

THE PROBABLE MEDICINAL USAGE OF *CASSIA TORA*: AN OVERVIEW

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ABSTRACT

Cassia tora (*C. tora*) is a small shrub budding as weed in Asian and African countries. It is a known edible leafy vegetable taken up by Asians. From time immemorial, different parts of *C. tora* have found application in Indian and Chinese medicine. Its varying useful medicinal effects are well documented in many publications. In this review we have compiled the traditional medicinal usage of *C. tora* which have been confirmed by scientific studies.

Keywords: Antioxidant, Antimicrobial, Hepatoprotective, Antimutagen, Hypolipidemic

1. INTRODUCTION

Cassia tora (*C. tora*) (sub-family: Caesalpinioideae; Family: Leguminosae/Fabaceae) is a small shrub which grows up in warm moist soil throughout the tropical parts of Asian and African countries. It is known by different names in different places like wise Foetid *Cassia tora*, Sickle Senna, Wild Senna, Sickle Pod, Coffee Pod, Tovara, Chakvad, Ring-worm Plant. *C. tora* has 10 cm long pinnate leaves, each leaf has three pairs of leaflets that are opposite, ovate, oblong and oblique at the base. The yellow-colored flowers are bearded in the axel of the leaves. The flowers consist of half inch diameter five petals. The seeds of *C. tora* are rhombohedral and brown in color. The *C. tora* gets flowers in the rainy season and the fruits in the winter season. *C. tora* leaves, seeds and roots are utilized as food ingredients since long (Ingle *et al.*, 2012).

In Ayurvedic and Chinese medicine books, different medical usage is depicted (DESCRIBED) for different parts of *C. tora* plant. In traditional Ayurvedic and Chinese Medicine, its usage has been described as an antioxidant, antimicrobial, antihepatotoxic, antidiuretic, antiarrhoeal and antimutagenic plant. Also, it has been

suggested that *C. tora* may lead to an improvement in visual acuity (Yen *et al.*, 1998; Patil *et al.*, 2004; Zhenbao *et al.*, 2007; Zhu *et al.*, 2008). Its beneficial effects are told to be (as glamorized at different commercial websites assessed on 21/12/2012, viz. http://www.aminaherbs.com/product.php?id_product=310; <http://www.iloveindia.com/indian-herbs/cassia-tora.html>) from skin diseases (like ringworm and itching or body scratch and psoriasis, eczema and dermatomycosis) to fever, bronchial infections, cardio-vascular disease, bowl problems (piles, hemorrhoids), leprosy.

So, we have started our search for authentic scientific experimental publications related to *C. tora* and it appears that not much research has been carried out to illustrate its medicinal importance. So we think to summarize the scientific findings till date available, which will help the other scientists and physicians to have a quick look on the usage of *C. tora* and further they can illustrate scientifically different aspect of this plant and elaborate our knowledge in the light of experimental proof.

1.1. Phytochemicals Isolated From *Cassia Tora*

The bioactive constituents of *C. tora* are anthraquinones, including 1-desmethyllaurantion-obtusin,

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1-desmethylchryso-obtusin, aurantio-obtusin, chryso-obtusin, obtusin (Zhu *et al.*, 2008; Meena *et al.*, 2010). The seeds of *C. tora* contain a variety of bioactive anthraquinones, including chrysophanol, emodin, rhein, which are mainly responsible for their pharmacological action (S) (Yen *et al.*, 1998; Duke, 2001; Wu and Yen, 2004). From the seeds of *C. tora*, an anthraquinone glucoside was also isolated and characterized as alaternin 2-O- β -D-glucopyranoside (Lee *et al.*, 1998).

From the roasted seeds of *C. tora*, a new naphthopyrone glycoside was isolated and characterized as 10-[(β -D-glucopyranosyl-(1 \rightarrow 6)-O- β -D-glucopyranosyl)oxy]-5-hydroxy-8-methoxy-2-methyl-4H-1-naphtho [1,2-b] pyran-4-one (isorubrofusarin gentiobioside). Along with isorubrofusarin gentiobioside, alaternin and adenosine were also isolated and identified (Lee *et al.*, 1997; Meena *et al.*, 2010). From the leaves of *C. tora*, Ononitol monohydrate, which is structurally similar to glycoside, was isolated (Dhanasekaran *et al.*, 2009).

1.2. Pharmacological Use

There are various pharmacological applications, which have been experimentally examined for *C. tora* (Fig. 1).

1.3. Anti-Oxidant Activity

Several diseases/disorders are associated to oxidative stress caused by free radicals (Gutteridge, 1993; Mukherjee and Gogoi, 2011). Antioxidants behave as a key defense system against free radical mediated toxicity by protecting the damages (Lee *et al.*, 2003). Anti-oxidants can act as free radical scavengers, lipid peroxidation inhibitor and savior to other free radical mediated processes, protecting the human organs against several pathologies such as Parkinson's disease, atherosclerosis, Alzheimer's disease and cancer (Mates *et al.*, 1999; Rosenkranz, 2002; Uttara *et al.*, 2009; Rejiya *et al.*, 2009).

Scalbert *et al.* (2005) was suggested that polyphenols may protect cell ingredients against oxidative damage and, by that mean they limit the risk of various degenerative diseases associated with oxidative stress. The polyphenolic content of *C. tora* is high (3.7 g kg⁻¹) in dried leaves. Keeping the fact of rich polyphenolic content in dried leaves of *C. tora*, in mind, Rejiya *et al.* (2009) evaluated the nitric oxide scavenging activity of methanolic leaves extract of *C. tora* and reducing power assays using Rutin and BHT (butylhydroxytoluene) as standards. The extract was also studied for its lipid peroxidation inhibition assay using rat liver and brain. Methanolic leaves extract of

C. tora showed better nitric oxide scavenging activity when compared to Rutin, so it can be used to minimize or retard the damage from nitric oxide radicals. The methanolic leaves extract of *C. tora* is very effective in inhibiting lipid peroxidation also (Rejiya *et al.*, 2009).

1.4. Anti-Inflammatory Activity

The Methanolic extract of the leaves of *C. tora* showed good activity against carageenin, serotonin, histamine and dextran induced rat hind paw oedema in a dose dependent manner (Maity *et al.*, 1998; Jain and Patil, 2010).

1.5. Anti-Proliferative Activity

Rejiya *et al.* (2009) explored the anti-proliferative potential of *C. tora* methanolic extract of leaves with Cisplatin, anticancer drug in human cervical cancer cells (HeLa). This study confirmed that *C. tora* methanolic extract strongly inhibited the growth of human cervical cancer cells (Rejiya *et al.*, 2009).

1.6. Hypolipidemic Activity

Ethanollic extract of seeds of *C. tora* and its fractions were examined for hypolipidemic activity on triton induced hyperlipidemic profile in Albino rats. Ethanollic extract and its ether soluble and water soluble fraction decreased the serum level of total cholesterol, LDL-cholesterol and triglyceride while slightly increased the HDL-cholesterol level (Patil *et al.*, 2004; Meena *et al.*, 2010).

Cho *et al.* (2005) supplemented, a mixture of *C. tora* fiber consisting of 2 g, 200 mg of alpha-tocopherol, 500 mg of ascorbic acid and 300 mg of maltodextrin to type II diabetic patients for 2 months. They observed that the level of serum total cholesterol, triglycerides and LDL-cholesterol declined in the *C. tora* group compared with the age and gender matched placebo group, while the Fasting blood glucose, HbA1c, blood urea, creatinine and activities of serum Aspartate Aminotransferase (AST) and alanine Aminotransferase (ALT) were not altered (Cho *et al.*, 2005).

1.7. Anti-Diabetic Activity

The hypoglycemic activity of *C. tora* has been reported by many scientists. Nam and Choi (2008) studied the effects of *C. tora* L. seed butanol fraction (CATO) on postprandial glucose control and insulin secretion from the pancreas of the normal and streptozotocin induced diabetic rats. They observed that in normal rats fed with CATO have lower postprandial glucose levels. In diabetic rats, the levels in the CATO fed group have lower postprandial glucose during the 30~180 min.

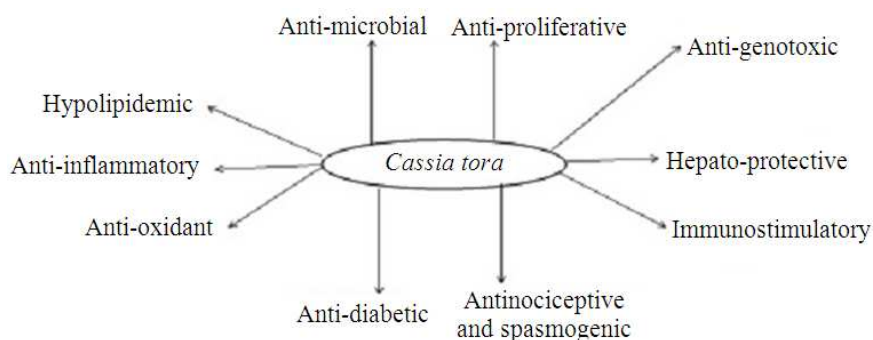


Fig. 1. Pharmacological activities of *Cassia tora*

When CATO was given orally to the diabetic rats for 5 days, the 12 hr fasting serum glucose level was diminished in the diabetic rats. The decrease in 12 hr fasting serum insulin level was less in the diabetic CATO rats than diabetic control rats. The findings of this study indicated that components of *C. tora L.* seeds have favorable effect on postprandial blood glucose control which may be partially mediated by stimulated insulin secretion from the pancreas of the diabetic rats (Nam and Choi, 2008).

1.8. Anti-Microbial Activity

The chloroform, methanol and aqueous extracts of leaves of *C. tora L.* observed to have antimicrobial property, as the extracts displayed activity against some bacteria and fungi which can cause skin infection and gastro-intestinal disorder ($0-5000 \mu\text{g mL}^{-1}$). Methanolic extracts also showed antifungal activity ($0-64 \text{ mg mL}^{-1}$). As per *in-vitro* study by Das *et al.* (2010) five strains of *Shigella dysenteriae*, four strains of *Staphylococcus aureus* and three strains of *Escherichia coli*, have shown sensitivity against *in vitro* treatment of the methanol extracts (up to $2000 \mu\text{g mL}^{-1}$).

1.9. Antinociceptive and Spasmogenic Activity

Antinociceptive activity of the methanolic extracts of leaves of *C. tora* was evaluated in the mice by Chidume *et al.* (2002). The extract reduced the nociceptive response of mice to increased force in a dose-dependent manner. The same extracts of *C. tora* also have spasmogenic effects. The spasmogenic effects of the extract were evaluated on guinea pig ileum, rabbit jejunum and mice intestinal transit. The extract elicited contraction of smooth muscles of guinea pig ileum and rabbit jejunum in a concentration-dependent manner (Chidume *et al.*, 2002).

1.10. Hepatoprotective Activity

Rajan *et al.* (2009) observed that (*in-vivo* model of rat) *C. tora* leaves methanol extract was effective in protecting liver against Carbon tetrachloride (CCl_4) induced liver damage. Further, Dhanasekaran *et al.* (2009) have carried out *in-vivo* study (hepatotoxicity induced by carbon tetrachloride in rats) and observed that Ononitol monohydrate (a class of glycoside isolated from *C. tora* leaves) decreases the levels of serum transaminase, lipid peroxidation and Tumor Necrosis Factor- α (TNF- α) while it increases the levels of antioxidant and hepatic glutathione enzyme activities. Histo-pathological findings put forward the hepatoprotective activity of ononitol monohydrate without any adverse effect (Dhanasekaran *et al.*, 2009).

1.11. Antigenotoxic Properties

The water extracts from *C. tora* (unroasted), markedly suppressed the mutagenicity of 2-amino-6-methyldipyrido imidazole (Glu-P-1) and 3-amino-1, 4-dimethyl-5H-pyrido (4,3- β) indole (Trp-P-1). While the roasted *C. tora* have less antigenotoxic potency than the unroasted one and it may be due to the reduction in their anthraquinones during roasting (Wu and Yen, 2004; Yen *et al.*, 1998).

1.12. Immunostimulatory Activities

In a study by Cherng *et al.* (2008) the immunostimulatory activities of four anthraquinones of *C. tora* (aloe-emodin, emodin, chrysophanol and rhein) on human Peripheral Blood Mononuclear Cells (PBMC) were evaluated. The results mentioned that at non-cytotoxic concentrations, the anthraquinones were effective in stimulating the proliferation of resting human PBMC and/or secretion of interferon- γ (IFN- γ). Nevertheless, at the concentration of 10 ng mL^{-1} , rhein significantly stimulated

proliferation of resting human PBMC, but inhibited IFN- γ secretion (Cherng *et al.*, 2008).

2. CONCLUSION

This review is a mini compendium of the effects of different parts of *C. tora* in various biological systems. It is also a summary of the potential health benefits of this wonder plant and should help advance research to further explore the useful impact of this plant/extract of differential parts of the plant in various chronic pathological conditions. It appears that literatures are scanty as far as toxicology of the various extracts of this plants concerned. Therefore, it is an urgent need to standardize the toxic properties/medicinal properties of *C. tora* and qualitative examination of the phytochemicals extracted from it for further use as an alternative therapy.

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