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ANTIHYPERLIPIDEMIC ACTIVITIES OF *Cassia tora* Linn.

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Abstract: *Cassia tora Linn commonly known as chakvat, chakunda & charota. It grows in tropical & Asian countries especially on way sides & waste places. Cassia tora is a herbaceous foetid annual weed.Herbal medicinal plants play an important role in the treatment of lipid disorders especially due to their lesser toxicity, side effects & cost effectiveness. The hypolipidemic activity of C. tora seeds extract have been studied in induced diabetic rats. The results of the present study demonstrated antidyslipidemic & antioxidant activites in seed extract of C.tora which could be used in prevention of diabetic dyslipidemia & related complications.*
Keywords: *Cassia tora, hyperlipidemia, antihyperlipidemic & other pharmacological activites.*

Introduction: In Ayurveda herbs are natural and 100% safe for human body. The ayurvedic herbs for reducing high cholesterol to maintain cholesterol levels in the body in a natural way. According to a study conducted by Indian Council of Medical Research (ICMR) three–fourth of the Indian population has abnormal levels of cholesterol. Hyperlipidemia (HL) is a metabolic abnormality of growing interest to the medical profession because it's is generally recognized that it signifies increased risk of cardiovascular complications. Cardiovascular diseases are leading cause of death in both industrialized and developing nations [1]. Disorders of lipid metabolism following oxidative stress are the prime risk factors for initiation and progression of heart diseases [2]. Currently available treatment for hyperlipidemia in modern medicine, fibrats, statins or bile acids sequestraints and their combinations do not regulate lipid metabolism up to a appreciable mark, also have several adverse effects in patients [3]. Therefore, there is a need to develop safe and effective treatment modalities for hyperlipidemia. Further more medicinal plants play an important role in the treatment of lipid disorders, especially due to their lesser toxicity, side effects and cost effectiveness. Therefore, the research and development of lipid lowering drugs from natural products are the best option and also are in great demand. In view of the above considerations, this article describe antihyperlipidemic activity of *C. tora* seeds.

Cassia tora is a dicot legume known as sickle senna, sickle pod, tora, coffee pod, tovara, chakvad, thakara in malayalam and foetid cassia [4]. It is mostly found in South-East Asia and the South West Pacific as an important weed. It is considered a wild weed, wild peanut or pistache that has many healing benefits. Different parts of the plant (Leaves, seed, and root) are claimed to be effective against a variety of ailments in indigenous medicine [5].

Classification

Botanical Name	: *Cassia tora*
Family Name	: Caesulpinaceae
Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Magnoliopsida
Subclass	: Rosidae
Order	: Fabales

Family : Fabaceae
Subfamily : Caesalpinioideae
Genus : Cassia
Species : S. tora

Useful parts of *Cassia tora*

Morphology of *C. tora*: *Cassia tora* Linn. (Family -Caesalpiniaceae) is generally distributed throughout India, Sri Lanka, West China and tropics. It is known as Charota(Hindi); Foetid Cassia (English) and Jui Ming Zi(Chinese). In India it occurs as wasteland rainy season weed, grows in dry soil throughout tropical parts and high hills of elevations up to 1,800 m as well as in plains4. The plant is an annual herbaceous foetid herb, almost an under-shrub, up to 30-90 cm high, with pinnate leaves. Leaflets are in 3 pairs, opposite, obovate, oblong with oblique base and up to 10 cm long. Flowers are in pair in axils of leaves with five petals and pale yellow in colour. In Indian conditions, flowering time is favourable after the monsoon rain. Pods are somewhat flattened or four angled, 10 to 15 cm long and sickle shaped, hence the common name sickle-pod. The seeds are 30-50 in a pod, rhombohedral and gathered in autumn and dried in sun5-7.The present attempt is to review and compile updated information on various aspects of *C. tora*plant used in Indian system of medicine for variety of purposes.

Chemical Constituints: Aloe-emodin, (+)-rhein, chrysophanol, 7% resins, cathatrine, calcium, iron, phosphorus, 1,3,5-trihydroxy-6-7-dimethoxy-2-methylanthroquinone, beta-sitosterol, naptho-alpha-pyrone-toralactune, chrysophanol, physcion, emodin, rubrofusarin, cchrysophonic acid-9-anthrone, tricontan-1-0l, stigmasterol, b-sitosteral-b-D-glucoside, freindlen, palmitic, stearic, succinic and d-tartaric acids uridine, quercitrin, isoquercitrin.

Antihyperlipidemic Activity of Seeds of C.tora

Preparation of Seed Extract: *Cassia tora* seeds were collected and identified taxonomically by Department of Pharmacology. Seeds were crushed and dried under shade. The powder (500 g) was extracted with 95 % ethanol in a soxhlet extractor for 72 h, the extract was concentrated to dryness under reduced pressure and controlled temperature (50–60 °C), yielding 23 g of reddish brown solid (crude extract). This was stored in refrigerator and used to investigate hypolipidemic activity.

Antihyperlipidemic Activity: An ethanolic extract of seeds was evaluated by Patil et al28for its hypolipidemic activity on triton induced hyperlipidemic profile. Ethanolic extract and its ether soluble and water-soluble fraction decreased serum and triglyceride level of total LDL-cholesterol but increased the serum HDL-cholesterol level by different percentages. In another study by Cho et al29, soluble fibres were isolated from the seeds showed the hypolipidemic effect due to their phenomenal rheological behaviour and lipid metabolism. It showed significant reduction in serum concentration of total cholesterol and triglyceride levels but increased level of the serum high-density lipoprotein cholesterol level. The soluble fibres enhance fecal lipid excretion and showed the hypolipidemic effect due to marked reduction in serum and hepatic lipid concentrations in rats.

The investigation done with cholesterol rich-HFD fed hyperlipidemic animals showed that *C. tora* seed extract could stimulate PHLA and hepatic LPL activity, both of which play a key role in lipid catabolism and their utilization in body [6]. We have reported that hypolipidemic action of guggulsterone, the active principle of guggulipid, is mediated through activation of PHLA, LPL, and lecithin cholesterol acyl transferase activities, inhibition of hepatic cholesterol biosynthesis, and increased faecal bile acid excretion [7]. The same mechanisms may also interplay to cause the hypolipidemic effect of *C. tora* seed extract.

Earlier studies have shown that feeding with *C. tora* seed extract and fibers isolated from seeds caused lowering in blood lipid levels in

rats fed with high cholesterol diet [8,9]. Chandan et al. [10], in a phyto-pharmacological overview on *C. tora* documented a variety of beneficial effects of the phytochemicals isolated from seed, leaf and root of this plant. Some of the main constituents of *C. tora* seed are anthraquinones, chrysophanol, emodin, rhein, euphol, basseol [11]. It also contains phenolic glycosides namely: rubrofusarine triglucoside, nor-rubrofusarin gentiobioside, demethyl flavasperone gentiobioside, torochrysone gentiobioside, torachrysone tetra- glucoside and torachrysone apioglucoside [12]. Seed oil contains different percentage of oleic, linoleic, palmitic, stearic and lignoceric acids [13]. It is suggested that all or some of these bioactive compounds may be responsible for hypolipidemic activity of *C. tora* seed.

C. tora caused a significant decrease in the plasma levels of TC, TG, PL and FFA in hyperglycemia. In alloxan induced diabetic rats, *C. tora* seed extract could increased the level of HDL by increasing the activity of LCAT, which might contribute to the regulation of blood lipids. LCAT play a key role in lipoprotein metabolism and most of the lipoprotein changes are the outcome of primary abnormality owing to the diseases related with lipid metabolism [14]. *C. tora* seed extract enhanced the excretion of bile acids through feces and this contributed to regress the cholestesteosis in liver damage. In conclusion, the lipid lowering activity of *C. tora* might be due to inhibition of hepatic cholesterol biosynthesis, activation of tissue lipases, SOD, CAT and these beneficial effects may be due to bioactive compounds like typical alkaloids, anthraquinones, chrysophanol, emodin, rhein, euphol, bas-seol phenolic glycosides namely: rubrofusarine triglucoside, nor-rubrofusarin gentiobioside, demethyl flavasperone gentiobioside, torochrysone gentio- bioside, torachrysone tetra- glucoside and torachrysone apioglucoside. [15]

Other Pharmacological Activities

Antitumour Activity: Emodin (1, 3, 8-trihydroxy methylanthraquinone) is a naturally occurring anthraquinone present in the roots and barks of *C. tora* as an active ingredient. At present, its role in combination chemotherapy with standard drugs to reduce toxicity and to enhance efficacy is pursued vigorously. Its additional inhibitory effects on angiogenic and metastasis regulatory processes make emodin a sensible candidate as a specific blocker of tumour associated events. Additionally, because of its quinone structure, emodin may interfere with electron transport process and in altering cellular redox status, which may account for its cytotoxic properties in different systems. This biological property of emodin molecule is offering a broad therapeutic window, which in future may become a member of anticancer [16].

Anti-inflammatory Activity: The methanolic extract of leaves exhibited significant anti-inflammatory activity against carageenin, histamine, serotonin and dextran induced rat hind paw oedema as a dose dependent manner [17].

Antihepatotoxic Activity: Protective effect of leaf extract against CCl4 induced hepatotoxicity has been reported. The extract showed the ability to stabilize biliary dysfunction in rat liver during chronic hepatic injury with CCl4 [18,19]. In another study new antihepatotoxic naphthopyrone glycosides, 9-[β-D-glucopyranosyl-(1→6)-O-β-glucpyranosyl) oxy] -10-hydroxy-7-methoxy-3-methyl-1H naphtho [2,3-c] pyran-1–one and 6-[(α-apio-furanosyl-(1→6)-O-β-D-glucopyranosyl) oxy]-rubrofusarin, together with cassiaside and rubro fusarin-6-β-gentiobioside were isolated from the seeds showed the significant hepatoprotective effects against galactosamine damage, which were higher than that of silybin from Silybum marianum Gaertn [20].

Antifungal Activity: The dealcoholized leaves extract has shown the significant antifungal activity to inhibit the growth of Candida albicans, Aspergillus niger, Sachharomyces cerevisiae and Trichophyton mentagrophytes when tested by turbidity and spore germination methods in a concentration dependent fashion. The effects produced by the extract were compared with a standard antifungal agent Griseofulvin [21].

Anthraquinones (emodin, physcion and rhein) isolated from *C. tora* seed show an antifungal property against phytopathogenic fungi i.e. Botrytis cinerea, Erysiphe graminis, Phytophthora infestans, Indian J Nat Prod Resour, December 2010 434 Puccinia recondita, Pyricularia grisea and Rhizoctonia solani, using a whole plant method in vivo and were compared with synthetic fungicides and three commercially available anthraquinones. The chloroform fraction of *C. tora* showed a strong fungicidal activity against B. cinerea, E. graminis, P. infestans and R. solani. Furthermore, aloe-emodin showed strong and moderate fungicidal activities against B. cinerea and R. solani, respectively, but did not inhibit the growth of E.

graminis, P. infestans, P. recondite and Py. grisea. Little or no activity was observed for anthraquinone and anthraquinone- 2-carboxylic acid when tested. Chlorothalonil and dichlofluanid as synthetic fungicides were active against P. infestans and
B. cinerea at 0.05 g/l, respectively [22].

Antibacterial Activity: Torachrysone, toralactone, aloe-emodin, rhein and emodin isolated from the seeds showed noticeable antibacterial effects on four strains of methicillin resistant Staphylococcus aureus with a minimum inhibitory concentration of 2-64 mg/ml. On the other hand, some phenolic glycosides were also isolated from seeds that did not show strong antibacterial effects on Escherichia coli and P. aeruginosa [23-26].

Anthelmintic Activity: Alcohol and aqueous seed extracts showed the anthelmintic activity against Pheretima posthuma and Ascardia galli due to the flavonoids present in it. Jain & Patil: Phytochemical and Pharmacological Profile of *Cassia tora* 435.Three concentrations (25, 50, 100 mg/ml) of each extract were studied, which involved the determination of time of paralysis and time of death of the worm. Both the extracts exhibited significant anthelmintic activity at highest concentration of 100mg/ml using Piprazine citrate as a standard in same concentration as that of extract and distilled water as control [27].

Antinociceptive Activity: The methanolic extract of leaves showed the antinociceptive and smooth muscle contracting activities and spasmogenic effects on guinea pig ileum, rabbit jejunum and mice intestinal transit in a concentration-dependent manner which is reversibly blocked by Atropine. Mepyramine also reduced the contractile amplitude due to the extract. The extract increased intestinal transit in mice dose dependently. *C. tora* extract 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 increased force (g), which is dose-dependent. Thus the use of *C. tora* traditionally as a purgative and in the treatment of other ailments is justifiable [28].

Hypotensive Activity: The seeds of *C. tora* elicit hypotensive effects in anesthetized rats. Experimental results indicate that the hypotensive effect of the extract possibly involves a vagal reflex, which reciprocally alters the vasomotor tone of the centrally emanating sympathetic nervous system [29-30]. A study by Koo et alon pentobarbital-anesthetized rats revealed that the medial portion of the medullary reticular formation is directly involved in the hypotensive effect of extracts. The role of the medullary reticular formation in the *C. tora* induced hypotension was suggested to be one, which modulates the basic cardiovascular reflexes, favouring a decrease in vasomotor tone [31].

Conclusion: An immense reason for why it is not grown more often is because of lack of knowledge people have of the plant. *Cassia tora* is not well known for many sustenance farmers in the region of where it is optimal to plant. *Cassia tora* is very affordable. Families of sustenance farmers or urban families can benefit from the medicinal and nutritional uses that it has because they would not have to spend as much money on buying goods such as laxatives, medicinal creams and ointments, coffee, and some vegetables. C.tora has many uses. The plant and seeds are edible. The edible part of the plant varies from 30 to 40 percent. Young leaves can be cooked as a vegetable while the roasted seeds are a good substitute for coffee. It is used as a natural pesticide in organic farms and its powder is most commonly used in the pet food industry. This weed could also become a reliable cheap source of nutritious feed for Ctenopharyngodon idella, a fast-growing exotic carp. *Cassia tora* tea is a herbal, pure, natural and non-polluted green health beverage. In the Republic of Korea, it is believed to rejuvenate human vision. Additionally, the tea has created a new term “coffee-tea”, because of its mysterious but very rich taste and its coffee aroma. It is made from 100 percent *Cassia tora*, with no artificial colouring and no caffeine, and could be a healthier substitute for coffee and sodas. Since *Cassia tora* has an external germicide and antiparasitic character, it has been used for treating skin diseases such as leprosy, ringworm, itching and psoriasis and also for snakebites. Other medicinal provisions from plant parts include balm for arthritis using leaves of *Cassia tora*.

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