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Phytochemical Study and Pharmacognosy of Cassia Occidentalis (Kasmard) in Eastern Rajasthan, India

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Abstract: Cassia occidentalis, commonly known as "Senna occidentalis," is a plant widely distributed in Eastern Rajasthan, India. This research paper aims to conduct a comprehensive phytochemical and pharmacogenetic study of Cassia occidentalis, shedding light on its medicinal properties and potential applications in traditional medicine. The study involves the identification of bioactive compounds, evaluation of pharmacological activities, and a detailed examination of the plant's morphological and anatomical features.

Keywords: Cassia occidentalis, phytochemical analysis, pharmacognostical study, traditional medicine, Eastern Rajasthan, medicinal plants

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INTRODUCTION

Morphological and Anatomical Features: Cassia occidentalis, commonly known as coffee senna or septic weed, is a fast-growing herbaceous plant or small shrub belonging to the Fabaceae family. Morphologically, it features erect, branched stems that can grow up to 2 meters in height. The plant has pinnate compound leaves with 4-8 pairs of obovate to lanceolate leaflets, which are smooth, dark green on the upper surface, and paler below. The flowers are bright yellow, arranged in axillary racemes, with five conspicuous petals and prominent stamens. The fruit is a slender, cylindrical pod containing several flattened, dark brown seeds.

Anatomically, the stem is circular in cross-section, with a well-defined epidermis covered by a thin cuticle. The vascular bundles are collateral and open, surrounded by sclerenchymatous cells providing structural support. The leaf anatomy shows a dorsiventral arrangement, with a prominent midrib and spongy mesophyll cells for efficient gas exchange. Glandular trichomes are present, particularly on the leaf petioles and lower surfaces, which may aid in defense against herbivory. This species exhibits xeromorphic adaptations like thick-walled epidermal cells, enabling it to thrive in various environmental conditions, including arid and semi-arid regions.

Distribution: Although it originated in tropical America, it is currently grown across North and Central America, Asia, Africa, and Oceania. It grows in Punjab, Madhya Pradesh, Uttar Pradesh, Gujarat, Rajasthan, and Orissa in India.

Synonyms: *C. falcata* L., *C. foetida* Pers., *C. caroliniana*, *C. ciliata* Raf., *C. torosa* Cav., *C. planisiliqua, C. marcadenia, C. obliquifolia, C. occidentalis* L. var. arista sensu Hassk.

Taxonomical Classification:

Kingdom – Plantae

Division – Angiosperm

Class – Dicotyledonae

Order - Fabales

Family – Fabaceae

Genus – Cassia

Species –*C. occidentalis*

Fruiting and flowering: Flowers bloom on plants throughout the year. In the Indian states of Rajasthan and Gujarat, fruiting occurs between the months of November and January.

Characters based on morphology: *Casia occidentalis Linn.* Typical locations for this erect, foetid, annual herb in India include Rajasthan, Gujarat, and other states. It grows to a height of 50–150 cm. Long (15–20 cm), petiolate, apical, paripinnate leaf. The plant has short racemes of yellow flowers, compressed pods that are glabrous and recurved, and dark olive green, ovoid seeds that are shiny, hard, and smooth. The pods are around 10–13 cm by 0.8 cm.

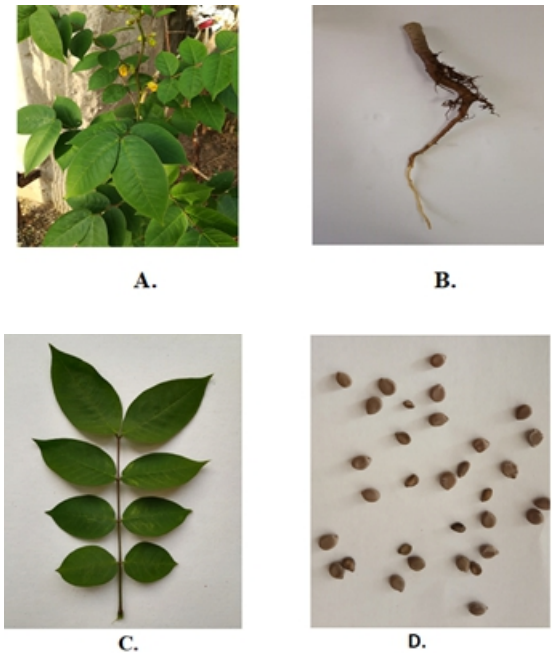


Figure 1: *C. occidentalis* Linn. A. Whole plant morphology B. Root C. Leaf D. Seeds

METHODOLOGY

Collection and Identification: Samples of *Cassia tora* were collected from different locations in Eastern Rajasthan, ensuring representation of the plant's variability. Voucher specimens were prepared and authenticated by a botanist.

Morphological and Anatomical Study: The morphological features of *Cassia tora*, including leaves, flowers, and seeds, were examined using standard botanical techniques. Microscopic studies were conducted to understand the anatomical characteristics.

Phytochemical Analysis: Various phytochemical tests were employed to identify and quantify the secondary metabolites present in *Cassia tora*, such as alkaloids, flavonoids, tannins, saponins, and glycosides.

Pharmacological Evaluation: We screened the plant extracts pharmacologically to see if they had any bioactivities, such as anti-inflammatory, antioxidant, or antibacterial capabilities.

RESULTS

Table 1: - Organoleptic Characters of *Cassia occidentalis* (Kasmard)

Plant name	Part of plant	Organoleptic characteristic			
		Color	Odor	Taste	Touch
Cassia occidentalis	Seed	Whitish brown	Characteristics	Bittersweet	Fibrous
Cassia occidentalis	Root	Brownish yellow	Bitter	Bitter	Fibrous

v **Macroscopy**

Leaf:

The compound leaves are opposite, uneven, glabrous on top and hairy on the underside. They have three to five pairs of leaflets and are pinnate. The leaves have an extremely putrid smell.

Stem: -

The plant has an upright stem that is 1-2 meters long and 0.5-1.5 cm thick. It branches spirally at the nodes and is green and wrinkled when young, but as it matures, it becomes light brown to dark brown, has numerous ascending branches that are flexuose and smooth, and has internodes that are 2 to 4 cm long.

v **Microscopy**

Leaf:

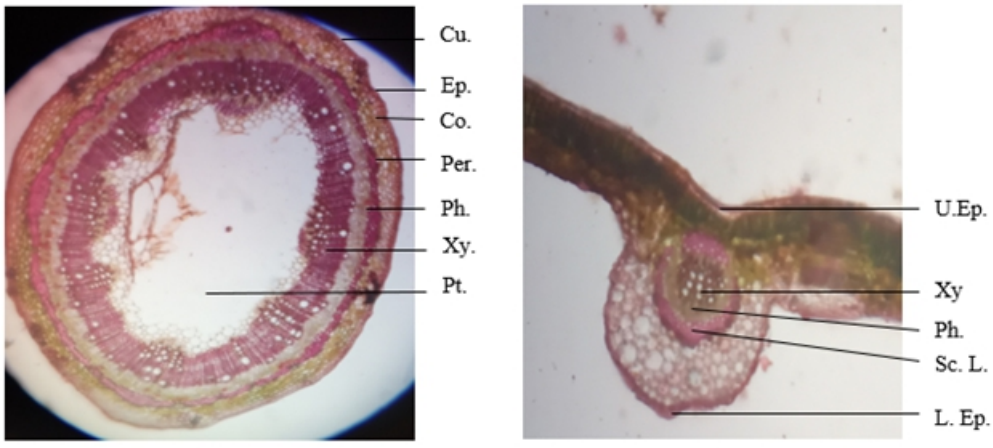
A flat lamina differentiates into palisade and spongy tissue, making the leaf dorsiventral. It has

ranunculaceous stomata on both the abaxial and adaxial surfaces, making it amphistomatic. Unicellular trichomes resembling horns were seen on the underside of the leaves. A little dip was seen on the dorsal side and a bulging ventral surface on the T.S. of the midrib. Elongated palisade cells lay orthogonally to the rectangular epidermal cells that bordered the ventral and dorsal surfaces. A delicate cuticle enveloped the cells of the epidermis. There was a chordate-shaped collateral vascular bundle.

Both sides have paracytic stomata, however the number of them is lesser on the underside. The mesophyll cells contain a large number of chloroplasts.

Stem:

In a cross-section of the stem, a thin cuticle covers the outside of the single-layered epidermis, which consists of cells with thin walls. Two to six layers of parenchymatous cells cover the surface of the cortex, which is made up of nine to twelve layers of collenchymatous cells. Encircling the pericycle is the single-layered, parenchymatous endodermis. Numerous cortical cells, including endodermis, contain calcium oxalate crystals, some of which are rosette-shaped while others are exclusively prismatic. A pericycle, first shown by parenchymatous cells, caps each arterial bundle. Many of these cells eventually develop thick walls and lignification, giving birth to stone cells and fibres.



Cassia occidantalis (L) Link: (A) T.S. of stem, (B) T.S. of Leaf, Cu. (Cuticle), Ep.(Epidermis), Co. (Cortex), Per. (Pericycle), Ph. (Phloem), Xy. (Xylem), Pt. (Pith) U.Ep. (Upperepidermis), Sc.L. (Sclarenchymatous layer),

Phytochemical Composition: Alkaloids, glycosides, tannins, saponins, and flavonoids were all found in the phytochemical examination. Various plant portions have varying quantities of these chemicals.

Table 2: Physicochemical Parameter of *Cassia occidentalis* (Kasmarda)

Parameters	***Cassia occidentalis*** **(Seed)**	***Cassia occidentalis*** **(Root)**

Foreign matter (w/w)	NA	NA
pH	6.0	8.0
Loss on Drying at 105ºC (% c)	0.16±0.023	0.10±0.005
Ash value at 450ºC (%w/w)	0.13±0.04	0.09±0.005
Acid insoluble ash value at 450 ºC (%w/w)	0.10±0.005	0.07±0.005
Water extractive value (% w/w)	0.26±0.026	0.20±0.005
Methanol extractive value (% w/w)	0.18±0.011	0.17±0.005

Table 3: Qualitative Parameter of *Cassia occidentalis* (Kasmard)

Sr. No.	**PARAMETER**	***Cassia occidentalis* (Seed)**		***Cassia occidentalis* (Root)**	
		Alcohol extract	***Water extract***	***Alcohol extract***	***Water extract***
1	**Alkaloids**				
	Mayer's reagent	--	--	--	--
	Wagner's reagent	--	++	--	++
	Dragendorff test	++	++	++	++
2	**Flavonoids**				
	Shinoda test	--	--	++	++
	Lead Acetate test	++	++	++	++
3	**Phenols**				
	FeCl3 test	++	++	++	++
4	**Proteins**				
	Biuret Test	++	++	++	++

	Xanthoproteic Test	++	++	++	++
	Millon's Test	++	++	++	++
5	**Glycosides**				
	Bontrager Test	--	--	++	++
6	**Carbohydrates**				
	Molisch Test	++	++	++	++
	Fehling's Test	++	++	++	++
	Benedict Test	++	++	++	++
7	**Steroids**				
	Salkowski test	--	--	++	++
8	**Tannins**				
	Lead Acetate	++	++	++	++
	test				
	FeCl3 test	++	++	++	++
	Potassium dichromate Test	--	--	++	++
9	**Saponin** Foam Test	--	++	--	++
10	**Fixed Oils** Filter ppr test	--	--	--	--
11	**Amino Acid**				
	Ninhydrin Test	++	++	++	++

Table 4: TLC of *Cassia occidentalis* (Kasmard)

Sr. No.	Plant Name	No. of Peaks and Rf	No. of peaks after Derivatization
1	*Cassia occidentalis* (Seed)	5 Peaks 0.07,0.13,0.58,0.84,0.98	7 Peaks 0.06,0.13,0.34,0.43,0.55,0.73,0.96
2	*Cassia occidentalis* (Root)	6 Peaks 0.05,0.10,0.48,0.55,0.68,0.87	8 Peaks 0.05,0.11,0.44,0.49,0.57,0.69,0.87, 0.93

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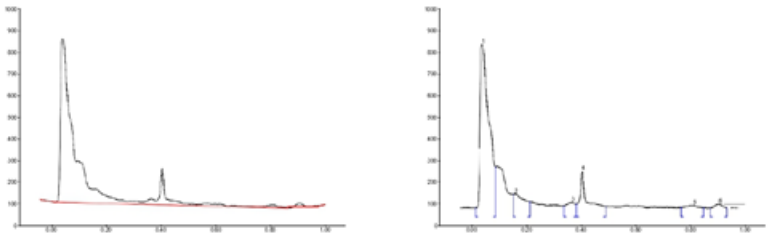
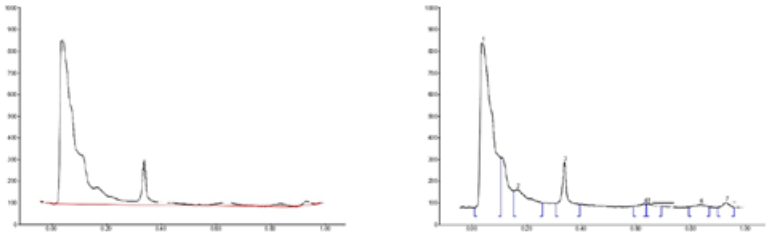
Track 2, ID: Cassia Occidentalis



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	0.9	0.04	757.1	72.09	0.09	192.2	19428.2	76.80	unknown *
2	0.15	63.7	0.16	64.9	6.18	0.21	28.3	1938.6	7.66	unknown *
3	0.34	10.4	0.37	25.8	2.46	0.38	17.9	606.7	2.40	unknown *
4	0.38	18.0	0.40	172.5	16.42	0.49	7.4	2560.8	10.12	unknown *
5	0.77	2.8	0.81	12.2	1.16	0.85	1.4	390.5	1.54	unknown *
6	0.87	0.7	0.90	17.8	1.69	0.93	0.3	372.7	1.47	unknown *

Track 3, ID: Cassia Occidentalis



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	0.1	0.04	758.4	67.87	0.11	228.9	25238.1	75.46	unknown *
2	0.15	77.2	0.16	82.1	7.34	0.26	21.8	3524.6	10.54	unknown *
3	0.31	19.3	0.34	208.6	18.66	0.39	14.3	3034.2	9.07	unknown *
4	0.59	6.2	0.63	17.3	1.55	0.64	15.5	381.9	1.14	unknown *
5	0.64	15.7	0.64	17.2	1.54	0.70	5.9	425.8	1.27	unknown *
6	0.80	1.7	0.84	12.7	1.13	0.87	3.0	424.2	1.27	unknown *
7	0.90	0.3	0.93	21.3	1.90	0.96	1.4	416.7	1.25	unknown *

Measurement Table

Wavelength	366
Lamp	D2 & W
Measurement Type	Remission
Measurement Mode	Absorption
Optical filter	Second order
Detector mode	Automatic
PM high voltage	340 V

User : S R Labs & Research Centre, Jaipur
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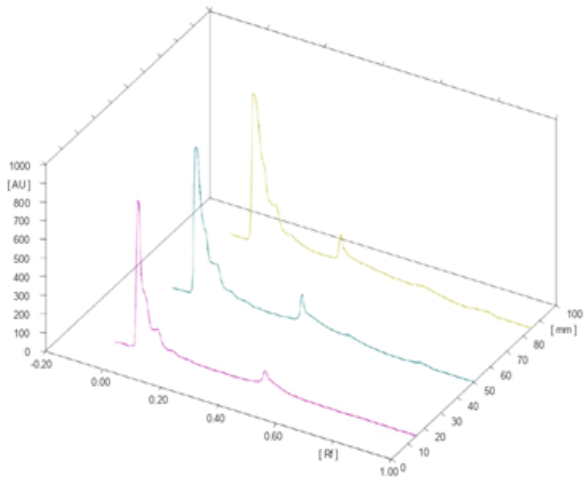
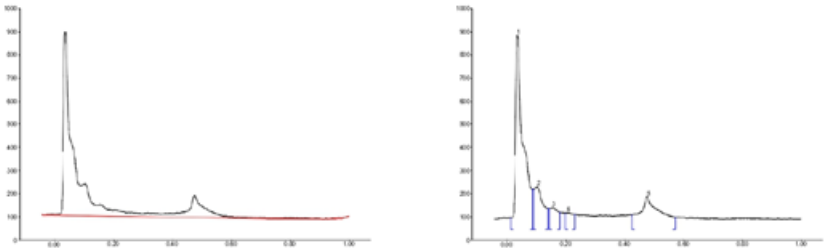
All tracks at WavelengthSc4



Track 1, ID: Cassia Occidentalis



Peak	Start Rf	Start Height	Max Rf	Max Height	Max %	End Rf	End Height	Area	Area %	Assigned substance
1	0.01	4.9	0.03	795.0	71.84	0.09	129.0	15509.6	64.70	unknown *
2	0.09	129.1	0.10	138.9	12.55	0.14	45.7	3218.7	13.43	unknown *
3	0.14	45.9	0.15	49.0	4.43	0.18	28.2	1072.0	4.47	unknown *
4	0.20	25.7	0.20	27.8	2.51	0.23	19.6	537.5	2.24	unknown *
5	0.42	17.1	0.48	95.9	8.66	0.57	8.5	3633.7	15.16	unknown *

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Table of substances

Substance	Position MD mm	Tracks 1	2	3

Results per track

winCATS summary report

Calibration results per Analysis
No results can be calculated due to the following error(s):
No substances assigned

Visualizer Document - Plate state Developed

Image information - 254 nm - Image1

Illumination instrument	CAMAG Visualizer : 192963 (Visualizer_192963)
Digital camera type : snr & Lens	DXA252 : 634063612, Computar, 16 mm, f4.0
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Resolution	Full
Plate border size	-2 mm
Automatic capture	Off
Save mode	Lossy (JPG)
Exposure mode	Automatic, digital level: 80 %, Band
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Image size:	952 Pxl x 952 Pxl (0.10 mm/Pxl)
Exposure :	112.93 ms gain: 1.00
White balance	R: 1.40, G: 1.00, B: 1.20
Illumination type / correction type :	254 nm remission : Default correction
Display settings:	
White balance:	R: 1.00 G: 1.00 B: 1.00
Contrast enhancement:	1.00
Brightness:	0.00
Accentuation:	0.80
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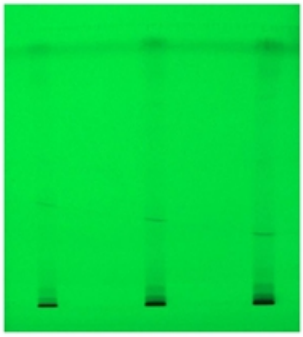
Blank plate compensation :	N/A



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Report ID : 07E8030705111D21

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Image information - 366 nm - Image1

Illumination instrument	CAMAG Visualizer : 192963 (Visualizer_192963)
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Capture settings:	
Image size:	952 Pxl x 952 Pxl (0.10 mm/Pxl)
Exposure :	761.07 ms gain: 1.00
White balance	R: 1.40, G: 1.00, B: 1.20
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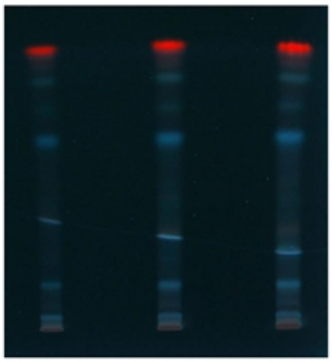
White balance:	R: 1.00 G: 1.00 B: 1.00
Contrast enhancement:	1.00
Brightness:	0.00
Accentuation:	0.80
Color saturation:	1.30
Blank plate compensation :	N/A



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Report ID : 07E8030705111D21

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Image information - White R - Image1

Illumination instrument	CAMAG Visualizer : 192963 (Visualizer_192963)
Digital camera type : snr & Lens	DXA252 : 634063612, Computar, 16 mm, f4.0
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Brightness:	0.00
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Pharmacological Activities: Preliminary pharmacological screening demonstrated significant anti-fungal, antibacterial, antimalarial, anti-inflammatory, and Hepatoprotective activities in *Cassia occidentalis* extracts.

Discussion: *Cassia occidentalis* has a long history of medicinal usage in Eastern Rajasthan, and this practice is supported by its phytochemical composition and pharmacological activity. There may be pharmaceutical industry uses for the bioactive chemicals found here.

CONCLUSION

This research on Cassia occidentalis in Eastern Rajasthan sheds light on its phytochemical and pharmacognostic properties. The HPTLC examination revealed the presence of two main chemicals. Further study may be built upon the recorded information to validate the traditional applications and explore the medicinal potential of this plant.

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