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CASSIA TORA AS A POTENTIAL HERBAL ANTIFUNGAL AGENT: PHYTOCHEMISTRY, ANTIFUNGAL ACTIVITY, AND TOPICAL OINTMENT FORMULATION APPROACHES

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ABSTRACT

Fungal infections are a common health problem worldwide, and their treatment remains an important area of medical research. Although synthetic antifungal medicines are widely used, their side effects and the increasing problem of antifungal resistance have encouraged researchers to explore medicinal plants as potential alternatives. Cassia Tora Lin, is a medicinal plant belonging to family Fabaceae and also known as Senna Tora. Different parts of this plant, especially its leaves and seeds, have been traditionally used for different therapeutic purposes. The plant contains several phytochemical constituents, including anthraquinones, flavonoids, phenolic compounds, and naphthopyrone derivatives, which may contribute to its biological activities. Previous studies have reported antimicrobial properties of Cassia Tora extracts, including activity against certain fungal organisms such as Candida albicans. This result suggests that the plant may be useful for further investigation as a potential source of herbal antifungal agents. This review aims to discuss the phytochemical constituents of Cassia Tora, its reported antifungal activity, and its possible use in the formulation of topical antifungal ointments. It also highlights important formulation factors, such as the selection of a suitable plant extract and ointment base, along with evaluation parameters including appearance, consistency, spread ability, stability, and antifungal activity. However, further research is needed to determine the effectiveness and safety of Cassia Tora-based ointments. This review highlights the potential of Cassia Tora in the development of herbal topical antifungal formulations and identifies areas requiring further scientific investigation. This review provides an overview of the botanical profile, phytochemistry, antifungal evidence, possible mechanisms, extraction and standardization approaches, formulation strategies, safety considerations and future research opportunities for Cassia Tora. Available evidence supports its investigation as a promising source of plant-derived antifungal compounds; however, standardized extracts, validated mechanisms, toxicological studies and well-designed clinical investigations are necessary before therapeutic claims can be established.

KEYWORDS: Cassia Tora, Phytochemicals, Antifungal activity, Topical ointment, Herbal formulation, Candida albicans.

INTRODUCTION

Plants and plant parts are the highest resource of drugs. Drugs are directly or indirectly dependent on plants for traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines and pharmaceutical intermediate [1]. Most fungal infections are not treated well, and they develop into chronic infections. India has one of the highest rates of Candida bloodstream infection in the world. Candida albicans is the main organism responsible for mucosal disease [2,3]. The World Health Organization (WHO) estimates that about 80% of people living in developing countries rely almost exclusively on traditional medicines for their primary health care needs [4]. India is virtually an herbarium of the world. In India, we are using plants and herbs as the basic source of medicine because we are rich in them. Herbals which form a part of our nutrition and provide us an additional therapeutic effect are in demand and Cassia Tora is one of such plant.

The Cassia Tora is known as Chakvad in Hindi [5]. The different plant parts are use in cure of cardiac disorders, dyspepsia, leprosy, ringworm, colic, constipation, flatulence, cough and bronchitis. Seeds are used to treat dysentery and eye diseases. Root is bitter in taste and used as tonic, stomachic and antidote against snake bite [6]. The leaf extracts having antibacterial activity against various

human pathogens [7,11]. The Cassia Tora leaves are reported as antioxidant and antifungal properties [12]. The antiarthritic activity, antidiabetic activity and anticancer activity of Cassia Tora leaf was reported [13,15]. A wide variety of herbal plants are available in the Indian subcontinent, and they are the backbone of traditional Indian medicines. Ethnobotanical studies revealed the use of Cassia Tora for skin infections [16]. Cassia Tora belongs to subfamily Caesalpiniaceae; family Fabaceae is an herbaceous annual foetid herb. An annual herb 30-90 cm high, tall and consists of alternative pinnate leaves with leaflets mostly with three opposite pairs that are obovate with a rounded tip. There are 30-50 seeds within a pod [17,18].

TOXONOMICAL CLASSIFICATION [19]:

Table 1: Taxonomical Classification of Cassia Tora:

Sr. No.	Kingdom	Plantae
1.	Division	Magnoliophyta/Angiospermae
2.	Class	Magnoliopsida/Dicotyledonae
3.	Order	Fabales
4.	Family	Leguminosae/Fabaceae
5.	Subfamily	Caesalpinioideae
6.	Tribe	Cassieae
7.	Subtribe	Cassiinae
8.	Genus	Cassia
9.	Species	Tora
10.	Botanical Name	Cassia Tora Lin.

TRADITIONAL USES OF CASSIA TORA [20]:

Table2: Traditional Uses of Cassia Tora:

Sr. No.	Organised Part	Traditional Uses
1.	Leaf	Laxative and antirheumatic properties. Additionally used for jaundice and skin conditions. Ringworm and eczema can both be treated with the leaf paste. Bronchitis and asthma are treated internally with a decoction of leaves and flowers. The pulverized leaves are used as a poultice on cuts and wounds to speed up suppuration, much as tincture-iodine. Localized usage of a leaf poultice for gout, sciatica, and joint aches.
2.	Seed	Aperients, a diuretic and antiasthenic. Additionally, it is administered to treat liver disorders and to enhance visual function (eye illnesses). It serves as a hepatoprotective agent in Korea. Treatment for skin conditions like ringworm and itching often involves the use of leaves and seeds. Additionally, seeds can treat psoriasis, leprosy, and earaches. According to traditional Chinese medicine, the seeds are helpful at lowering blood pressure, lowering cholesterol, and improving vision. They are also antiasthenic, aperients, and diuretics.
3.	Stem bark	Extracts are being used for a variety of skin conditions and as a laxative.
4.	Flower	Decoction of leaves and flowers use to treat bronchitis and asthma internally.
5.	Pods	Pods are used to treat dysentery and eye condition.
6.	Roots	The root is stomachic, bitter, tonic, and useful for treating snakebites. Other applications include the treatment of worm infections, bronchitis, asthma, and malignancies of the abdomen.
7.	Whole plant	The best cure for irregular childbirth, bone fractures, colds, epilepsy, night blindness, scabies, scorpion bites, and stomach-aches are this herb.

MORPHOLOGICAL CHARACTERISTICS [21]:

Table 3: Morphological Characteristics of Cassia Tora:

Sr. No.	Organised Part	Description
1.	Leaves	Leaves are complex and typically 7.5-10 cm long. There are three pairs of opposing leaflets, each averaging 2.5-4.5 cm. They have base that is somewhat oblique, often rounded, 6-10 conspicuous veins, and divergent venation. They are glaucous, obovate-oblong, membranous, glabrous, and more or less pubescent.
2.	Seed	Seed is smooth and lustrous, oblong or rhombohedral as well as firm and 1 cm long and 3-4 mm thick. Both ends appear to have been chopped off at an angle. Cotyledons were rolled, folded, and twisted.
3.	Root	The root's outside surface is dark brown, while its inner surface is creamy with a lengthy crack.
4.	Fruit/Pod	Fruit is sub tertragonous, with 15-23 cm long, obliquely septate pods with very broad sutures.



Figure: 1. Whole Plant of Cassia Tora



Figure: 2. Pods of Cassia Tora



Figure: 3. Flowers of Cassia Tora



Figure: 4. Leaves of Cassia Tora



Figure: 5. Roots of Cassia Tora



Figure: 6. Stems of Cassia Tora

PHYTOCHEMICAL PROFILE:

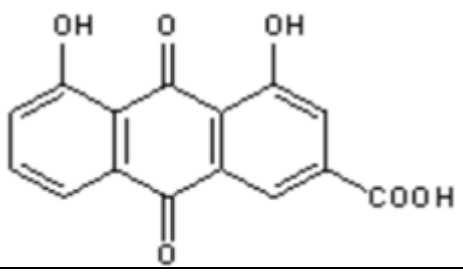
Phytochemical investigations have demonstrated that Cassia Tora contains several classes of secondary metabolites.

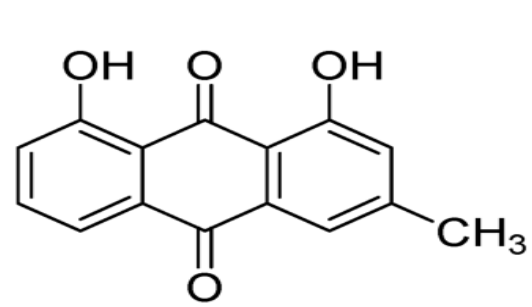
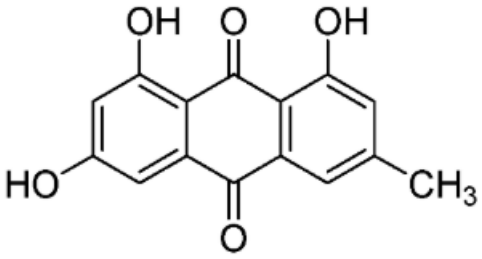
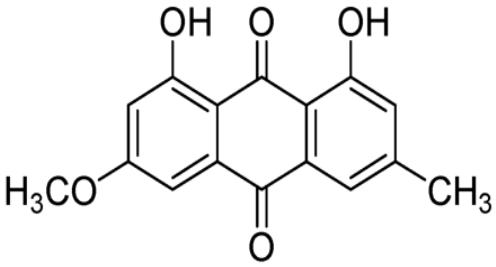
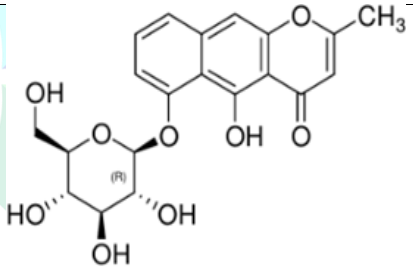
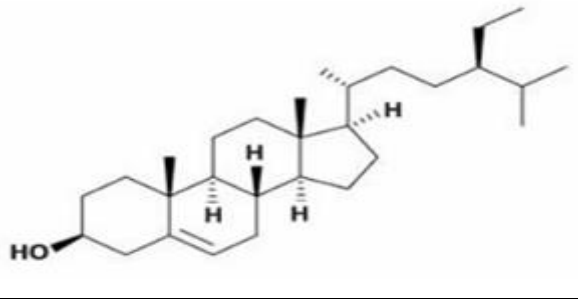
Table 4. Important Phytochemical Groups Reported from Cassia Tora.

Sr. No	Phytochemical Group	Examples	Reported Plant Parts
1	Anthraquinones	Chrysophanol, emodin, Rhein, physcion	Seeds, leaves
2	Anthraquinone glycosides	Chrysophanol glycosides, obtusifolin glycosides	Seeds /leaves
3	Naphthopyrones	Cassiaside, rubrofusarin derivatives, toralactone derivatives	Seeds
4	Flavonoids	Quercetin-related compounds, kaempferol-related compounds	leaves / flowers
5	Sterols	β-Sitosterol, stigmasterol	Seeds/ leaves
6	Phenolic compounds	Various phenolic constituents	Several parts
7	Sennosides	Sennoside-related compounds	Leaves/ Pods

CHEMICAL CONSTITUENTS:

Table 5: Chemical Constituents and Structures of Cassia Tora.

Sr. No.	Name of Chemical Constituents	Structures
1.	Rhein [21].	

2.	Chrysophanol [22].	
3.	Emodin [22].	
4.	Physcion [22].	
5.	Cassiaside [23].	
6.	β-Sitosterol [24].	

PHARMACOLOGICAL ACTIVITIES:

Cassia Tora shows a wide range of Pharmacological Activities. Several studies have been conducted using both in vivo and in vitro models to analyse its various medicinal properties. These activities are described below:

Antifungal Activity: The significant antifungal activity was also noted with the leaf extract of this drug and it was observed that it was inhibited the growth and progress of Trichophyton mentagrophyte, Saccharomyces cerevisiae, Aspergillus Niger, and Candida albican. It was revealed from the study that crysophanic acid-9-anthrone and Chrysophanol with other components such as physcion, Rhein and emodin were actively involved in the antifungal activity of the drug [25,26].

Wound Healing Activity: This drug was also tested on the wound. It is revealed that the drug extract significantly protects the wound and helps for healing in albino mice [27].

Hypolipidemic Activity: Extract prepared in ethanol of seeds is found to possess the hypolipidemic activity and it satisfactorily reduced LDL cholesterol and Triglyceride level and increased the HDL level [28].

Anti-inflammatory Activity: It was also observed that leaves extract of Cassia Tora prepared in methanol possesses significant activity against inflammation in edema in rat's hind paw. In this study, the inflammation was induced by carrageenan, histamine and serotonin [18].

Antitumor Activity: One of the root and bark content of this plant Emodin, an anthraquinone, possess anti-tumour activity [18].

Antimicrobial Activity: The methanolic and aqueous extracts of Cassia Tora leaves have shown significant antimicrobial activity against Pseudomonas aeruginosa, Staphylococcus aureus and Escherichia coli by disc diffusion method [29]. The antibacterial activity of ethanolic and aqueous extracts of Cassia Tora leaves were investigated by disc diffusion method. Both extracts showed significant antibacterial activity against Pseudomonas aeruginosa, Staphylococcus aureus and Lactobacillus and aqueous extract was found to be more effective [30].

MATERIAL REQUIRED:

1. Cassia Tora extract
2. Emulsifying wax (ointment base)
3. Soft paraffin
4. Liquid paraffin
5. Cetostearyl alcohol
6. Sodium lauryl sulphate
7. Purified water

COLLECTION AND PROCESSING OF PLANT MATERIAL:

The fresh leaves of Cassia Tora were collected from the roadside in Koregaon Bhima (Pune, Maharashtra) during October 2026. The collected leaves were cleaned manually to remove unwanted foreign matters. They were washed, sun dried and then oven dried at 50°C for 24 hours and then powdered. This fine powder obtained was further subjected to extraction**.**

EXTRACTION OF LEAVES:

Various extraction techniques are used to obtain bioactive constituents from medicinal plants, including maceration, percolation, infusion, decoction, Soxhlet extraction, ultrasonic-assisted extraction, and microwave-assisted extraction. Among these techniques, Soxhlet extraction was selected for the present study because the apparatus is available in the laboratory, and this method is suitable for extracting plant constituents using an appropriate solvent, and it allows repeated contact between the plant material and the solvent. Therefore, it was considered a convenient and suitable method for extracting the phytoconstituents from Cassia Tora leaves. Dried leaves were powdered and subjected to extraction using Soxhlet apparatus with hydro alcoholic solvent such as, ethanol-water for 4-5hours for 2-3 days. Add sufficient solvent to Round Bottom Flask (RBF). After that assemble Soxhlet. Heat gently so solvent continuously evaporates, condenses and passes through the plant material. Continue extraction until extract become sufficiently exhausted. After the extraction allow the apparatus to cool and the filter the extract. Concentrate the filtrate using a rotary evaporator, if available or with the Ultrasonicator. Use controlled temperature appropriate for solvent system. Continue until a concentrated/semisolid extract is obtained. Weigh the obtained extract.

Preliminary Phytochemical Screening:

Preliminary phytochemical screening was carried out by the standard procedure. The extract was tested for phytoconstituents such as steroids, alkaloids, carbohydrates, flavonoids, saponins, tannin, anthraquinones, and cardiac glycosides [31].

FORMULATION OF OINTMENT:

Sr. No.	Name Of Ingredients	Quantity for 100g of Ointment	Quantity for 80g of Ointment	Quantity for 60g of Ointment	Quantity for 40g of Ointment	Quantity for 20g of Ointment
1.	Cassia Tora extract	3g	2.4g	1.8g	1.2g	0.6g
2.	Emulsifying wax (ointment base)	15g	12g	9g	6g	3g
3.	Soft paraffin	45g	36g	27g	18g	9g
4.	Liquid paraffin	10g	8g	6g	4g	2g
5.	Cetostearyl alcohol	5g	4g	3g	2g	1g
6.	Sodium lauryl sulphate	1g	0.8g	0.6g	0.4g	0.2g
7.	Purified water	21g(21ml)	16.8g(16.8ml)	12.6g(12.6ml)	8.4g(8.4ml)	4.2g(4.2ml)
8.	Total	100g	80g	60g	40g	20g

MANUFACTURING PROCEDURE:

Preparation of oil phase:

Take required quantities of:

1. Emulsifying wax (ointment base)

2. Soft paraffin

3. Liquid paraffin

4. Cetostearyl alcohol

Place this ingredient in suitable beaker. Heat the ingredients gently in a water bath until they melt and form a uniform mixture.

Preparation of aqueous phase:

Take required quantities of:

1. Purified water
2. Sodium Lauryl Sulphate (SLS)

Dissolve SLS in purified water and heat the aqueous phase to approximately the same temperature as the oil phase. Warm the aqueous phase separately.

Formulation of ointment base:

Maintain both phases at approximately the same temperature. Add the aqueous phase gradually to the oil phase with continuous stirring. Continue stirring until a uniform ointment base forms.

Addition of herbal extract:

Allow the base to cool while stirring. Add accurately weigh Cassia Tora extract and mix thoroughly until evenly distributed. Continue mixing until a smooth, homogeneous preparation is obtained. Add the extract at a suitable temperature to avoid degradation of its active constituents. Transfer the prepared ointment into clean, suitable containers, seal properly, and label each container with the formulation code, ingredients, preparation date, and other necessary details.

CONCLUSION:

Cassia Tora is a medicinal plant with promising potential as a source of natural antifungal agents. Its phytochemical constituents, including anthraquinones, flavonoids, and other phenolic compounds, may contribute to its biological activities. This review is studies reporting antifungal effects suggest that Cassia Tora deserves further investigation as a potential alternative source of plant-based antifungal agents. The formulation of a topical ointment containing Cassia Tora leaf extract may provide a convenient approach for applying the plant extract to the skin. However, its effectiveness depends on factors such as extract concentration, selection of the ointment base, stability, skin compatibility, and release of active constituents. Further studies, including standardized antifungal testing, formulation evaluation, toxicity assessment, and clinical investigations, are required to establish its safety and therapeutic efficacy.

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