standardized extracts that can be translated into effective pharmacological treatments.

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