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Blossoms of Recovery: Exploring the Therapeutic Journey of Saraca asoca (Ashoka) Through Time and Cultures

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Abstract: ***Saraca indica, commonly known as Ashoka, is a rainforest tree belonging to the Caesalpiniaceae family, native to the Indian subcontinent and Southeast Asia. It can reach heights of up to 20 meters, boasting a dense crown of dark green foliage and clusters of small, fragrant, yellow-orange flowers. The compound leaves consist of 6-10 pairs of leaflets, while the bark is smooth and greyish-brown. This tree holds significant importance in traditional medicine systems like Ayurveda and Unani, particularly renowned for its effects on women's health. Its name, "without sorrow" or "sorrow-less tree," speaks to its reputation for promoting female well-being and youthfulness. Phytochemical analysis reveals that Saraca indica contains a diverse array of compounds, including glycosides, flavonoids, tannins, saponins, esters, and primary alcohols. These constituents contribute to its wide range of medicinal properties. Saraca indica has been traditionally used for its anti-menorrhagic effects, aiding in the regulation of menstruation and alleviation of menstrual disorders. Additionally, it shows potential anti-cancer properties, anti-oxytocic effects, anti-inflammatory activity, and protection against ulcers in the gastrointestinal tract. Moreover, it exhibits antimicrobial activity against various pathogens. While traditional uses are well-documented and supported by anecdotal evidence, scientific research into Saraca indica's pharmacological activities is ongoing. Studies have shown promising results regarding its effects on menstrual disorders, cancer cell inhibition, inflammation modulation, ulcer prevention, and microbial infections. Further research is necessary to elucidate its mechanisms of action and to explore its potential therapeutic applications fully. Saraca indica stands as a versatile botanical treasure with immense potential for both traditional and modern medicinal practices.***

Keywords: Saraca indica, askok, women friendly plant, pharmacological activity, phytoconstituents

1.Introduction

The demand for herbal products increases all over the world and major pharmaceutical companies are currently conducting research on medicinal plants on large scale for their potential medicinal value. Plant medicine has served as a cornerstone for treating various ailments worldwide long before the introduction of modern synthetic drugs. Among the multitude of botanical species with medicinal significance, Saraca indica stands out as a rainforest tree native to India. It thrives across diverse regions of the country, particularly in the Himalayas, Kerala, Bengal, and the broader southern region. Originally, Saraca indica's distribution encompassed the central areas of the Deccan plateau and the middle section of the Western Ghats along the Indian subcontinent's western coastal zone. However, as a wild species, Saraca indica faces the threat of vulnerability. Its natural habitat is dwindling, leading to its increased rarity. Nonetheless, isolated wild Saraca indica trees can still be found in the foothills of the central and eastern Himalayas, scattered locations across the northern plains of India, and along the west coast near Mumbai. Despite its challenges, the medicinal potential of Saraca indica persists, emphasizing the importance of preserving this valuable botanical resource for future generations.

Figure 1

Figure 2

Figure 3

The Ashoka tree is prized for its captivating foliage and aromatic flowers, making it a cherished sight in landscapes. It is a graceful, compact evergreen tree, adorned with lush clusters of deep green leaves. Its flowering season, typically from February to April, showcases dense bunches of vibrant yellow blooms that transition to a striking red hue before wilting. Saraca indica holds immense significance in Unani and Ayurvedic medicinal traditions, particularly in addressing feminine health concerns like menorrhagia and gynecological disorders. The bark of the Ashoka tree offers a blend of bitter, astringent, and sweet flavors, believed to contribute to women's health and youthfulness. Known for its stimulating effects on endometrial and ovarian tissues, it finds application in treating internal bleeding, hemorrhoids, ulcers, uterine ailments, and conditions like menorrhagia and leucorrhoea, often associated with uterine fibroids. Additionally, Saraca indica boasts a spectrum of medicinal properties, making it a cornerstone in traditional healing practices. It is utilized to manage painful conditions, enhance complexion, aid digestion, alleviate excessive thirst, combat infections, and address blood disorders and inflammation. Its multifaceted therapeutic potential underscores its enduring significance in Unani and Ayurvedic systems of medicine, where it continues to play a pivotal role in treating a myriad of ailments.

Classification:

Kingdom: Plantae
Division: Magnoliophyta
Class: Mgnoliopsida
Order: Fabales
Family: Caesalpinaceae
Genus: Saraca
Species: indica

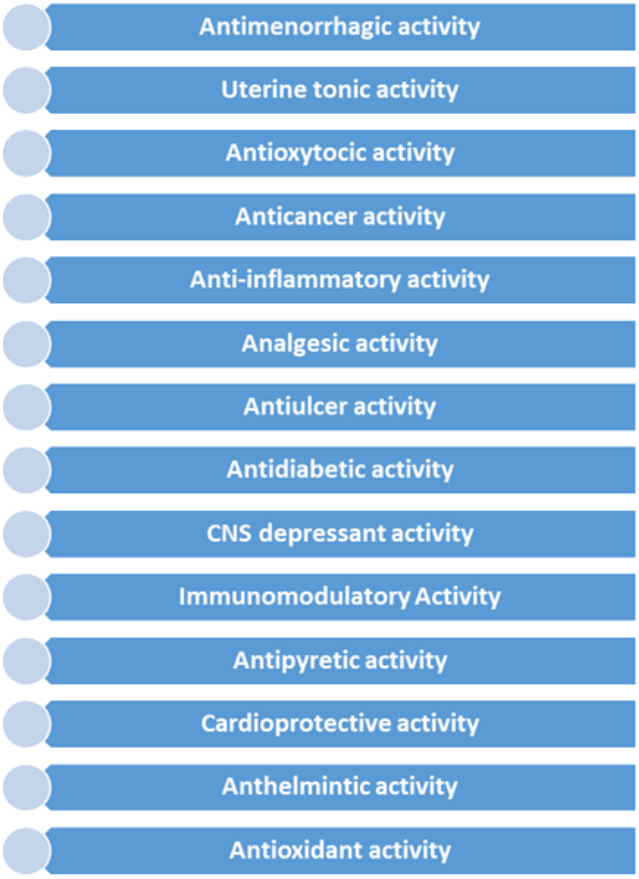
Vernacular name:

Ashoka (Urdu), Shabuqa (Arabic) Kankeli (Sanskrit), Ashokadamara (Kannada), Ashok (Kashmiri), Asokam (Malayalam), Ashoka (Gujrati), Ashoka (Hindi), Ashok (Marathi), Ashoka (Bengali), Ashoka (Oriya), Ashok (Punjabi), Asogam (Tamil), Ashoka (Assamese).

Chemical Constituents:

The bark of Saraca indica contains a variety of chemical constituents contributing to its medicinal properties. These include epicatechin, procyanidin P2, 11'-deoxyprocyanidin B, catechin, 24-methyl-cholesta-5-en-3β-ol, 24-ethycholesta-5, 22-dien-33-ol, leucopelargonidin-3-O-β-D-glucoside, leucopelargonidin, and leucocyanidin. In the flower part of the plant, oleic, linoleic, palmitic, and stearic acids are found, along with β-sitosterol, quercetin, kaempferol-3-O-β-D-glucoside, quercetin-3-O-β-D-glucoside, apigenin-7-O-β-D-glucoside, pelargonidin-3,5-diglucoside, cyanidin-3,5-diglucoside, and gallic acid. The seeds and pods also contain oleic, linoleic, palmitic, and stearic acids, as well as catechol, (-)-epicatechol, and leucocyanidin. Moreover, five lignan glycosides (lyoniside, nudiposide, 5-methoxy-9-β-xylopyranosyl-(−)-isolariciresinol, icariside E3, and schizandriside) and three flavonoids (−)-epicatechin, epiafzelechin-(4β→8)-epicatechin, and procyanidin B2, along with β-sitosterol glucoside, have been isolated from the dried bark of the plant. These diverse chemical constituents contribute to Saraca indica's therapeutic potential and its extensive use in traditional medicine systems like Ayurveda and Unani (Pradhan, 2009)

Pharmacological activity



Antimenorrhagic activity

Saraca indica exhibits potent pharmacological activity, particularly in addressing menorrhagic conditions. In Bangladesh, the bark of Saraca indica has been traditionally used to alleviate menorrhagia. Similarly, in India, both the

dried bark and flowers of Saraca indica are administered as a tonic to women with uterine disorders. The stem bark is also employed to treat various menstrual cycle-related disorders. In Sri Lanka, Ashoka bark is utilized for menstrual disorders and menorrhagia. In India, hot water extracts of Saraca indica bark are administered to adult females, exhibiting uterine-stimulating effects akin to ergot but without tonic contractions. Additionally, it is employed as an emmenagogue, uterine sedative, and in preparations for female health issues. In Pakistan, Saraca indica bark is used for uterine afflictions and menorrhagia. The dried bark is utilized as an astringent to control menorrhagia and excessive uterine bleeding, while also providing refrigerant and demulcent effects for uterine disorders and menstrual pain. Studies have reported that the aqueous extract of the bark contains active principles capable of stimulating and relaxing the plain muscle of the guinea pig's ileum. Furthermore, the drug stimulates the uterus, increasing contraction frequency and duration. Crystalline glycoside substances within Saraca indica are also known to stimulate uterine contractions. These findings underscore the therapeutic potential of Saraca indica in addressing various gynecological concerns and menstrual irregularities, highlighting its importance in traditional medicinal practices across different regions.

Uterine tonic activity

Saraca indica demonstrates remarkable uterine tonic activity, making it highly valued in indigenous medicinal systems for its ability to stimulate the endometrium and ovarian tissue. Studies have investigated the estrogenic effects of U-3107, an herbal preparation containing Saraca indica, in both normal and ovariectomized rats. When administered orally as an aqueous suspension over a period of 21 days, U-3107 exhibited estrogenic activity, particularly in rats with functional ovaries. Interestingly, in ovariectomized rats, there was no significant increase in uterine weight, indicating that U-3107's estrogenic effects are dependent on the presence of functional ovaries and do not exhibit progestational activity. U-3107 is formulated with various plant extracts known for their efficacy in managing a range of menstrual disorders, including puberty-related issues, menorrhagia, dysmenorrhagia, premenstrual syndrome, abnormal bleeding, and threatened abortion. This highlights the versatility and therapeutic potential of Saraca indica and its constituents in addressing diverse gynecological concerns, reaffirming its status as a valuable herbal remedy in the realm of women's health.

Antioxytocic activity

Saraca indica has been investigated for its antioxytocic activity, particularly in rat and human isolated uterine preparations. Studies have demonstrated oxytocic activity of the plant, especially in estrogen-primed or gravid uteruses, which showed increased sensitivity to the alcoholic extract. However, the oxytocic action was completely blocked by pentolinium bitartrate. Interestingly, while the seed extract of Saraca indica has shown effectiveness against dermatophytic fungi, in vitro tests on rat uterus preparations did not reveal oxytocic activity. Previous studies on Saraca indica's oxytocic effects have produced mixed results, with some showing negative outcomes and others showing positive ones. These findings suggest the complexity of Saraca indica's pharmacological effects and highlight the need for further research to fully understand its mechanisms of action and potential therapeutic applications, especially concerning its effects on uterine function and oxytocic activity.

Anticancer activity

Saraca indica has demonstrated promising anticancer activity, particularly in its flowers. Studies have identified an anticancer principle within Saraca indica flowers that exhibited 50 percent cytotoxicity in vitro against Dalton's lymphoma ascites and Sarcoma-180 tumor cells. This cytotoxic effect was observed at concentrations of 38 micrograms and 54 micrograms, respectively. Importantly, this activity was selective, as there was no observed cytotoxicity against normal lymphocytes. Furthermore, the anticancer principle displayed preferential activity for lymphocytes derived from leukemia patients. These findings highlight the potential of Saraca indica as a source of anticancer agents, warranting further exploration into its mechanisms of action and potential therapeutic applications in cancer treatment.

Anti-inflammatory activity

The ethanolic extract of Saraca indica leaves has been evaluated for its anti-inflammatory activity. In the assessment of anti-inflammatory properties, the leaves of Saraca indica were tested against Carrageenan-induced paw edema, a commonly used method to screen anti-inflammatory activity in animals. The results demonstrated significant reduction in paw edema upon administration of the ethanolic extract of Saraca indica, with a statistically significant decrease ($P<0.01$). Notably, the plant extract, particularly at a dose of 200 mg/kg, exhibited significant anti-inflammatory activity, resulting in a 56.95% inhibition in the increase of paw volume. Although the effect was of a shorter duration and intensity compared to that of 10 mg/kg diclofenac, it nonetheless underscores the potential of Saraca indica as a natural anti-inflammatory agent. Further research into its mechanisms of action and dosage optimization could enhance its therapeutic utility in managing inflammatory conditions.

Analgesic activity

Analgesic activity has been attributed to extracts derived from Saraca indica leaves. Various leaf extracts, including petroleum ether, chloroform, methanol, and water, were analyzed for their phytoconstituents, such as sterols, glycosides, saponins, carbohydrates, alkaloids, flavonoids, tannins, and proteins. To evaluate analgesic efficacy, the extracts were tested using the tail immersion method and the formalin-induced pain method in albino mice. The analgesic activity exhibited by the petroleum ether, chloroform, methanol, and water extracts showed a dose-dependent response. The formalin test, a principal model for assessing analgesia and comparing with clinical pain, was utilized in the evaluation. In the formalin test, pain in the early phase is attributed to direct stimulation of sensory

nerve fibers by formalin, while in the late phase, pain arises from inflammatory mediators such as histamine, prostaglandins, serotonin, and bradykinins. These findings underscore the potential of Saraca indica leaf extracts as a source of analgesic agents, highlighting their relevance in the management of pain, including inflammatory conditions.

Antiulcer activity

Saraca indica flowers have been utilized in the form of an aqueous suspension to combat gastric ulcers in albino rats. The major constituents found in Saraca indica flowers include saracasin, saracadin, waxy substances, fatty acids, and flavonoids. These compounds collectively contribute to the therapeutic properties of the flowers. Studies have demonstrated that the suspension of Saraca indica flowers exhibits antiulcer potential through various mechanisms. These mechanisms may include the inhibition of basal gastric secretion, stimulation of mucus secretion, and enhancement of endogenous gastric mucosal prostaglandin synthesis. By targeting these pathways, Saraca indica flowers effectively protect against gastric ulcers, offering a natural and potentially effective treatment option for this common gastrointestinal condition.

Antidiabetic activity

The methanolic bark extracts of Saraca indica Linn were investigated for their hypoglycemic effect in both normal and streptozotocin-induced diabetic rats. The study aimed to assess the potential antidiabetic activity of the extract. Administration of the extract at a dose of 400mg/kg via the oral route resulted in a significant hypoglycemic effect. This finding suggests that Saraca indica bark extracts hold promise as a natural remedy for managing diabetes. Further research into its mechanisms of action and optimal dosage regimens could potentially lead to the development of new therapeutic interventions for diabetes mellitus.

CNS depressant activity

Saraca indica leaf extracts, prepared using various solvents such as petroleum ether, chloroform, methanol, and water, have demonstrated CNS depressant activity, with effectiveness varying based on their polarity. To assess this activity, the phenobarbitone-induced sleeping time method was employed, utilizing an actophotometer to measure locomotor activity in mice. Results showed that Saraca indica leaf extract significantly decreased locomotor activity in mice by 67.33%. This suggests the potential of Saraca indica as a natural CNS depressant, warranting further investigation into its specific mechanisms of action and potential therapeutic applications in conditions characterized by CNS hyperactivity.

Immunomodulatory Activity

Saraca indica seed integument has been found to induce apoptosis in human T-lymphocytes, indicating its potential immunomodulatory activity. Within the seed integument, saracin, a lectin, has been identified as a key component. Saracin exhibits mitogenic properties for human lymphocytes, suggesting its role in regulating immune responses. Interestingly, saracin demonstrates a higher affinity for CD8 (+) T cells compared to CD4 (+) T cells, as revealed by fluorescence-activated cell sorting (FACS) analysis. This differential binding pattern highlights the specificity of saracin in targeting certain immune cell populations. Overall, saracin represents an intriguing immunomodulator for the mammalian immune system, warranting further research into its mechanisms of action and potential therapeutic applications in immune-related disorders.

Antipyretic activity

Saraca indica seed was investigated for its antipyretic activity using Brewer's yeast-induced pyrexia in Wistar rats, with oral doses of 300 mg/kg and 500 mg/kg. In comparison to the control group, both dose levels of the research drug and the standard drug aspirin (at 100 mg/kg) demonstrated significant antipyretic activity ($P<0.01$). Particularly noteworthy was the highly significant antipyretic effect observed at the dose of 500 mg/kg. These findings underscore the potential of Saraca indica seed as a natural antipyretic agent, suggesting its possible utility in managing fever and related conditions. Further research could elucidate its mechanisms of action and optimize dosage regimens for therapeutic use.

Cardioprotective activity

The cardioprotective activity of the alcoholic extract of Saraca indica bark was examined against cyclophosphamide-induced cardiotoxicity. Treatment with Saraca indica resulted in a significant reversal ($p<0.05$) of the altered levels of cardiac biomarkers, ECG parameters, oxidative enzymes, and lipid profile induced by cyclophosphamide. Histopathological examination, along with biochemical and ECG analyses, provided further support for the cardioprotective effects of Saraca indica. These beneficial effects are believed to be attributed to its antioxidant activity. These findings suggest the potential of Saraca indica bark extract as a protective agent against cyclophosphamide-induced cardiotoxicity, highlighting its possible therapeutic application in the prevention or management of cardiovascular diseases. Further research may be warranted to elucidate the underlying mechanisms and optimize its clinical use.

Anthelmintic activity:

The anthelmintic potential of Saraca indica leaves extract has been investigated through both maceration and Soxhlet extraction methods, utilizing solvents such as ethanol and methanol. Each extract underwent testing for anthelmintic activity using standard procedures. Suspensions obtained from both maceration and Soxhlet methods were prepared in DMSO to achieve concentrations of 1%, 2.5%, and 5%. Additionally, standard concentrations of the anthelmintic drug Piperazine citrate were prepared as positive controls, while negative controls were also established. Two milliliters of each concentration of both the methanolic and ethanolic fractions, along with Piperazine citrate, were

diluted to 10ml independently with normal saline and poured into petri dishes.

Nine groups, each containing approximately an equal number of earthworms (six in each group), were released into the respective petri dishes. The results indicated that both the ethanolic and methanolic extracts exhibited stronger anthelmintic activity compared to the positive control. This heightened activity could be attributed to the presence of phytochemical constituents such as glycosides, alkaloids, tannins, flavonoids, and terpenoids within the ethanolic and methanolic extracts. These findings suggest the potential of Saraca indica leaves as a source of natural anthelmintic agents, with further research warranted to elucidate its mechanism of action and therapeutic potential.

Antioxidant activity

studies have demonstrated the antioxidant potential of Saraca indica bark extracts, including ethanolic, hydroalcoholic, and acetone extracts. Panchawat and Sisodia investigated the in vitro antioxidant activity of Saraca indica stem bark using the DPPH (1,1-diphenyl-2-picrylhydrazyl) model, attributing the observed antioxidant properties to its high phenolic content.

Furthermore, evaluation of petroleum ether, chloroform, and methanolic extracts of Saraca indica leaves demonstrated significant antioxidant and antihyperglycemic activity in streptozotocin-induced diabetic mice. This study highlighted the extract's ability to lower blood glucose levels and its antioxidant efficacy in scavenging DPPH and H2O radicals.

A comparative study between Saraca indica and Pterospermum acerifolium, along with ascorbic acid, assessed their dose-dependent antioxidant activity using the in vitro DPPH model. The processed extracts of Saraca indica and Pterospermum acerifolium exhibited notable antioxidant properties.

Moreover, investigations into the cardioprotective effects of Saraca indica against cyclophosphamide-induced cardiotoxicity in rats revealed its ability to mitigate free radical-induced membrane injury. Biochemical, ECG, and histopathology reports provided evidence supporting the cardioprotective effects of Saraca indica, attributed in part to its antioxidant activity. These findings collectively underscore the potential therapeutic benefits of Saraca indica as a natural antioxidant agent, warranting further exploration for clinical applications.

2.Conclusions

In conclusion, the extensive medicinal properties attributed to Saraca indica underscore its significance as a valuable botanical resource. Particularly noteworthy is its role in addressing various female disorders, positioning it as a pivotal plant in traditional medicine. Stem bark extracts, enriched with glycosides, flavonoids, tannins, saponins, esters, and primary alcohols, form the cornerstone of its therapeutic applications.

Saraca indica has long been utilized in treating women's health issues such as menorrhagia, leucorrhoea, bleeding hemorrhoids, and dysfunctional uterine bleeding, among others. This rich history of traditional use highlights its efficacy and relevance in addressing a spectrum of female-specific ailments. Given its multifaceted therapeutic potential, Saraca indica stands as a compelling subject for further exploration and integration into modern medical practices aimed at enhancing women's health and well-being.

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