Phytochemical Screening of Cassia Fistula Flower Extract

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ABSTRACT

Cassia fistula Linn. (Family: Caesalpinaceae), popularly referred to as 'Sonali' or 'Bandarlati', has been utilised in several traditional medicinal systems for numerous diseases since antiquity. *Cassia fistula* proliferates in Bangladesh and numerous other Asian nations, including India, China, Hong Kong, Philippines, Malaysia, Indonesia, and Thailand. This article intends to deliver a thorough examination of the phytochemical and pharmacological characteristics of *Cassia fistula*. In traditional medicine, it has been utilised for the treatment of diabetes, haematemesis, leucoderma, pruritus, intestinal disorders, and as antipyretics, analgesics, and laxatives. The fruits, stem, bark, and leaves of this plant encompass an array of biologically active chemicals, including anthraquinones, flavonoids, flavon-3-ol derivatives, alkaloids, glycosides, tannins, saponins, terpenoids, reducing sugars, and steroids, all of which possess diverse therapeutic characteristics. The extract from the fruit and stem bark has several activities including antipyretic, anti-inflammatory, antioxidant, antidiabetic, hypolipidemic, hepatoprotective, antibacterial, anticancer, and antiulcer properties. The article examines the diverse operations of the plant.

Keywords: *Cassia fistula*, diabetes, glycosides, alkaloids, anti-inflammatory, anticancer.

INTRODUCTION

Cassia fistula L. (Caesalpinioideae), commonly referred to as the golden shower, is a semi-wild Indian Laburnum renowned for its therapeutic virtues. It is widely distributed across several regions, including Mexico, Mauritius, China, South Africa, and West Africa [3]. Antibiotics have preserved millions of lives and improved life expectancy. However, the emergence of multi-drug-resistant bacteria is threatening the efficiency of many antimicrobial agents [1]. This public health concern is compounded by the dwindling availability of effective treatments for infections caused bt resistant pathogens [2]. Such challenges underscore the importance of exploring alternative medicinal plants with diverse phytochemical constituents recognized for their therapeutic potential.

Cassia fistula, also known as the golden shower tree, is a deciduous medium-sized tree growing to about 20 to 40 m in height. The bark of this plant is tough and greyish, while the leaves are pinnately complex.[4] It features ostentatious racemes, reaching lengths of up to 40 cm, adorned with vibrant yellow, fragrant blossoms. The fruits of these plants are elongated, cylindrical pods containing seeds that are broadly ovate and placed horizontally within the sweetish flesh. [5]

Botanic Description

Cassia fistula is a medium-sized deciduous tree, reaching a height of 10 meters, with a straight trunk measuring up to 5 meters in height and 1 metre in diameter, accompanied by spreading branches. The stem bark is pale grey, smooth, and slender in youth, transitioning to dark brown and rough in maturity. Leaves are arranged alternately, pinnate, measuring 30-40 cm in length, with 4-8 pairs of ovate leaflets, each 7.5-15 cm long and 2-5 cm wide, whole, with petiolules measuring 2-6 mm in length. Flowers are bright yellow, arranged in drooping racemes measuring 30-60 cm in length; the calyx is oblong, obtuse, and pubescent; the corolla consists of five subequal, obovate, shortly clawed petals, reaching up to 3.5 cm in diameter; there are 10 stamens.[6]

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Medicinal uses

Medicine: The compound "C. fistula," a gentle laxative, is derived from the saccharine pulp around the seed. Indian laburnum is purported to possess aperient, astringent, laxative, purgative, and vermifuge properties and is utilised in folk medicine for treating burns, cancer, constipation, convulsions, delirium, diarrhoea, dysuria, epilepsy, gravel, haematuria, pimples, and glandular tumours [7]. Ayurvedic medicine identifies the seed as antibilious, aperitif, carminative, and laxative; the root is utilised for adenopathy, burning sensations, leprosy, skin disorders, syphilis, and tubercular glands; the leaves are employed for erysipelas, malaria, rheumatism, and ulcers; the buds address biliousness, constipation, fever, leprosy, and skin ailments; the fruit is indicated for abdominal pain, constipation, fever, heart disease, and leprosy. The Greeks utilise the leaves for inflammation, the flowers as a purgative, and the fruit for its anti-inflammatory, antipyretic, abortifacient, demulcent, purgative, and refrigerant properties, beneficial for respiratory issues, ocular disorders, influenza, cardiac and hepatic conditions, and rheumatism, however it is suspected of triggering asthma. Seeds are regarded as emetic substances. [8]

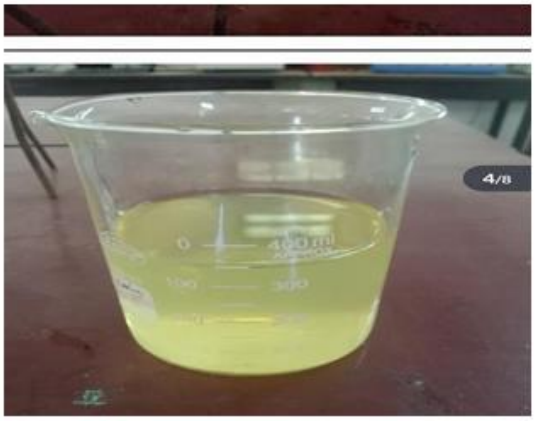
Taxonomy

The taxonomy of the *Cassia fistula* plant is as follows:

- **Kingdom**: Plantae
- **Phylum**: Tracheophyta
- **Class**: Magnoliopsida
- **Order**: Fabales
- **Family**: Fabaceae (pea or bean family)
- **Subfamily**: Caesalpinioideae
- **Genus**: Cassia
- **Species**: Cassia fistula

Cassia fistula tree

Cassia fistula flower



Cassia fistula flower extract

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MATERIALS AND METHODS: - PLANT COLLECTION

The flower was and washed with distilled water then dried in air to get rid of any moisture

Preparation of Flower extract

In a 250 mL glass beaker containing 100 mL of sterile distilled water, 50 g of cleaned, dried, and finely chopped *Cassia fistula* flower were added to prepare the extract. The combination was subsequently boiled for 60 minutes, or until the aqueous solution transitioned from a clear to a light-yellow colour. The extract was filtered using Whatman no:1 filter paper.

Phytochemical screening

Phytochemical screening was performed to assess the qualitative chemical composition of flower extract using commonly employed precipitation and coloration reactions to identify the major and secondary metabolites.

Test for alkaloids

Mayer's test: Sample (2-3ml) was treated with few drops of Mayer's reagent. Appearance of white precipitate obtained.

Test for flavonoids

Alkaline test: Neutral $Fecl_3$ is added to the extract, a black precipitate is obtained.

Test for amino acids

Ninhydrin test: Test sample (3ml) and 3 drops of 5% ninhydrin solution were heated in boiling water for 10 minutes. Purple colour appeared.

Test for steroids

To the test sample add $CHCl_3$ and con.H_2SO_4, the solution changes from purple to blue or green in colour.

Test for terpenoids

To the test sample add 5 ml of $CHCl_3$ and 3 ml of con.H_2SO_4, a reddish-brown precipitate obtained.

Test for phenol

The sample solution was treated with lead acetate solution to get a precipitate.

Test for saponins

Foam test: To 1 ml of the extract 5 ml distilled water was added and shaken vigorously. A foamy lather obtained.

Tests for glycosides (Br_2 water test)

On adding Br_2 water to the extract a pale-yellow colour appeared.

Anthocyanin (NaOH test)

To the test sample add 2 ml of NaOH solution, blue green colour appeared.

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Test for Tannins

Add 5% $FeCl_3$, a black precipitate obtained.

Test for reducing sugar

Molisch's reagent is added to the extract, purple colour obtained.

Test for xanthoproteins

To the extract add con. HNO_3 and NH_3, reddish orange colour obtained.

Quantitative Analysis of Basic Radicals

Test for lead: To the leaf extract add KI, a yellow precipitate obtained.

Test for bismuth: To the leaf extract add NH_4OH to excess, white or pale blue precipitate appears and dissolves to a deep blue solution.

Test for copper: Cupron reagent and NH_4OH were added to the leaf extract, green colour appears.

Test for zinc: Add potassium ferrocyanide to the leaf extract, white precipitate appears.

Test for cadmium: To the leaf extract add dil. HCL, water and H_2S gas is passed. Yellow precipitate obtained.

Test for iron: Add potassium ferrocyanide to the leaf extract, Prussian blue colour appears.

Teat for cobalt: To the leaf extract add potassium thiocyanate, blue colour appears.

Test for aluminium: To the leaf extract add dil. HCL, aluminon reagent and ammonium carbonate is added. A bright red precipitate is obtained.

Test for manganese: Conc. HNO_3, sodium bismuthate and water were added to the leaf extract a pink colour appears.

Test for nickel: To the leaf extract add dimethyl glyoxime and NH_4OH, a scarlet red precipitate obtained.

Test for barium: Acetic acid and sodium rhodizonate were added to the leaf extract, a brown spot is obtained.

Test for calcium: To the leaf extract add NH_4OH and ammonium oxalate, a white precipitate is obtained.

Test for strontium: To the leaf extract, add NH_4OH and sodium rhodizonate, a brown spot obtained.

Test for magnesium: Magneson reagent and NaOH were added to the leaf extract, blue precipitate is obtained.

Test for ammonium: To the test solution add NaOH and Nessler's reagent, reddish brown precipitate is obtained.

RESULT AND DISCUSSION

Phytochemical analysis

The aqueous extract of Cassia fistula flowers was employed for preliminary phytochemical screening. The table displays the results of the preliminary phytochemical study of *Cassia fistula* flower extract. The aqueous extract contains a restricted array of biologically active compounds, including alkaloids, flavonoids, phenols, terpenoids, tannins, saponins, glycosides and steroids.

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Table: 1 (Phytochemical screening of *cassia fistula* flower extract)

Phytochemicals	***Cassia fistula* flower aqueous extract**
Anthocyanin	Absent
Glycosides	Pale yellow precipitate
Terpenoids	Reddish-brown precipitate
Phenols	Absent
Tannins	Black precipitate
Steroids	Green colour
Reducing sugars	Absent
Alkaloids	White precipitate
Phenolic compounds	Intense colour
Saponins	Foamy lather obtained
Flavonoids	black precipitate
Xanthoproteins	Absent

Basic Radicals:

The primary radicals identified in *Cassia fistula* flower extract are typically ascertained through quantitative chemical analysis of its phytochemical composition; the subsequent basic radicals may be present.

Table: 2 (Basic radical analysis of cassia fistula flower extract)

Basic radicals	**Cassia fistula flower aqueous extract**
Lead	Negative
Bismuth	Negative
Copper	Positive
Zinc	Positive
Cadmium	Negative
Cobalt	Negative
Aluminum	Negative
Manganese	Positive
Nickel	Negative
Barium	Negative
Calcium	Positive
Strontium	Negative
Magnesium	Positive
Ammonium	Negative
Iron	Positive

CONCLUSION

The bioactive chemicals identified in extracts of *C. fistula* flowers demonstrated pharmacological potential, and the study advocates for further exploration of ethnomedicinal applications and pharmacological capabilities. The phytochemical examination of *Cassia fistula* flower extract reveals significant presence of glycosides, terpenoids, tannins, steroids, alkaloids, phenolic compounds, saponins, and flavonoids. The floral extract demonstrates the absence of heavy metal contamination (lead, arsenic, cadmium).

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