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Phytochemical Composition and Pharmacological Effects of *Cassia Fistula*

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Abstract

Cassia fistula is widely utilized in conventional medicines against various diseases. The plant possesses diverse pharmacological characteristics including anti-tussive, hepatoprotective, anti-pyretic, anti-oxidant, anti-inflammatory, anti-cancer, anti-fungal, anti-microbial, anti-itching, anti-ulcer, anti-epileptic, anti-fertility and wound healing characteristics. Its leaves and bark are used to treat skin diseases, while its roots are useful as diuretic and are used to treat tubercular glands, cardiac disorders, and ulcer. Its fruit pulp is used as a mild laxative in numerous stomach problems. Its flowers are used to treat leprosy, abdominal problems and fever and its seeds possess anti-pyretic, cooling and laxative properties. The plant is an important source of tannins, glycosides and flavonoides, linoleic, oleic, stearic and carbohydrates. Its leaves contain glycosides, free rhein, sennosides A and B, isofavoneoxalic acids and oxyanthraquinones derivatives, while the stem bark contains lepeol, hexacosanol, tannins and B-sitosterol. The pulp is composed of carbohydrate, arginine, protein, leucine and flavonid-3-ol-subordinates. Its pods contain astringent matter, fistulic acids, glutten matter and kaempferol, whereas its seeds are rich in malvalic acid, sterculic acid and vernolic oil. Moreover, aurantimide, ceryl alcohol, kaempferol, anthraquinonees, bianthroquonones and glycosides basic oils are present in the flower.

***Keywords*:** anti-fertility, anti-microbial, *Cassia fistula*, pharmacological, therapeutic

1. Introduction

Nature has provided many plant resources which are very important for animals. So, a considerable body of research is focused currently on identifying the nutritional and pharmacological potential of plants

for therapeutic purposes [1, 2]. *Cassia fistula* (Figure 1), generally known as *amaltas* (in Hindi) or Golden Shower (in English), is a well-known plant in deciduous forests ascending up to 1300m in outer Himalaya [3]. It belongs to the family *Fabacae.* It can grow in poor, shallow soil and also on trap, rock and stone soil almost everywhere. It is commonly grown throughout Bangladesh and in other Asian regions including India, the Philippines, Hong Kong, China, Mexico, Africa, South Asia, Malaysia, Indonesia, and Thailand. The entire plant has medicinal properties and it has been utilized as a part of several medicines used for the treatment of various diseases since ages [4].

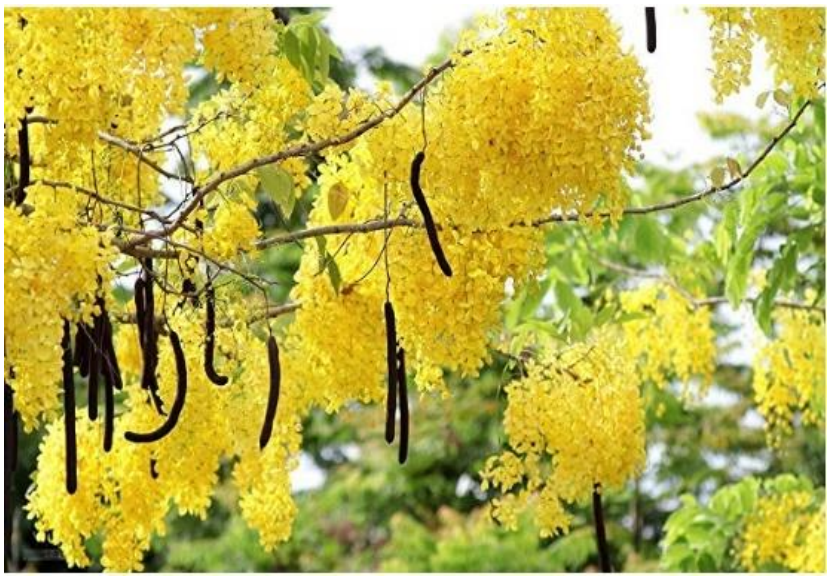

Figure 1. *Casia Fistula* [41]

It is well-known that the conventional system of medicine has turned into a subject of worldwide significance. Recent evaluations by the World Health Organization recommend/suggest that in numerous developing countries and regions, a large part of the population depends on conventional medicinal practices. Natural medicines or phytomedicines are abundantly recognized/used due to cultural and historical reasons. Since the worldwide situation is presently changing in favor of the utilization of conventional non-toxic ingredients extracted from plants for pharmaceutical purposes [5], improvement in current medication by involving the ingredients of *C. fistula* has been attracting attention. The current study was performed to review the phytochemical, pharmacological and therapeutic potential of *C. fistula*.

2. Phytochemical Composition

An abundant quantity of many constituents in different parts of the *Cassia fistula* plant has been investigated. The plant is an important source of oleic, linoleic, stearic and carbohydrates. The leaves of *C. fistula* primarily contain glycosides, free rhein, sennosides A and B, isofavoneoxalic acids, and oxyanthraquinones derivatives. The powder of stem bark contains lepeol, hexacosanol, tannins and B-sitosterol. The pulp of *C. fistula* fruit contains carbohydrates (26.3%), arginine, protein (19.9%), leucine and flavonid-3-ol-subordinates. The pods contain astringent matter, fistulic acids, glutten matter and kaempferol. The seeds contain malvalic acid, sterculic acid and vernolic oil. Its flower contains aurantimide, ceryl alcohol, kaempferol, anthraquinonees, bianthroquonones and glycosides basic oils. The plant also contains various amount of 2-Hexadecanone (12%), fistulin, unstable segments, phytol (16.1%), precious stones, 4-Hydroxy benzoic corrosive in different parts of the tree [6, 7].

3. Traditional Applications

3.1. Seed

It contains cooling, anti-pyretic, laxative and carminative properties. It has a slightly sweet taste and is used for treating constipation [8].

3.2. Flower

It is used for treating fever, leprosy, stomach pain and skin illnesses [9]. It has laxative and wound recovering potential. Its extract is used to deal with stomach problems [10].

3.3. Fruit

It is used for treating leprosy, fever, stomach problems and skin diseases [11].

3.4. Root

It is helpful against cardiovascular disorders, wounds and ulcers, rheumatic condition, tubercular organs and different skin illnesses [12, 13].

3.5. Pulp

It is utilized in the treatment of malaria, black water fever and as an anti-pyretic. It is safe as laxative for kids and pregnant ladies and is also used in liver disorders, biliousness and rheumatism [14, 15, 16].

3.6. Leaves

They possess the property to recover constipation [9].

4. Therapeutic Potential

4.1. Hepatoprotective Activity

The leaves of *C. fistula* demonstrated a huge hepatoprotective effect by bringing down serum levels of bilirubin, transaminase, and basic phosphatase. The defensive impact is similar to that of a standard hepatoprotective agent [17, 18].

4.2. Anti-pyretic Activity

The pod of *C. fistula* demonstrated/ decreased yeast induced fever with significant anti-pyretic effect [6, 19].

4.3. Anti-tussive Activity

Methanolic extract was examined for its impact on cough initiated by sulfur dioxide in mice. The anti-tussive activity was similar to that of codeine phosphate which is the prototype anti-tussive agent. Indeed, the extract of *C. fistula* reduced cough up to 51.85% as compared to the standard [20, 21, 22].

4.4. Anti-oxidant Activity

The methanolic (20%) and ethnolic (20%) extracts of stem bark and leaves of *C. fistula* were studied for anti-oxidant activity. Both extracts showed significant scavenging activity. *C. fistula* was investigated as a free radical scavenger [23, 24].

4.5. Anti-inflammatory Activity

Anti-inflammatory potential of methanolic and aqueous extracts of *C. fistula* bark was tested on winster albino rats. It was concluded that the extracts exhibited high anti-inflammatory potential in chronic as well as in acute models. The extracts demonstrated dose-dependent defensive effects against the generation of free radicals in liver and lipid peroxidation [9, 13, 20].

4.6. Wound Healing/Anti-bacterial Effect

Anti-microbial resistance against pathogenic microorganisms is a big issue. The ethanolic extract of *C. fistula* leaves was subjected to anti-microbial evaluation against *Pseudomonas aeruginosa* and

Staphylococcus aureus. The wound healing and tissue recovery rates were significantly enhanced in rats by *C. fistula*. The plant is generally accepted to have anti-bacterial potential against *Escherrichia coli, Bacillus, Mycobacterium smegmatis, Bacillus subtilis, Pseudomonas aerogenes, Klebsiella aerogenes* and *Proteus vulgaris* [25, 26, 27].

4.7. Anti-cancer Potential

The methanolic extract of *C. fistula* displayed a significant effect on the life duration of tumor in mice and also on the development of *Ehrlich ascites carcinoma*. The dose of this extract resulted in the reduction of tumor volume and in an increased life span [28, 29].

4.8. Anti-diabetic Activity

The seeds of *C. fistula* demonstrated a significant hypoglycemic effect by suppressing the blood glucose level in diabetic rats. A significant hypoglycemic activity was observed in normal members of albino rats [30].

4.9. Central Nervous System Activity

The methanolic extract of *C. fistula* seed showed a significant effect on the behavior of mice. The extract potentiated the sedative potential of diazepam, chlorpromazine and sodium pentobarbitone [31, 32].

4.10. Anti-itching Activity

Currently, there is no permanent cure available of the common chronic skin infection *vicharchika*. *C. fistula* was found effective against skin inflammation and eczema [25, 33].

4.11. Anti-ulcer Potential

There are reports available about the anti-ulcer potential of ethanolic leaf extract of *C. fistula* [34, 35].

4.12. Anti-fertility Activity

The ether extract of *C. fistula* seed was evaluated for anti-fertility action in proven fertile albino female rats by providing them doses of 500, 200 and 100 mg/kg body weight per day. After giving oral doses to the mated female rats, there was noted a significant decrease in live fetuses, fertility index and the number of uterus implants on the 15th day of pregnancy [10, 28, 36].

4.13. Laxative/purgative Activity

C. fistula is accepted to have laxative properties because of its waxy aloin content. It is less dangerous and is trusted as a superior purgative than senna [37, 38].

4.14. Anti-epileptic Potential

Anti-epileptic activity of *C. fistula* has been reported. The seed extracts of *C. fistula* delayed the onset of convulsions induced by pentylenetetrazol and also significantly lowered the duration of clonic convulsions in mice [6, 39, 40].

5. Conclusion

C. fistula finds many therapeutic applications due to its diverse pharmacological characteristics including hepatoprotective, anti-ulcer, wound healing, anti-pyretic, anti-tussive, anti-inflammatory, anti-oxidant, anti-cancer, anti-fungal, anti-microbial, anti-itching, anti-epileptic and anti-fertility characteristics. Its leaves and bark are used for treating skin diseases, while its roots are useful as diuretic and in the treatment of tubercular glands, cardiac disorders, and ulcer. Its fruit pulp is used as a mild laxative in numerous stomach problems. Its flowers are used for treating leprosy, abdominal issues and fever. Its seeds possess laxative, cooling and anti-pyretic properties. The plant is an excellent source of tannins, glycosides, flavonoides, linoleic, oleic, stearic and carbohydrates. It also contains glycosides, free rhein, sennosides A and B, isofavoneoxalic acids, oxyanthraquinones derivatives, lepeol, hexacosanol, tannins, B-sitosterol, arginine, protein, leucine, flavonid-3-ol-subordinates, astringent matter, fistulic acids, glutten matter, kaempferol, malvalic acid, sterculic acid, vernolic oil, aurantimide, ceryl alcohol, kaempferol, anthraquinonees, bianthroquonones and glycosides basic oils.

List of Abbreviations

C. fistula = *Cassia fistula*

PTZ = Pentylenetetrazol

mg = milligram

kg = Kilogram

CNS = Central Nervous System

References

[1] Rehman A, Hussain S, Javed M, Ali Z, Rehman H, Shahzady TG Zahra A. Chemical composition and remedial perspectives of *Hippophae rhamnoides linn. Postepy Biol Komorki*. 2018;45(3):199–209.

[2] Naseer S, Hussain S, Zahid Z. Nutritional and antioxidant potential of common vegetables in Pakistan. *RADS J Biol Res Appl Sci*. 2019;10(1):36–40.

[3] Neelam C, Ranjan B, Komal S, Nootan C. Review on Cassia fistula. *Int J Res Ayurveda Pharm*. 2011;2(2):426–430.

[4] Bhalodia NR, Shukla V. Antibacterial and antifungal activities from leaf extracts of Cassia fistula l.: An ethnomedicinal plant. *J Adv Pharm Technol Res*. 2011;2(2):104–109.

[5] Naseer S, Hussain S, Naeem N, Pervaiz M, Rahman M. The phytochemistry and medicinal value of Psidium guajava (guava). *Clin Phytoscience*. 2018;4(1):32.

[6] Danish M, Singh P, Mishra G, Srivastava S, Jha K, Khosa R. Cassia fistula Linn.(Amulthus)-An important medicinal plant: a review of its traditional uses, phytochemistry and pharmacological properties. *J Nat Prod Plant Resour*. 2011;1(1):101–118.

[7] Dey A, Abu A, Shakar S, Rahman A, Amin M. Evaluation of the anti-inflammatory and antipyretic activities of the plant Boerhavia repens.(Family: Nyctaginaceae). *J Nat Prod Plant Resour*. 2012;2(4):471–474.

[8] Tian-Shung W, Amooru D, Chung-Ren S, Ping-Chung K, Chemical constituents and pharmacology of Aristolochi species. *Stud Nat Prod Chem*. 2005;32: 855–1018.

[9] Markouk M, Bekkouche K, Larhsini M, Bousaid M, Lazrek H, Jana M. Evaluation of some Moroccan medicinal plant extracts for larvicidal activity. *J Ethnopharmacol*. 2000;73(1-2):293–297.

[10] Murugan V, Shareef H, Ramasarma G, Ramanathan M, Suresh B. Anti-fertility activity of the stem bark of Alangium salviifolium (Linn. F) wang in Wister female rats. *Indian J Pharmacol*. 2000;32(6):388–389.

[11] Tuomilehto J, Lindström J, Eriksson JG, Valle TT, Hämäläinen H,… Rastas M. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New Engl J Med*. 2001;344(18):1343–1350.

[12] Chopra RN, Nayar SL, Chopra IC. *Supplement to glossary of Indian medicinal plants.* New Delhi: Publication and Information Directorate; 1969.

[13] Alam M, Siddiqui M, Husain W. Treatment of diabetes through herbal drugs in rural India. *Fitoterapia*. 1990;61(3):240–242.

[14] Patel D, Karbhari S, Gulati O, Gokhale S. Antipyretic and analgesic activities of Aconitum spicatum and Cassia fistula. *Arch Int Pharmacodyn Ther*. 1965;157(1):22–27.

[15] Biswas K, Ghosh A. *In Bharatia Banawasadhi* (vol. 2). Calcutta: Calcutta University, Advancement of learning; 1973.

[16] Sharma DK. Enumerations on phytochemical, pharmacological and ethnobotanical properties of Cassia fistula Linn: yellow shower. *Seeds*. 2017;6(5):300–306.

[17] Bhakta T, Mukherjee PK, Mukherjee K, Banerjee S, Mandal SC, … Saha B. Evaluation of hepatoprotective activity of Cassia fistula leaf extract. *J Ethnopharmacol*. 1999;66(3):277–282.

[18] Bhalerao S, Kelkar T. Traditional medicinal uses, phytochemical profile and pharmacological activities of Cassia fistula Linn. *Int Res J Biol Sci*. 2012;1(5):79–84.

[19] Guri-Fakim A, Gueho J, Sewraj M, Dulloo E. *Plantes Medicinales de lile Maurice.* Mauritius: Editions de L'Ocean Indien; 1994.

[20] Kilbas AA, Srivastava HM, Trujillo JJ. *Theory and application of differential equations* (vol. 204). Amsterdam: Elsevier; 2006.

[21] Pradeep K, Raj Mohan CV, Gobianand K, Karthikeyan S. Protective effect of Cassia fistula Linn. on diethylnitrosamine induced hepatocellular damage and oxidative stress in ethanol pretreated rats. *Biol Res*. 2010;43(1): 113–125.

[22] Nirmala A, Eliza J, Rajalakshmi M, Priya E, Daisy P. Effect of hexane extract of Cassia fistula barks on blood glucose and lipid

profile in streptozotocin diabetic rats. *Int J Pharmacol*. 2008;4(4): 292–296.

[23] Aruoma OI. Methodological considerations for characterizing potential antioxidant actions of bioactive components in plant foods. *Mut Res-Fund Mol M*. 2003;523: 9–20.

[24] Jaffary F, Nilforoushzadeh MA, Moradi S, Derakhshan R, Ansari N. Concentrated extracts of Cassia fistula versus Intralesional injection of Meglumine antimoniate in treatment of acute cutaneous Leishmaniasis. *J Skin Stem Cell*. 2014;1(1): e16631.

[25] Kumar MS, Sripriya R, Raghavan HV, Sehgal PK. Wound healing potential of Cassia fistula on infected albino rat model. *J Surg Res*. 2006;131(2): 283–289.

[26] Jagatheeswari D, Deepa J, Ali HSJ, Ranganathan P. Acalypha indica L-An important medicinal plant: a review of its traditional uses and pharmacological properties. *Int J Res Bot*. 2013;3(1): 19–22.

[27] Rajeswari R, Thejomoorthy P, Mathuram LN, Raju K. Anti-inflammatory activity of Cassia fistula Linn. bark extracts in sub-acute models of inflammation in rats. *Tamilnadu J Vet Anim Sci*. 2006;2(5): 193–199.

[28] Carroll KK, Guthrie N, So FV, Chambers AF. Anticancer properties of flavonoids, with emphasis on citrus flavonoids. In: Rice-Evans C, Packer L. (Eds.). *Flavonoids in health and disease*. New York: Marcel Dekker; 1997.

[29] Morgan MT, Nakanishi Y, Kroll DJ, Griset AP, Carnahan MA,… Grinstaff MW. Dendrimer-encapsulated camptothecins: increased solubility, cellular uptake, and cellular retention affords enhanced anticancer activity in vitro. *Cancer Res*. 2006;66(24): 11913–11921.

[30] Trujillo KA, Akil H. Inhibition of morphine tolerance and dependence by the NMDA receptor antagonist MK-801. *Science*. 1991;251(4989): 85–87.

[31] Mansour A, Fox CA, Burke S, Meng F, Thompson RC,… Watson SJ. Mu, delta, and kappa opioid receptor mRNA expression in the

rat CNS: an in situ hybridization study. *J Comp Neurol*. 1994;350(3): 412–438.

[32] Pestalozzi BC, Zahrieh D, Price K, Holmberg S, Lindtner J,… Pagani O. Identifying breast cancer patients at risk for Central Nervous System (CNS) metastases in trials of the International Breast Cancer Study Group (IBCSG). *Ann Oncol*. 2006;17(6): 935–944.

[33] Wirotesangthong M, Inagaki N, Tanaka H, Thanakijcharoenpath W, Nagai H. Inhibitory effects of Piper betle on production of allergic mediators by bone marrow-derived mast cells and lung epithelial cells. *Int Immunopharmacol*. 2008;8(3): 453–457.

[34] Borrelli F, Izzo AA. The plant kingdom as a source of anti-ulcer remedies. *Phytother Res*. 2000;14(8): 581–591.

[35] Gregory M, Vithalrao K, Gregory F, Kalaichelvan V. Anti-ulcer (ulcer-preventive) activity of Ficus arnottiana Miq.(Moraceae) leaf methanolic extract. Am J Pharmacol Toxicol. 2009; 4(3): 89-93. DOI: 10.3844/ajptsp.2009.89.93

[36] Mei Z, Li X, Wu Q, Hu S, Yang X. The research on the anti-inflammatory activity and hepatotoxicity of triptolide-loaded solid lipid nanoparticle. *Pharmacol Res*. 2005;51(4): 345–351.

[37] Ahmad I, Mehmood Z, Mohammad F. Screening of some Indian medicinal plants for their antimicrobial properties. *J Ethnopharmacol*. 1998;62(2): 183–193.

[38] Srinivas G, Babykutty S, Sathiadevan PP, Srinivas P. Molecular mechanism of emodin action: transition from laxative ingredient to an antitumor agent. *Med Res Rev*. 2007;27(5): 591–608.

[39] Sackellares JC, Lee SI, Dreifuss F. Stupor following administration of valproic acid to patients receiving other antiepileptic drugs. *Epilepsia*. 1979;20(6): 697–703.

[40] Beniczky SA, Viken J, Jensen LT, Andersen NB. Bone mineral density in adult patients treated with various antiepileptic drugs. *Seizure-Eur J Epilep*. 2012;21(6): 471–472.

[41] Feedipedia. (n.d.). *Golden tree (Cassia fistula)*. Retrieved from https://www.feedipedia.org/node/325