IJPSR (2011), Vol. 2, Issue 9 (Review Article)

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 09 May, 2011; received in revised form 21 August, 2011; accepted 27 August, 2011

CASSIA TORA LINN.: AN OVERVIEW

Harshal A. Pawar*[1] and Priscilla M. D'mello [2]

Department of Pharmacognosy, Dr. L. H. Hiranandani College of Pharmacy [1], Smt. CHM Campus, Opp. Railway Station, Ulhasnagar, Dist. Thane-421003, Maharashtra, India

K. M. Kundnani College of Pharmacy [2], Plot No. 23, Jole Joy Building, Rambhau Salgaokar Marg, Cuffe Parade, Colaba, Mumbai-400005, Maharashtra, India

Keywords:

Cassia tora Linn, Pharmacognosy, Phytochemistry, Biopotential, Traditional medicines, Leguminosae, Anthraquinone glycosides

Correspondence to Author:

Harshal A. Pawar

Principal, K. M. Kundnani College of Pharmacy, Plot No. 23, Jole Joy Building, Rambhau Salgaokar Marg, Cuffe Parade, Colaba, Mumbai-400005, Maharashtra, India

ABSTRACT

Cassia tora Linn. (Family: Leguminosae) is well known plant widely distributed in India and other tropical countries. It is an annual under shrub and grows in wild wasteland. Different parts of the plant (Leaves, seed, and root) are reputed for their medicinal value. It is well recognized traditional medicine as laxative and is useful for treatment of leprosy, ringworm infection, ophthalmic, skin diseases and liver disorders. Several chemical compounds such as Anthraquinone glycosides, Naphthopyrone glycosides, Phenolic compounds, Flavonoids etc. have been isolated from this plant. The present review summarizes the scientific information of various aspects of *Cassia tora* plant used in traditional system of medicine for variety of purpose.

INTRODUCTION: The World Health Organization (WHO) estimates that about 80% of people living in developing countries rely almost exclusively on traditional medicines for their primary health care needs [1]. India is virtually a herbarium of the world. In India, we are using plants and herbs as the basic source of medicine because we are rich in them. Herbals which form a part of our nutrition and provide us an additional therapeutic effect are in demand and C*assia tora* is one of such plant.

Cassia tora Linn. (*C. tora*) is well known medicinal plant commonly found in India and other tropical countries [2]. Various medicinal properties have been attributed to this plant in the traditional system of Indian medicine. Several anthraquinones have been isolated from the seeds of *C. tora* [3, 4]. Sennosides, which are well known for their medicinal importance, have been detected in the leaves of the plants [5]. The extracts of *C. tora* have been used as a remedy for various skin ailments, rheumatic disease and as laxatives [6, 7, 8]. The extract of *C. tora* leaves has been found to possess significant hepatoprotective activity and anti-inflammatory activity [9, 10]. The seeds of *C. tora* have been used in Chinese medicine as aperients, antiasthma, diuretic agent and also improve the visual activity [11].

The present article summarizes the updated information on various aspects such as pharmacognosy, phytochemistry and biopotential of *C. tora* Linn. It also focuses on correlation between active constituents and medicinal uses of this plant.

Pharmacognosy:

Source and distribution: *Cassia tora* Linn (Family: Leguminosae) is annual under shrub grows all over the tropical countries (throughout India, Pakistan, Bangladesh and west China) and grows well in wasteland as a rainy season weed [8]. It grows in low lying coastal area, river banks, abundant in waste places and other moist places like uncultivated fields, up to 1000-1400 meters.

It is also known as 'Chakramard' in Ayurveda, 'Panwar' in Unani and 'Jue Ming Zi' in Chinese system of medicine. It is most commonly known as 'Sickle pod' due to Sickle shape of pods.

Phytography (Botany): It is an annual foetid herb, 30–90 cm high (**Figure 1**: *C. tora* plant). Leaves are green in colour, pinnate, up to 6-8cm long, leaflets are in 3 pairs, distinctly petioled, opposite, conical at one end, ovate, oblong and base oblique. Flowers are pale yellow in color usually in nearly sessile pairs in the axils of the leaves with five petals, upper one are very crowded. Pods are subteret or 4 angled, very slende, 6-12inch long, incompletely septate, membranous with numerous brown oblong, rhombohedral seeds (Figure-2: *C. tora* seeds and pods) [9, 12].

FIG. 1 : *CASSIA TORA* PLANT

Uses in Folk and Traditional Medicines: Different parts of the plant (Leaves, seed, and root) are reputed for their medicinal value. The leaves of *C. tora* are reported to have antirheumatic activity in folklore practice. Decoction of the leaves is used as laxative [7]. The seeds of *C. tora* have been used in Chinese medicine as aperients, antiasthnic and diuretic agent. It is also given to improve visual activity (eye diseases) and to treat liver disorders [13]. In Korea, the hot extract of seeds is taken orally for protection of liver [14]. Leaves and seeds are used in the treatment of skin disorders (Ringworm and itch) [6]. Stem bark extract is used for various skin ailments, rheumatic diseases and as laxative. In Ayurveda, the plant is used in 'Dadrughani Vati' and 'Pamari Taila' [15].

Phytochemistry:

Leaves: The leaves showed mainly the presence of Anthraquinone glycosides and Flavonoids. The Anthraquinone glycoside includes rhein, emodine, physion, chrysophanol (marker), Obtusin, chryso-obtusin, chryso-obtusin-2-O-β-D-glucoside, obtusifolin and chryso-obtusifolin-2-O- β -D-glucoside [3, 4].

Sennosides, which are well known for their medicinal importance, have been detected in the leaves of the plant. The % of Sennoside content in the leaf of *C. tora* was found to be 0.14 [5].

Leaves also reported to contain Kaempferol-3-diglucoside (Flavonol glycoside). A potential hepatoprotective constituent, Ononitol monohydrate, was isolated from *C. tora* leaves [16].

Seeds: Several compounds belonging to anthraquinone and naphthopyrone groups have been isolated from seeds of this plant. Three crystalline substances have been isolated from seeds of *C. tora* known as tora substance A, B and C. From properties of these substances and some typical derivatives, it appeared that tora substance C might be identical with rubrofusarin a metabolic product of the fungus, *Fusarium culmorum* and tora substance B with nor-rubrofusarin the demethylation product of rubrofusarin [17, 18, 19].

The seeds of *C. tora* yielded sitosterol from petroleum ether extract, chrysophanol, physion emodin and rubrofusarine from chloroform extract and two glycosides, rubrofusarin -6- β -gentiobioside and 8-Hydroxy-3-methyl anthraquinone -1- β -gentiobioside have been found in ethanolic extract [4, 17, 20]. Three naphthopyrone glucoside, cassiaside, rubrofusarin -6-O- β-D-gentiobioside and toralactone -9-O- β-D- -gentiobioside isolated from butanol soluble extract of seed [21].

It also contains phenolic glycosides namely rubrofusarine triglucoside, nor-rubrofusarin gentiobioside, demethylflavasperone gentiobioside, torochrysone gentiobioside, torachrysone tetra-glucoside and torachrysone apioglucoside.

Seed oil contains different percentage of oleic, linoleic, palmitic, stearic and lignoceric acids [22, 23].

The *C. tora* seed is composed of hull (27%), endosperm (32%) and germ (41%).

Gum obtained from the seeds of *C. tora* is known as 'Panwar gum'. Chemically it is neutral heteropolysaccharide of galactose and mannose (i.e. galactomannans). pH of the Panwar gum mucilage is approximately 7 [24, 25]. Seeds of *C. tora* contain about 23.2% of proteins, rich in all essential amino-acids, particularly, methionine and tryptophan [26].

Other parts: Pods are rich in sennosides. Flowers are reported to contain Kaemferol and leucopelargonidine. The roots of *C. tora* showed the presence of 1, 3, 5 trihydroxy 6, 7 dimethoxy-2-methyle anthraquinone, leucopelargonidine and β-Sitosterol [27, 28]. The Stem bark of this plant contains arachidic acid, isostearic acid, linolineic acid, palmitic acid, marginic acid, behenic acid, phenolics like rhein, emodine, Hexahydroxy flavones and a Hydroxycoumarin (Aurapterol) [29](**Figure 2**).

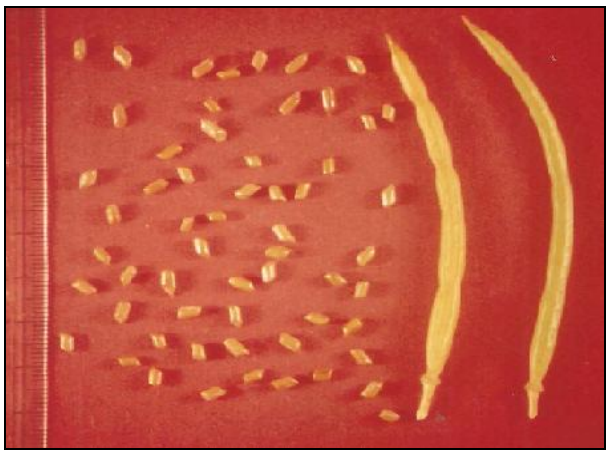

FIG. 2 : *CASSIA TORA* SEEDS AND PODS

Biopotential of *C. tora*: The plant has been found to exhibit diverse pharmacological activities. Several research workers have reported different biological activities of *C. tora* in various *in vitro* and *in vivo* test models. These have been described in detailed in following headings:

Antioxidant Activity: The methanolic extract of seeds of *C. tora* (MECT) shows stronger antioxidant activity. It was found that MECT exhibits stronger antioxidant activity as compared to Alpha-tocopherol. Emodin was demonstrated as antioxidant component of MECT [30].

The phenolic active component, alaternin and nor-rubrofusarin glucoside isolated from extract of *C. tora* also showed a potent free radical scavenging activity.

Hypolipidemic Activity: Ethanolic extract and its ether soluble and water soluble fractions were evaluated for their hypolipidemic activity against triton induced hyperlipidemic profile. Decreased serum and triglyceride level of total LDL cholesterol but increased HDL cholesterol level by different percentages was observed.

Soluble fibers isolated from the seeds showed the hypolipidemic level due to their phenomenal rheological behavior and lipid metabolism. The soluble fibers enhances fecal lipid excretion and showed significant hypolipidemic effect due to marked reduction in serum concentration of total cholesterol and triglyceride level [31, 32].

Hepatoprotective Activity: The different extracts of seeds of Cassia tora have been studied for cytoprotection against galactosamine toxicity in primary cultured hepatocytes. Methanolic extract of seeds showed a significant hepatoprotective effect against toxicity of galactosamine in primary cultured rat hepatocytes. Methanolic extract at a dose of 400mg/ml orally exhibited significant protective effect by lowering the serum level of transaminases in rats.

The % Cytoprotection of different isolates obtained from the methanol extract of seeds of *C. tora* were also studied against galactosamine toxicity in primary cultured hepatocytes. The naphtha-pyrone glycosides were found to have significant hepatoprotective effect against galactosamine damage [21]. It has also been reported that Ononitol monohydrate isolated from the leaves possesses significant hepatoprotective activity as compared to reference drug sylimarin. Ononitol monohydrate decreases the level of serum transaminase thereby shows its hepatoprotective activity [16].

Antifertility Activity: *C. tora* leaves extract (200mg/100mg/Kg body weight) exhibited maximum antifertility activity in Female rats. The antifertility activity of the drug has been found to be related to oestrogenic activity [33].

Antibacterial Effect: The effect of phenolics glycoside, their aglycones and several other compounds structurally related to them on *E.coli K12, Pseudomonas aeruginosa PA 01* and some strains of *Staphylococcus aureus* were examined.

Among them, torochrysone, torolactone, aloe-emodine, rhein and emodine showed noticeable antibacterial effect on four strains of methicillin resistant Staphylococcus aureus with minimum inhibitory concentration of 264µg/ml [18, 34].

Antimutagenic Activity: The antimutagenic activity of a methanolic extract of roasted *C. tora* seeds against Aflatoxin-B1 (AFB1) was demonstrated with Salmonella typhimurium assay. The number of relevant per plate decreased significantly when the extract was added to assay system using Salmonella typhimurium TA100 and or TA98 [35].

Alaternin and isorubrafusarin gentiobioside found to possess antimutagenic activity.

Antitumor Activity: Emodine, an anthraquinone, present in root and bark of *C. tora* possess anti-tumor activity. It shows inhibitory effect on angiogenic and metasis regulatory process. Because of its quinine like structure, emodine may interfere with electron transport process and in altering cellular redox status, which may account for its cytotoxic property [36].

Anti-inflammatory Effect: The Anti-inflammatory effect of methanolic extract of leaves of *C. tora* was investigated against carrageenan, histamine, serotonin and dextran induced rat hind paw oedema. It exhibited significant anti-inflammatory activity against these agents [10].

Spasmogenic and Antinociceptive Activity: The methanolic extract of leaves was evaluated in guinea pig ileum, rabbit jejunum and mice intestinal transit for antinociceptive and spasmogenic effect. The extract contracted smooth muscles of guinea pig ileum and rabbit jejunum in a concentration dependent manner which is reversibly blocked by Atropine. The extract increased intestinal transit in mice. The extract also significantly reduced the number of acetic acid induced abdominal constrictions in mice and the effect was comparable to that of Aspirin. The extract also significantly reduced the nociceptive response of mice to increases force, which is dose dependent. Thus the use of *C. tora* traditionally as purgative and in treatment of other ailments is justifiable [37].

Purgative Effect: The methanolic extract of *C. tora* leaves was found to possess purgative action. Seeds have been used as a purgative, probably due to the presence of emodine, aloe-emodine and anthraquinone glycosides [38, 39, 40].

Antifungal Activity: The leaf extract has shown the significant antifungal activity to inhibit the growth of *Candida albicans, Aspergillus niger, Sachharomyces cerevisiae* and *Trichophyton mentagrophyte* [41].

It shows antifungal activity due to chrysophenol and crysophanic acid- 9- anthrone and other anthraquinones such as emodine, physcion and rhein [42, 43].

Oxytocic Activity: The seeds of *C. tora* contain oxytocic principle. It was found to be effective in producing the contraction of isolated uterus of guinea pig. The claim for oxytocic principle from the seeds lacks credibility due to insufficient experimental data [44].

Antihelmintic Activity: Alcohol and aqueous extracts of *C. tora* seeds showed antihelmintic activity against *Pheretima posthuma* and *Ascardia galli* due to the presence of flavonoids. Both the extract exhibited antihelmintic activity at highest concentration of 100mg/ml [45].

Toxicity: The toxicity of the crude extract of the leaves of *C. tora* on Swiss mice was investigated. A dose of 200mg/Kg given orally was found to be lethal. Dose level of 100mg/Kg was lethal when given intraperitoneally and intravenously respectively.

Continuous administration of diet containing 0.5% or more seed of *C. tora* for 13 weeks proved toxic to rats producing myeloid hyperplasia with peripheral leukocytosis, thrombocytosis and mild anaemia [46].

CONCLUSION: The scientific studies and research on *C. tora* suggests an enormous biological potential of this plant. Clinical and pharmacological studies with standardized extracts and isolated constituents need to be performed to investigate unexploited potential of this plant. There is huge scope for research on *C. tora* and could be further exploited in future as a source of useful phytochemical compound for the pharma industry. There is no doubt that this plant is a reservoir of potentially useful chemical compounds which serve as a drugs, as newer leads and clues for modern drug design by synthesis. It is thought that thorough information as presented in this review on pharmacognosy, phytochemistry and biopotential of *C. tora* may provide strong evidence for the use of this plant in different medicines.

ACKNOWLEDGEMENT: Author is very much thankful to Dr. (Mrs.) S. S. Bhalerao, Principal of Hyderabad Sindh National Collegiate Boards (HSNCB's), Dr. L. H. Hiranandani College of Pharmacy, Ulhasnagar, for her continuous support and encouragement.

REFERENCES:

1. Dabriyal, RM, Narayana, DBA, Ayurvedic Herbal Raw Material, The Eastern Pharmacist, 1998, 31-35
2. Nadkarni, R.M., Indian Materia Medica, Vol I, Popular Book Depot, Mumbai, 1954, p.291.
3. Shibata,S., Morishita, E., Kaheda, M., Kimura, Y., Takido, M and Takashashi, S., Chem.Pharm.Bull, 1969, 17,454.
4. Raghunathan K., Hariharan V. and Rangaswami S., Chrysophanol-1-β-gentiobioside, a new anthraquinone glycoside from Cassia tora Linn. Indian J.Chem, 1974, 12, 1251-1253.
5. Lohar D.L., Chawan D.D. and Garg S.P., Phytochemical studies on Cassia species of Indian Arid Zone" Current Science, 1975, 44(2), 67
6. Hooker, J.D., the Flora of British India, Vol.II, L.Reeve and Co., England, 1879, p.26.
7. Kirtikar, K.R. and Basu, B.D., Indian Medicinal Plants, Vol II, Periodical Experts D- 42, Vivek Vihar Delhi, 1975, pg.877.
8. Jain, S.K., Medicinal Plants, National Book Trust, New Delhi., 1968, p.37.
9. Maitya, T.K., Mandal, S.C., Mukherjee, P.K., Saha, K., Dass, J., Saha, B.P and Pal, M., Evaluation of hepatoprotective potential of *Cassia tora* leaf extract, Nat. Prod. Sci., 1997, 3,122.
10. Maitya T.K., Mandal S.C., Saha B.P. and Pal M., Evaluation of hepatoprotective potential of *Cassia tora* leaf extract, Nat. Prod. Sci, 1998, 4(4), 226.
11. Asolkar, L.V., Kakkar, K.K., and Chakre, O.J., Second supplement to glossary of Indian medicinal Plants, PID, CSIR, New Delhi, 1992, pg.180-181.
12. Maitya T.K., Mandal S.C, Saha B.P. and Pal M., Studies on some Pharmacognostic profile of *Cassia tora* Linn, Ancient science of Life, 1999, XIX (3and4), 113-117
13. Nikado T, Ohmoto T, Sankawa U, Kitanaka S, and Takido M, Chem.Pharm.Bull, 1984,32,3075.
14. Yun HS, Chang IM, Korean J Pharmacognosy, 1977, 8,125.
15. Thakur RS, Puri HS, Husain A, Major Medicinal Plants of India, 1st edition, 1989, p.143.
16. Ignacimuthu C, Dhanasekaran M, Agastian P, Potential hepatoprotective activity of ononitol monohydrate isolated from Cassia tora L.on carbon tetrachloride induced hepatotoxicity in Wistar Rats, Phytomedicine, 2009, 16,891-895.
17. Narayan C.S. and Rangaswami S., Isolation of three crystalline substances from the seeds of *Cassia tora*, Current Science, 1956, Vol.25, 559
18. Hatani T,Hiroshi U, Hidey KI, Sumico S, Tomofusa T, Takashi Yoshida, Phenolic constituents of Cassia seeds and Antibacterial effect of some naphthalenes and anthraquinones on methicillin resistant Staphylococcus aureus, Chem. Pharm. Bull., 1999, 47(8), 1121-1127.
19. Chemical Abstract, 1957,51,6740.
20. Miyuki K, Morishita E, Shibata S. Constituents of *Cassia tora* L: Glucosides of Rubrofusarin, Chem.Pharm.Bull, 1969, 17,458.
21. Sui-ming W, Mary MW, Otto S and Hildebert W, New antihepatoxic naptho-pyrone glycosides from the seeds of *Cassia tora*, Planta Medica; 1989, 55,276-282.
22. Suba Jois I.H. and Manjunath B.L., Chemical examination of seeds of *Cassia tora* linn, Journal of Indian Chem. Soc., 1930, 7,521.
23. Wilkinson RE, Hardcastle WS, Comparative fatty acid contents of various organs of *Cassia tora*, Bot. Gaz. (Chicago), 1969, 130, 254.
24. Chemical Abstract, 1970, 72, 87136g.
25. Joshi S.B. and Verma K.C., Panwargum as suspending and emulsifying agent (*Cassia tora*), Indian J. Pharm, 1964, 26, 175.
26. Pawar H., D'Mello PM, Isolation of seed gum from Cassia tora and Preliminary studies of its application as binder for tablets, Indian Drugs, 2004, 41(8), 465
27. Joshi S.S. and Nigam S.S., Amino acid composition of wild legumes, Current Sciences, 1976, 45, 450.
28. Guha Bakshi D.N., Sensarma P., Pal D.C., A Lexicon of Medicinal Plants in India, Naya Prakash, Calcutta, First edition, Vol. 1, pg.394-395.
29. Tiwari RD, Behari JR, Chemical examination of roots of *Cassia tora*, Planta Med., 1972, 21,395
30. Chakrabarty K. and Chawla H., Terpenoids and phenolics from *Cassia tora* stem bark", Indian J. Chem; 1983, 22(B), 1165-1166.
31. Grow-Chin Yen, Horn-wen Chen and Pin-der DUN, "Extraction and Identification of an antioxidative component from Cassia tora Linn", J.Agri. Food Chem, 1998, 46, 820-824.
32. Patil UK, Saraf S, Dixit VK, Hypolipidemic activity of seeds of C*assia tora* Linn, J. Ethnopharmacol, 2004, 90(2-3), 249-252.
33. Cho IJ, LeeC, Ha TY, Hypolipidemic effect of soluble fiber isolated from seeds of *Cassia tora* Linn, in rats fed a high cholesterol diet, J. Agric Food chem., 2007, 55(4), 1592-1596.
34. Sinha Minal, Tiwari P.V., Screening of antifertility activity of certain indigenous drugs, South East Asian Seminar on Herbs and Herbal Medicine Patha.1999, 55-62.
35. Roopshree TS, Raman D, Shobha Rani RH and Narendra C., Antibacterial activity of antipsoriatic herbs: *Cassia tora*, *Momordica charantia* and *Calendula officinalis*, Int J Appl Res Nat Prod, 2008, 1(3), 20-28
36. Choi .J.S., Lee H.J, Park. K.Y. *In vitro* antimutagenic effect of alateranin and rubrofusarin gentiobioside from roasted Cassia tora, Natural Product Sciences, 4(2), 1998, 100 -104.

37. Wu CH, Hsieh CL, Song TY and Yen GC, Inhibitory affects of *Cassia tora L*. on Benzo[a]pyrene-mediated DNA damage toward HepG2 cells, J Agric Food Chem, 2001, 49(5), 2579-2586
38. Chidume FC, Kwanashie HO, Adekeye JO, Wambebe C, Gamaniel KS, Antinociceptive and smooth muscle contracting activities of the Methanolic extract of *Cassia tora* leaf, J. Ethnopharmacology, 81, 2002, 205-209
39. Pal M., Roy D.K., and Pal P.R., Emodine from the leaves of *Cassia tora* Linn, Indian J. Pharm, 1977, 39(5), 116-117.
40. Maitya T.K. and Winda S.C., Purgative activity of Cassia tora leaf extract and isolated *Aloe emodin*, Indian J. Pharm. Sci., 2003, 93-95.
41. Lemli J, Cuveela, J. Chromatography of anthrone glycosides of purgative drug, Planta Med., 1974, 26,193 (Chemical Abstract, 1975, 82,35074X)
42. Mukharjee P.K., Saha K., Das J. Saha B.P., Pal M., Antifungal activity of the leaf extract of *Cassia tora* linn, Phytother. Res., 1996, 10,521-522.
43. Acharya T.K. and Chatterjee I.B., Isolation of chrysophanic acid –9-anthrone, a fungicidal compound from *Cassia tora*, Sci.Cult. 1974, 40,376.
44. Acharya T.K. and Chatterjee I.B., Isolation of chrysophanic acid –9-anthrone, The major antifungal Principle of *Cassia tora*, Lloydia, 1975, 38,213.
45. Yogindernath, Chopra, I.C. and Rao P.R., Oxytocic principle from the seeds of *Cassia tora*, Current Sciences; 1962, 31,285.
46. Deore SL, Khadabadi SS, Kamdi KS, Ingle VP, Kawalkar NG, Sawarkar PS, Patil UA and Vyas AJ, *In-vitro* antihelmintic activity of *Cassia tora*, Chem Tech, 2009, 1(2), 177-179
47. Pal M. and Pal PR, The toxicity of *Cassia tora* leaf extract in mice, Indian Drug, 1978, 49- 50.

****