



Qualitative Phytochemical Screening of *Cassia italica* Leaf Extracts

Emeline KATHIEO, Souleymane DABO, Ndiak NDIAYE*, Alioune FALL

Department of Chemistry, Cheikh Anta Diop University, Dakar, Senegal

* Corresponding author: Ndiak NDIAYE e-mail: ndiak.ndiaye@ucad.edu.sn Tel: (+221) 77 612 42 47

Submitted 13/04/2026, Published online on 30/06/2026 in the <https://www.m.elewa.org/journals/journal-of-applied-biosciences-about-jab/> <https://doi.org/10.35759/JABs.221.4>

ABSTRACT

Objective: *Cassia italica* (Sene) is widely used in African traditional medicine for the treatment of various ailments, including constipation, digestive disorders, and inflammation. This study aimed to qualitatively evaluate the presence of major phytochemical groups in leaf extracts of *Cassia italica* using standard screening methods.

Methodology and Results: Successive extractions were performed by maceration using solvents of increasing polarity: hexane, dichloromethane, and ethanol.

The results showed that extraction yields increased with solvent polarity, suggesting a predominance of polar compounds. Phytochemical screening revealed the presence of several classes of secondary metabolites, including flavonoids, polyphenols, alkaloids, tannins, anthraquinones, saponins, sterols, terpenes, and cardiogenic glycosides. The dichloromethane extract exhibited the highest diversity of compounds, while the ethanolic extract was rich in polar constituents and the hexane extract in lipophilic compounds.

Conclusion and Application of results: These findings highlight the importance of sequential extraction using solvents of increasing polarity for efficient phytochemical fractionation. Overall, *Cassia italica* leaves are a rich source of bioactive secondary metabolites.

Keywords: *Cassia italica*; phytochemical screening; secondary metabolites; medicinal plants.

INTRODUCTION

Traditional medicine remains a primary source of healthcare in many developing countries and continues to gain popularity in industrialized nations. In China, herbal medicines account for nearly 50% of total drug consumption (Kaptchuk and Tilburt, 2008). Similarly, in several African countries such as Ghana, Mali, Nigeria, and Zambia, approximately 60% of children with malaria are initially treated using traditional remedies (Tilburt, 2008; Ozioma, 2019). These observations underline the importance of

medicinal plants and the need for their scientific validation. Phytochemical screening is a set of qualitative analytical techniques used to identify major groups of secondary metabolites in plant materials. These methods rely on precipitation and colorimetric reactions to detect compounds such as alkaloids, flavonoids, tannins, anthraquinones, saponins, sterols, terpenes, and polyphenols (Harbone, 1998; Djengue, 2017). These metabolites are known for their diverse biological activities and are widely used in phytotherapy (Ali,

2008; Hussain ,2021). In this context, the present study focuses on the qualitative phytochemical analysis of *Cassia italica* leaves. Although this plant is widely used in

MATERIALS AND METHODS

Plant Material Leaves of *Cassia italica* were collected in Ndiongolor (Fatick region, Senegal). The plant material was washed, air-dried at room temperature for two weeks in the absence of direct light, and then ground into a fine powder using a mechanical grinder.

Chemicals and Reagents: Analytical grade solvents—hexane, dichloromethane, and ethanol (99% purity)—were used for extraction. All reagents used for phytochemical tests were of standard laboratory grade.

Extraction Procedure Successive maceration was performed using solvents of increasing polarity. Briefly, 100 g of powdered plant material were macerated in 1 L of hexane for 72 hours in the dark. The mixture was filtered, and the filtrate was concentrated using a rotary evaporator at 40°C. The residue was dried in a desiccator and stored at 4°C.

The remaining plant material was subsequently extracted under the same conditions using dichloromethane and then ethanol. Each extract was concentrated and stored as described above.

Phytochemical Screening

Polyphenol detection test : To demonstrate the presence of polyphenols, 2 mL of the ethanolic extract is poured into a test tube, then a few drops of a 2% ferric chloride (FeCl₃) solution are added. If a bluish-black or green coloration appears, with varying intensity, it indicates the presence of polyphenols; therefore, the test is considered positive.

Anthraquinone detection test: According to the method described by Evans and Trease (2002), the Bornträger test is used to detect anthraquinones. For this test, 2 mL of our ethanolic extract was mixed with 2 mL of chloroform and then vigorously shaken for

traditional medicine, a systematic characterization of its chemical constituents remains essential for its valorization.

three minutes. After shaking, the solution was filtered using filter paper. The resulting filtrate was then shaken with an equal volume of 10% ammonia solution. If a violet coloration appears in the aqueous phase, the result is considered positive.

Flavonoid detection test: The Shinoda reaction was used to detect flavonoids. This test consists of mixing 1 mL of the aqueous extract with 1 mL of concentrated hydrochloric acid (HCl), followed by the addition of magnesium powder. The appearance of a colour ranging from orange to purplish red indicates the presence of flavonoids.

Tannin detection test : The identification of catechic tannins is carried out using Stiasny's reagent. Thus, 5 mL of each extract (hexanic, dichloromethane, and ethanolic) are evaporated to dryness. After adding 15 mL of Stiasny's reagent to the different residues, the mixtures are maintained in a water bath at a temperature of 80°C for half an hour. Catechic tannins are characterized by the formation of a coarse precipitate. For the identification of gallic tannins, each of the previous solutions is filtered. The filtrate is collected and saturated with sodium acetate. The addition of 3 drops of FeCl₃ leads to the appearance of an intense blue-black coloration, thus indicating the presence of gallic tannins.

Alkaloid detection test : Alkaloids are nitrogen-containing compounds that behave as bases and produce precipitation reactions. In an acidic medium, the reaction between alkaloid salts and iodinated derivatives of heavy metals forms characteristic-coloured precipitates. Thus, the test consists of adding a few millilitres of half-diluted hydrochloric acid to 1 mL of each extract (hexanic, dichloromethane, and ethanolic). Afterward, a

few drops of Mayer’s reagent (1.35 g of HgCl₂ + 5 g of KI in 100 mL of distilled water) are added. The appearance of a yellow precipitate indicates the presence of alkaloids.

Saponoside detection test : One (1) g of plant material is added to 100 mL of distilled water and then brought to a moderate boil for half an hour. After cooling and filtration, 1 mL of the extract is poured into two separate test tubes. Then, 1 mL of sulfuric acid is added to one tube, and 10 mL of diluted water is added to the other. Each tube is manually shaken for 15 seconds. After standing for 15 minutes, the formation of a persistent foam layer of about 1 cm in height indicates the presence of saponoside (EL-Haoud *et al.*, 2018).

Sterol and terpene detection test : The Liebermann reaction is used to detect sterols

and terpenes. Each extract (hexanic, dichloromethane, and ethanolic) is dissolved while heating in 1 mL of acetic anhydride. Then, 0.5 mL of concentrated sulfuric acid is added. The appearance of a violet ring, which turns blue and then green at the interface, indicates a positive test confirming the presence of sterols and terpenes.

Cardiotonic glycoside detection test : From 0.2 g of each extract (hexanic, dichloromethane, and ethanolic), 10 mL of Kedde’s reagent (2% 3,5-dinitrobenzoic acid in alcohol) are added, along with a few drops of concentrated potassium hydroxide (KOH). The appearance of a reddish-violet coloration confirms the presence of cardiotonic glycosides.

RESULTS

Extraction yield : The results of the successive extraction with increasing polarity are presented in Table 1. The yields increase with the increasing polarity of the extraction

solvents. This result shows that the leaves of *Cassia italica* contain a higher proportion of polar compounds.

Table 1: Extraction yield of *Cassia italica* leaves

Extract	Yield (%)
Hexane	2.99
Dichloromethane	3.14
Ethanol	3.31

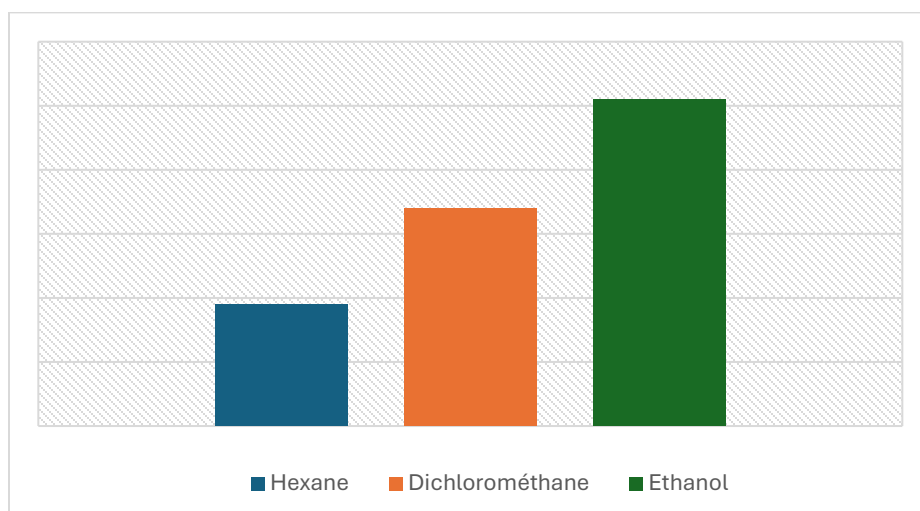


Figure 1: Comparative diagram of extraction yields according to the solvent used

Phytochemical composition : The phytochemical screening carried out on the leaf extracts of *Cassia italica* revealed the presence of nine groups of chemical compounds: alkaloids, catechic tannins, gallic tannins, flavonoids, polyphenols, saponosides, terpenes and sterols, cardiotoxic glycosides, and anthraquinones. The results of these tests are presented in Table 2 below.

Table 2: Results of the phytochemical screening of the extracts

Secondary Metabolites	Test(s)	Hexanic Extract	Dichloromethane Extract	Ethanol Extract	colours or Other Indicators of Presence/Absence
Flavonoids	Shinoda test (Mg + HCl)	–	+++	++	Orange to purplish red
Polyphenols	Ferric chloride test (FeCl ₃)	–	+++	+	Green, bluish-black
Alkaloids	Mayer’s reagent	–	++	++	Yellow precipitate
Tannins (Gallic)	Kedde reagent	–	–	–	Blue-black precipitate
Tannins (Catechic)	Kedde reagent	+	–	+++	Greenish-blue coloration
Anthraquinones	Bornträger test	–	+	++	Violet (aqueous phase)
Sterols and Terpenes	Liebermann reaction	+	+++	–	Blue-green
Cardiotonic Glycosides	Kedde reaction	+	++	+++	Reddish-violet

DISCUSSION

The increase in extraction yield with solvent polarity confirms that *Cassia italica* leaves are rich in polar phytochemicals. This finding is consistent with previous studies reporting the presence of polyphenolic compounds in medicinal plants. The dichloromethane extract exhibited the broadest spectrum of metabolites, likely due to its intermediate polarity, allowing it to solubilize both polar and nonpolar compounds. In contrast, hexane

preferentially extracted lipophilic compounds, while ethanol was more effective for polar constituents. The presence of flavonoids, tannins, and polyphenols suggests potential antioxidant activity, while alkaloids and saponins may contribute to antimicrobial and anti-inflammatory properties (Yagi, 2003; Sofowora, 2008). These results support the traditional uses of *Cassia italica* in herbal medicine (Ibrahim, 2005; Omer, 2022)

CONCLUSION AND APPLICATION OF RESULTS

This study demonstrates that *Cassia italica* leaves contain a wide range of bioactive secondary metabolites. The use of solvents with increasing polarity proved effective for comprehensive extraction and phytochemical

characterization. These findings provide a scientific basis for the traditional use of this plant and highlight its potential for further pharmacological investigation.

REFERENCES

- Ali BH, Blunden G, Tanira MO, Nemmar A, 2008. Some phytochemical, pharmacological and toxicological properties of *Cassia italica*. *Journal of Ethnopharmacology*, 116(3), 345–352.
- Burkill, HM, 1985. Entry for *Lasiurus hirsutus* (Forssk.) Boiss. [family POACEAE]. In: The useful plants of West tropical Africa, 2nd edition. Royal Botanic Gardens, Kew, UK.
- Djiengue HW, Dansi A, Assogba MF, Ahissou H, Adjatin A, Dansi M, Gbenou DJ, 2017. Phytochemical screening and toxicity of *Lippia multiflora* Moldenke, a minor aromatic leafy vegetable consumed in Benin. *Int. J. Curr. Res. Biosci. Plant Biol.*, 4 (5) pp 77 – 84, 2017.
- EL-Haoud H, Boufellous M, Berrani A, Hind T, Bengueddour R, 2018. SCREENING PHYTOCHIMIQUE D'UNE PLANTE MEDICINALE: *Mentha Spicata* L. *American Journal of Innovative Research and Applied Sciences*. ISSN 2429-5396.
- Harbone JB, 1998. *Phytochemical methods: A guide to modern techniques of plant analysis [Methodes phytochimiques]*. 3rd ed. London: Chapman and Hall, 1998.
- Hussain A, Ali AA, Ayaz S, Akram M, Ali A, Mehar P, Wahidullah, Tariq Y, 2021. Hepatoprotective effects of various medicinal plants: a systematic review. *Pharmacognosy and Phytochemistry Review*. 2021 ;10(3) :109–121.
- Ibrahim LF, Kawashty SA, El-Ezz DA, 2005. Flavonoids and phenolic compounds from *Cassia italica*. *Phytochemistry*, 66(3), 357–363.
- Omer HA. A, Caprioli G, Abouelenein D, Mustafa AM, Uba AI, Ak G, Ozturk RB, Zengin G, Yagi S, 2022. *Phenolic profile, antioxidant and enzyme inhibitory activities of leaves from two Cassia and two Senna species*. *Molecules*, 2022.
- Ozioma EOJ and Chinwe, OAN, 2019. Herbal Medicines in African Traditional Medicine. In: Builders, P.F., Herbal Medicine, IntechOpen, London, 191-214.
- Sofowora, A, 2008. *Medicinal plants and traditional medicine in Africa* (3rd ed.). Spectrum Books Ltd.
- Tilburt JC and Kaptchuk, TJ, 2008. Herbal medicine research and global health : An ethical analysis. *Bulletin of the World Health organization*, 86, 594-599.
- World Health Organization. *World Malaria Report 2015*. Geneva: World Health Organization; 2015.
- Yagi S, El Tigani S, Ali M, Elkhidir I, Mohammed AM. A, 2013. Chemical constituents and insecticidal activity of *Senna italica* Mill. from the Sudan, *International Letters of Chemistry, Physics and Astronomy*, 9(2): 146-151.
- Yam MF, Ang LF, Ameer OZ, Salman IM, Aziz HA, Asmawi MZ, 2009. Anti-inflammatory and analgesic effects of *Elephantopus tomentosus* ethanolic extract. *Journal of acupuncture and meridian studies*. Pp 280-287, 2009. Available on: <https://www.ncbi.nlm.nih.gov/pubmed/2063350>