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The Promise of Usefulness of the Evergreen Shrub *Cassia Auriculata*

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Abstract

The herbal medicines are selecting over modern medicine due to their efficacy, safety, and lesser side effects. *Cassia auriculata* especially used in Ayurvedic medicine. *C. auriculata* is commonly known as tanner's cassia, and it belongs to the family Fabaceae and subfamily Caesalpiniaceae. In various studies, it is reported that *Cassia Auriculata* contain many phytoconstituents such terpenoids, flavonoids, alkaloids, glycosides, phenols, anthraquinones, saponin, tannins, proteins, carbohydrates, cardiac glycosides, ester, flavones and fatty acid. The ethnobotanical investigation showed that the *Cassia auriculata* was used for the various ailments and have many pharmacological properties like antidiabetics, anti-inflammatory, antileprotic, antibacterial, wound healing and many more. This review focused on its whole description, distribution, morphological, microscopical and macroscopical characteristics along with pharmacological activities of *Cassia auriculata*.

Keywords: Cassia auriculata, formulation, ethnobotanical uses, pharmacological activities.

1. INTRODUCTION

Pharmacognosy is an applied science that studies the biological, biochemical, and economic aspects of natural drugs and their constituents, derived from the Greek words "gignosco" meaning "to acquire knowledge" and "pharmacy" meaning "a drug."[1] Despite traditional medical care being the primary source of healthcare in developing nations like India, the use of complementary and alternative medicine is rapidly increasing globally, with the growing understanding of human physiology and metabolic processes expanding the spectrum of medicinal plant applications. Around half of all medications on the market are derived from natural raw materials, with high demand due to the inability to produce synthetic active chemicals in medicinal plants. The World Health Organization estimates that traditional medicine serves as primary care for 80% of the population in developing countries.[2] Around half of all medications on the market are derived from natural raw materials, with high demand due to the inability to produce synthetic active chemicals in medicinal plants. The World Health Organization estimates that traditional medicine serves as primary care for 80% of the population in developing countries. Research on natural medicines has surged in the past decade, with 80% of developed nations using traditional medicine containing therapeutic plants. To fully understand their characteristics, safety, and effectiveness, more research on these plants is

necessary.[3] Third-world nations are increasingly seeking low-cost, renewable, and biodegradable antibacterial compounds from plants, as current medications are expensive. Herbal remedies with a long history are considered safer than synthetic ones. Traditional medicine approaches are still relevant for managing chronic illnesses and accelerating the development of new natural products, as most people cannot afford current medications.[4] The growing market for dietary botanical supplements necessitates more comprehensive clinical and scientific research for herbal and traditional medicine to gain greater acceptance and visibility.[5] Traditional medicine in healthcare is crucial, and the rise in herbal medicine over the past decade has raised concerns about their proper usage. India has a great opportunity to explore medicinal lead compounds from the traditional Ayurvedic medical system, which could be used to produce new drugs, highlighting the importance of incorporating herbal remedies into healthcare practices.[6] Over half of current medications are derived from natural products, which are extensively utilized by the pharmaceutical industry in drug research.[7] India extensively uses traditional plant medicines and nutritional interventions based on Ayurveda and other indigenous medicinal systems. Medication safety is a critical issue, and therapeutic plant culture using laboratory-created species may impact the efficacy and safety of Ayurvedic drugs available in the market.[8] Homeopathic and allopathic fields are increasingly focusing on medicinal plants for public health, especially in underdeveloped nations, as they are believed to be safe for extensive use without intoxication.[9] Plants offer safe, renewable, and biodegradable medications, making the search for low-cost antibacterial compounds in nature increasingly necessary, despite the affordability of modern drugs in third-world nations.[10] The World Health Organization recognizes the importance and utilization of therapeutic floras in resource-poor countries.[11] The number of attempts to document medicinal plants has increased.[12]

2. PLANT DESCRIPTION

Tanners Senna, a plant in India's hot deciduous forests, is highly valued in Ayurvedic and Siddha medical systems for its anthelminthic agents and astringents, found in its fruits, leaves, and bark.[13] Roots, leaves, and flowers can treat various health issues, including tumors, skin conditions, asthma, ulcers, diarrhea, leprosy, urine discharge, diabetes, and dysentery.[14] *C. auriculata* is the primary component in "kalpa herbal tea," a popular beverage among individuals with diabetes mellitus, constipation, and urinary tract issues.[15] "avarai panchayat choornam" is a powdered and dried plant mixture used for urinary infections, conjunctivitis, and ophthalmia, and is also an alternative preparation for diabetic medicine.[16] The plant's striking yellow blooms are a key feature, supporting its diverse biological functions. Its numerous biological qualities include hepatoprotective, antioxidant, anticancer, antidiabetic, anti-inflammatory, and antibacterial properties.[17][18]
The plant is known by various regional names such as Tarwar, Awal, Tarval, Tangedu, Merakatangeedu, Arsual, Taravada, Tarwad, Mature Tea Tree, Pitapuspa, Pitkalika, Manojyna, Pitkala, and Charmaranga.[19]

Distribution: This species is found in India's hot deciduous forests, particularly in dry regions of Madhya Pradesh, Tamil Nadu, Rajasthan, and other parts of the country.

Morphology: *C. auriculata*, a plant widely used in Ayurvedic medicine, has been extensively referenced for its potential in treating illnesses.[20] C. auriculata, a member of the Fabaceae family and Caesalpiniaceae subfamily, is commonly known as Tanners Cassia.[21] This tea variety, known by various names in different languages, includes Tanners Cassia, Tarwar, avarai, avaram, avartaki, pitapuspa, pitakalika, Manojyana, Carmaranga, pitakala, and mataran tea.[22] This evergreen shrub, native to Asia, particularly India, is renowned for its stunning yellow blooms.[23] This evergreen shrub, native to Asia, particularly India, is renowned for its stunning yellow blooms.

Leaves: The dull green leaves are thin, stiff, and hairy, with 16-24 pairs of leaflets and a vertical or linear gland between each pair. They are rectangular, glabrous, dull-witted at both ends, and marginally overlapping. The legume is a short, oblong, obtuse plant with a flat, thin, papery, undulately crimpled, pilose, and pale brown base, with 12-20 seeds in each fruit, each carried in a distinct cavity.

Flowers: The flower, bright yellow and irregular in shape, is bisexual and has 2.5 cm long pedicels. Its terminal inflorescence is formed by an upright raceme in the top leaves. The petals are distinguished by the size difference between outer and inner sepals. The ovary has marginal ovules and 10 separate anthers.[24]

Fruit: The legume is a short, oblong plant with a pale brown, pilose base, and 12-20 seeds in each fruit, each carried in a separate cavity.[25]

Taxonomic Classification:[26]

Kingdom: Plantae
Clade : Tracheophyte
Clade : Angiosperms
Order : Fabale
Family : Fabaceae
Subfamily : Caesalpinioideae
Genus : Cassia
Species: *Cassia auriculata L.*

Macroscopic Characteristics

The Avaram tree, *Cassia auriculata Linn*, belongs to the Fabaceae family and Caesalpiniaceae subfamily and has numerous, slender, and pubescent leaves. Its rachis is 8.8-12.5 cm long and narrowly furrowed. The leaflets are oval oblong, obtuse, and mucronate, with large, reniform rotunda stipules. The tree produces large, irregular, bisexual, bright yellow blooms that measure almost 5 cm wide, with 2.5 cm long, glabrous pedicels that complement the flowers.

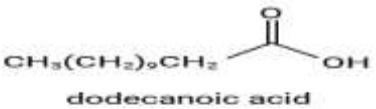
Microscopic Charateristics

Leaves: *C. auriculata* leaves contain various chemicals such as alpha-tocopherol–beta–D–mannosidase, 3-methyl-d glucose, n-hexadecanoic acid, resorcinol, octadecyl, and carboxylic acid. The leaves are thin, pubescent, narrowly rugged, robust, and have a rachis of 8.8–12.5 cm. Measuring 2-2.5 cm in length and 1-1.3 cm in breadth, they are fastened using quick stitches. The leaflets are 16–24 cm long, narrowly furrowed, slender, pubescent, and have an upright linear gland between each pair.[28]

Seeds: *C. auriculata* seeds contain 40.8% linoleic, oleic, and palmitic acids, with benzoic acid, glycine, resorcinol, cupric acid ethyl ester, and water-soluble galactomannan-like molecules in the ethanolic seed extract.[29]

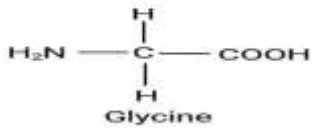
Roots: *C. auriculata* root bark contains chalcone 3,6,-dihydroxy-4-methoxy chalcone and leucocyanidin-3-o-rhamnopyroside, while roots contain anthraquinone glycosides and leucoanthocyanins.[30]

Fruit: The legumes are small, green, or pale brown, 1.5 cm broad and 7-11 cm long, with a long style base, flat, thin, papery, pilose, undulate, crimpled, and tripped, each cavity holding around 1220 seeds.[31]

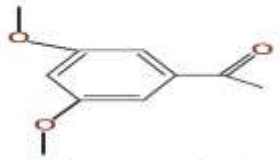


dodecanoic acid

Stearic acid



Glycine


dimethoxyacetophenone

Flowers: Terpenoids, flavonoids, alkaloids, steroids, glycosides, phenol, anthraquinones, saponin, and tannins that help reduce sugars.

Leaves: Alkaloids, cardiac glycosides, carbohydrates, flavonoids, phenols, proteins, tannins, and terpenoids.

Bark: Quinoline, monoterpenoid, phthalate ester, carbamate, ethylene sesquiterpenoids, phthalate ester, and alkaloid.

Root: Flavones, glycoside, Beta-d-galactopyranoside 7, 4-dihydroxy flavone 5-o Rutinoside, 1,3,8-trihydroxy-6methoxy-2 methyl-anthraquinone, 1,3-dihydroxy-2 methylantraquinone, and anthraquinone glycosides.

Seed: Light yellow fatty acids, including oleic, palmitic, and linoleic acids, acid benzoic, 0.21% resorcinol, 2-methyl ester with hydroxyl, and 1-methylbutul ester of glycine.

Medicinal Uses

Reports suggest that the herb has antipyretic properties,[32] antidiabetic, hepatoprotective, antiperoxidative, and antihyperglycemic agent.[33] and microbicidal activity.[34] It has been demonstrated that C. auriculata contains antiviral and antispasmodic properties.[35] The plant is utilized in traditional medicine to treat various ailments such as leprosy, diarrhea, worm infestation, female infertility, and pitta sickness.[36] It has been discovered that the plant's various portions reduce the symptoms associated with diabetes.[37]

The Flowers: The flowers are utilized for treating various ailments such as diabetes, throat discomfort, nocturnal emissions, and urine discharges.[38]

The Bark: The bark is utilized as an astringent in treating skin disorders.[39] They are effective in preventing bleeding and secretion, as well as rectifying any disrupted nutritional processes.[40]

The Leaf: Leaf extract protects cells from alcohol-induced oxidative stress through reduced tissue lipid peroxidation, increased antioxidant levels, and liver damage, while also having an emollient effect.[41]

The Seeds: Tanner's cassia seeds are utilized to treat purulent ophthalmia or conjunctival inflammation, which should be applied to the affected eyes after being finely powdered. Seeds are beneficial for various conditions such as chronic purulent conjunctivitis, chyluria, ophthalmia, dysentery, diarrhea, swellings, gastrointestinal disorders, leprosy, skin diseases, worm infestations, and aphrodisiac conditions.[42]

The Roots: The roots are utilized for treating asthma and skin conditions.[43] Roots are beneficial for skin conditions, leprosy, tumors, asthma, and urethrorrhea, providing cooling, astringent, alterative, depurative, and exoteric properties.[44]

Pharmacological Activities

Antidiabetic Activity

The study found that oral administration of various extracts of *Cassia auriculata* bark, including hexane, ethyl acetate, methanol, and aqueous extracts, effectively lowers blood sugar levels in streptozotocin-induced diabetic rats. The extracts showed long-term antihyperglycemic effects at a dosage of 250 mg/kg b.wt, with methanol extract significantly increasing fasting blood glucose, HbA1c, C-peptide, serum insulin, and liver enzyme levels. This activity surpasses other extracts. Pancreatic tissue histological analyses further substantiated the benefits of C. auriculata extracts.[45]

Indian traditional medicine uses *Cassia auriculata*, also known as "Tanner's cassia," to treat diabetes. Oral administration of the flower's extract for 30 days leads to a significant drop in blood glucose and an increase in plasma insulin levels. However, the extract's hypoglycemic action is demonstrated by its reduction in free radical generation and antioxidant properties. The most significant impact was observed in animals receiving 0.45 g/kg body weight, with Glibenclamide having a lower effect.[46]

Antibacterial Compound

The study aims to identify the antibacterial component in *Cassia auriculata* leaves, a medicinal plant with antimicrobial properties used globally for treating various illnesses, including acute and chronic ones. A preliminary screening of plant extracts against human pathogenic bacteria was conducted using Aegle marmelos, Chloris Virgata, Clausena anisata, Feronia limonia, and Cassia auriculata. Results showed that the extra molecule responsible for *Cassia auriculate's* antibacterial action was effective against the examined species, as determined by IR, 1HNMR, 13CNMR, and mass spectrometry.[47] *Cassia auriculata* has antibacterial properties against 10 human diseases using five solvents: methanol, hexane, chloroform, ethyl acetate, and acetone. Methanol extracts showed the most potent antibacterial action against Vibrio cholerae and Staphylococcus aureus. Chloroform extracts had weak effects on Escherichia coli and Pseudomonas aeruginosa. Ethyl acetate extract had greater antioxidant, phenolic, and flavonoid compounds.[48]

Anthelmintic Activity

Cassia auriculata has antibacterial properties against 10 human diseases using five solvents: methanol, hexane, chloroform, ethyl acetate, and acetone. Methanol extracts demonstrated the most potent antibacterial action against Vibrio cholerae and Staphylococcus aureus, while chloroform extracts had no inhibitory zone against Escherichia coli but weak effects on Pseudomonas aeruginosa. The study investigated the anthelmintic activity of a plant extract on worms at different doses (5, 10, and 20 mg/ml). The ethyl acetate extract showed greater antioxidant, phenolic, and flavonoid compounds. The ethanol and quath extracts demonstrated significant action at the maximum concentration of 20 mg/ml. The study concluded that the plant had significant anthelmintic action, allowing for scientific in vivo testing on animals.[49]

Anticlastogenic Activity

The study investigates *Cassia auriculata Linn*. antimutagenic potential against cyclophosphamide (CP)-induced chromosomal damage in Swiss albino mice. Four groups were used, with the first group receiving CP treatment. The third and fourth groups with CP received ethyl acetate extract at 100 and 200 mg/kg, and chromosome abnormalities during metaphase were examined in bone marrow cells. The study found that extracts from C. auriculata Linn's flavonoid-rich root effectively shield rats from chromosomal aberration caused by CP, with rats receiving 100 and 200 mg/kg of extract showing 12.16 and 7.33% chromosomal abnormalities respectively.[50]

Immunomodulatory Activity

The study investigated the immunomodulatory properties of the methanolic extract of *Cassia auriculata* in rats, focusing on its effects on sheep red blood cell responses and neutrophil adhesion test, which is commonly used in traditional medicine for treating asthma and diabetes. The study found that *Cassia auriculata*, an extract of the plant, significantly increased neutrophil adhesion and delayed type hypersensitivity response in sensitized rats. The plant's enhanced response to sheep red blood cells indicates a strong boost in cell-mediated immunity, potentially treating various medical disorders at dosages of 50 and 100 mg/kg, without affecting humoral immunity.[51]

Antistress Activity

The study investigated the potential of *Cassia auriculata* ethanolic seed extract in reducing stress in mice. The extract was tested using the Elevated Plus Maze, Tail Suspension Test, and Force Swimming Test, and mixed with standard doses of diazepam and fluoxetine. The study aims to demonstrate how ECS can prevent stress-related disorders at in vivo levels by controlling stress hormones and GABA, as evidenced by a rise in people entering and staying in the Elevated Plus labyrinth and a decline in immobility in Force swimming and Tail suspension tests.[52]

Antiulcer Activity

The study evaluated the anti-ulcer properties of *Cassia auriculata* leaf extract against pylorous ligation-induced stomach ulcers in rats. Results showed a significant decrease in ulcer incidence with a 300 mg/kg dose of the methanolic leaf extract. The extract also reduced stomach volumes, acidities, and ulcerative indices compared to the control group.[53] The study investigated the anti-ulcer effects of cassia auriculata leaf extracts against pylorus ligation-induced stomach ulcers in rats. Results showed that the methanolic leaf extract significantly decreased the incidence of ulcers in rats with pyloric ligation, compared to the control group. The extract's protection value was 79.4%, compared to the 90.7% protection index for famotidine, a common medication. The study suggests that cassia auriculata leaf extracts may have potential for treating stomach ulcers.[54]

Hepatoprotective Activity

The study evaluated the hepatoprotective properties of *Cassia auriculata* Linn's flower extracts in albino rats against the hepatotoxicity caused by paracetamol. The extracts were tested using biochemical markers like alkaline phosphatase, total and direct bilirubin, and SGPT. The results showed that the flowers' extracts demonstrated a strong hepatoprotective effect, comparable to silymarins. The study also examined histopathology, revealing the flowers' potential as a natural hepatoprotective agent.[55] The study investigates the hepatoprotective effect of silymarin-containing *Cassia auriculata* polymer nanospheres against carbon tetrachloride toxicity in rats at dose levels of 50 mg/kg and 100 mg/kg body weight. This novel formulation targets the illness state and has a distinct character and site specificity, addressing the lack of pharmaceutically manufactured products for treating liver problems. The study examined various enzyme

activities in various substances, including serum glutamate pyruvate transaminase, alkaline phosphate, and total protein. Results showed that *C. auriculata* polymer nanospheres and silymarin significantly improved liver health by increasing HDL levels and reducing GSH activity, while reducing serum enzymes, bilirubin, and cholesterol. This suggests that C. auriculata polymer nanospheres could protect liver cells from carbon tetrachloride's harmful effects in liver disorders.[56]

Antituberculosis Activity

The study investigated the anti-tuberculosis properties of *Cassia auriculata* barks using solvent extracts and GC-MS. The extracts contained phenolic chemicals, steroids, alkaloids, and terpenoids. Molecular docking experiments were conducted using Mycobacterium tuberculosis's inhibitor protein, 5HKF. Computer-aided drug design revealed that previously recognized anti-tuberculosis medications block the Mycobacterium tuberculosis (H37Rv) Protein (5HKF). The study compared repurposed medicines to original drugs using Molinspiration cheminformatics, examining their absorption, distribution, metabolism, excretion, and toxicity. Results showed that certain repurposed medicines significantly inhibited Mycobacterium tuberculosis, suggesting further research into treatment and prevention of the disease. The findings could help improve the understanding of drug-like properties.[57]

Antiproliferative Effect

A substance from *Cassia auriculata* leaves was tested against the HCT 15 human colon cancer cell line, showing 50% suppression after 48 hours. The compound could be useful in stopping colon cancer cell lines, according to the research. Assays for lactate dehydrogenase, nuclear morphology, and cytotoxicity were also conducted.[58]

Antiobesity Activity

The study aimed to investigate the impact of *Cassia auriculata* leaf extract on the obesity of rats on a high-fat diet. The rats were divided into four groups: orlistat standard, high-fat diet control, normal control, and control. The treatment was administered orally, with weight growth, feed consumption, BMI, waist-hip ratio, obesity index, lipid profile, blood glucose, and body fat depot content evaluated. The ethanolic extract of *Cassia auriculata* leaves, when taken orally, showed strong anti-obesity activity in an obesity model caused by a high-fat diet, marking the first report on the leaves' ability to prevent obesity. The extracts were tested at 200 and 400 mg/kg/orally.[59]

Antioxidant Activity

Recent research indicates that plants can effectively treat various human ailments due to their rich phytochemical content. The pharmaceutical industry utilizes secondary metabolites from Cassia auriculata, a plant rich in triterpenoids, tannins, flavonoids, alkaloids, saponins, glycosides, gums, mucilage, and phenolic compounds, assessing its antioxidant activity in ether, ethanol, and ethyl acetate. This study highlights the potential of plants in treating various illnesses. The study analyzed *Cassia auriculata* extracts for phytochemical content, revealing proteins, carbohydrates, alkaloids, flavonoids, steroids, saponins, and tannins. The ethanolic extract showed significant antioxidant activity, suggesting that *Cassia auriculata* may be a beneficial source of naturally occurring antioxidants. Further research is needed to identify precise active ingredients and assess their antioxidant activity in various in vitro settings.[60]

Corrosion of Aluminium and Mild Steel

The study tested the corrosion inhibitory properties of air-dried *Cassia auriculata* flowers on aluminum and mild steel using weight loss, polarization studies, and impedance methods. Results showed that the percentage of inhibition decreases with temperature but increases with extract concentration. The presence of certain phytochemical elements on the surfaces of these metals may be responsible for the inhibitory effect.[61]

Cold Cream

Cassia auriculata, a Caesalpiniaceae plant, has been traditionally used for treating various illnesses, and this evaluation aims to explore its pharmacological characteristics, phytochemical analysis, safety/toxicity research, and pharmacognostic study. *Cassia auriculata Linn*, a common plant in Asia, has numerous pharmacological properties, including anti-viral, anti-obesity, anti-cancer, anti-fungal, antibacterial, antimicrobial, and anti-diabetic effects. Its phytochemical constituents include proteins, carbohydrates, anthraquinone derivatives, glycosides, alkaloids, flavonoids, tannins, and saponins. These compounds are

used in Ayurveda to treat various chronic and acute illnesses, with medicinal plants and their components also possessing antimicrobial properties. The investigation aims to isolate the antibacterial component in *Cassia auriculata* leaves using ethanol and distilled water to create a natural cream. Chemical analyses confirmed the presence of live biomolecules in all extracts. The addition of *Cassia auriculata linn* flower extract to the cream base improved outcomes, with the aqueous extract yielding better results than the ethanol extract when using natural cream in traditional criteria.[62]

Antipsoriatic Activity

The study uses an induced animal model and Freund's adjuvant to evaluate the antipsoriatic impact of ointments containing ethanol extract of *Cassia auriculata* flowers. The ointments were tested for their antipsoriatic effects on skin, liver, ulcers, diabetes, and conjunctivitis. The phenotypic and histological characteristics of the psoriasis severity index (PSI) and epidermal thickness were used to assess the ointments' effectiveness. The study evaluated the physical properties of *Cassia auriculata* flowers and found that they had antipsoriatic action. When animals were given 0.5 and 1.0% ointments, the ortho keratinocyte layer increased significantly, while the epidermal layer decreased. The ointment also reduced the severity of psoriatic lesions from day 7 to day 21. These findings validate the traditional use of *Cassia auriculata* flowers for skin diseases.[63]

Antiinflamamatory Activity

The study examined the in-vitro anti-inflammatory and anti-diabetic properties of *Senna auriculata* flower extract in acetone, chloroform, and aqueous forms. The plant contains bioactive substances like phenols, alkaloids, flavonoids, lipids, saponins, and steroids. The acetone extract showed the highest inhibition rate (73.84%), while the methanolic extract from *Cassia auriculata* leaves showed the most significant anti-inflammatory benefits.[65]

Wound Healing Activity

A study on *Cassia auriculata* Linn.'s medicinal properties found that its ethanol and aqueous extracts showed significant dose-dependent healing abilities in a chick embryo wound model. The ethanol extract at 500 µg concentration increased wound contraction by 50% compared to the negative control group. Additionally, the extract showed better angiogenic properties. This chick embryo wound model is a reliable alternative for screening wound-curing compounds.[66]

Analgesic Activity

Cassia auriculata is a popular herb for treating skin and urinary issues, hypoglycemia, and analgesia, a condition where pain perception is diminished, with locals using it for various ailments. The study examines the analgesic properties of a plant's methanolic extract using hot plate, tail flick, and acetic acid-induced writhing in Swiss albino mice. Results show the extract has strong analgesic action and relieves pain.[67]

Antimicrobial Activity

Plants generate phytochemicals, which are utilized in the pharmaceutical industry to treat a range of diseases, including infections caused by bacteria. Six bacterial strains were investigated in this study: Bacillus cereus, Staphylococcus aureus, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, and Proteus mirabilis. The antibacterial activity of methanol, chloroform, and aqueous extracts of *Cassia auriculata* leaf was also evaluated. Except for Pseudomonas aeruginosa, the results demonstrated that the methanol and chloroform extracts had significant inhibitory effects against all species. The aqueous extracts of *Cassia auriculata* showed moderate activity, with phytochemical contents including proteins, carbohydrates, alkaloids, flavonoids, steroids, saponins, and tannins. These extracts may have antibacterial properties due to tannins, steroids, flavonoids, and saponins. Further research is needed to identify the specific active principles.[68]

In Silico And In Vitro Approaches

This study evaluates Cassia auriculata potential as an anti-inflammatory and anticancer agent. Solvent extraction was used to extract aerial sections of CA, and their extracts were analyzed for phytochemical composition. The extracts showed anti-inflammatory properties with IC50 values of 125.02 µg/ml for red blood cell membrane stabilization and 195.7 µg/ml for protein denaturation activity inhibition. AutoDock techniques were used to predict the interaction of CA ethanol extract with target protein, KAT1. The study explores the potential of CA ethanol extract as an alternative to current treatments for inflammation and

cancer. Despite extensive research on kinase inhibitors targeting Akt, their toxicity and resistance issues have hindered their effectiveness. The study uses in vitro and in silico methodologies to demonstrate the anti-inflammatory and anticancer properties of CA ethanol extract.[69]

Blood Glucose And Lipids Activity

The study investigates the hypoglycemic and hypolipidemic effects of *Cassia auriculata* seed extracts and their interaction with oral hypoglycemic medications. Male adult Wistar rats were hyperglycemic by injecting 60 mg/kg of alloxan via the tail vein, addressing the lack of knowledge on these effects. The study investigates the hypoglycemic and hypolipidemic effects of *Cassia auriculata* seed extracts and their interaction with oral hypoglycemic medications. Male adult Wistar rats were hyperglycemic by injecting 60 mg/kg of alloxan via the tail vein, addressing the lack of knowledge on these effects. The study found that *Cassia auriculata* seed extracts have hypoglycemic and hypolipidemic effects in mice with hyperglycemia. The glibenclamide-treated group had less hypoglycemic activity than the extract-treated groups, ACA-2 and PCA-2. All therapy groups showed more favorable lipid profile alterations than the glibenclamide-treated group. Glibenclamide and Cassia auriculata extracts, administered at a lower dose, improved blood parameters linked to diabetes. Further clinical validation is needed to confirm these positive effects.[70]

Free Radical Scavenging

Free radicals play a crucial role in our bodies, both as beneficial and harmful organisms. Oxidative stress, caused by excess free radical generation or reduced antioxidant levels, can lead to pathological diseases like diabetes, cancer, atherosclerosis, inflammatory conditions, Alzheimer's, and Parkinson's. Synthetic medications can also produce free radicals, causing further illnesses. However, antioxidants found in plant sources, such as those used in Ayurveda medicine, can prevent free radical reactions and protect against oxidative damage, with fewer negative effects. The study investigates the antioxidant activity of *Cassia auriculata* L. plant extracts, using ascorbic acid as a reference. The extracts from leaves, stems, and fruits were evaluated for radical scavenging using DPPH and NO reduction power. The results indicate that acetone extract from fruits, leaves, and stems could be a valuable source of natural antioxidants, potentially serving as a new source for the Antioxidant Activity Index (AAI), meeting modern dietary needs.[71]

Anthelmintic Activity

Helminth infections are a prevalent global health issue, affecting a significant portion of the population. Natural antibacterial agents, such as acetone, ethanol, methanol, and quath extracts, could be a more effective alternative to synthetic antibiotics. The World Health Organization (WHO) states that only a few medications are regularly used to treat parasitic parasite infections. This study examined the anthelmintic activity of leaf extracts from *Cassia auriculata L* against Ecinia foeitida. The study examined the anthelmintic activity of a plant extract at three concentrations (5, 10, and 20 mg/ml) on worms. The results showed a progressive increase in activity with dosage increase. The ethanol and quath extracts showed significant activity at the maximum concentration of 20 mg/ml. The study concluded that the plant exhibited strong anthelmintic activity, allowing for scientific in vivo trials for its application in cattle.[72]

Anti Solar Efficacy

The study uses UV technique to test *Cassia auriculata* extracts for anti-solar potential in vitro. Extracts were prepared in both ethanolic and aqueous forms, and their phytochemicals and antioxidant impact were assessed using DPPH. The study screened *Cassia auriculata*'s anti-solar potential using a Shimadzu UV-1700 double-beam UV-visible spectrophotometer. The extracts contain essential phytoconstituents like phenols, triterpenoids, flavonoids, tannins, saponins, phytosterols, alkaloids, and glycosides. They also have antioxidant activity, making them a natural sunscreen. The ethanolic extract performed better than the aqueous extract, suggesting they could be a viable substitute for synthetic sunscreens.[73]

Pharmacokinetic

ADMET outcomes, including toxicity, distribution, metabolism, excretion, and absorption, are crucial in drug discovery and development as they ensure adequate efficacy against the target and the right properties at the right dosage.[74] The study reveals that all standards and antibiotics have a high chance of being absorbed in the human gut, with HIA+ values of 95.366%, 98.03%, 98.64%, 94.98%, and 99.56% for various phytocompounds. These compounds have a high likelihood of passing across the blood-brain barrier, a crucial pharmacokinetic characteristic for medication development. The study predicts that phytocompounds and standards with high water solubility range have high potential for absorption and distribution. They have

improved metabolic activities using Cytochrome P450 inhibitors, making them suitable for therapeutic use. They are non-AMES-toxic, meaning they do not cause cancer and do not have mutagenic capacities. However, the chosen substances and benchmarks show type III oral acute toxicity, which can be upgraded to type IV during lead optimization.[75] The chosen standards and phytocompounds are non-inhibitors of hERG, with compounds C1 and C-2 showing the most promise. Thus, each chosen molecule is a safer and superior medication candidate for the intended receptor. The study involved Wistar strain adult albino rats, divided into three groups after an overnight fast. Groups 2 and 3 received oral gavage treatment for 14 days, while Group 1 received water. After 14 days, Group 2 received MT 90 mg/kg and Group 3 received 45 mg/kg. Blood samples were taken and centrifuged to determine molecular weight. Plasma samples were separated and stored at -20°C. Drug was extracted from plasma using protein precipitation and reverse phase HPLC for analysis.[76] The bioanalytical approach was used to investigate pharmacokinetics for MT, using PK solver 2.0® software to evaluate the PK parameter. The study was conducted at two dosages, 90 mg/kg and 45 mg/kg, after oral administration with or without CA. The PK profile of the 90 mg/kg dosage was comparable to a published trial. Table 1 and Figure 2 display the results.[77] The study found that pretreatment with CA significantly altered the PK characteristics of MT. Group II, treated with 90 mg/kg of MT and CA, saw an increase in maximum plasma concentration (Cmax) and an increase in AUC0 24 (AUC0 24). The half-life almost doubled, but the time needed to attain Cmax remained constant. Group III, treated with a half-dose of MT, experienced a drop in Cmax and a doubled Tmax compared to Group I.The study found that when combined with metformin, CA-SFE extracts reduced AUCM by 60% compared to metformin alone. The maximum concentration of metformin dropped by 55% at the same dosage. CA-SFE reduced AUCM by 33 and 30% at doses of 250 and 500 mg kg−1, respectively. The effects of CAHA extracts at 500 and 1000 mg kg−1 were not statistically different. Comparing blood glucose levels between metformin- and CA-treated groups showed no discernible difference.[78]

Toxicity Studies

A 2011 study by Pai Aruna and Karki Roopa, following OECD guidelines, found no significant toxicity in animals when extracts from *Cassia auriculata* seeds were given in stepwise dosages ranging from 50 mg/kg b. wt. to 5000 mg/kg b. wt., following a 2011 acute oral toxicity study.[79] In 2012, a study by Deshpande Supriya S., Kewatkar Shailesh, and Paithankar Vivek V. demonstrated that an ethyl acetate extract of *Cassia auriculata Linn.* roots did not cause toxicity or alter animal behavior.[80] Kalaivani et al.'s 2008 acute toxicity studies found that administering graded doses of *Cassia auriculata* leaves and flower extracts to rats for 30 days did not affect their behavior or appearance, and all rats survived the test period.[81] The study evaluated the hepatoprotective effect of *Cassia auriculata* Linn's flowers extracts in albino rats against hepatotoxicity caused by paracetamol. The extracts were tested using biochemical markers like alkaline phosphatase, total and direct bilirubin, serum glutamic pyruvate transaminase, and glutamic oxaloacetic transaminase. The results showed that the flowers' extracts had a strong hepatoprotective effect, comparable to silymarin's.[82]

The study examined the antidiabetic effects of *Cassia auriculata* L's floral extracts on rats with alloxan-induced diabetes. The extracts showed phytochemical and antioxidant properties, with the water-soluble part having the highest capacity to scavenge free radicals. Diabetic rats showed lower insulin levels and increased blood glucose after alloxan injection. Oral water-soluble extract increased triglyceride and cholesterol levels. Liver damage enzymes like ALP, ACP, AST, and ALT were also increased in alloxan-induced diabetic rats. Treatment with extracts and diabetes improved parameters, with water-soluble ethanol extract showing more effective antihyperglycemic activity.[83] Snake bites are a major health concern in rural areas, causing high morbidity and fatality rates. Anti-venoms are effective but do not address localized symptoms. *Cassia auriculata* L., a traditional medicinal plant, has been used to protect against toxicity caused by Echis carinatus venom. Traditional healers in Karnataka's Western Ghats have used *C. auriculata* leaf methanol extract to treat snake and scorpion stings. The extract reduced bleeding, edema, and myotoxicity in vivo and inhibited ECV proteases, PLA2, and hyaluronidases in vitro. It also prolonged mice's life and decreased ECV's deadly potency.[84]

Ethics Approval and Consent Participate

This article does not contain any studies with human participants or animals performed by any of the authors so this section is not applicable.

Consent for Publication

All author has given their concern for publication of this manuscript.

Availability of Data Material

All data have been mentioned in the manuscript, no other data are with authors.

Competing Interests

The authors declare that are no possible conflicts of interest to the research, authors, and/or publication of this article.

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