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A COMPREHENSIVE REVIEW ON: A PLANT CASSIA TORA (FABACEAE) AS ANTIPSORIATIC AGENT

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ABSTRACT

Psoriasis is a very common chronic, disfiguring, inflammatory condition of the skin. This problem has a profound psychological impact on lowering self-esteem and interpersonal relationships. This skin disorder is seen worldwide and is thus a matter of serious concern. The prescribed synthetic drugs available in the market for the treatment of psoriasis are associated with different adverse effects, so researchers around the world are searching for new, effective, and safer drugs from natural resources. Many medicinal plants are available in nature and these plants are used for treating skin diseases. Psoriasis is characterized by plaques and patches on the skin. It is an autoimmune disease that involves T helper cells in the pathogenesis of the disease. It manifests inflammatory, scaly red or white silvery flaky skin which may be a fluid-filled lesion with soreness and itchiness. The prevalence rate of psoriasis is increasing day by day and treatment of psoriasis is long term and not completely cures the disease. The plant Cassia tora L. is traditionally claimed to be useful in the treatment of a number of skin diseases, it is a small shrub growing as weed in Asian and African countries. It is known edible leafy vegetable taken up by Asians. It has been Traditionally used in ringworm infection over the years. Leaflet and seed are primary parts used for medicinal purposes. It has found application in Indian and Chinese medicine. The plant Cassia tora L., (Fabaceae), traditionally, is claimed to be useful in the treatment of psoriasis and other skin diseases. The three flavonoids, namely luteolin-7-O-E-glucopyranoside (1), quercetin-3-O-E-Dglucuronide (2) and formononetin-7-O-E-D-glucoside (3), Extracted from cassia tora Linn shows

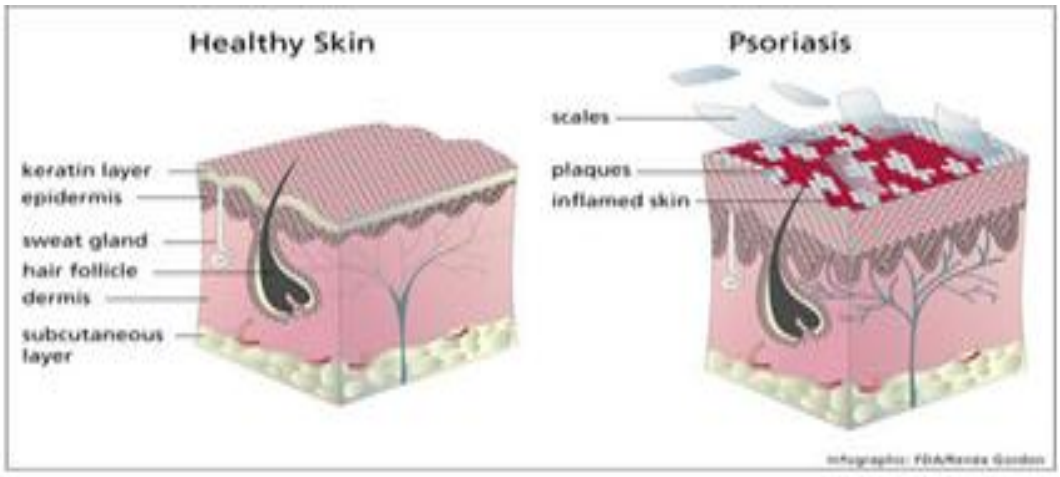
remarkable antipsoriatic activity. The present article includes all the possible formulations prepared from plant cassia tora, useful in treatment of psoriasis. From this review It is concluded that cassia tora has large scope for research on its Antipsoriatic activity and formulation to develop one of the newer, safer, patient acceptable and economical dosage form.

KEYWORDS: Psoriasis, Cassia Tora, Pharmacognosy, Flavonoids, Formulation and Evaluation.

INTRODUCTION

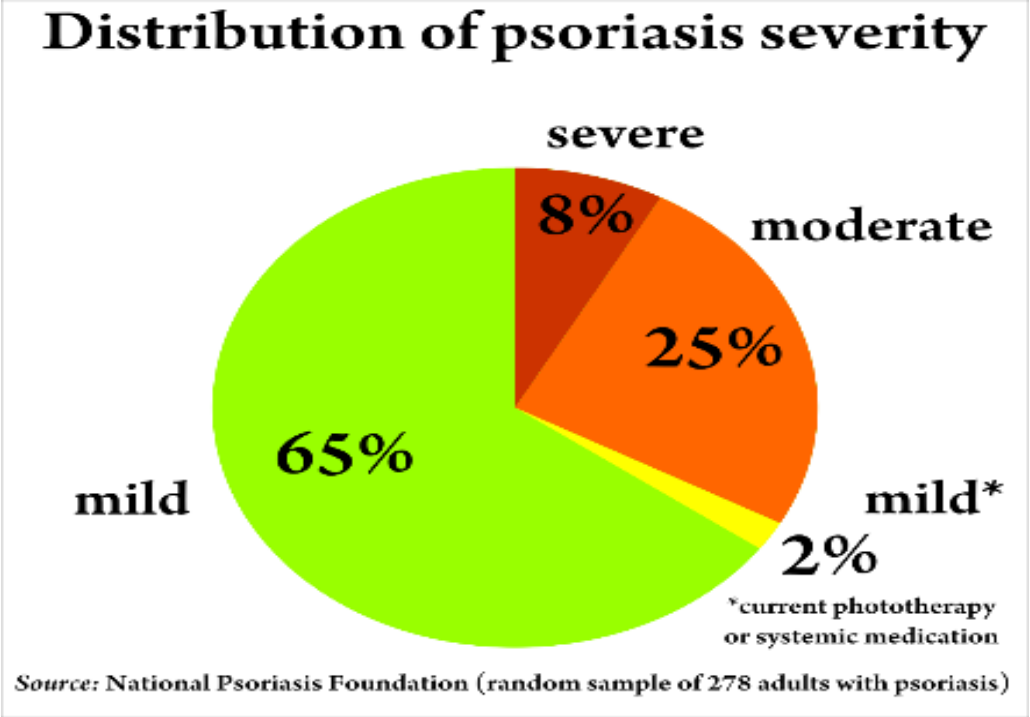
Defination and epidermalogy

Psoriasis is a chronic inflammatory skin disease with a strong genetic predisposition and autoimmune pathogenic traits. The worldwide prevalence is about 2%, but varies according to regions.[1] Pathophysiology of the disease includes mainly the activation and migration of T cells to the dermis triggering the release of cytokines particularly TNF- alpha, which causes the inflammation and abnormal rapid production of skin cells. The possible factor and triggers causing psoriasis are emotional stress, skin injury, systemic infection, and intestinal upset.[2]



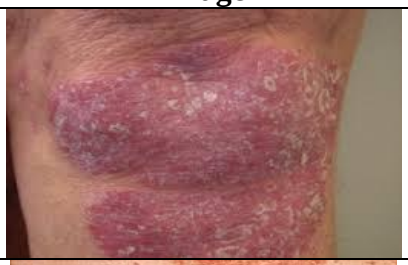
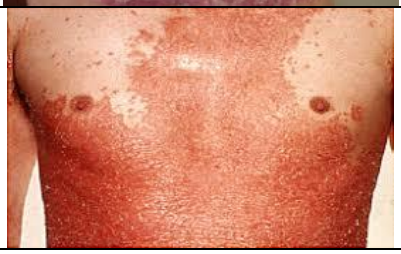
Psoriasis is not only a skin disease as it has a great impact on the physical and psychological quality of life of the person. Some of the co-occuring conditions are cardiovascular diseases, obesity, vascular diseases, diabetic mellitus, hypertension, gastrointestinal diseases including inflammatory bowel disease (Crohn's disease), hepatic disease, infection, and mood disorders such as depression, anxiety, suicidal mentation, and stigmatization. It mostly occurs during the early age of 20 to 30 years and in the late age of 50 to 60 years. The condition at this peak

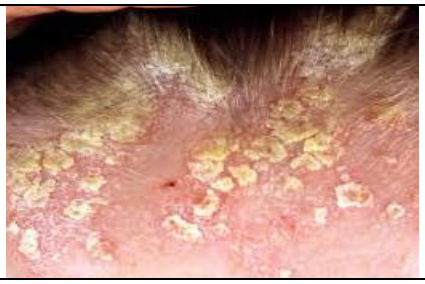
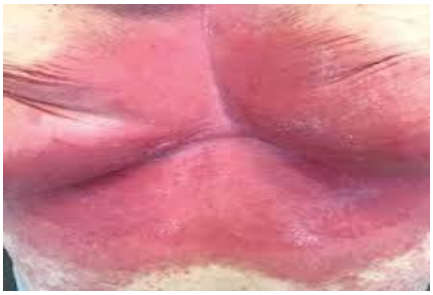
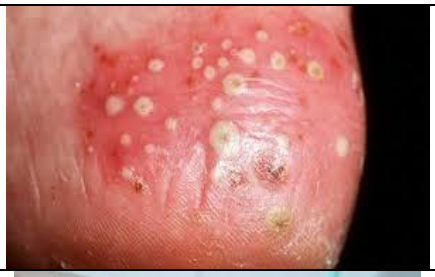
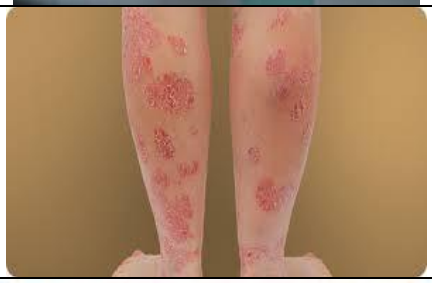
age period (teenage) makes the person lose confidence in approaching people due to stigmatization and thereby mentally debilitated and struggle for a secure life.[3]



Types of psoriasis

Based on the characteristic features of lesions, the location of appearance, and associated attributes, psoriasis can be classified into the following types as illustrated in Table 1.

Sr. no	Type	Symptoms	Image
1	Plaque psoriasis	• A red colour Spherical lesion which grows into patches.[3]	
2	Erythroderma/ Exfoliative psoriasis	• Affects whole body • The skin may be scrap off and become tender and itchy. • Body fails to maintain temperature.	

3	Scalp psoriasis	• Dandruff like white faking. • Itching and burn • Hair loss[3]	
4	Intetriginous/ Inverse psoriasis	• It is also called flexural psoriasis, • It affects intertriginous locations, and is characterized clinically by slightly erosive erythematous plaques and patches.[1] • It is concerned with inflamed patches.	
5	Pustular psoriasis	• Pustular psoriasis is characterized by multiple, coalescing sterile pustules. It mainly affect the hands feet ,toes, and the nail apparatus.[1]	
6	Guttate psoriasis	• It usually affects children or adolescents, and is often triggered by streptococcal infections of tonsils.[1]	
7	Psoriatic arthritis	• Soreness in joints • Red patches	
8	Nail Psoriasis	• Yellow to brownish spots apper below nails. • Deposition of cell under nail become impenetrable.[3]	

Pathogenesis of psoriasis

1] Event in Innate immunity

When stratum corneum get affected by external stimulus like trauma, stress, or infection,

The effector cells get activated. [neutrophils, plasmacytoid dendritic cells (DCs), and myeloid dendritic cells (CD 11C+ DCs)].

The activated keratinocytes release several cytokines and chemokines and protins (interleukin-8 (IL-8), chemokine (C-X-C) motif ligand 1 (CXCL), S100A7/A8/A9)

They create an environment for the neutrophil migration into the epidermal lesional site. On activation, plasmacytoid DCs release interferon-α (IL-α) and myeloid dendritic cells release interleukin-23, interleukin-20, tumor necrosis factor-α (TNF-α), and inducible nitric oxide synthase (iNOS)(3)

2] Event in aquired immunity

T lymphocytes, mainly T-helper (Th) cells, are involved in the hyperproliferation of the cells which are mediated by various cytokines. [interferon-γ (IFN-γ) and TNF-α from Th-1 cells, interleukin-17A (IL-17A) and interleukin- 17 F (IL-17F) from Th-17 cells, and interleukin-22 (IL-22)from Th-22 cells.].

The characteristic feature of this cell is the presence of CCR6, a chemokine receptor with CCL20 ligand.

In normal physiological conditions, the level of CCL20 expressed in epidermal keratinocytes and dermal endothelial cells seems to below but its level is raised in the psoriatic condition by stimulation of the pro-inflammatory cytokines such as TNF-α, IL-1α, IL-17, and IFN-γ. The CCL 20 expressed in the epidermis may recruit more of the CCR6 T cell into the inflamed epidermis which enhances the release of IL-17. Hence, the level of CCR6 is elevated both in the skin and blood of the psoriatic patient.[3]

3] Genetic basis of psoriasis

Psoriasis is a multi-factorial genetic disorder where the manifestation and severity of the disease is probably dependent on the patient's genetic background and environmental factors. Significantly higher incidence of the disease among relatives of patients.

The genes responsible for familial psoriasis through genome-wide linkage scans identified several putative susceptible loci.

I. The Major Histocompatibility Complex (MHC) class I is identified as a chief susceptibility factor for psoriasis The gene locus at 6p21 primarily associated with psoriasis development has been documented as the psoriasis susceptibility region 1. II)(PSORS1) HLA-Cw6 gene has been found to be the strongest susceptibility allele of the PSORS1 locus to early-onset chronic plaque type and guttate psoriasis At PSORS1, the coiled coil -helical rod protein 1 (CCHCR1) and corneodesmosin (CDSN) has been found to possess a regulatory role toward keratinocyte proliferation.[4]

Treatments for psoriasis

At the moment there is no cure for psoriasis, but it can be well controlled by using a variety of treatments Topical Treatments for Psoriasis are many, but they have different side effects

- Coal tar generally used in treatment of psoriasis having side effects of skin irritation, odor, staining of clothes.
- Topical steroids used in treatment of psoriasis having side effects of hypo pigmentation and skin atrophy. Salicylic acid is the most commonly used keratolytic agent which is often advocated for removing psoriatic scale. Concentrations between 2% and 10% in an ointment base are usually dispensed. Salicylic acid is often used in combination with coal tar or corticosteroids
- Tazarotene also used for psoriasis, it is best when used with topical corticosteroids but produces skin irritation, photosensitivity.
- Calcipotriene used in permutation with topical Steroids, and the side effects are skin irritation, photosensitivity.
- Calcineurin inhibitors are used for facial psoriasis, having side effects of skin burning and itching formononetin-7-O-E-D-glucoside found.
- Kottakkal Aryavaidya sala : The main ingredient in the formulation are Coconut oil(Crocus nusifer), Wightia tinctoria, Azadirchata indica, Marketed as Kottakal Psorkat gel.[3]
- Psorset oil and Psorset ointment: Petented product of Oushadhi, the key ingredient are wightia tinctoria, sodium borate, Coconut oil.[3]
- Talket: marketed by Himalaya, the key ingredient are Turmeric and Neem. It provides antimicrobial, Detoxifying, antiallergic properties with increase immune response.[3]

Role of herbal plant in management of psoriasis

Since ancient time plants have been found to play a major role in managing different disorders and diseases. Variety of plants are used in treatment of skin diseases, as well as plants are used to keep skin healthy, with no side effects hence nowdays major populationis attracted toward use of herbal in managing and treating skin disorders as well as for beautifying purposes. Plants are the only economic source of a number of well established and important drugs. In addition, they are also the source of chemical intermediates needs for the production of some drugs. Indian Materia Medica includes about 2000 drugs of natural origin almost all of which are derived from 3 different traditional system and folklore practices WHO estimates that of the 35, 000 – 70,000 species of plants that are used for medicinal purposes around the world, Medicinal plants also play a major role and constitute the backbone of TM (Traditional System of medicine) practices.[5]

Since medicinal plants are nontoxic and easily affordable they play a vital role not only for pharmacological research and drug development, but also when plant constituents are used directly as therapeutic agents and as starting materials for the synthesis of drugs.[6] Today medicinal plants are important to the global economy, as approximately 85% of traditional medicine preparations involve the use of plants or plant extracts The medicinal properties of plant species have made an outstanding contribution in the origin and evolution of many traditional herbal therapies. Natural drugs from the plants are gaining popularity because of several advantages such as often having fewer side-effects, better patient tolerance, being relatively less expensive and acceptable due to a long history of use. Besides herbal medicines provide rational means for the treatment of many diseases that are obstinate and incurable in other systems of medicine. For these reasons several plants have been investigated for treatment of skin diseases ranging from itching to skin cancer. A large proportion of the world's population depends on traditional medicine because of the scarcity and high costs of orthodox medicine Over the past few years, however, the medicinal plants have regained a wide recognition due to an escalating faith in herbal medicine in view of its lesser side effects compared to allopathic medicine in addition the necessity of meeting the requirements of medicine for an increasing human population. Medicinal plants are the richest bio-resource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs. Medicinal plants have provided the modern medicine with numerous plant-derived therapeutic agents Natural products play a dominant role in the

development of novel drug leads for the treatment and prevention of diseases Interestingly it is estimated that more than 25% of the modern medicines are directly or indirectly derived from plants. It is worth mentioning that Indian medicinal plants are considered as a vast source of several pharmacologically principles and compounds that are commonly used as home remedies against multiple ailments. Ethano pharmacological studies on such herbs/ medicinally important plants are an area of interest for the investigators throughout the world. Although in traditional medicine Cassia species have been well known for their laxative and purgative properties and for the treatment of skin diseases, Still Cassia invites attention of researchers worldwide for its phytochemistry and pharmacological activities ranging from antidiabetic to antiviral.[5]

Plant profile

Cassia tora (Family: Leguminosae/Fabaceae) is a small shrub grows in warm and moist soil in tropical part of Asian and African countries.

Fig. 3: Plant cassia tora.

Taxonomical classification[7]

Family – Fabaceae

Sub family - Caesalpinioideae

Tribe- Cassieae

Subtribe- Cassiinae

Genus- Cassia

Species- tora

Botanical description[7]

Vernacular names

English Foetid cassia

Hindi Charota, Chakvad, Chakavat.

Kanartak Tagace, Taragasi.

Malayalam Takara

Sanskrit Chakramardah, Prapunnatah

Tamil Tagarai

Telugu Tantemu, Tagirisa

Gujrat Kovaraya

Punjab Chakunda

Urdu Panwar

Marathi Takala, Takla, Tankli

Chinese: Chueh Ming.

Description and Distribution

Cassia tora occurs as a waste land rainy season plant growing in the dry soil throughout the tropical parts throughout India, China Sri Lanka and West tropics. The plant is an annual herbaceous herb, almost an under shrub about 30-90 cm high with pinnate leaves. Leaflets are in three pairs, opposite, obovate and oblong. Flowers are in pairs in axile of leaves with five petals and yellow colored. Pods are somewhat flattened or four angled 10-15 cm long and sickle shaped. The seeds are 30-50 in a rhombohedral pod.[5]

Medicinal uses

- Due to its moist quality, sweet flavor and cold property, Cassia tora is used to cure blurring vision.
- The seeds are reputed in the Chinese medicine as antiasthenic, asperient, diuretic and an effective agent in lowering cholesterol and reducing blood pressure.[5]
- Ayurvedic preparations—‘Dadrughan-vati’ and ‘Chakramardha tailamu’ are beneficial for ringworm, eczema, leucoderma and other skin diseases.
- The plant also pacifies dandruff, constipation, cough, hepatitis, fever and haemorrhoids.
- **Root:** Root is used as bitter tonic, stomachic, antidote against snake bite, in worm infection, abdominal tumours, bronchitis, asthma.

- **Leaves:** Used as antiperiodic, in liver disorders, paste of leaves applied to ringworm, eczema, cut wounds, ulcers. Decoction of leaves used as laxative, in gout, sciatica and joint pain.
- **Seeds:** Used in eye diseases, liver complaints, ear aches, leprosy, psoriasis, in vision improvement, diuretic, lowering cholesterol and blood pressure.[8]

Phytochemistry of cassia tora[8]

Sr. no	Active constituent	Type of extract	Type of activity
1	Flavonoids Luteolin-7-O-β-glucopyronoside Quercetin-3-O-β-D-glucoronide Formononetin-7-O-β-D- glucoside	Leaves and seed extract	Antipsoriatic
2	Napthopyrone glucoside	Seed	Antidibetic
3	Emodin	Leaf, stem , seed	Antioxidant, Antitumor
4	Chrysophanic acid Anthrone Crysophanol	Extract of deffated seed	Antifungal
5	Torachrysone, toralactone, aloe emodin, rhein, emodin	Aq. Seed extract	Antibacterial
6	Aurantio-obustin	70% ethanolic extract of seed	Estrogenic activity

Ayurvedic properties[9]

Rasa: Katu (pungent)

Guna: Laghu (Light), Ruksha (dryness)

Veerya: Ushna (hot)

Vipaka: katu (pungent)

Doshaghnata: Kapha- vatashamyaka (subsides kapha-vaata)

Rogaghanata (Therapeutic uses)[9]

Twakvira (Skin disorde)

Raktavikara (Blood disorder)

Dadru (Ringworm)

Raktavikara Hridaroga (Heart disesase)

Vibhanda (Constipation)

Shwas (Bronchial infection)

Gulma (Tumor like growth)

Medoroga (Obesity)

Kaasa (Cough)

Aoupsargika roga (opportunistic infection)

Antipsoriatic activity of flavonides from cassia tora[10]

In this study author demonstrated the antipsoriatic activities of the three compunds namely Luteolin-7-O-β-glucopyranoside(I), Quercetin-3-O-β-D-glucuronide (II), and Formononetin-7-O-β-glucoside (III) isolated from cassia tora leaves .

Extraction and isolation

1. Extraction was carried by using Soxhlet apparatus with ethanol (70% v/v) and 750 g of the powdered leaves of C. tora, for18 h. The extracted solution was filtered and concentrated in a rotary evaporator under reduced pressure (rotary vacuum flash evaporator).
2. The crude ethanol extract (23 g) obtained was subjected to chromatography (Silica gel 120 mesh, 500 g) with gradient elution using solvents of increasing polarity: n-hexane, chloroform, ethyl acetate and methanol. A total of 72 fractions was eluted in this research.
3. A Shinoda test : Tested Positive (presence of flavonoids)
4. Thin-layer chromatography (TLC) was carried.

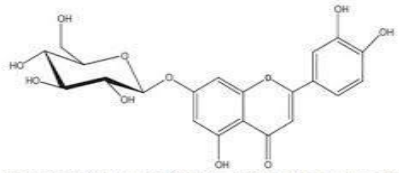
Mobile phase: benzene:methanol:ammonia (9:1:0.1) solvent system.

Spraying reagent: ammonia, (a reagent specific for flavonoids)

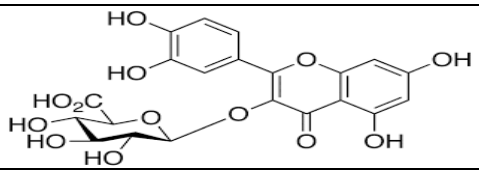
The eluates ethyl acetate, ethyl acetate: methanol (40:60) and methanol were positive for flavonoids producing pink color with Shinoda test.

The fractions 1-40 were negative for flavonoids. The fractions 41-46, 62-69 and 84-94 exhibited single spot with Rf values of 0.61, 0.64 and 0.76, respectively. Fractions with similar spots and positive for flavonoids were pooled together and concentrated to obtain compound 1, 2 and 3. The yield of each compound was 710 mg, 640 mg, and 1 g for compounds 1, 2 and 3, respectively. The isolated compounds was purified by recrystallization with methanol. The author and team studied all analytical parameter for all three compounds and shown below.

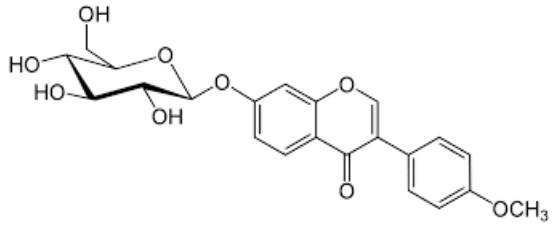
I) Luteolin-7-O-β-glucopyranoside.

Structure	 Chemical structure of luteolin-7-O-β-glucopyranoside
Nature	Yellow amorphous powder
Tests	a) Alkali- Yellow colour b)Mg-HCL- Pink colour c) $FeCl_3$- Olive green colour d)Molish test – Positive
UV spectroscopy	λmax MeOH nm: 269, 336
IR(KBr)	λmax 3340 (OH), 1634 (C=C), 1507, 1374 (aromatic ring) cm-1
Mass	($C_{21}H_{20}O_{11}$) m/z 447 [M-H]- ; 285 [M-H-162]- = [aglycone-H]-
^{1}H NMR	(500 MHz, DMSO-d6): G 12.97 (1H, s, H-bounded OH-5), 7.44 (1H, dd, J = 8.1, 1.8 Hz, H-6c), 7.42 (1H, d, J = 1.8 Hz, H-2c), 6.90 (1H, d, J = 8.1 Hz, H-5c), 6.78 (1H, d, J = 2.1 Hz, H-8), 6.74 (1H, s, H-3), 6.44 (1H, d, J = 2.1 Hz, H-6), 5.08 (1H, d, J = 7.2 Hz, H-1cc), 3.72 (1H, br d, J = 9.9 Hz, H-6cca), 3.55 to 3.10 (5H, m, H-2cc, 3cc, H-4cc, 5cc, 6ccb).
^{13}C NMR	(100 MHz, DMSO-d6): G 183.82 (C-4), 166.8 (C-2), 165.8 (C-7), 162.96 (C-5), 158.2 (C-9), 149.7 (C-4c), 148.2 (C-3c), 121.9 (C-1c), 119.8 (C-6c), 114.9 (C-5c), 112.6 (C-2c), 105.84 (C-10), 104.74 (C-3), 102.8 (C-1cc), 99.4 (C-6), 94.6 (C-8), 78.7 (C-5cc), 77.9 (C-3cc), 74.82 (C-2cc), 70.8 (C-4cc), 61.9 (C-6cc).

2) Quercetin-3-O-β-D-glucuronide.

Structure	
Nature	Yellow amorphous powder
Tests	a)Alkali- golden yellow coloure b)Mg-HCL – Red coloure c)$FeCl_3$- Olive green
Uv	λmax 256, 275sh, 303sh, 370
IR (KBr)	λmax 3058 (OH), 1682 (C=C), 1507, 1334 (aromatic ring) cm-1
Mass	(C21H27O13) m/z 477 [M − H]−
^{1}H NMR	(500 MHz, DMSO-d6): G 12.52 (1H, s, H-5), 8.06 (1H, br s, H-2c), 7.38 (1H, d, J =8.2 Hz, H-6c), 6.80 (1H, d, J = 8.2 Hz, H-5c), 6.37 (1H, br s, H-8), 6.23 (1H, br s, H-6), 5.32 (1H, d, J = 6.5 Hz, H-1cc).
^{13}C NMR	(100 MHz, DMSO-d6): G 177.4 (C-4), 172.2 (C-6c), 164.3 (C-7), 161.1 (C-5), 157.1 (C-2), 156.7 (C-9), 148.4 (C-4c), 144.6 (C-3c), 133.7 (C-3), 121.3 (C-1c), 122.6 (C-6c), 117.3 (C-2c), 115.2 (C-5c), 104.3 (C-10), 101.6 (C-1s), 99.7 (C-6), 93.1 (C-8), 76.9 (C-3s), 74.7 (C-5s), 74.4 (C-2s), 71.6 (C-4s).

3) Formononetin-7-O-β-glucoside.

Structure	
Nature	Pale yellow amorphous powder, MW 431, mp 204-206°C
Tests	a)Alkali- yellow coloure b)Mg-HCL –Pink coloure c)$FeCl_3$- Olive green colour d) Molisch test- positive
Uv	(MeOH) λmax 208, 259
IR (KBr)	3402cm-1 (OH) 2924, 2517, 2170, 1625 (C = O in flavon), 1530
Mass	
^{1}H NMR	(500 MHz, DMSO-d6): G 8.44 (1H, s, H-2), 8.08 (1H, d, J = 8.8 Hz, H-5), 7.54 (1H, d, J = 6.6, 2.3 Hz, H-6c), 7.28 (1H, d, J = 2.2 Hz, H-8), 7.14 (1H,dd, H-6), 7.10 (1H, d, J = 9 Hz, H-5c), 5.14 (1H, d, J = 7.2 Hz, H-1cc), 3.79 (3H, s, OCH3), 3.70 to 3.31 (5H, m, H-2cc, 3cc, 4cc, 5cc, 6cc)
^{13}C NMR	(DMSO-d6, 100 MHz) G 173.7 (C-4), 160.2 (C-7), 158.8 (C-4'), 156.9 (C-9), 154.4 (C-2), 130.8 (C-2c, C-6c), 125.6 (C-1c), 125.3 (C-3, C-5), 118.4 (C-10), 115.3 (C-6), 113.7 (C-3c, C-5c), 104.4 (C-8), 102.1 (C-1cc), 77.4 (C-5cc), 74.6 (C-2cc), 73.4 (C-3cc), 61.4 (C-6cc), 54.7 (OCH3).

In determination of antipsoriatic activity author used UV induced photodermatitis model, for histopathological analysis of the section which revealed the absence of Munro's microabscess, elongation of rete ridges, and capillary loop dilation in ethanol extract (400 mg/kg) isolated compound II, III and standard group. The ethanolic extract (400 mg/kg) and isolated compounds I, II and III exhibited a significant ($p < 0.01$) percentage reduction of relative epidermal thickness when compared with a positive control. From the HPLC analysis, three flavonoids was identified by comparison of the retention times of standard marker, namely luteolin, quercetin and formononetin. From all above data author concluded, using animal model, that the flavonoids from Cassia tora leaves have significant antipsoriatic activity.

Formulations of cassia tora

1) O/W cream[11]

The methanolic extract of cassia leaves was prepared and by taking 200gm of powdered leaves extract with 600ml methanol macerated for1 day, then extract is filtered and evapourated under reduce pressure to dryness.

- Aqueouse phase: Water qs (heated 70 ± 5◦C), add disodium Edta (0.01%), BHT (0.001%), Dibasic potassium phosphate (0.2%).
- Oil phase: liquid paraffin (80%), Cetosteryl alchol (100%), PG (5%), Glycerin (5%), White soft paraffin wax (12%), PEG 400 (5%), Tween80 (5.33%), BHA (0.001%).
- The cream was prepared by Mixing cassia extract(0.005%) with benzyl alchol and then adding into aqueouse phase by continuouse stirring at slow speed for 1hr. furthure proceed by Adding oily phase into above mixture and slowly decreases temperature & meanwhile added isopropyl myristate (4%) in mixture above.
- Evaluation of cream: The physical evaluation for the cream has carried.

Colour	Light green
Odour	Characteristics
Nature	Semisolid
PH	6.5-7
Sensitivity test	Pass
Irritation test	Pass
Gritinees	Pass
Bleeding test	Pass
Stability test	40◦C ± 2◦C/75 RH ± 5% RH(3 month)
Acute dermal toxicity test	Safe upto 2000mg/kg

- **Antipsoriatic activity:** The Screening of antipsoriatic activity was carried out by topical application of different concentration of O/W creams, cream base, methanolic extract of Cassia tora L. leaves, and Standard (Retino-A (Tretinoin cream-0.05%)) by using ultraviolet-B-induced psoriasis in rat. It is found that Histopathologically, numbers of features are observed in fully developed lesions in psoriasis such as Munro's microabscess, regular elongation of rete ridges, and capillary loop dilation In case of psoriasis model, histopathological analysis revealed that there were absence of Munro's microabscess, elongation of rete ridges, and capillary loop dilation in the section in Test 2 (0.1%) and standard group. Hence from above study it is concluded that the O/W creams and methanolic extract of Cassia tora L. leaves exhibited significant reduction in percentage of relative epidermal thickness and spleen index as compared to positive control, it is one of the approach in treatment of psoriasis.From this experimental study it is conclude that topical O/W creams and crude extract containing methanolic extract of Cassia tora L. leaves have potent antipsoriatic activity in ultraviolet-B-induced psoriasis in rat.

2) Oral dosage form[12]

This article aimed to develop and evaluate orally administrable dosage form containing bioactive flavonoids namely Luteolin-7-O-β-D-Glucuronide (II), Kaempferol 3-O-[2-O-(6-O-feruloyl)-β-D-glucopyranosyl]-βD-galactopyranoside (III) from the bark of Givotia rottleriformis and Formononetin-7-O-β-D-glucoside (VI) from the leaves of Cassia tora and furthure evaluation of antipsoriatic activity using rat UV ray photo dermatitis model and cytokine inhibition assay.

- **Extraction and isolation**

a. About 500 g of the powdered Givotia rottleriformis bark was extracted using a Soxhlet apparatus with ethanol (70% v/v) (18 h). The extracted solution evapourated under reduced pressure (rotary vacuum flash evaporator). The crude ethanol extract (25 g) was obtained further subjected to chromatography (Silica gel 120 mesh, 500 g) with gradient elution using solvents of increasing polarity, hexane, chloroform, ethyl acetate and methanol. Three flavonoidal glycosides were isolated namely Rutin (I), Luteolin-7-O-β-D-Glucuronide (II) and Kaempferol 3-O-[2-O-(6-O-feruloyl)-β-D-glucopyranosyl]-β-Dgalactopyranoside (III).

b. The leaves of Cassia tora powder (500g) extracted using a Soxhlet apparatus with ethanol (70% v/v) (18 h). The extracted solution evaporated under reduced pressure (rotary vacuum flash evaporator). The crude ethanol extract (34 g) thus obtained was subjected to chromatography (Silica gel 120 mesh, 500 g) with gradient elution using solvents of increasing polarity, hexane, chloroform, ethyl acetate and methanol. Three flavonoidal glycosides were were isolated namely, Quercetin-3-O-β-dglucuronide (IV), Luteolin-7-O-β-glucopyranoside (V) and Formononetin-7-O-β-D-Glucoside (VI).[8]

- **Preparation of granules**

The tablets was prepared by wet granulation method. The compound II, III and VI (1:1:1) was mixed uniformly in mortar and pestle for 15 minutes. Followed by addition of microcrystalline cellulose, mixed well and granulated by using starch solution as granulating agent. Then granules was sifted through sieve no 20, and then it was dried.

- **Characterization of granules**

The powder blend was evaluated for its physical characteristics-bulk density, tapped density, angle of repose, compressibility index, and Hausner's ratio.

- **Preparation of tablets:** The dried granules was lubricated with magnesium stearate and then lubricated granules was compressed into tablets by using Rimek punching machine.

- **Evaluation of tablets:** The formulated herbal tablets was evaluated for quality control tests such as appearance, thickness, hardness, friability, weight variation test, disintegration, drug content and In vitro drug release as per British Pharmacopoeia (BP), 2009.

- **Stability studies:** The formulated tablets was subjected to stability studies as per ICH guidelines.

- **Antipsoriatic activity:** The formulation was exhibited antipsoriatic activity by good reduction in the thickness of epidermis, significant retention of the stratum granulosum and the absence of movement of neutrophils in UV-B induced psoriasis. In cytokine inhibition assay, the formulation showed remarkable inhibition of IL-17 and TNF- α, key cytokines involved in the pathogenesis of psoriasis at higher concentration.

- Hence from above data it is concluded that the oral dosage from prepared by mixing powders of Givotia rottleriformis and cassia tora shows remarkable antipsoriatic activity.

3) Herbal mixture

The Aqueous extracts of Calendula officinalis, Momordica charantia, Cassia tora and Azadirachta indica seed oil have been used individually for treating skin diseases such as psoriasis in traditional system of medicine. Though the individual herbal extracts and neem seed oil have been used safely there are no reports on the safety of these herbs and oil when used in combination. Hence a limit test at 5,000 mg/kg was carried out for the mixture comprising the extracts and the oil per Organization for Economic Cooperation and Development (OECD) guideline. Female rats received a single oral dose of 5,000 mg/kg body weight (b. wt.) of herbal mixture and three control female rats were orally given 2 ml. of distilled water. No concrete evidences of toxicities attributable to treatment with the herbal mixture were observed on behavioral pattern, hematology, clinical signs, serum biochemistry examination of liver and renal function and also histological evaluation of liver, kidney and heart. Therefore, single oral administration of herbal mixture up to 5,000 mg/kg b. wt. to rats under this study condition produced no significantly toxicological effects. Hence from this it

is concluded that the oil of the plants mentioned above are useful in treating various skin diseases including psoriasis, in combination or individually.

4) Polyherbal gel[13]

In this experimental study, three medicinal plants Cynodon dactylon (L.) Pers, Cassia tora Linn. and Cassia alata Linn have studied for significant antiinflammatory potential, and selected to be formulated as polyherbal gels. The gels was prepared using the dried methanolic extract of Cassia tora Linn, Cassia alata Linn and Cynodon dactylon (L.) Pers.

- **Composition of gel**

Ingredient	Quantity
Extract	6%
Carbapol-940	1%
PG	4%
Ethanol	3%
Methyl paraben	0.2%
Propyl paraben	0.02%
EDTA	0.03%

- **Evaluation of gel: The physical evaluation of gel was carried.**

Appereance	Light green
PH	6.98
Homogenity	Good
Spreading diameter after 1min	38mm
Viscosity(CP)	4900

- **Antiinflammatory activity**

It was done by carrageenan induced rat paw edema and formalin- induced rat paw edema. Both Individual and polyherbal gel of Cassia alata Linn, Cassia tora Linn. and Cynodon dactylon (L.) Pers was found to possess anti-inflammatory effect in acute and chronic models. Polyherbal gel was also showed synergistic effect as compared to individual gels which can be useful for the treatment of local inflammation.

5) Antioxidant cream[14]

This study aimed to determine the in vivo antioxidant activity of newly formulated O/W cream of methanolic extract of Cassia tora L. leaves. The topical O/W creams of C. tora L. prevent the oxidative stress induced in rats by exposure to UV-B light by virtue of its in vivo antioxidant property, and these findings furthure help to understand the mechanism of the antipsoriatic activity of O/W creams of C. tora L. in UV-B-induced psoriasis in the rat.

- **Formulation**

The extract was heated up to 70 ± 5 ∘ C. Aqueous phase consisting of water (q.s) was heated to the same temperature and disodium EDTA (0.01%), butyl hydroxyl toluene (0.001%), and dibasic potassium phosphate (0.2%) added in it. CTM (0.05%, 0.1%, and 0.2%) was mixed in benzyl alcohol (1%) and added in it. oily phase was added to the aqueous phase with continuous stirring at slow speed for 1 hour and slowly decreased the temperature and meanwhile was added isopropyl myristate (4%) in the mixtures of both phases. Allowed to cool at room temperature. Oily phase was consisted of light liquid paraffin (8%), cetostearyl alcohol (10%), propylene glycol (5%), and white so□ paraffin wax (12%). Base was also prepared by the same previous method and with same ingredients but without CTM.

- **Evaluation of antioxidant activity**

Ultraviolet- (UV-) B induced rats was treated with different standard, O/W creams, cream base, and methanolic extract of Cassia tora L. leaves (CTM). The parameters like lipid peroxidation (LPO), reduced glutathione (GSH), superoxide dismutase (SOD), and catalase (CAT) levels was assessed. The result of acute dermal toxicity showed that the creams was safe up to 2000 mg/kg (topically). Exposure of ultraviolet light of medium wave (UV-B light) decreased the level of GSH, CAT, and SOD and increased the LPO level. Hence from this study it is concluded that topical O/W creams of C. tora L. prevent the oxidative stress induced in rats by exposure to UV-B light by virtue of its in vivo antioxidant property.This finding was help to understand the mechanism of the antipsoriatic activity of O/W creams of C. tora L. in UV-B-induced psoriasis in the rat.

REFERENCES

1. Rendon a, sciences ks-i journal of molecular, 2019 undefined. Psoriasis pathogenesis and treatment. Mdpi.com [internet], 2020; 21. available from: https://www.mdpi.com/1422-0067/20/6/1475.
2. Kuchekar a, pujari r, … sk-ij of, 2011 undefined. Psoriasis: a comprehensive review. Academia.edu [internet], 2020; 21. available from: http://www.academia.edu/download/53443952/12.pdf.
3. Ramanunny a, wadhwa s, … ss-cd, 2020 undefined. Treatment strategies against psoriasis: principle, perspectives and practices. Ingentaconnect.com, 2020; 21. available from: https://www.ingentaconnect.com/content/ben/cdd/2020/00000017/00000001/art00007.

4. Chandra a, ray a, senapati s, chatterjee r. Genetic and epigenetic basis of psoriasis pathogenesis. Molecular immunology, 2015.
5. Deshpande h, bhalsing s. Recent advances in the phytochemistry of some medicinally important cassia species: a review. Int j pharma med biol sci, 2013; 2(3): 60–78.
6. Verma s. Medicinal plants used in cure of skin diseases. Adv appl sci res [internet], 2016; 7(3): 65–7. Available from: www.pelagiaresearchlibrary.com.
7. Srivastav s, singh p, mishra g. Pharmacological review of cassia tora linn. (fabaceae) [internet]. Researchgate.net, 2011; 2020: 21. Available from: www.pelagiaresearchlibrary.com.
8. Biswas i, seth p, laskar s. Exploration of therapeutic potential of anthraquinones and flavonoids isolated from different species of cassia : a promising journey from ethnomedicine to biomedicine, 2017; 13(1): 1–8.
9. Dubey rb, sawant bs. Pharmacognostic study of cassia tora l.: a review. J pharm sci innov, 2015; 4(4): 208–11.
10. Vijayalakshmi a, geetha m. Anti-psoriatic activity of flavonoids from cassia tora leaves using the rat ultraviolet b ray photodermatitis model. Brazilian j pharmacogn [internet], 2014; 24(3): 322–9. Available from: http://dx.doi.org/10.1016/j.bjp.2014.07.010.
11. Singhal m, kansara n. Cassia tora linn cream inhibits ultraviolet-b-induced psoriasis in rats . Isrn dermatol, 2012.
12. Vijayalakshmi a, ravichandiran v, masilamani k. Antipsoriatic and inhibitory effects of an oral dosage form containing bioflavonoids on inflammatory cytokines il-1α, il-1β, il-6, il-8, il-17 and tnf-α. Indian j pharm educ res, 2014.
13. Dixit g, misal g, gulkari v, upadhye k. Formulation and evaluation of polyherbal gel for anti-inflammatory activity. Ijpsr [internet], 2013; 4(3): 1186–91. Available from: www.ijpsr.com
14. Gupta v, rathore ds, kansara np, badiger am. In vivo antioxidant activity of topical cream of cassia tora l. Leaves extract . Dataset pap Pharmacol, 2013.