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Review

Cassia Fistula in Traditional Medicine: Phytochemical Profiling, Therapeutic uses and Antifungal Activity

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	Abstract
Published on: 04.03.2026	Medicinal plants have played a pivotal role in the origin and advancement of traditional herbal medicine systems worldwide. Species belonging to the genus <i>Cassia</i> are of considerable therapeutic importance due to their rich phytochemical diversity and wide range of <i>pharmacological activities</i>. These plants contain numerous bioactive secondary metabolites, including tannins, flavonoids, glycosides, anthraquinones, oxyanthraquinones, carbohydrates, and fatty acids, which contribute to their therapeutic efficacy. <i>Cassia fistula</i> Linn., commonly known as the Golden Shower tree, is one of the most extensively used medicinal plants in <i>Ayurvedic</i>, <i>Unani</i>, and other traditional medicine systems. Native to India and widely distributed in tropical and subtropical regions, <i>C. fistula</i> has been traditionally employed for the management of gastrointestinal disorders, skin diseases, liver ailments, respiratory disorders, fever, rheumatism, and metabolic diseases. Various plant parts, including the leaves, roots, bark, flowers, fruits, and seeds, have been reported to exhibit laxative, purgative, hepatoprotective, anti-inflammatory, analgesic, antimicrobial, antioxidant, antidiabetic, antitumor, antifertility, and wound-healing properties. Experimental studies further indicate its effectiveness against bacterial infections, hypercholesterolaemia, and oxidative stress, along with notable hypoglycaemic and central nervous system activities. Despite its long-standing traditional use and documented biological potential, many of the therapeutic claims associated with <i>Cassia fistula</i> require systematic clinical validation. This review critically compiles and evaluates available literature on the phytochemistry, ethnomedicinal uses, and pharmacological properties of <i>Cassia fistula</i>, highlighting its therapeutic relevance and identifying gaps for future scientific research.
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Keywords: <i>Cassia fistula</i> ; Traditional medicine; Phytochemicals; Pharmacological activity; Herbal drugs; Antioxidant activity; Hepatoprotective effect; Antimicrobial properties	

INTRODUCTION:

Medicinal plants have served as a cornerstone of traditional healthcare systems since ancient times and continue to play a crucial role in modern drug discovery. According to the World Health Organization (WHO), more than 70% of the global population relies on traditional medicine for primary healthcare, particularly in developing countries where nearly 80% of people depend on plant-based remedies for managing common ailments. Herbal drugs and phytopharmaceutical formulations are generally perceived as safer, less toxic, and associated with fewer adverse effects compared to synthetic drugs, thereby reinforcing their widespread acceptance.

The genus *Cassia* L. comprises a large number of medicinally important species that are extensively utilized in Ayurvedic, Unani, Siddha, and other ethnomedical systems. Species belonging to this genus are known to possess a wide range of bioactive secondary metabolites, including tannins, flavonoids, glycosides, anthraquinones, oxyanthraquinones, fatty acids, and carbohydrates, which contribute to their diverse pharmacological activities. Several *Cassia* species have been reported to exhibit hepatoprotective, anti-inflammatory, antimicrobial, antifungal, antitussive, antioxidant, and wound-healing properties, highlighting their therapeutic significance.

Among them, *Cassia fistula* Linn., commonly known as the Golden Shower tree or Indian Laburnum, is a deciduous tree belonging to the family Caesalpiniaceae. It is widely distributed throughout India and other tropical and subtropical regions, including Southeast Asia, Africa, and parts of South America, and is cultivated both as an ornamental plant and a medicinal resource. *C. fistula* is officially recognized in the British Pharmacopoeia and holds a

prominent position in traditional Indian medicine. The plant is particularly valued for its mild laxative and purgative properties, attributed mainly to anthraquinone derivatives such as wax aloin, making it suitable for use in children and pregnant women.

Traditionally, different parts of *C. fistula*—including leaves, roots, bark, flowers, fruits, and seeds—are used in the treatment of gastrointestinal disorders, skin diseases, liver ailments, fever, rheumatism, respiratory disorders, diabetes mellitus, and infectious diseases. Various preparations such as infusions, decoctions, powders, and standardized extracts are employed either alone or in combination with other medicinal plants. Experimental studies have demonstrated that *C. fistula* possesses analgesic, antipyretic, anti-inflammatory, hypoglycaemic, hepatoprotective, antimicrobial, antifungal, antitumor, antifertility, and central nervous system modulatory activities. Additionally, its efficacy against drug-resistant microbial pathogens and dermatophytic fungi underscores its potential in addressing emerging challenges such as antimicrobial resistance.

Despite its extensive traditional use and promising pharmacological profile, many of the therapeutic claims associated with *Cassia fistula* remain inadequately supported by controlled clinical trials. Furthermore, several conditions traditionally treated with this plant are considered self-limiting, necessitating a critical evaluation of its actual therapeutic benefits. Therefore, a comprehensive review of the available literature is essential to consolidate existing knowledge on the phytochemistry, ethnomedicinal applications, pharmacological properties, and toxicological aspects of *Cassia fistula*. This review aims to provide an updated and critical overview of the medicinal potential of *C. fistula* while identifying gaps that warrant further experimental and clinical research.



Figure 1: *Cassia fistula* tree and flower

Cassia fistula Linn. is a medicinally important flowering plant belonging to the family *Fabaceae* and is taxonomically classified under the kingdom *Plantae*. The species falls within the subkingdom

Tracheobionta, super division *Spermatophyta*, division *Magnoliophyta*, class *Magnoliopsida*, subclass *Rosidae*, and order *Fabales*. This taxonomic placement reflects its characteristic vascular structure,

seed-bearing habit, and dicotyledonous morphology, which are consistent with other therapeutically significant members of the legume family.

Within the genus *Cassia*, *C. fistula* is one of the most extensively studied species due to its broad range of ethnomedicinal applications and well-documented pharmacological properties. The plant is widely distributed across tropical and subtropical regions and has gained prominence not only as a medicinal resource but also as an ornamental species owing to its distinctive bright yellow inflorescences.

The widespread traditional use of *Cassia fistula* is further evidenced by its numerous vernacular names across different linguistic and cultural regions. In India and neighbouring countries, the plant is commonly known as **Sonalu**, **Bundaralati**, and **Soondali** in Bengali; **Amaltas** in Hindi, Punjabi, and Urdu; **Bahava** in Marathi; **Kakkemara** in Kannada; **Sarakkonnai** and **Konai** in Tamil; and **Kondrakayi** or **Aragvadamu** in Telugu. In Sanskrit literature, the plant is referred to as **Nripadruma**, highlighting its significance in Ayurvedic texts. Internationally, it is known in English as **Indian Laburnum**, **Purging Fistula**, and **Golden Shower**, while Arabic sources refer to it as **Khayarsambhar**.

The extensive geographical distribution and diverse nomenclature of *C. fistula* underscore its long-standing acceptance in traditional medical systems such as Ayurveda, Unani, and folk medicine. These taxonomic and ethnobotanical attributes provide a strong foundation for understanding the therapeutic

relevance of *Cassia fistula* and justify its inclusion in comprehensive reviews focused on medicinal plants, phytochemistry, and drug discovery.^[1,2,3,4,6,7]

Plant Description: *Cassia fistula* is a moderate sized deciduous tree 10 m tall, flowers yellow, leaves alternate, pinnate, 30-40 cm long, with 4-8 pairs of ovate leaflets, 7.5-15 cm long, 2-5 cm broad. Fruits pendulous, cylindrical, brown, septate, 25-50 cm long, 1.5-3 cm in diameter, with 25-100 seeds. Seeds lenticular, light brown, lustrous. *Cassia fistula* grows throughout in Bangladesh and in many other Asian countries and is used as a traditional herbal medicine in India, China, Hong Kong, the Philippines, Malaysia, Indonesia, and Thailand.^[3]

The fruit pods are 40-70 cm long and 20-27mm in diameter, straight or slightly curved, smooth but finely striated transversely, the striations appearing as fine fissures. The rounded distal ends bear a small point marking the position of the style. The dorsal suture appears as a single vascular strand and the ventral suture as two closely applied strands. Internally the pod is divided by thin, buff coloured, transverse dissepiments at intervals of about 0.5cm. Each compartment contains one seed which is flat, oval, reddish brown with a well-marked raphe. The seed contains a whitish endosperm in which the yellowish embryo is embedded.^[7] Flowers are yellowish in colour, contain 5 petals, drooping racemes, 30-60 cm long.^[10] Calyx is approximately 1 cm long, divided into the base, pubescent; segments oblong, obtuse.^[10]

Kingdom	Plantae
Subkingdom	Tracheobionta
Super Division	Spermatophyta
Division	Mangoliophyta
Class	Magnoliophyta
Sub Class	Rosidae
Order	Fabales
Family	Fabaceae
Genus	Cassia
Species	Fistula

Table 1: Taxonomical Classification^[8]

Ayurvedic Medicine Uses: In Ayurvedic medicine, Golden Shower Tree is known as "disease killer". Its fruit pulp is used as mild laxative. as well as cardiac conditions and stomach problems such as acid reflux. Flowers used for fever, root as a diuretic. The bark and leaves are used for skin diseases. The seeds are recognised as antibilious, aperitif, carminative, and laxative while the root is used for curing adenopathy,

burning sensations, leprosy, skin diseases, syphilis, and tubercular glands. The leaves of the tree are used for erysipelas, malaria, rheumatism, and ulcers, the buds are used for biliousness, constipation, fever, leprosy, and skin disease and the fruit for abdominal pain, constipation, fever, heart disease, and leprosy. Thus every part of this plant is recognized for its medicinal properties. The plant is being considered

as a firewood source in Mexico. The reddish wood, hard and heavy, strong and durable, is suited for cabinetwork, farm implements. The bark has been employed in tanning, often in conjunction with avaram. The drug "*Cassia fistula*", a mild laxative, is obtained from the sweetish pulp around the seed. [3]

Phytochemical Studies: The plant is rich in phenolic antioxidants such as anthraquinones, flavonoids and flavone-3-ol derivatives. *Cassia fistula* the results shows positive for alkaloids, terpenoids, reducing sugars, saponins, tannins, carbonyl, phlobatannin, and steroids *Cassia fistula*'s laxative actions come from a group of well documented compounds called anthraquinone. The seeds contain approximately 2% anthraquinones, 24% crude protein, 4.5% crude fat, 6.5% crude fibre, and 50% carbohydrates. The stem bark contains two flavanol glycosides and a xanthone glycosides 13. The leaves have been documented with 15.88% crude protein, 6.65% crude fat, 20% crude fibre, and 39.86% carbohydrates. In addition, the plant also contains fistulic acid, rhein, rhein glucoside, galactomannan, sennosides A and B, tannin, substances, phlobaphenes, emodin, oxyanthraquinones chrysophanic acid, fistuacacidin, barbaloin, lupeol, beta-sitosterol, and hexacosanol^[3]

Traditional uses: The root is prescribed as a tonic, astringent, febrifuge and strong purgative. The leaves extract reduced mutagenicity in *E. coli*. Extract of the root bark with alcohol can be used for backward fever. The leaves are laxative and used externally as emollient, a poultice is used for chilblains, in insect bites, swelling, rheumatism and facial paralysis. Leaves possess anti periodic and laxative properties, the leaves are used in jaundice, piles, rheumatism ulcers and also externally skin eruptions, ring worms, eczema. The leaves and bark mixed with oil are applied to pustules, insect bites. The roots are used in chest pain, joint pain, migraine and blood dysentery. The extract of the root lowered the blood sugar level up to 30 %. Leaves and flowers are both purgative like the pulp.

Ashes from burnt pods mixed with little salt are used with honey taking 3- 4 times to relieve cough. Root is useful in fever, heart diseases, retained excretions and biliousness. Fruits are used as cathartics and in snake bite. Juice of leaves is used in skin diseases. Flowers and pods are used as purgative, febrifugal, biliousness and astringent. The ethanolic 50% extract of pods show antifertility activity in female albino rats. The heated pods are applied to swellings on the neck due to cold. The fruits are reported to be used for asthma. Pulp is given in disorders of liver. The drug is used as analgesic as an antipyretic; it is a remedy for malaria and fever. It is also applied in blood poisoning, anthrax and antidiysenteric, leprosy and antidiabetic, for the removal of abdominal obstruction. The extract of the flower inhibits the

ovarian function and stimulate the uterine function in albino rats. Fruits are used in the treatment of diabetes, antipyretic, abortifacient, demulcent, lessens inflammation and heat of the body; useful in chest complaints, throat troubles, liver complaints, diseases of eye and gripping. Juice of leaves is useful as dressing for ringworm, relieving irritation and relief of dropsical swelling. The pulp of the fruit around the seeds is a mild purgative. It is also used in biliousness and in diabetes. Externally, it is useful for evacuation in flatulent colic, as dressing for gouty or rheumatic joints. The pith is particularly useful if there is swelling in stomach, liver or intestine. The seeds are emetic, used in constipation and have cathartic properties.

The seeds are slightly sweet and possess laxative, carminative, cooling, improves the appetite, and antipyretic activity. They are useful in jaundice, biliousness, skin disease and in swollen throat. A seed dried produce marked hypoglycaemic activity. Seed powder is used in amoebiasis. The fruit pulp is used for constipation, colic, chlorosis and urinary disorders. The bark possesses tonic and antidiysenteric properties, it is also used for skin complaints, the powder or decoction of the bark is administered in leprosy, jaundice, syphilis and heart diseases. The aqueous extract of the root bark exhibits anti-inflammatory activity. The root is used in cardiac disorders biliousness, rheumatic condition, haemorrhages, wounds, ulcers and boils and various skin diseases. The stem bark is used against amenorrhoea, chest pain and swellings.^[7]

PHYTOCHEMISTRY:

C.fistula extracts have been attributed to their primary and secondary metabolite composition. Primary metabolite analysis has essentially been focussed on the seed, pollen, fruit, leaf and pod. The composition of protein 12 %, carbohydrate 11.75%, lipid 12% and free amino acid 1.42%, respectively. The stem bark of *Cassia fistula* contains two flavanol glycosides, 5, 7, 3', 4'-tetrahydroxy-6, 8-dimethoxyflavone-3-O- α -arabinopyranoside, 5, 7, 4' trihydroxy-6, 8, 3'- trimethoxyflavone-3-O- α -L-rhamnosyl (1 $\rightarrow$ 2)-O- β -D-glucopyranoside and a xanthone glycoside, 1, 8-dihydroxy-3, 7-dimethoxyxanthone-4-O- α -L-rhamnosyl (1 $\rightarrow$ 2)-O--D- β glucopyranoside²⁶. The fruit of *Cassia fistula* was a good source of Fe and Mn, and their concentrations were considerably higher than those in apple, apricot, peach, pear and Orange and also revealed the presence of aspartic acid, glutamic acid and lysine constituted 15.3, 13.0 and 7.8%, respectively, of the total amino acids in the pulp.

The seeds yield a gum (7.65%) which is the most efficient suspending agent for calomel, kaolin and talc. Extraction of the dried and crushed seeds with petroleum ether (b.p.60-80°C) in a specially

modified soxhlet apparatus gave 5.0% brownish yellow oil. Subsequently, Chrysophanic acid was also isolated from this oil. Mucilage (25.8%) was isolated from the seeds by extraction with hot water. The seeds constituted the same amino acids with 16.6, 19.5 and 6.6%, respectively while, isolated 5-Nonatetracontanone, 2-hentriacontanone, triacontane, 16 hentriacontane and beta-sitosterol from the hexane fraction of the fruits. Fruit pulp contains sugar, gum, astringent matter, gluten, colouring matter and water proteins (19.94%) and carbohydrates (26.30%); arginine, leucine, methionine, phenylalanine, tryptophan, aspartic and glutamic acids; a new dimeric proanthocyanidin CFI isolated along with (–) epiafzelechin, (+) catechin, kaempferol, dihydrokaempferol and 1, 8-dihydroxy-3-methylanthraquinone²⁸. The neutral lipids were accounted for over 89.80% of the total weight of the lipid employed. Saturated and unsaturated fatty acids present in the oil were separated and varied from 23.79% to 28.20% and 63.28% to 66.71% respectively. The fatty acid composition of the oil was analysed by Gas Liquid Chromatography (GLC). The major fatty acids found in the oil were linoleic acid (42.42%), oleic acid (29.62%), stearic acid (14.33%) and palmitic acid (11.41%). In addition to the above, caprylic acid (0.76%) and myristic acid (1.44%) were also present in minor amounts. Yueh-Hsiung Kuo et al. (2002), identified four new compounds from the seeds of *Cassia fistula*, 5-(2-hydroxy phenoxy methyl) furfural, (22 S)-7-hydroxy-5-hydroxymethyl-2-(22 -hydroxypropyl) chromone, benzyl 2- hydroxy-3,6- dimethoxybenzoate and benzyl 2-O-D-glucopyranosyl- 3,6-dimethoxybenzoate, together with four known compounds, 5 hydroxymethylfurfural, (22 S)-7-hydroxy-2-(22 -hydroxypropyl)-5- methylchromone, and two oxyanthraquinones, chrysophanol and chrysophane.^[8]

PHARMACOLOGICAL STUDY

Anti-Fungal Activity: 4-hydroxy benzoic acid hydrate obtained from the extracts of the flower of *Cassia fistula* (an ethnomedicinal plant) showed antifungal activity against *Trichophyton*

mentagrophytes (MIC 0.5 mg/ml) and *Epidermophyton floccosum* (MIC 0.5 mg/ml).

Antibacterial activity: Three lectins from the *Cassia fistula* seeds possess antibacterial activities against various pathogenic bacteria. The antibacterial activity of the aqueous and alcoholic extract of stem bark of *Cassia fistula* was highly effective.

Anti-inflammatory activity: The extract of leaves of *Cassia fistula* was suggested for anti-inflammatory effects.⁵⁶ The anti-inflammatory and antioxidant activities of the *Cassia fistula* bark were found significant.

Antimicrobial activity: The leaves, stem bark and fruit pulp showed antibacterial activity. The fruit pulp was the most potent in this respect. The activity might be due to the presence of flavonoids. The solvent ether extract of the fruit pulp possesses the maximum activity and when compared to chloramphenicol, the activity of 1 gm of this extract was found to be more than that seen with 100-g of chloramphenicol.

Pharmacological activities: The different portions of the plant species have exhibited numerous medicinal benefits for instance, hypoglycemic antioxidant and anti-tumour potentials. *Cassia fistula* is very important in different traditional medicinal systems because it possesses distinctive properties valuable in treating the dermal infections, inflammatory conditions, ulcers, rheumatism, jaundice as well as anorexia. The root has purgative effects; treats heart related illnesses, fever, biliousness, nausea, retained metal. Assessed the protective effects as well as antioxidant properties of *C. fistula* on oxidative damage induced by hydrogen peroxide on the red blood cells. Their results demonstrated that the *C.fistula* extract extracted using ethanol had significantly high antioxidant potential because they were able to protect the red blood cells with an efficacy level of 90%. Water extract of *C. fistula* exhibited an efficacy level of 75% antioxidant and protective potential.

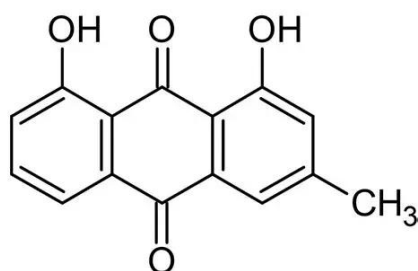


Figure 2: Chrysophanol

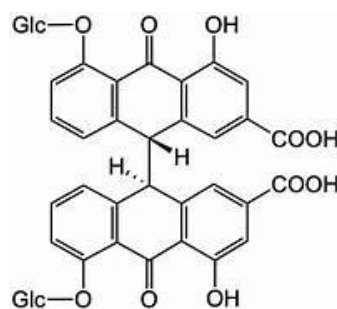


Figure 3: Sennosides A

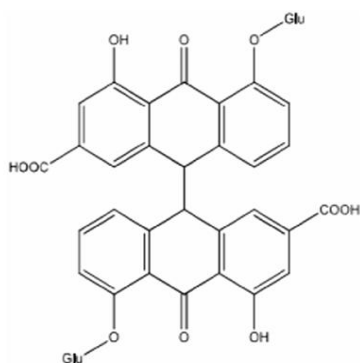


Figure 4: Sennosides B

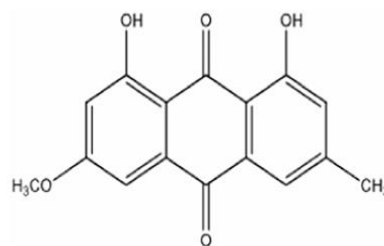


Figure 5: Physcion

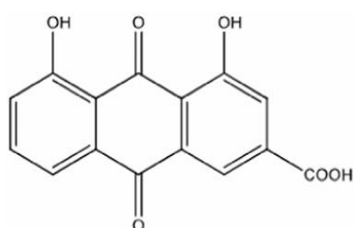


Figure 6: Rhein

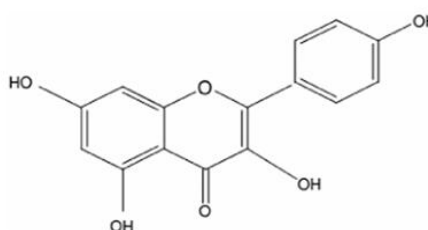


Figure 7: Kaempferol

excretions among other conditions. The extracts from the leaves are effective in treating ringworm infections, cough in addition to snake bites. The fruit pulp is laxative and analgesic; it can relieve obstructions in the chest, the accumulated heat within the circulatory system as well as the intense heat accumulated within the liver tissues.

It is similarly a benign aperient for children as well as women, enhances the sight's sharpness in addition to loosening the bowels for the purposes of *etal.* assessed the protective effects as well as antioxidant properties of *C. fistula* on oxidative damage induced by hydrogen peroxide on the red blood cells. Their results demonstrated that the *C. fistula* extract extracted using ethanol had significantly high antioxidant potential because they were able to protect the red blood cells with an efficacy level of 90%. Water extract of *C. fistula* exhibited an efficacy level of 75% antioxidant and protective potential. Sharma demonstrated that methanolic extracts of flowers, leaves, stem bark and pulp of *C. fistula* have potent antioxidant properties.

The antioxidant potential was verified to be stronger in the extract of stem bark then leaf extracts followed by flower extracts and lastly the pulp extracts. The results correlated with the total contents of polyphenolic compounds present in the methanolic extracts. The pulp and flower methanolic extracts displayed significantly weak antioxidant potential possibly because of the presence of reducing sugars

and pro-oxidants that might have outcompeted the antioxidant constituents found in the extracts.

Therefore, the extract of stem bark showed higher antioxidant potential with respect to peroxidation inhibition, reducing power, radical and O₂ scavenging capacity. Water extract from flowers of *C. fistula* showed antioxidant activity in alloxan and was able to induce diabetes in experimental rats. A noteworthy drop in products with peroxidation activity i.e., conjugated dienes, hydroperoxides, thiobarbituric acid reactive components were detected in tissues of the heart on treated rats with diabetes. The reduced activities played by enzymes with antioxidant potential including superoxide dismutase, glutathione peroxidase, glutathione reductase, glutathione, and catalase in rats with diabetes were adjusted towards near normal range when they were administered the aqueous extract. Jangir and Jain carried out an investigation on the antioxidant properties of the fruit extracts of *C. fistula* to determine its mechanism of action.

His results showed that the hydroalcoholic extract of the fruit pulp demonstrated antioxidant properties because the extract was able to inhibit hydroxyl and DPPH radicals in addition to effects of reducing power. The scavenging potential was correlated to the presence of phenolic compounds found in the extract. DPPH radicals have been applied widely to investigate the scavenging activities of natural compounds. The colour of the reaction mixture changes

from purple to yellow when DPPH radicals are scavenged. The bioactive potential attributed to polyphenols is essentially facilitated to some level by scavenging the free radicals, actions of complexing and metal antioxidants, their ability to decrease restricted concentration of O₂ as well as to break down peroxides, their interaction with other enzymes in addition to synergistic effects with different antioxidants.^[9]

Anti-Cancer Activity: *Cassia fistula* also showed anti-cancer effects in human colon adenocarcinoma cell line at a very low dose. B. Irshad, *et al.*, proved that fruit extracts could inhibit the growth of human cervical cancer cell lines (SiHa) as well as breast cancer cell lines (MCF-7). It can be useful to treat colon cancer studies. It also regulated the proliferation of cancer cell lines such as human cervical cancer, breast adenocarcinoma, and hepatocellular carcinoma.^[10]

Anti-HIV Activity: Plant lectins antiviral action was initially described in 1988, when D-mannose-specific plant lectins inhibited HIV binding in vitro. Against human cancer cell lines, fruit extracts have anti-cancer activity. *C. fistula* regulates HIV-1 protease activity and is used in Thai medicine. Some compounds of *C. fistula*, including piceatannol, Chrysophanol, resveratrol, emodin, and rhein, have been isolated from this plant and have shown anti-HIV-1 protease properties. Rhein inhibits angiogenesis and the survival of hormone-dependent and independent cancer cells *in vitro* under normoxic or hypoxic conditions, whilst chromones and other compounds that shown potent anti-cancer ability.^[10]

Anti-COVID-19 Activity: Lectins have potential anti-infectivity capacity for various RNA viruses that includes SARS-CoV-2. Lectins are a broad set of carbohydrate-attaching natural proteins that attach reversibly and with particular to mono and oligosaccharides. Thus, by interacting with viral envelope proteins, lectins can limit viral replication. Such anti-viral lectins have been widely investigated in vitro for their ability to neutralise various encapsulated viruses, including corona viruses. Antiviral lectins can prevent virus entry by binding to glycans on either the virus or the host cell. Antiviral lectins can bind to the viral Spike protein of SARS-CoV, and lectins such as mannose, glucose and N-acetylglucosamine have been reported to impede the entry of numerous corona viruses, including SARS-CoV.^[10]

DISCUSSION:

The resurgence of interest in plant-based therapeutics highlights the continued relevance of medicinal plants in global healthcare. Despite significant advancements in synthetic pharmaceuticals, nearly 80% of the population in developing and

underdeveloped regions continues to depend on traditional herbal remedies for primary healthcare needs. In this context, *Cassia fistula* L. emerges as a valuable medicinal species with extensive ethnopharmacological importance.

Evidence from traditional usage and contemporary scientific investigations demonstrates that *Cassia fistula* possesses significant hepatoprotective, anti-inflammatory, antioxidant, antibacterial, antifungal, and antitussive activities. The plant has also shown promising wound-healing potential and effectiveness in the management of gastrointestinal disorders and hepatic conditions. Recent findings further suggest its possible application in treating dandruff and other dermatological infections, particularly through methanolic extracts rich in polyphenols, while n-hexane extracts exhibit high flavonoid content.

The therapeutic potential of *C. fistula* can be attributed to its diverse phytochemical composition, including glycosides, tannins, flavonoids, anthraquinones, sennosides (A and B), rhein glycosides, kaempferol, fistulin, essential oils, volatile constituents, phytol, and fatty acids such as linoleic, oleic, and stearic acids. The presence of these bioactive compounds supports its documented antimicrobial, antioxidative, and hepatoprotective properties.

Although numerous in vitro studies have confirmed its pharmacological activities, comprehensive in vivo studies and well-designed clinical trials are still required to elucidate precise mechanisms of action, determine optimal dosages, and establish long-term safety profiles. Further isolation, characterization, and standardization of active phytoconstituents are essential for developing validated herbal formulations and potential lead molecules for novel drug discovery.

In summary, *Cassia fistula* represents a promising medicinal plant with broad-spectrum biological activities. Continued systematic research focusing on its phytochemistry, pharmacodynamics, and toxicological evaluation will facilitate its integration into evidence-based phytotherapy and contribute to the development of new natural therapeutic agents.^[1,2,10]

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