Exploring the Therapeutic Potential of *Cassia tora* Linn. (Fabaceae): A Comprehensive Review

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ABSTRACT

Universally therapeutic plants are key foundations of new drugs and at high speed, they are disappearing. Modern drug discovery is grounded on the traditional facts of therapeutic plants. As stated by WHO (World Health Organization), in developing countries 80% of people rely on herbal drugs for their initial healthcare. This review discusses the therapeutic potential of *Cassia tora* Linn. It is a widely known plant and is popular in India and other tropical countries. Different parts (leaves, seeds, and roots) of the plants are well known for their therapeutic potential. *Cassia tora* is a plant with a variety of active components, including anthraquinones, which are aromatic organic compounds. The leaves hold anthraquinones and are used as a paste for treating childhood teething, fever, and constipation. Traditionally, this is widely used as a remedy for the treatment of hypertension, cough, stomach problems, diabetes, skin disorders, etc. Seeds have also been recognized as eyesight boosters. Considering these facts, it has a wide range of medical applications that can be explored further with proper research.

Keywords: Medicinal plants, *Cassia tora* Linn., Traditional uses, Therapeutic potential.

1. INTRODUCTION

India is basically the herbarium of the world. The leading area of global research is the research on medicinal plants. The nature has offered a storehouse of remedies for the treatment of all aliments of mankind (Bhandirge *et al.*, 2016). Mainly in rural and tribal part of our country traditional herbal drugs are still followed. For the support of good health medicinal plants and traditional medicines have been extensively used in economically developing countries as therapeutic remedy. Raw materials of medicinal plants are utilized in the manufacturing of new medicinal remedy is expanding gradually due to their therapeutic potentials to withstand the problems (Dobriyal *et al.*, 1998). Also these plants possess several medicinal properties such as anti-cancer, anti-diabetic, antifungal activity, antibacterial activity, etc. (Devshmita and Varnika, 2021).

Cassia tora Linn. (Family; Leguminosae/Fabaceae; Sub-family: Caesalpinioideae) is a small yearly undershrub or herb rising like a weed in all over the tropical regions of Asian countries (Acharya and Chatterjee, 1975). In India it is found as a weed, grows in arid soil all over the tropical parts as well as in the plains. In various regions, it is referred by various names like Chakramarda (Sanskrit), Charota (Hindi), Foetid cassia (English), Sanotapre or Chakramandi (Nepali), and Jui Ming zi (Chinese) (Sharma *et al.*, 2005). In general, because of the sickle-shaped pods it is more commonly known as "Sickle Pod" (Pawar and D'mello, 2011). An ayurvedic preparation "Dadhughanavati" is a successful antifungal formulation of *Cassia tora* Linn. (Acharya and Chatterjee, 1975; Hatano *et al.*, 1999). It is widely popular Ayurvedic herb renowned for its effectiveness in treating various conditions such as bronchitis, antiperiodic, and a laxative, leprosy, skin ringworm, cardiac conditions, cough and ophthalmic diseases along with hepatic disorders and haemorroids (; Chaurasia *et al.*, 2011; Deoda *et al.*, 2012).

Traditional Ayuverdic and Chinese medicine recognize various parts of *cassia tora* as possessing as antioxidant, antihepatoxic, antimutagenic, antibacterial, antidiarrhoeal, and antimicrobial herbs. Moreover, it has demonstrated positive effects on a range of health issues, including bronchial infections, fever, cardiovascular conditions, leprosy, bowel disorders, and various skin ailments such as itching, ringworm, body scratching, eczema, psoriasis, and dermatomycosis (Shukla *et al.*, 2013).

2. Taxonomic Classification

Table 1: Taxonomic classification of *Cassia tora* L. (Deoda *et al.*, 2012)

Kingdom	Plantae
Division	Magnoliophyta/Angiospermae

Class	Magnolipsida/Dicotyledoneae
Order	Fabales
Family	Fabaceae/Leguminosae
Subfamily	Caesalpinioideae
Tribe	Cassieae
Subtribe	Cassinae
Genus	*Cassia*
Species	*C. tora*
Botanical Name	*Cassia tora* Linn.

3. Distribution

The diversity of habitat, from annual herbs, under shrubs to huge trees can be observed. Approximately 45 species of *Cassia* are known to exist in India. Because of their tremendous medical benefits, there is significant concern within the scientific community regarding the phytochemical and pharmacological investigation of Cassia tora and its related species (Kumar *et al.*, 2021). The plant C*assia tora* L. is extensively found across various regions, including Nepal, India, Korea, China, and Nigeria. It extremely thrives road sides, along riverbanks, in waste areas and on hills up to 1000-1800 m as well as in plains. In India, it predominantly grows in the southern and central regions, uncultivated tropical fields, dry and damp areas (Kirtikar and Basu, 1995).

4. Morphology

Cassia tora Linn. is a yearly fetid herb, up to 30 to 90 cm tall. The leaf is intricate, green, and usually measure 7.5-10cm in length. They consist of three leaflets arranged in pairs, with opposing pairs ranging from 2.5-4.5cm. The leaflets have an oblique base, often rounded, and exhibit 6-10 veins with opposing venation. They are glaucous, membranous, obovate, glabrous, oblong, and nearly persistent (Mazumder *et al.*, 2005; Deoda *et al.*, 2012). Flowers are Yellow, moderate; sepals ovate to oblong, up to 8mm. long and 4mm wide, unequal, oblong to rounded 5 petals, up to 12mm. long, glabrous; fertile stamens 7, dehiscent (Narayan and Rangaswami, 1956). Fruits are Subtertragonous, 15-23cm, long, pods are obliquely septate with broad sutures (Warrier, 1993). Seeds are Hard, 3-4 mm thick, rhombohedral, brownish-black, smooth and shiny, cotyledons folded, rolled and controlled [8, 17]. Roots are Dark brown external surface, inner surface creamy with long fissure. Near the foot area, the main root is twisted to an angle 30° (Warrier, 1993; Deoda *et al.*, 2012).

Figure 1: Parts of *Cassia tora* Linn.: Fruit, Flowers, and Leaves

5. Medicinal properties and Therapeutic uses

Table 2: Medicinal properties and therapeutic uses of *Cassia tora* L.

S.No.	Plant Part Used	Traditional uses
1.	Leaves	• Antirheumatic, laxative, leaf paste for jaundice treatment, decoction of leaves to ringworm, eczema, bronchitis and asthma.
2.	Seeds	• In Chinese traditional medicine, it is commonly used as a remedy for weakness (antiasthenic), as well as for promoting bowel movements (aperients) and increasing urine production (diuretic). • Used for the treatment of itchy or red eyes and also to reduce the discomfort in case of light reactive eyes. • Seeds are taken as protein rich foods and also used in the preparation of sweets. • In Korea, to protect liver, hot extract of seeds is taken orally. • Seeds are employed in the management of cardiac conditions, cough, indigestion, leprosy, ringworm, flatulence, lung infections, and colic constipation. • Get help for losing weight as well. • Roasted seeds are useful as a coffee substitute. • Also used in dyeing and tanning.

3.	Stem bark extract	• Different skin infections, addressing rheumatic ailments, and acting as a laxative.
4.	Flowers	• Infusion of flowers used to cure lung infections and asthma internally.
5.	Pods	• These are utilized to treat intestinal infections and improve visualization.
6.	Roots	• Paste of dried ground roots are used to cure snakebites and ringworms.
6.	Plant	• Majorly used in the treatment of bone fracture, cold epilepsy, abnormal child birth, stomachache, night blindness, scorpion bite and scabies. • As Vermicides, insecticides, anti-malarial, anti-allergic.

Sources: Das *et al*., 2011; Bhandirge *et al.*, 2016; Telrandhe and Gunde, 2022

6. Phytochemistry

The chemical constituents observed in leaves, seeds, flowers, and roots are as follows (Zhu *et al.*, 2008; Burbure *et al.*, 2015);

- Leaves: Mainly the presence of Isoquercitric, quercitrin, steric, stigmasterol, palmetic, uridine,freidlen and emodin are observed.
- Seeds: physcion, Naptho alpha pyrone toralacture, emodin, chrysophanol, chrysophonic acid-9-anthrone, rubrofusarin.
- Flowers: leucopelargonodine and kaemferol.
- Roots: Beta- sitosterol and Anthraquinone.

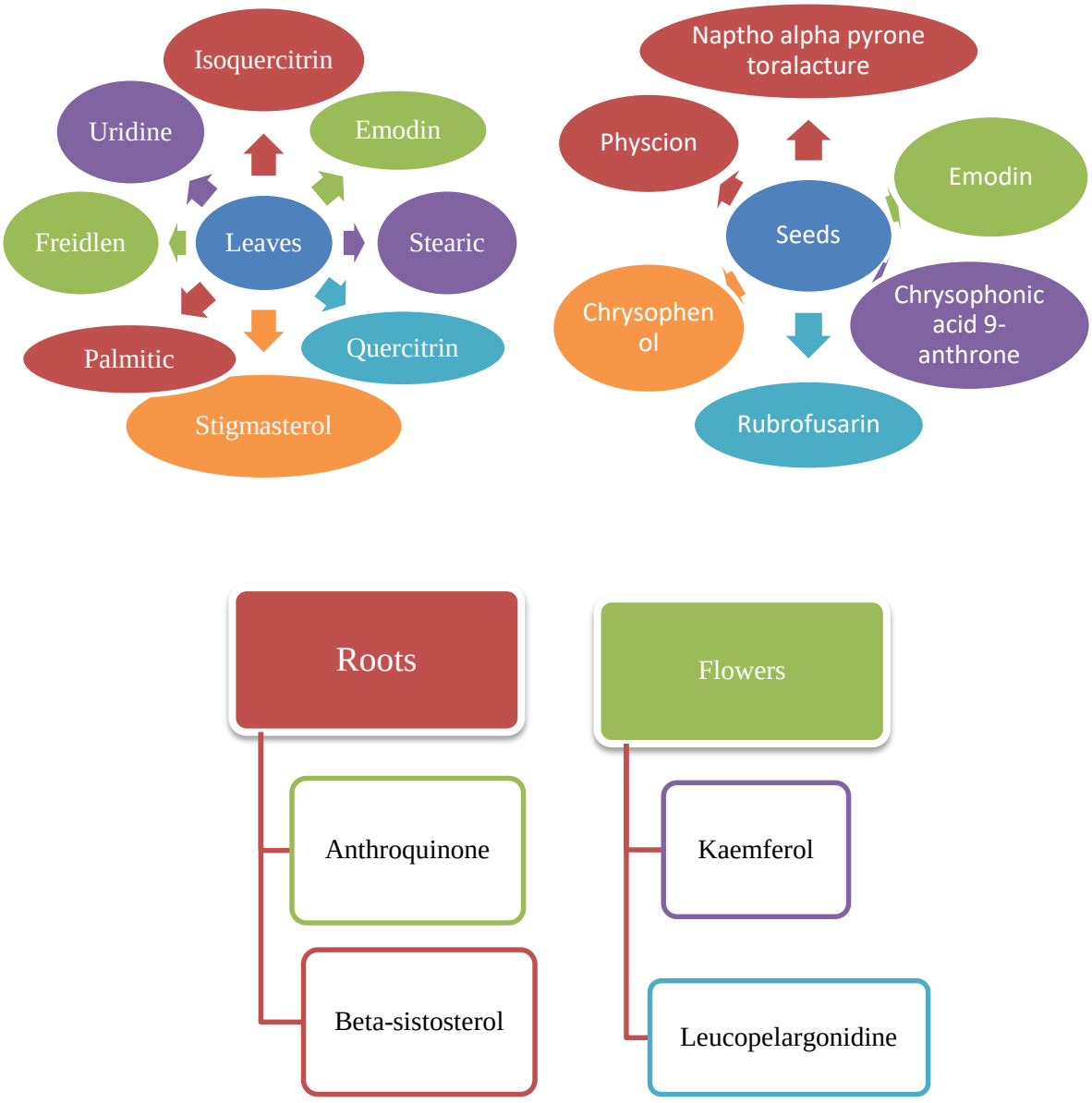

Fig. 2: Chemical constituents observed in leaves, seeds, roots, and flowers of *Cassia tora* Linn. (Zhu *et al.*, 2008; Burbure *et al.*, 2015)

7. PHARMACOLOGICAL ACTIVITIES

Cassia tora Linn. possesses diverse pharmacological activities. Many researchers have outlined various activities of *Cassia tora* in different in vivo and in vitro research models. These are detailed in given titles:

7.1 Anticancer Activity

The study investigated the impact of ethyl acetate and hexane fractions of the leaf extract on the MCF7 breast cancer cell line, employing the MTT test to assess their effect. Results revealed that the hexane leaf extract exhibited cell viabilities of 42% and 55%, respectively, indicating a notable effect on the

cancer cell line. Subsequent half and one-fourth dilution of the hexane extract further reduced cell viability, suggesting increased potency. Conversely, the ethyl acetate fraction show less efficiency, with half and one fourth dilutions resulting in 48% and 77% cell survival, respectively. This indicates that, at equivalent dilutions, the hexane fraction of leaf extract possesses stronger anticancer properties compared to ethyl acetate fraction (John *et al.*, 2012; Vijayalakshmi *et al.*, 2015; Abel *et al.*, 2016).

7.2 Antifertility Activity

The fruit extract treatment of *Cassia tora* Linn. was administrated to male rats, which results in reduced level of fructose, protein, glycogen, ascorbic acid and sialic acid contents and markedly decreased the masses of testes and accessory reproductive organs. The reduced level of testosterone results in highly declined sperm density and motility. Level of FSH hormone and testosterones were significantly lowered in rats. Number of spermatids, spermatocytes, and spermatozoa within the lumens of seminiferous tubules lowered and germinal epithelium of testes degenerated. Leaf extract reveals the maximum powerful antifertility effect in feminine rats. It has been determined that the contraceptive effects of the drug are associated with its estrogenic activity (Khan and Mali, 2017).

7.2 Antifungual Activity

Observations revealed that the dealcoholized leaf extract of *Cassia tora* demonstrated notable antifungal activity during *in vitro* testing. This delivers evidence for the leaves, so that the leaves are being utilized in the management of diverse skin ailments (Mukherjee *et al.*, 1996; Cho *et al.*, 2007).

7.4 Anti-inflammatory activity

The study examined the methanolic extract of *Cassia tora* leaf for its substantial anti-inflammatory effects against various indicators such as histamine, carageenin, dextran and serotonin included rat hind paw oedema in a dosage-dependent method. The extract exhibits maximum anti- inflammatory activity against these agents (Mukherjee *et al.*, 1996; Cho *et al.*, 2007).

7.5 Antigenotoxic Activity

The mutagenic potential of 2-amino-6-methyldipyrido imidazole (Glu-p-1) and 3-amino-1,4-dimethyl-5H-pyrido indole was greatly suppressed by unroasted *Cassia tora* seed extract. The antigenotoxic potential of roasted *Cassia tora* seeds is lower as compared to the unroasted seeds, possibly because roasting leads to reduction in anthraquinones (Zhu *et al.*, 2008; Burbure *et al.*, 2015).

7.6 Antioxidant Activity

The methanolic extracts of seed of the plant exhibit powerful antioxidant activity. It has been observed that the antioxidant activity of emodin, when compared to the methanolic extract of *Cassia tora* [31]. The phenolic active elements, non-rubrofusarin glucose and alaternin extracted from the plant, exhibit robust scavenging activity against free radicals. Alternan, in particular, stands out for its potential effectiveness in preventing diseases associated with free radicals (Abel *et al.*, Vijayalakshmi *et al.*, 2015).

7.7 Hepatoprotective Activity

According to Rajan et al. 2009, in a rat model, the methanolic leaf extract of this plant effectively protected the liver from damage induced by carbon tetrachloride (CCl_4) (Bhandirge *et al.*, 2016). In another in-vivo study conducted by Dhanasekaran et al. in 2009, it was observed that ononitol monohydrate effectively lowers the levels of Tumor Necrosis Factor- α (TNF-α), serum transaminase and lipid peroxidation. Additionally, the study noted an increase in antioxidant levels and hepatic glutathione enzyme activities (Maity *et al.*, 1998).

7.8 Immunostimulatory Activity

Four anthraquinones found in *Cassia tora*, namely rhein, aloe-emodin, chrysophanol, and emodin exhibit immunostimulatory effects on human peripheral blood mononuclear cells (PMBC). These anthraquinones have been shown to effectively stimulate the proliferation of PMBC and enhance the secretion of interferon-γ (IFN-γ) (Wu and Yen, 2004; Samanta *et al.*, 2011).

7.9 Purgative Effect

The methanolic extract prepared of *Cassia tora* leaf was discovered to have own laxative and purgative action. The seeds of the plant consist of emodin, aloe emodin and anthraquinone glycosides due to which plant have been used as purgative (Chakrabarty and Chawla, 1983; Yen *et al.*, 1998; Cho *et al.*, 2007).

7.10 Hypolipidemic Activity

In a study investigating the hypolipidemic effects, the ethanolic extract of *Cassia tora* seeds along with its water-soluble and ether-soluble fractions were estimated against triton-induced hyperlipidemia. It was observed that these extracts led to a decrease in serum triglyceride and total LDL-cholesterol levels, while also increasing serum HDL cholesterol levels by varying percentages (Dhanasekaran *et al.*, 2009; Rajan *et al.*, 2009; Sirappuselvi and Chitra, 2012).

8. Conflicts of interests

No conflicts of interest are present.

9. Conclusion

This review provides a concise overview review of the therapeutic potential of *Cassia tora* Linn. The research and scientific studies on *Cassia tora* suggest a significant organic potential of this plant. It is recognized as an important reservoir of biologically active phytochemicals and is extensively utilized in Ayurvedic and Chinese medicinal practices. However, there is a need for advanced research to further explore the isolation and standardization of its active constituents due to its vast use and its application in numerous ailments, which need to be familiarized to trap its medicinal boon to a full extent.

10. References

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