International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 2 Mar – Apr 2025, pp: 744-757 www.ijprajournal.com ISSN: 2456-4494

Pharmacognostic, Extraction, Phytochemical screening and Pharmacological study of Senna Leaves

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Date of Submission: 15-03-2025 Date of Acceptance: 25-03-2025

ABSTRACT
Senna leaves and pods are produced in India in quantities ranging from Ten to twelve thousand tonnes., with 85% of the cropbeing exported. The earnings from exportsvary from 35 to 36 crores. Senna (Cassia angustifolia Vahl.), a member of the Leguminosae (Fabaceae) family, has long been used in traditional medicine as a laxative due to its active compounds known as sennosides. This research explores the pharmacological properties of Senna leaves, focusing on their laxative, anti-inflammatory, antimicrobial, and antioxidant activities. The study provides a scientific basis for the therapeutic uses of Senna and underscores the importance of its bioactive constituents in modern pharmacological practice.

KEYWORDS: Senna leaves, pharmacognostic, laxative, anti-inflammatory, antimicrobial, antioxidant, sennosides, herbal medicine.

I. INTRODUCTION

The genus Senna contains five hundred species, with twenty-six species of the genus Cassia containing anthracenederivatives in the free form orgly cosides. Because of its laxative activity and availability in considerable numbers,Cassia angustifolia (Indian Senna)andC. acutifolia (Alexandrian Senna) are official in many pharmacopoeias. C. fistula, C.obovata, C.dentate, C.sofara, C.sieberiana, C.podocarpa, and C. alata are the other species with documented laxative action. Senna alexandrinais also known under Egyptian Senna, Tinnevelly Senna (C. angustifoliaVahl.), East Indian Senna, or the French séné de la palthe. It received the names Alexandrian Senna and Egyptian Senna because Al exandria in Egypt was the main tradeport in past times. Sennaalexandrina Mill. Was recently acknowledged as the right name for a plant species, which was previously classified as two separate species, Cassia Senna L. and Cassia angustifolia Vahl., which are extremely closely related.C. angustifolia Vahl., and C. sennaL., family-Fabaceae are two morphologically similar species native to Northern Africa and Arabia. They differ in size (C. angustifolia is taller than C. senna) but are edible, display pinnate leaves and yellow blooms, and include the same laxative ingredients. Few taxonomic studies have been reported on Cassia and Sennaspecies regarding their biological identity as a repertory to numerous bioactive chemicals. Amended their study to validate the phylogenetic relationship of Cassia and Sennaspecies in Egypt using modern technologies such as ITS bar-coding, RAPD analysis, and metabolic profiling in comparison to traditional taxonomic features.

Taxonomy and systematics

Chamaecrista, Cassia, and Senna form a monophyletic group that some writers refer to as Cassia sensu lato. Cassiinae was established in 1982 as a subtribe of the Cassieae tribe. The tribe Cassieae has 21 taxa and is now known to be polyphyletic, although the taxonomy remains accepted because a revision of Fabaceae has yet to be published.

Senna has had a complicated taxonomic history. Linnaeus incorporated what is now known as Senna into his Cassia notion in Species Plantarum in 1753. In the fourth edition of The Gardeners Dictionary (1754), Philip Miller separated Senna from Cassia. Until 1982, many authors, following Linnaeus, did not recognize Senna and Chamaecrista, instead including them in a broadly defined Cassia sensu lato. Phylogenetic investigations of DNA have revealed that Chamaecrista, Cassia, and Senna are all monophyletic, although the connections between these three genera remain unknown. As a result, they appear as a trisomy on phylogenetic trees.

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The purpose of this study is to look at the pharmacological effects of Senna leaves, namely their laxative qualities as well as their anti-inflammatory, antibacterial, and antioxidant activity. The findings are designed to help us better comprehend Senna's medicinal significance and application in current pharmacotherapy.

II. LITERATURE REVIEW

Alin Ciobica 2022: The use of phytochemicals is gaining interest in the treatment of metabolic syndromes over the synthetic formulation of drugs. Sennais evolving as one of the important plants that have been vastly studied for its beneficial effects. Various parts of Sennaspecies including the root, stem, leaves, and flower are found rich in numerous phytochemicals. Invitro, invivo, and clinical experiments established that extracts from Senna plants have diverse beneficial effects by acting as a strong antioxidant and antimicrobial agent. In this review, the Sennagenusis comprehensively discussed in terms of its botanical characteristics, traditional use, geographic presence, and phytochemical profile. The bioactive compound richness contributes to the biological activity of Sennaplant extracts. The review emphasizes the invivo and invitro antioxidant and anti-infectious properties of the Sennaplant. Preclinical studies confirmed the beneficial effects of the Senna plant extracts and their bioactive components regarding health-promoting activities. The safety, side effects, and the rapeutic limitations of the Sennaplant are also discussed in this review. Additional research is necessary to utilize the phenolic compounds towards its use as an alternative to pharmacological treatments and even as an ingredient in functional foods.

Oxid Med Cell Longev etal, 2022: The use of phytochemicals is gaining interest for the treatment of metabolic syndromes over the synthetic formulation of drugs. Sennais evolving as one of the important plants that have been vastly studied for its beneficial effects. Various parts of Sennaspecies including the root, stem, leaves, and flower are found rich in numerous phytochemicals. In vitro, in vivo, and clinical experiments established that extracts from Sennaplants have diverse beneficial effects by acting as a strong antioxidant and antimicrobial agent. In this review, the Sennagenusis comprehensively discussed in terms of its botanical characteristics, traditional use, geographic presence, and phytochemical profile. The bioactive compound richness contributes to the biological activity of Senna plant extracts. The review emphasizes the in vivo and in vitro antioxidant and anti-infectious properties of the Sennaplant. Preclinical studies confirmed the beneficial effects of the Sennaplant extracts and its bioactive components regarding health-promoting activities. The safety, side effects, and the rapeutic Limitations of the Sennaplant are also discussed in this review. Additional research is necessary to utilize the phenolic compounds towards its use as an alternative to pharmacological treatments and even as an ingredient in functional foods.

Sharad Kamble*, Tejaswini Shinge and Poonam Shinde, 2020: Senna alata (L) Roxb or Cassiaalata Lisa medicinal plant in the family Fabaceae which has been known in Thai language as Chumhetthet. Fresh or dried leaflets of S.alata have been used as folk medicines in many countries for the treatment of constipation, stomach pain, and ringworm and skin diseases. This study was conducted to find out the appropriate extraction method for S. alata leaves to promote the 80% ethanolic extract containing the maximum amount of total anthraquin one sand to standardize the extracts of S.alata. In this paper overall study of the extraction process and standardization techniques of Senna leaves were reviewed successfully. Ofthe various extraction methods, the maceration extraction method was found the highest yield. The standardization process of senna leaves like LOD, Solubility extract, etc. was studied.

Syed Rizwan Abbas2020: Ale xandrian senna is aperennial plant, 60-80cmtall,glabrous to sub glabrous Senna Mill. It belongs to the family Fabaceae, subfamily Caesalpinioideae, containing countless types, extensive, and has various morphological characters. Al exandriansennais an evergreen shrub in all seasons of the year, mostly two to three feet tall, and grows in semi-arid soil, the stem of Senna Alexandrian is straight, smooth, and dark green having long branches with four to five pairs of leaflets. Al exandrian first originated eastward to Somalia from some wild plants it also naturally originates in Asia from the Arabian peninsula to India and Seri Lanka. Anthraquinonoid compounds (sennoside (A, B, C, and D), flavonoid, saccharide, naphthalene derivatives, phytosterols, essentialoils, waxes, tannins, mineral salts, resins, and mucilage are found as effective chemical constituents present in Senna. Crushed pods and leaves of Senna are used to lose constipation and increase bowel movement and are used as a homemade remedy for many diseases like water-borne diseases including typhoid also joint, tendons ligaments and bone-

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related diseases, pneumonia, reducing fever, bacterial, viral, and fungal longterm infections, leukaemia, jaundice, intestinal worms and use as a healer for splenic enlargement. Senna is FDA approved medicine.

Nilofer 1, 2 and Saudan Singh 2018: Senna (Cassia angustifolia Vahl.) is a native of tropical Africa and was introduced in the 11thcenturyinthe Tamil Nadustate of India. Sennosides A and B, extracted from senna leaves and immature pods are utilized for their purgative, antimicrobial, anticancer, and antioxidant properties. Sennosides A and B (stereoisomers of dihydrodianthraone glucosides) contribute more than 80% of the biological activity of senna. Its extract possesses antibacterial and antifungal activity against several microorganisms like E. coli, Klebsiella zneumonia, Shigella shinga, S. aureus, S. typhi, Aspergillus terrus, Aspergillus flavus, aspergillus niger, Aspergillus junii, S. marcescent and P. aerogenosa. Senna can be grown as anannual or perennial crop depending upon climatic conditions prevailing in the cultivating area. During the rainy season, the crop is affected by the attack of white flies hence proper management of the harvesting period can have a great impact on getting disease-free plant produce. Due to its potential usage in several drugs, Senna finds a very good demand in the international market. An important point to be noted is that Senna is not yet being produced commercially in other parts of the world except India. Hence, there is as cope for its large-scale production in India and successful export of this valued medicinal herb worldwide. Production of leaves varies from 4,500-6,000 tonnes per year H.

depending upon the area. About 80% of the production is exported with an earning range of Rs. 35-36 crores per annum. Senna holds good demand in the industrial sector as well as an attractive herb for the research field. Different aspects and recent advances related to medicinal properties, pharmacognosy, and cultivation have been reviewed in the article. A part from that, areas where there is as cope to explore tremendous new findings have been explained in the present review with special reference to Cassia angustifolia Vahl.

Ramchander, Pawan Jalwal, and Anil Middha et al 2017: Cassia Angustifolia is an ayurvedic herbmore popularly known as senna. It is also known as swarnapatriin Sanskrit. It is an FDA-approved nonprescription laxative. Due to its laxative property, it is used to clear the bowel before diagnostic tests such as colonoscopy. Senna is an Arabian name but it is native to Sudan. It is a small herb growing to a height of 2-3feet.InIndia, it is cultivated in Tamil Nadu, Andhra Pradesh, and Karnataka. Its commercial cultivation has recently come up in Kutch (Gujrat) and Jodhpur (Rajasthan). The first systematic examination of the leaves was carried out by Tschirch and Hiepe.

PLAN OF WORK

A. Extensive literary study
B. Identification, collecting, and authentication of Senna leaf.
C. Pharmacognostical screening.

D. Procurement Evaluation.
E. Extraction of senna leaf.
F. Phytochemical screening
G. Pharmacological Study

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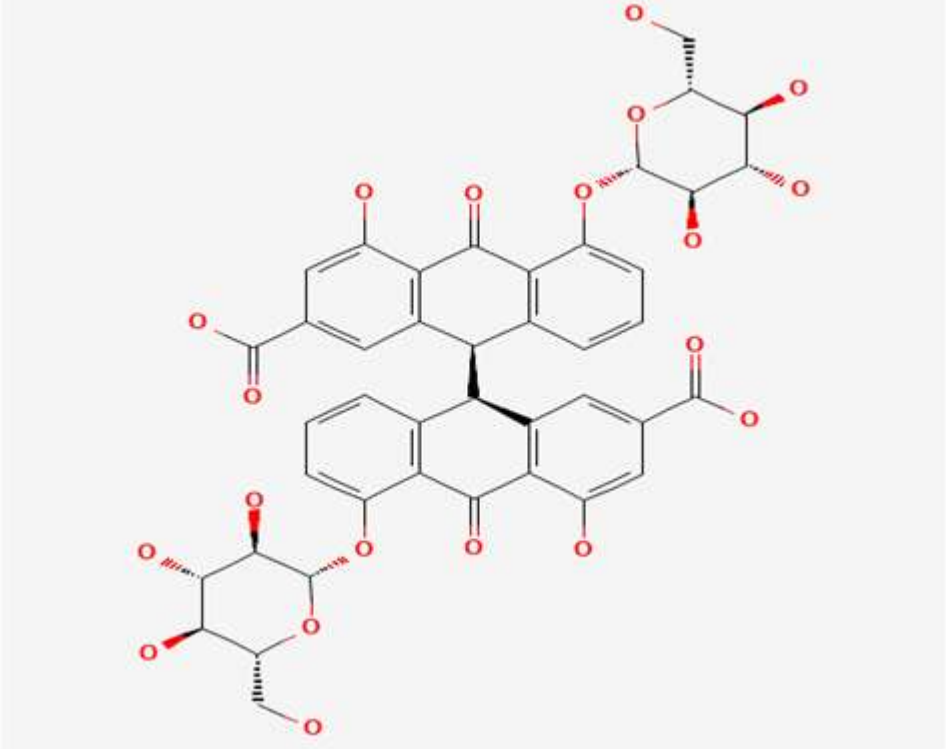
DRUGPROFILE

Parameter	Details
Common Name	Senna
Scientific Name	Cassia angustifolia, Cassia acutifolia
IUPAC Name	(9R)-9-[(9R)-2-carboxy-4-hydroxy-10-oxo-5-[(2S,3R,4S,5S,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)oxan-2-yl]oxy-9H-anthracen-9-yl]-4-hydroxy-10-oxo-5-[(2S,3R,4S,5S,6R)-3,4,5-trihydroxy-6-(hydroxymethyl)oxan-2-yl]oxy-9H-anthracene-2-carboxylic acid
Structure	
Molecular Weight	862.7 g/mol
Active Ingredients	Sennosides A and B, flavonoids, anthraquinone glycosides
Mechanism of Action	Stimulates bowel muscles (peristalsis) and increases fluid secretion in the colon.
Common Uses	-Laxative for constipation relief - Colon cleansing (for procedures like colonoscopies)
Dosage Forms	- Tea (dried leaves or extracts) - Tablets or capsules (powdered leaf or extract) - Liquid extracts or syrups

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Botanical Name	Cassia anugstifolia
Kingdom	Plantae
Sub Kingdom	Tracheobionata
Division	Magnoliophyta
Class	Mabnoliopsida
Subclass	Rosidae
Order	Fabales
Family	Caesalpinaceae
Genus	Cassia
Species	angustifilia

CULTIVATION & COLLECTION

Commercial opportunities for farmers: -

C.alexandrina (syn. C. acutifolia, C.angustifolia Vahl., and C.alexandrina) is a perennial xerophytic plant that grows in semi-arid to arid zones of India. Cassia senna (syn. C. acutifolia, C. angustifolia Vahl., and C. Alexandrina) is a perennial xerophytic plant that grows in Sudan and Egypt (adapted to survive with little water). Senna's popularity around the world, as well as the strong demand for its leaves, provides plenty of chances for commercial cultivation. The farmer's primary crop improvement approaches (conventional, biotechnology with micro propagation or transformed roots).

The researchers also compared the laxative effects of Cassia species to Senna leaves in male albino rats. According to the findings, C. podocarpa and C. alata showed higher anthraquinone levels. C. podocarpa's laxative activity was comparable to that of regular Senna leaves. This study found that the two Cassia species might be used to manufacture laxative medications in Nigeria—genetic Soil and Climate.

The crop does well in a variety of soils, but it is most typically produced in sandy loam, red loam, and alluvial loam. The optimal soil pH for cultivation is between 7.0 and 8.5. However, sandy loam, which is more friable and well-drained, is the superior choice. Senna can also be successfully grown in black cotton soils. Senna is mostly grown as a rain-fed dry crop, with irrigation in some areas.

Seed sowing and timing Senna is primarily grown for its antibacterial and antifungal effects: -

Cassia angustifolia extracts exhibited antibacterial properties. Gram-positive bacteria S. aureus, Gram-negative bacteria E. coli and P. aeruginosa, and fungi A. Niger, A. flavus, F. oxisporum, and R. stolonifer were identified using the disc diffusion method. The phytochemical analysis of C. angustifolia extracts revealed the presence of alkaloids, flavonoids, carbohydrates, proteins, tannins, and triterpenoids. Origin and Distribution Senna hails from Yemen and the Saudi Arabian region of Hadramaut. Senna was initially used in medicine by Arabian physicians in the ninth century A.D. It has also been used in traditional Arabic and European medicine for many years, primarily as a cathartic. It was introduced to India in the mid-18th century by Arab traders in Tamil Nadu's Tirunelveli region, and is thus also known as Tinnevelly Senna. Sporadic distribution is reported in parts of Sindh.

Function: -

- Used to relieve occasional constipation.
- Mildest of the stimulant laxatives; less pronounced laxative effect than the violent

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purgation produced by castor oil.

- Has been used to treat constipation during pregnancy or the puerperium; bulk-forming laxatives or stool softeners preferred.
- Because senna may be distributed in to milk, other laxatives usually are preferred for postpartum constipation.
- Used to treat constipation occurring secondary to idiopathics lowing of transit time, to constipating drugs, or to irritable bowel or spastic colon syndrome

PHARMACOGNOSTICAL STUDY

Morphological Characteristics: -

Senna fruits and hydroxyanthracene derivatives from leaves (dianthrones) have been discovered to exist as glycosides (sennosides), with sennidines being the most frequent aglycone. Dianthrones are not naturally occurring compounds; rather, they are created enzymatically in the plant during low-temperature drying (Wagner, 1999; Jnanesha et al., 2018, Jnanesha and Kumar, 2019, Jnanesha et al., 2021).

Appearance	Generally Entireandless Brokenin Good Condition
Color	Light Green
Odor	Faint
Taste	Bitter Mucilaginous
Shape	Lanceolate
Size	2.5-5.0 Cm Long and 7-9 mm wide

Senna is a medicinal shrub from the Fabaceae family that is grown largely in tropical locations. Senna, along with Ayurveda, Siddha, Unani, Yoga, Naturopathy, and Homeopathy in India, is a widely accepted natural laxative treatment.

In the Pharmacopeias of the United States, United Kingdom, Germany, and other countries. Tirunelveli Senna is called after a town in South India noted for growing Senna. The grain was introduced to India from North Africa and eventually became indigenous. The plant is grown throughout India's subtropical regions, with a concentration in Tamil Nadu, Gujarat, and Rajasthan's semi-arid regions. It is supplied under the brand name "Tirunelveli Senna".

Senna plant leaves and pods are being examined internationally for their antimutagenic, anti-genotoxic, and antifungal properties. India is presently the world's largest producer of farmed Senna (about 10,000 acres reported). In 2012-2013, an export volume of 15,975 metric tonnes was achieved, valued at $10 million, and has steadily increased subsequently. Senna is farmed commercially for its leaves and immature pods, which serve as purgatives in the lower colon. The leaves can also be ground into a paste and used to treat numerous skin ailments.

According to a laboratory investigation, the purgative components are similar to those found in aloe and rhubarb, and the drug's actions are mostly attributable to anthraquinone derivatives and their glucosides. It contains Rhein, aloe-

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emodin, kaempferol, and isorhamnetin. Sennosides A, B, C, D, G, rhein, aloe-amine, Kaempferein, and iso-rhein can be found in Senna leaves and pods in both free and compound forms. It functions as an expectorant, wound dressing, antidysentery, carminative, and laxative. Senna is manufactured from dried leaves of C. angustifolia Vahl. After drying, the leaves turn a pale green color. The plant's pods and roots are also utilized. Tschirch and Hiepe (1900) undertook the first thorough study of the leaves. The chemical composition of Senna leaves and pods is thought to be responsible for their medicinal properties. In contrast, the market value of leaves is defined by their physical features, such as morphology and texture. The residual stem is marketed as Senna stem, and the remaining leaf is powdered and sold as Senna powder. As a result, a systematic breeding method is required to generate acceptable and high-yielding cultivars with desired properties for low-rainfall locations. Knowledge of genetic variety, its nature, and degree is useful in selecting parents from a large number of potential genotypes for successful breeding operations.

SYNONYM

Senna Alexandrina is also known as Egyptian senna, Tinnevelly senna, East Indian senna, and the French séné de la route.

It was given the titles Alexandrian senna and Egyptian senna since Alexandria, Egypt, was historically the primary commerce port. The fruits and leaves were brought from Nubia, Sudan, and other locations to Alexandria, and then across the Mediterranean Sea to Europe and neighboring Asia.

Though it appears to be a scientific name, Cassia Officinal is is the apothecary term for this plant, so Officinal is—the Latin adjective denoting tools, utensils, and medical compounds are written with an initial upper-case letter, as opposed to specific epithets, which are always written with an initial lower-case letter today.

Synonyms:

- Cassiaacutifolia Delile.
- Cassiaalexandrina (Garsault) Thell.
- Cassiaangustifolia M. Vahl.
- Cassialanceolata Collad.
- C.lanceolata Link is a synonym of Sennasophoravar. sophera.
- C.lanceolata Pers. is a synonym of Chamaecrista desvauxiivar. mollissima.
- Cassialenitiva Bisch.
- Cassiasenna Linn.
- Sennaacutifolia (Delile) Batka.
- Sennaalexandrina Garsault.
- Sennaangustifolia (Vahl)Batka.

Senna has five hundred species, while Cassia has twenty-six species that contain free or glycoside anthracene derivatives. Cassia Angustifolia (Indian Senna) and C. acutifolia (Alexandrian Senna) are commonly used in pharmacopeias due to their laxative properties and abundance. C. fistula, C. obovata, C. dentate, C. sofara, C. sieberiana, C. podocarpa, and C. alata are the additional species with known laxative properties. Senna alexandrina is also known as Egyptian Senna, Tinnevelly Senna (C. angustifolia Vahl.), East Indian Senna, and French séné de la palthe. It was named Alexandrian Senna and Egyptian Senna after Alexandria, Egypt, which was once the primary commerce port.Senna alexandrina Mill was recently recognized as the correct name for a plant species that was previously classified as two distinct species, Cassia Senna L. and Cassia angustifolia Vahl., which are extremely closely related. C. angustifolia Vahl. and C. senna L. are two morphologically similar species from Northern Africa and Arabia, belonging to the Fabaceae family. They differ in size (C. angustifolia is taller than C. senna), but are edible, with pinnate leaves and yellow blossoms, and contain the same laxative components. Few taxonomic research has been conducted on Cassia and Senna species to determine their biological identity as a source of various bioactive compounds. Amended their research to validate the evolutionary relationship of Cassia and Senna species in Egypt utilizing new technologies like ITS bar-coding and RAPD analysis and metabolic profiling in comparison to traditional taxonomic features.

BIOLOGICAL SOURCE

Senna is a medicinal herb that is commonly used in Ayurvedic, Unani, and allopathic medicine. The leaves and pods of Senna are the most valuable because they contain the chemicals sennoside-A and sennoside.

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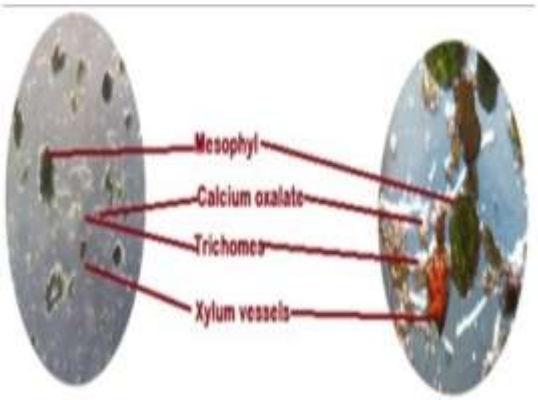
The laxative properties of sennoside-A and sennoside-B are the primary reasons for their use. Senna is in high demand globally, making it a lucrative crop for farmers due to its low cultivation costs, drought tolerance, income potential, and low maintenance requirements. Improved cultivars and agronomic practices offer excellent opportunities for farmers.

MICROSCOPY

Alexandrian Senna is a shrubby plant that grows to a height of 0.5-1 meters (20" to 40"), seldom two meters (6'). It has a branching, pale-green upright stem and long spreading branches with four or five pairs of leaves. These leaves create intricate, feathery, mutual pairs. The leaflets come in 4 to 6 pairs, are fully edged, and have a sharp top. The midribs are equally split at the base of the leaflets.

The flowers are in a raceme internal blossom, huge in size, colored yellow that tends to brown. Its legume fruit is horned, broadly rectangular, compressed, and flat and contains around six seeds.



Senna Angustifolia Leaf Powder

CHEMICAL CONSTITUENTS

Senosides are anthraquinone glycosides found in high concentrations in Senna leaves (2.0-3.0%) and pods (3.0-4.0%). (Sennosides A, B, C, and D) are abundant in Senna's leaves (2.0-3.0%) and pods (3.0-4.0%). Sennosides A and B are two active crystalline glycosides discovered in Senna. They may be acid hydrolyzed to provide two glucose molecules and the aglycones Sennidin A and B. Sennidin A is dextrorotatory.

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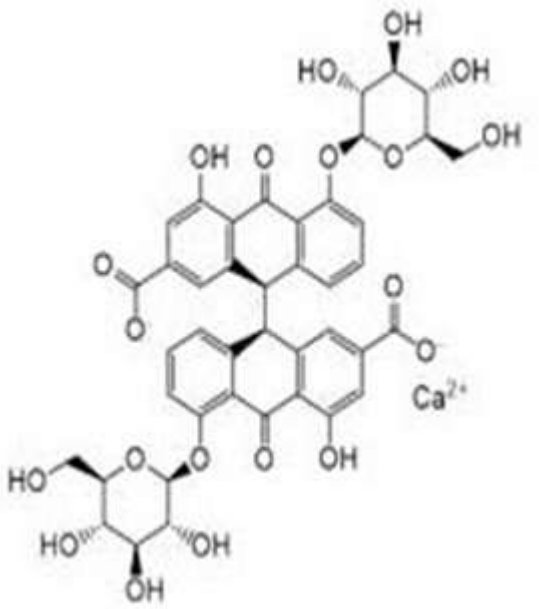
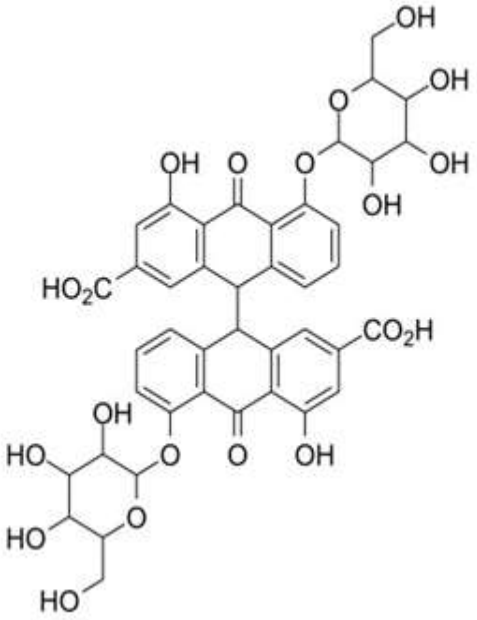
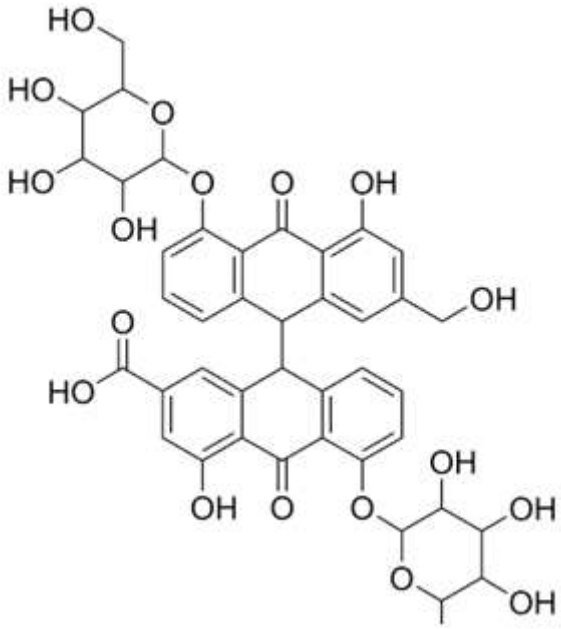


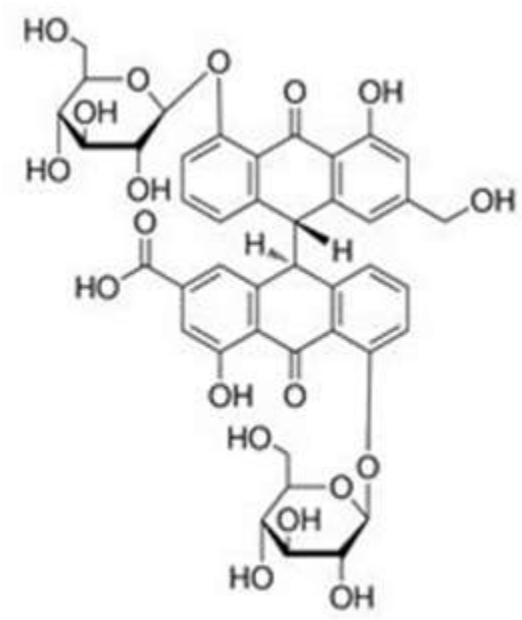
Sennoside A



Sennoside B



Sennoside C



Sennoside D

Structure of major active constituent of cassia angustifolia

III. EXTRACTION

Materials and methods

Plant Materials

S. alata leaves were purchased from a local herbal supplier and authenticated by comparison with herbarium specimens at the Department of Pharmaceutical Botany, Faculty of Pharmacy, Mahidol University.

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Extraction

1. **Continuous Extraction Using a Soxhlet Apparatus** Dry powdered leaves were extracted using a Soxhlet apparatus and 90 % ethanol as solvent. After evaporation, an ethanolic extract (A) was obtained.
2. **Extraction of Crude Anthraquinones** Extract A was hydrolyzed with 5% hydrochloric acid before being extracted with chloroform. After filtering, the volume was decreased with a rotary vacuum evaporator, yielding a crude anthraquinones extract (B).
3. **Maceration and Lyophilization** The dry leaves were crushed and macerated in sterile distilled water for 24 hours before being filtered. The filtrate was then lyophilized, and the resulting extract (C) was stored in a tightly sealed container.

Sonication A 100-mg sample of crushed leaves was sonicated with either 95% ethanol (D) or water (E). Following filtration, the residue was extracted twice more using the same method. The filtrate volume was adjusted to 25 mL.

Extract	Extraction method	Solvent	Percent.	Appearance
A	Continuous extraction	Ethanol	26.4	greenish-black, sticky
B	Extraction of crude Anthraquinones		7.3*	black, sticky
C	Maceration and Lyophilization	Water	10.1	dry powder
D	Sonication	Ethanol	-	Solution
E	Sonication	Water	-	Solution

Table 1. Percentage yields and appearances of the extracts

PHYTOCHEMICAL SCREENING

Microscopic and phytochemical studies are required to authenticate this ayurvedic product, given the need for powdered microscopy and preliminary phytochemical assays. The tests were designed to detect the presence of active chemical elements such as alkaloids, glycosides, terpenoids, and tannins.

Alkaloidal Tests

- **Wagner Test (Iodinesolution)**; - Take the extract of senna and add Wagner reagentitgives a brown or red dish-brown precipitate. Which shows the presence of alkaloids.
- **Hager test(a saturated solution of picricacid in cold water)** Take the extract of senna and add It to give a characteristic crystalline precipitate with num erous alkaloids.
- **Dragendorffs Reagent (Potassiumiodide + bismuthnitrate)**

Taket h e extract of senna and add Dragendorffs Reagentitformsn orange-colored precipitate with the reagent.

Glycoside Test

- **Borntrager Test: -**

The medication is heated with dilute sulfuric acid, filtered filtrate, benzene, ether, or chloroform, and shale. The organic layer is separated, and ammonia is added. The ammoniacal layer turns pink to crimson due to the presence of anthraquinone glycosides.

Terpenoid test

- **Salkowaskis Test**

4 mg of extract were treated with 0.5 mL of acetic anhydride and 0.5 mL of chloroform. Then concentrated solution of sulphuric acid was applied slowly and red violet color was seen indicating the presence of terpenoid.

Steroid Test

- **Acetican hydride**

4 mg of extract were treated with 0.5 mL of acetic anhydride and 0.5 mL of chloroform. Then a concentrated solution of sulphuric acid was slowly added, resulting in a green bluish color indicating the presence of steroids.

Flavonoid test

- **Leadacetate test.**

2ml of extract solution was treated with 1ml of lead acetate solution, and the presence of flavonoids was detected as a white color.

- **Zinc Hydrochloride Test.**

The sample solution is mixed in a mixture of Zinc dust and Concentrated HCL solution, Deep

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Magenta color is obtained.

Saponin Test

- **Frothing test**

0.5ml of extract was mixed with 5ml of distilled water, and foaming persisted indicated the presence of saponins.

PHYTOCHEMICAL SCREENING OF CASSIAANGUSTIFOLIA

Phyto constituent	**Test performed**	**Result**
Alkaloidal tests	Dragondroff Test Hagers test. Wagnerstest.	+ + +
Glycoside Test	Borntrager Test Killer Kilani Test	+ +
Terpenoid test	Salkows kistest	+
Tannin test	Ferricchloride test Gelatin test	+ -
Flavonoid test	Leadacetate test. Zinc Hydrochloride Test.	+ +
Steroid Test	Acetic an hydride	-
Saponin Test	Frothing Test	-

Senosides are anthraquinone glycosides found in high concentrations in Senna leaves (2.0-3.0%) and pods (3.0-4.0%). (Sennosides A, B, C, and D) Are abundant in Senna's leaves (2.0-3.0%) and pods (3.0-4.0%). Sennosides A and B are two active crystalline glycosides discovered in Senna. They might be acid hydrolyzed to produce two glucose molecules, and the aglycones Sennidin A and B. Sennidin A are dextrorotatory.

In contrast, Sennidin B's pharmacological qualities and medicinal purposes Serapion and Mesue, Arabian physicians, recognized Senna's medicinal virtues in their texts as early as the ninth century AD. Senna derives from the Arabic word

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 2 Mar – Apr 2025, pp: 744-757 www.ijprajournal.com ISSN: 2456-4494

Senna. The leaves and pods are used as an infusion in Indian medicine's Ayurvedic and Unani systems and are a great tonic (Leng, 1986). Senna is utilized in a variety of Indian home items, including decoction, powder, sirup, infusion, and confections. Senna is utilized as an antipyretic in the treatment of splenic disorders.

PHARMACOLOGICAL STUDY
MATERIALS AND METHODS:

1. Plant Material and Preparation of Extract:

Fresh and dried Senna leaves were gathered and authenticated. The leaves were pulverized, and the resulting substance was extracted with solvents such as ethanol and water. The extract was concentrated and dried for use in pharmacological tests.

2.Laxative Activity:

- In vivo study: The laxative activity was investigated using animal models (e.g., albino rats). Different doses of Senna leaf extract were supplied orally, and the number of defecations and faecal wetness were recorded.
- Mechanism of action: Senna's effects on gastrointestinal motility were investigated using isolated rabbit jejunum samples.

3.Anti-inflammatory Activity:

- **In vivo study:**Senna leaf extract's anti-inflammatory activity was assessed utilizing carrageenan-induced paw edema in rats. The reduction in paw volume was measured after providing various doses of the extract.
- **In vitro study:**Cell culture models were used to examine the suppression of pro-inflammatory cytokines, such as TNF-α and IL-6.

4.Antimicrobial Activity:

The antimicrobial effects of Senna leaf extract were tested against a range of pathogens, including Staphylococcus aureus, Escherichia coli, Candida albicans, and Pseudomonas aeruginosa. The minimum inhibitory concentration (MIC) was determined using the agar well diffusion method.

5.Antioxidant Activity:

The antioxidant potential of Senna leaf extract was examined using conventional assays such as the DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging assay, ABTS (2,2'-casino-bis (3-ethylbenzothiazoline-6-sulfonic acid)) assay, and the total phenolic content assay.

6.Statistical Analysis:

The data from the various experiments were statistically examined using suitable methods (e.g., ANOVA) to determine the significance of the effects at different dosages.

IV. RESULT AND DISCUSSION

1. Laxative Activity:

- **In vivo:**In rats, the administration of Senna leaf extract at doses of 100, 200, and 400 mg/kg body weight significantly increased defecation frequency and faeces weight when compared to the control group. The laxative effect was dose-dependent, with higher doses producing stronger effects.
- **Mechanism of Action:**Senna extract significantly increased contractility in the isolated rabbit jejunum, indicating a stimulant laxative effect. The mechanism was mediated by the activation of the enteric nervous system and the stimulation of peristalsis.

2. Anti-inflammatory Activity:

- **In vivo:** Senna leaf extract at doses of 100, 200, and 400 mg/kg significantly reduced the paw oedema in the carrageenan-induced rat model. The effect was comparable to the standard anti-inflammatory drug, indomethacin.
- **In vitro:**The extract suppressed the release of pro-inflammatory cytokines (TNF-α and IL-6) in cultured macrophage cells, indicating its anti-inflammatory activity.

3. Antimicrobial Activity:

Senna leaf extract has modest antibacterial efficacy against Gram-positive, Gram-negative, and fungal pathogens. The MIC values for several pathogens ranged from 250 µg/mL to 1000 µg/mL, with Staphylococcus aureus exhibiting the highest sensitivity.

4. Antioxidant Activity:

- Senna leaf extract demonstrated high antioxidant activity, with IC50 values of 85 µg/mL for DPPH and 75 µg/mL for ABTS.

Discussion:

The extract's total phenolic content was determined to be 120 mg gallic acid equivalents per gram, indicating the existence of antioxidant-rich substances that may contribute to its therapeutic effects. Senna leaves' traditional usage as a laxative

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 2 Mar – Apr 2025, pp: 744-757 www.ijprajournal.com ISSN: 2456-4494

is supported by pharmacological research, which shows that they stimulate gastrointestinal motility. The findings of the anti-inflammatory research indicate that Senna leaves may be effective in the treatment of inflammatory disorders, possibly as an addition to standard anti-inflammatory therapy. Senna's antimicrobial activity demonstrates its potential as a natural antibacterial agent, albeit more research is needed to determine its active antimicrobial ingredients.

The antioxidant activity of Senna leaf extract is consistent with the presence of phenolic chemicals, which have been demonstrated to help counteract oxidative stress. This may have an extra therapeutic effect, especially in cases where oxidative stress is a major factor.

V. CONCLUSION

The growing global demand for Senna leaves and pods creates an ideal opportunity for farmers to cultivate this crop during the rabi and summer. Senna leaves and pods are produced in India in numbers ranging from ten to twelve thousand tonnes, with 85% of the crop exported. The earnings from exports range from 35 to 36 crore. Indian Senna competes with Alexandrian Senna for cost-effectiveness, leaf size, and sennoside content, resulting in long, narrow leaves (>5.0 cm).

This pharmacological study supports Senna leaves' medicinal potential beyond their well-known laxative properties. This study's findings on anti-inflammatory, antibacterial, and antioxidant properties give a solid foundation for Senna's wider use in modern herbal therapy. More study into the pharmacokinetics, safety, and molecular mechanisms of action will be required to completely integrate Senna into clinical practice.

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