WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES
SJIF Impact Factor 7.632
Volume 10, Issue 9, 860-870 Review Article ISSN 2278 – 4357

A REVIEW ON CASSIA SPECIES PHARMACOLOGICAL, TRADITIONAL AND MEDICINAL ASPECTS

Dr. Sachin[1]*, Dr. Naresh Garg[2] and Dr. Omparkash Sharma[3]

[1]P.G. Scholar Department of Dravyaguna, Sriganganagar College of Ayurvedic Science And Hospital.

[2,3]Associate Professor, Department of Dravyaguna, Sriganganagar College of Ayurvedic Science and Hospital.

Article Received on
25 June 2021,

Revised on 14 July 2021,
Accepted on 04 Aug. 2021,

DOI: 10.20959/wjpps20219-19787

***Corresponding Author**
Dr. Sachin
P.G. Scholar Department of Dravyaguna, Sriganganagar College of Ayurvedic Science And Hospital.

ABSTRACT

Background: The World Health Organization (WHO) estimates that about 80% of people living in developing countries rely on traditional medicines for their primary health care need. Medicinal herbs are moving from fringe to mainstream use with a greater number of people seeking remedies and health approaches free from side effects caused by synthetic chemicals. India officially recognizes over 3000 plants for their medicinal value. It is generally estimated that over 6000 plants in India are in use for traditional, folk and herbal medicine. **Aim of the Study:** This article aims to provide a comprehensive review on pharmacological, medicinal and traditional value of *Cassia* species (Caesalpiniaceae) plant(s) in developing countries. **Material and Methods:** *Cassia* species are 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. Several chemical compounds such as Anthraquinone glycosides, Naphthopyrone glycosides, Phenolic compounds, Flavonoids etc. have been isolated from this plant and well recognized traditional medicine as laxative and is useful for treatment of leprosy, ringworm infection, ophthalmic, skin diseases and liver disorders. **Result:** The pharmacological, medicinal and traditional value reported in present review to confirm the therapeutic value of *Cassia* species to different developing countries. Thus, this review may provide the compiled information which will guide to develop the novel agent for various disorders from different *Cassia* species. **Conclusion:** On the basis of scientific studies and review articles on *Cassia* species suggest an enormous biological potential of

these plants.

KEYWORDS: Glycosides, Ringworm infection, Tannins, Anthraquinone glycosides.

INTRODUCTION

The World Health Organization (WHO) estimates that about 80% of people living in developing countries rely exclusively on traditional medicines for their primary health care need[1] India is virtually a herbarium of the world, using plants and herbs as the basic source of medicine. Herbals which form a part of our nutrition and provide us an additional therapeutic effect are in demand and *Cassia* species is one of such plant.[2]

Cassia species (Caesalpiniaceae) are well known medicinal plant commonly found in India and other tropical countries.[3] 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 Cassia species.[4,5] Sennosides, which are well known for their medicinal importance, have been detected in the leaves of the plant.[5]

Cassia species are already reported in the ancient ayurvedic literatures and literature survey indicated its use against various skin diseases such as ringworm, eczema, and scabies. Because of the high incidence of skin diseases, especially among the weaker section of the Indian population, it was felt worthwhile undertaking research on this plant. According to *Ayurveda* the leaves and seeds are acrid, laxative, antiperiodic, anthelmintic, ophthalmic, liver tonic, cardiotonic and expectorant. The leaves and seeds are useful in leprosy, ringworm, flatulence, colic, dyspepsia, constipation, cough, bronchitis, cardiac disorders. *Cassia* species powder made from *Cassia* species seeds and *Cassia* species splits are some ancient natural ingredients. In India, *Cassia* species is used as a natural pesticide in organic farms. Roasted seeds are substituted for coffee, like tephrosia seeds. *Cassia* species powders are most popularly used in the pet-food industry. It is mix with guar gum for use in mining and other industrial application. The extracts of *Cassia* species have been used as a remedy for various skin ailments, rheumatic disease and as laxatives.[6,7,8]

The extract of *Cassia* species leaves has been found to possess significant hepatoprotective activity and anti- inflammatory activity.[9,10] The seeds of *Cassia* species have been used in Chinese medicine as aperients, antiasthma, diuretic agent and also improve the visual activity.[11] *Cassia* species are well known oriental herb used in traditional medicine which

grows up to 1-2 m in height and is found as a rainy season weed throughout India. It constitutes an ayurvedic preparation "*Dadrughan-vati"* which is used for ringworm, leucoderma, etc. *Chakramardha tailamu*, a compound ayurvedic oil of this herb is beneficial in eczema, ringworm and other skin diseases.[11,12] Whole plant is employed in the treatment of impetigo, ulcers, helminthiasis and as a purgative.[13]

Geographical Source and Distribution of *Cassia* species

Cassia species are 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.[7] 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.[2] Near about hundreds of *Cassia* species are present, but the exact number is still not clear. Because *Cassia* was long used as a wastebin taxon for Cassieae in general, most notably *Senna* and *Chamaecrista* with which it makes up the Cassiinae. Some of them *Cassia* plants used as herbal medicine according their nativity and other *Cassia* species are recorded in Red data book.

Phytography

Cassia species are wild crop and grown in most parts of India as a weed. It is an annual foetid herb, 30–90 cm high. Leaves are green in colour, pinnate, up to 6-8cm long, leaflets are in 3 pairs, distinctly petiole, opposite, conical at one end, ovate, oblong and base oblique.[2] Flowers are pale yellow in colour usually in nearly sessile pairs in the axils of the leaves with five petals, upper one IS very crowded. Pods are subteret or 4 angled, very slende, 6-12 inch long, incompletely septate, membranous with numerous brown oblong rhombohedral seeds.[8]

Phytochemistry

Phytochemical screening of the plants extracts employing TLC indicated that these extracts as well as callus extracts contains- glycoside, flavonoids, and anthrone, anthrancene derivatives. It contains 1-2% volatile *Cassia* oil, which is mainly responsible for the spicy aroma taste. The primary chemical constituents of *Cassia* include cinnamaldehyde, gum, tannis, mannitol, coumarins, and essential oils (aldehydes, eugenol and pinene); it also contains sugars, resins, and mucilage, among other constituents.

Root

Eight compounds were isolated from the ethyl acetate fraction of *Cassia obtusifolia*, which are betulinic acid, chrysophanol, physcion, stigmasterol, 1- hydroxy-7-methoxy-3-methyl-

anthraquinone, 8-O-methylchrysophanol, 1-O- methylchrysophanol and aloe-emodin.

Seed

Seed contains anthraquinones, namely; (aurantio-obtusin, chryso-obtusin, obtusin, chrysoobtusin-2-O-beta-D-glucoside, physcion, emodin, chrysophanol, obtusifolin, obtusifolin-2-O-beta-D-glucoside, alaternin 2- O-*β*-Dglucopyranoside)[15], brassinosteroids (brassinolide, castasterone, typhasterol, teasterone, and 28-norcastasterone), and monoglycerides (monopalmitin and monoolein).[16] Phenolic glycosides such as rubrofusarin triglucoside, nor-rubrofusarin gentiobioside, demethylflavasperone gentiobioside, torachrysone gentiobioside, torachrysone tetraglucoside and torachrysone apioglucoside were also isolated.[17]

The seeds yield a gum (7.65%) which is the most efficient suspending agent for calomel, kaolin and talc.[18] 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.[19] Mucilage (25.8%) was isolated from the seeds by extraction with hot water.[20]

Thirteen phenolic glycosides including six new compounds were isolated from seed of Cassia species. These are rubrofusarin triglucoside, nor-rubrofusarin, gentiobioside, demethyflavasperone gentiobioside, torachrysone gentiobioside, torachrysone tetraglucoside and torachrysone apioglucoside. Two new naphtha-pyrone glycosides, 9(beta-D-glucopyranosynl-(1— 6)-O-beta-D-glucopyranosyl) oxy]-10- hydroxy-7-methoxy-3-mehtyl-1H-naptho [2,3- c] pyran-1-one and 6-O-beta-D- glucopyranosyl) oxy]-rubrofusarin, together With Cassiaside and rubrofusarin 6 beta- gentiobioside were isolated from the seeds of Cassia species.

Stem Bark

The isolation of a anthraquinone, 1- hydroxy-5-methoxy-2-methyl anthraquinone and its glycoside, 5-methoxy-2-methyl anthraquinone-1-O-α-L-rhamnoside along with chrysophanol, emodin and β-sitosterol from the stem of *Cassia* species Linn. is reported.[18] The stem also contains d-mannitol, myricyl alcohol, β-sitosterol, glucose, tigonelline, 1-stachydnine and choline. The stem-bark yields ethyl arachidate and behenic acids, marginic and palmitic acids, euphol, aurapterol, basseol, rhein, 3, 5, 8, 3´4´5´- hexahydroxy flavones.[21]

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.

Pharmacological Activities

All over the world scientific research is getting momentum to evaluate the pharmacological activities and medicinal properties of *Cassia* species. On the basis of various experimental researches, the following pharmacological activities or medicinal properties of *Cassia* species have been reported.

Hepatoprotective Activity

Hydro-alcoholic extracts of *Cassia* species, whole plant showedsignificant decrease in the levels of serum markers, indicating the protection of hepatic cells and significant dose dependent protection against paracetamol induced hepatocellular injury.[24] Methanolic extract of *Cassia* species leaves at a dose of 400 mg/kg showed significant hepatoprotective effect by lowering the serum levels of transaminase (SGOT and SGPT), bilirubin and alkaline phosphatase (ALP).[8]

Anti-Inflammatory Activity

Methanolic extract of the *Cassia* species leaves was investigated against carrageenin, histamine, serotonin and dextran induced rat hind paw oedema. It exhibited significant anti-inflammatory activity against all these agents. The extract (400 mg/kg) showed maximum inhibition of oedema of 40.33%, 31.37%, 53.57% and 29.15% at the end of 3 hr with carrageenin, dextran, histamine and serotonin induced rat paw oedema, respectively. Using a chronic test, the granuloma pouch in rats, the extract exhibited a 48.13% reduction in granuloma weight.[8]

Hypolipidemic Activity

Ethanolic extract of *Cassia* species seeds and its ether soluble and water-soluble fraction decreased serum level of total cholesterol by 42.07, 40.77 and 71.25% and increased the serum HDL cholesterol level by 6.72, 17.20 and 19.18%, respectively. Ethanolic extract, ether fraction and water fraction decreased triglyceride level by 26.84, 35.74 and 38.46%, respectively. The reduction in LDL-cholesterol level by ethanolic extract, ether soluble fraction and water-soluble fraction were 69.25, 72.06, and 76.12%, respectively.[25]

Antimutagenic Activity

Antimutagenic activity of a methanol extract of *Cassia* species seeds were demonstrated against aflatoxin B1 with the *Salmonella typhimurium* assay. The numbers of revertants per plate decreased significantly when this extract was added to the assay system using *Salmonella typhimurium* TA100 and/or TA98. The methanol extract was then sequentially partitioned with CH_2Cl_2, n- butanol and H_2O. The CH_2Cl_2 and n-butanol fractions possessed antimutagenic activity but the H_2O fraction was inactive. Column chromatography using silica gel yielded pure chrysophanol, chrysoobtusin and aurantio obtusin from CH_2Cl_2 fraction *Cassia*side and rubro-fusarin gentiobioside from the n-BuOH fraction. Each of these compounds demonstrated significant antimutagenic activity.[26]

Antishigellosis Activity

The ethyl acetate fraction of the crude extract of *Cassia* species showed maximum activity with the zone of inhibition ranging between 23-25 mm at the concentration of 200 µg disc-1. The minimum inhibitory concentration (MIC) of ethyl acetate, chloroform and ethanol extracts was found between 32-64 µg ml-1 whereas the methanol and petroleum fractions showed MIC values between 128-512 µg / ml.[27]

Antibacterial Activity

De-alcoholized extract of *Cassia* species seeds inhibited the growth of *Micrococcus pyogenes* var. albus, *Micrococcus citreus*, *Cornebacterium diphtheria*, *Bacillus megatherium*, *Salmonella typhosa*, *Salmonella paratyphi*, *Salmonella schottmuelleri* and *Escherichia coli*.[103]

Antiulcer Activity

Antiulcer effect of methanolic extract of *Cassia* species seed extract was evaluated using pylorus ligation and indomethacin induced ulcers in wistar albino rats. Various biochemical parameters such as gastric volume, free and total acidity were estimated. A significant reduction of ulcer index as well as gastric acid output in extract treated animals was observed with respect to control animals. The extract exhibited 75% protection in pylorus ligation model and 70.31% protection in indomethacin induced ulcers.[30]

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*.[31] It shows antifungal activity due to chrysophenol and crysophanic acid- 9- anthrone and other

anthraquinones such as emodine, physcion and rhein.[32,33]

Antioxidant Activity

The methanolic extract of *Cassia* species seeds show stronger antioxidant activity. It was found that it exhibits stronger antioxidant activity as compared to Alpha- tocopherol.[34] The phenolic active component, alaternin and nor-rubrofusarin glucoside isolated from extract of *Cassia species* also showed a potent free radical scavenging activity.

Medicinal and Therapeutic Use of Different *Cassia* species In Various Countries

It is used as tonic, carminative and stimulant. Its leaves, seeds, and roots are used medicinally, primarily in Asia. It is believed to possess a laxative effect, as well as to be beneficial for the eyes. As a folk remedy, the seeds are often roasted, then boiled in water to produce a tea. Roasted seeds have also been used as a substitute for coffee. According to ayurveda the leaves and seeds 1are acrid, laxative, antiperiodic, anthelmintic, ophthalmic, liver tonic, cardio-tonic, expectorant, leprosy, ringworm, flatulence, colic, dyspepsia, constipation, cough, bronchitis.[4] According to Chinese materia medica, it promotes blood circulation, and its cold nature makes it effective in the treatment of heat syndromes. Seed tarts ailments due heat such as blindness, conjunctivitis, hyperdacryosis.[3]

Traditional Uses of Different *Cassia* Species in Various Countries

Traditionally, the leaves of *Cassia* Species are popular as pot herb. It is used as a natural pesticide in the organic farms of India. It has been reported that *Cassia* species contain chrysophanic acid-9-anthrone which is an important fungicide. The intake of these seeds can cure skin diseases like ring worm, itch and psoriasis. These herbal seeds can also remove intense heat from the liver and improve the acuity of sight and loosen the bowels to relieve constipation. The leaves contain anthroquinones, and are employed in weak decoction for treating childhood teething, fever and constipation. The paste of the ground, dried root is used in Ayurveda as a treatment for ringworm and snakebite.

Herb-Drug Interactions

Cassia species as been predicted to interact with a number of drugs that lower potassium (such as the corticosteroids, or drugs where the effects become potentially harmful when potassium is lowered, there appears to be little or no direct evidence that this occurs in practice.

DISCUSSION[9,10,11,13]

Demands of traditional herbal medicines are increasing day by day not only by the developing countries but also by the developed countries throughout the world. The demand is due to the increased acceptance of ayurvada and traditional herbal medicines, because of having their safe therapeutic effect and no side effects, as such modern peoples relies more on drug resources of plant origin.

Several chemical compounds such as Anthraquinone glycosides, Naphthopyrone glycosides, Phenolic compounds, Flavonoids etc. have been isolated from *Cassia species* plants. These chemical compounds are responsible for Pharmacological activities such as hepatoprotective, anti-inflammatory, antigenotoxic, hypolipidemic, spasmogenic and antinociceptive, antiproliferative, hypotensive, purgative, antidiabetic, estrogenic and antiestrogenic, antiulcer, antioxidant, antifungal, antishigellosis, anthelmintic, antimutagenic, antibacterial and antiplasmodial.

In different countries *Cassia* species medicinally used in many diseases such as anemia, constipation, dermatitis, dyspepsia, fever, hydropsy, liver problems, menstrual disorders, skin problems, venereal disease, as a diuretic, emmenagogues, laxative and as a purgative, abortifacient, insecticide, purgative, vermifuge, for ascites, craw-craw, dhobeyitch, eczema, gonorrhea, herpes, leprosy, mycosis, parturition, ringworm, shingles, skin problems, sores, wounds.

Traditionally, leave Juice of *Cassia* species made into plaster with sandal wood or mixed with lime juice, used for ringworm and dhobi itch. Externally, used for washing syphilitic sores. *Cassia* root taken internally with black pepper for the treatment of snake bite. Infusion or decoction of leaves, with black pepper, used for asthma and hiccups. In Bangladesh, root juice used for fevers and as diuretic; paste from leaves used for ringworm and sores. In India, different species of *Cassia* used for diarrhoea, osteoarthritis, common cold, asthma, allergic rhinitis, and other respiratory disorders.

There is no doubt that these plant species are reservoir of potentially useful chemical compounds which can serve as a drug, as newer leads and clues for modern drug design by synthesis. It is thought that thorough information as presented in this review on Pharmacological, Traditional and Medicinal values of *Cassia* species may provide strong evidence for the use of this plant in different medicines.

CONCLUSION

The scientific studies and review articles on *Cassia* species suggest an enormous biological potential of these plants. Pharmacological, medicinal and traditional studies with standardized extracts and isolated constituents need to be performed to investigate unexploited potential of this plant. In different countries use of *Cassia* species in different manner would create attention about this plant for their pharmacological, traditional and medicinal values. There is huge scope for research on *Cassia* species and could be further exploited in future as a source of useful phytochemical compound for the pharma industry. There are many other traditional uses of *Cassia* species in ayurveda which serves as basis for further studies. This review will definitely help the researchers to explore its different properties and interactions of *Cassia* species.

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