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SARACA ASOCA: A COMPREHENSIVE REVIEW ON ASHOKA TREE

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Abstract: Saraca asoca, also known as the Ashoka tree, is a plant species native to South Asia. It is frequently planted on temple grounds and other hallowed locations as it is a sacred tree in Buddhism and Hinduism. The tree is well-known for both its therapeutic qualities and lovely blossoms. to carry out a comprehensive assessment of the medicinal potential of seeds, encompassing preliminary phytochemical screening, physiochemical analysis, macroscopic and microscopic characterisation, and experimental antipyretic efficacy. The pharmacognocal, phytochemical, and other suggested techniques for standardizations of Saraca asoca seed were examined. Additionally, utilizing Brewer's yeast-induced pyrexia in Wistar rats, the acetone extract of the seeds was assessed for acute toxicity and antipyretic efficacy at oral dosages of 300 mg/kg and 500 mg/kg. Following phytochemical screening, saponin, tannins, and flavonoids that prevent pyrexia were found in the acetone extract. When compared to the control group, the therapeutic effectiveness attained at both the dosage levels of the study medication and the conventional treatment aspirin (100 mg/kg) demonstrated considerable ($P<0.01$) antipyretic action. It was also discovered that the extremely strong antipyretic effect that was seen at the 500 mg/kg dosage was naturally occurring. Rats administered 500 mg/kg of the acetone extract had noteworthy antipyretic effects when the usual pharmacognostical and phytochemical procedures were followed.

Keywords: Antipyretic, Saraca asoca, Seed, Pharmacognosy, Acetone extract.

2. INTRODUCTION

Herbal medications are used by many medical therapies to treat their patients due to their remarkable effect; yet, the mechanism of action of these medicines is not well understood. Since many ingredients in Ayurvedic medicine have several mechanisms of action, they are regarded vital for the necessary holistic effect, hence for ages, herbal extracts have been employed in place of purified chemicals. One of the most fabled and revered trees in India, Ashoka has been used from ancient times[1]–[3]. The Ashoka tree, sometimes called Saraca asoca (Roxb.) or Saraca indica, is a member of the Caesalpiniaceae family and is widely distributed across India, particularly in Kerala, West Bengal, southern India, and the Himalayas up to

750 meters in elevation. The tree is a tiny, spreading evergreen that grows to a height of 7 to 10 meters. Its bark has a warty surface and is dark brown or almost gray. Its foliage is aromatic and polygamous apetalous, with leaves that are 15-20 cm long and 6–12 cm long, rectangular, and stiffly subcoriaceous[5–6].

The blooms are yellowish orange in color before becoming crimson. It has been observed that the stem bark of S. asoca contains glycosides, flavonoids, tannins, and saponins[4],[7]. It functions as an antimicrobial, uterotonic, spasmogenic, oxytocic, and antidysentric agent[5],[8]. Moreover, antiprogestational and antioestrogenic properties against menorrhagia have been reported[4]. Despite the fact that many of this plant's seeds are easily discovered strewn about close to the trees and are not used for any specific purpose, a thorough search of the literature turns up no appropriate research on the pharmacological activity of the seeds. Therefore, the current study is to evaluate the acetone extract of S. asoca seeds pharmacognosically, ascertain physiochemical parameters, conduct a preliminary phytochemical screening, and determine the antipyretic activity of the extract.

3. MATERIALS AND METHODS

3.1. Collection and identification of plant material

The seeds of S. asoca were gathered from the State Government Herbal Garden in Kalyani, West Bengal, India, and the Narendrapur Ramakrishna Mission's medicinal plant garden in Kolkata. The seeds were identified at the Botanical Survey of India, Howrah, India, using Sample Registration No. (AS-01) and Reference No. BSI/CNH/AD/Tech./2010. For future usage, a genuine herbarium specimen was placed at the Department of Dravyaguna, IPGAE&R, Kolkata, India, herbarium museum.

3.2. Chemicals

The supplier of aspirin was NICE Chem. Pvt. Ltd. in Cochin, India. All of the chemicals employed in the various tests, including sodium hydroxide, ferric chloride, and gallic acid, were of analytical grade.

3.3. Processing and solvent extraction

After carefully cleaning and washing the seeds to get rid of any unnecessary material, they were left to dry for around 20 days in the sun. After being sun-dried whole, the seeds were ground into a powder using a Hammer mill and sieved using a #40 mesh screen. For experimental reasons, powdered substance was kept in airtight containers and maintained appropriately. The study drug's powder was then successively

extracted using a Soxhlet's extractor in petroleum ether (60–80 °C), chloroform, acetone, methanol, and water before being filtered. To produce semi-solid mass, the extract was concentrated under vacuum in a rotary evaporator. This was kept in a refrigerator at or below 10 °C for use in later studies after being further dried in a vacuum oven drier to produce a solid residue.

3.4. Animals

For in-vivo testing, albino (Wistar) rats of either sex and Swiss albino mice of either sex weighing between 120 and 150 g were utilized. All of the animals were purchased from M/s Ghosh Scientific, Kolkata, a breeder licensed by the West Bengal government. They were kept in the animal home of IPGAE&R, which is registered with the CPCSEA (Reg. No. 1180/ac/08/CPCSEA dated 27.03.08), under standard environmental conditions with regulated 12-hour light/dark cycles. The animals had unlimited access to food and drink while being housed in typical polypropylene cages. Before any studies were conducted, these animals were allowed to acclimate for a duration of fourteen days. The Institutional Animal Ethical Committee gave its approval to all experimental protocols.

3.5. Pharmacognostic study

We collected fresh seeds that were verified by the Botanical Survey of India in order to conduct histological and morphological analyses. In the Dravyaguna section of IPGAE&R, coarse powder (#40 mesh) was employed in accordance with established protocols to determine several pharmacognostical (macroscopic and microscopic) characteristics[9],[10].

3.6. Physiochemical parameters and preliminary phytochemical screening

Using accepted techniques, several physiochemical parameters of the powdered seeds (such as moisture content, ash values, extractive values, total phenolic content, saponification value, etc.) were estimated[11]–[13]. Under visible and UV (254 and 365 nm) lighting, the powdered material's fluorescence was analyzed[14],[15]. The existence of several phytoconstituents was next ascertained by putting the acetone extract of the seeds through a series of qualitative tests[16],[17].

3.7. Acute toxicity test

In accordance with OECD guideline 423, an acute toxicity investigation of the acetone extract of S. asoca seeds was conducted on healthy Swiss albino mice[18]. Each of the five groups including six mice received a single oral dosage of the extract at a dosage of 100 mg, 300 mg, 500 mg, 700 mg, and 1,000 mg/kg body weight, respectively. For a total of 14 days, these groups were watched for any indications of toxic symptoms, behavioral abnormalities, difficulty moving, convulsions, and death for 1, 2, 4, 8, and 24 hours. Their activity levels and behavioral habits were carefully observed and recorded during this time[19].

3.8. Antipyretic activity

Wistar rats were given pyrexia caused by Brewer's yeast, and the antipyretic activity was evaluated using the protocol outlined by Loux et al. [20]. Prior to the trial, rats were given unlimited water during an overnight fast. Using a digital tele-thermometer (IMCORP, Ambala, India), the average body temperature of every animal was recorded. The animal's dorsum was subcutaneously injected with 10% w/v Brewer's yeast (10 mL/kg) suspended in normal saline to produce pyrexia. Through experimental trials, it was shown that the peak pyrexia occurred eighteen hours after the yeast was administered. The study included animals whose rectal temperatures had increased by at least 1 °C. When the pyrexia reached its climax, the medications were taken orally. The standard group (group II) got aspirin (100 mg/kg), the research groups (group III and IV) received the research medicine at dosages of 300 mg/kg and 500 mg/kg, respectively, and the control group (group I) received 5% gum acacia. After the medicine was administered, the rectal temperature was taken every 1, 2, 3, 4, and 5 hours.

3.9. Statistical analysis

A one-way ANOVA was used to statistically assess the data, and Dunnet's t test was then used to compare each group individually to the control group[19], [21]. The findings were presented as Mean±SEM, with statistical significance denoted by $P<0.01$.

4. RESULTS

4.1. Macroscopic characteristics

The 6–10 inch long legumes of S. asoca have 4–8 gray, dicotyledonous seeds that resemble chestnuts. The seeds are smooth-surfaced, ellipsoid-oblong, compressed, and measure 3–5 cm in length with an average diameter of 8–9 cm. While sun-dried seeds have a smooth, firm texture and dark brown color, the seed coating is brown or somewhat black in hue. The seed's coarse powder has a light brown hue, a pleasant scent, and a somewhat sweet flavor.

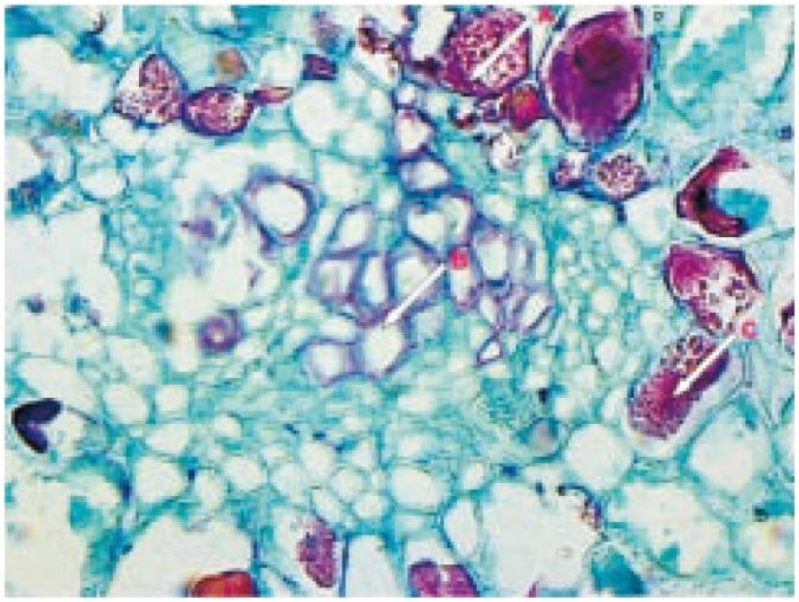

Figure 1: T.S. of S. asoca seed.

4.2. Microscopic characteristics

A very thin membranous aril made up of many layers of parenchymatous and collenchymatous cells with vessels, starch grains, prismatic crystals, and other elements is seen in the seed (Figure 1). The fine powder was dyed with various chemicals and mounted in glycerin. The existence of tannin-containing cells, stone cells, crystals, endospermic cells, starch grains, capillaries, etc. was observed under a microscope at Dewinter, Italy.

4.3. Physiochemical parameters

For the purpose of standardization, many physiochemical parameters were measured, including total solids (93.5%), moisture content (6.5%), total ash (6.7%), water soluble ash (6.0%), and acid insoluble ash (0.7%). The seed oil's saponification value was determined to be 145 mg KOH/g of oil. It was also determined what each extract's extractive value was. The extractives soluble in petroleum ether were 0.18% w/w, soluble in chloroform was 0.05% w/w, soluble in acetone was 1.27% w/w, soluble in methanol was 3.22% w/w, and soluble in water was 0.63% w/w. Fluorescence examination was performed on the powdered seeds in accordance with standard protocol (Table 1). Using the absorbance calibration curve created with various

gallic acid concentrations, the total phenolic content of 100 mg powdered S. asoca seeds was calculated to be equal to 3.7 mg of gallic acid.

Table 1*: Fluorescence analysis of S. asoca seed powder.*

Reagent	Normal light	UV 254 nm	UV 365 nm
1M Sodium hydroxide	Light brown	Dark brown	Violet
Acetic acid	Light brown	Light brown	Light brown
1M Hydrochloric acid	Brown	Greenish brown	Dark greenish brown
dil. Nitric acid	Brown	Greenish brown	Dark green
5% Iodine	Blackish brown	Greenish brown	Black
5% Ferric chloride	Blackish brown	Black	Black
Methanol	Light brown	Light green	Olive green
50% Nitric acid	Orange	Green	Dark green
1M Sulphuric acid	Light yellow	Light green	Olive green
dil. Ammonia	Orange	Green	Dark green
Sodium hydroxide in MeOH	Brown	Green	Olive green

4.4. Preliminary phytochemical screening

Using conventional chemical techniques, a preliminary phytochemical study of the extracts showed the presence of carbohydrates, flavonoids, polyphenols, tannins, and saponins.

4.5. Pharmacological study

Acute toxicity study

During the acute toxicity trial utilizing the acetone extract, no indications of toxic symptoms were found following oral administration of a dosage up to 1,000 mg/kg.

Antipyretic activity

When tested on rats with yeast-induced pyrexia, the acetone extract of S. asoca seeds shown a strong antipyretic activity at both dosage levels (300 mg/kg and 500 mg/kg). When compared to the control group, the extract's antipyretic efficacy was determined to be extremely significant and dosage dependent. Compared to the standard medicine and the research drug at a dose of 300 mg/kg, the antipyretic effect, which lasted for five hours, was shown at a dose of 500 mg/kg of the drug. In terms of percentage decrease, the research drug's 500 mg/kg dosage of pyrexia inhibition was considerably .

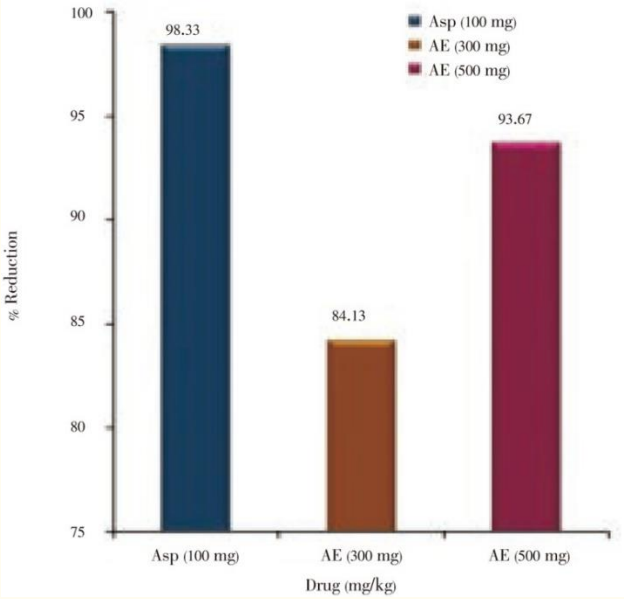

Figure 2: ***Percentage reduction of rectal temperature of aspirin and acetone extracts of the seeds of Saraca asoca.***

Asp: Aspirin; AE: Acetone extract.

5. CONCLUSION

Standardization is critical for the management of quality, the evaluation of purity, and the identification of any sample. The current study examined the pharmacognostic investigation, physiochemical analysis, toxicity assessment, and antipyretic effect of S. asoca seeds on rats. Pharmacological effectiveness of a medicine is established and its standardization depends heavily on pharmacognostical investigations and the measurement of several physiochemical parameters. As a result, these investigations aid in the identification and verification of the plant material[22]–24. Based on the phytoconstituents found in the seed, the antipyretic effect of the acetone extract of the seed was also assessed. Fever might be brought on by an infection, inflammation, transplant rejection, tissue injury, or other conditions. The body's natural process is to provide an environment that makes it impossible for pathogens or injured tissues to thrive. Pathogenic fever is the term for fever caused by yeast. Prostaglandin synthesis, which raises the temperature of the thermoregulatory center, is one of its etiologies. By preventing PgE2 production, the majority of antipyretic medications, such as aspirin and paracetamol, suppress COX-2 expression and lower body temperature[28]–[32].

The current study's findings show that there is no toxic effect up to the drug's maximum dose of 1,000 mg/kg during an acute toxicity study. Additionally, acetone extract from S. asoca seeds was found to have a significant ($P<0.01$) antipyretic effect in yeast-provoked elevation of body temperature, especially at 500 mg/kg when compared to the standard drug aspirin at 100 mg/kg. Aspirin (100 mg/kg) and the research medication (300 mg/kg) showed their effects on pyrexia for up to 4 hours, whereas the research drug, at 500 mg/kg, inhibited it for up to 5 hours. In the same way, the temperature drop at the 500 mg/kg dosage level (92.30%) was very similar to the impact of the aspirin standard medicine (98.01%). Therefore, our study drug's reduction of prostaglandin production in rats with yeast-induced pyrexia may be the same mechanism as aspirin's antipyretic activity.

Since flavonoids often have antipyretic, analgesic, and anti-inflammatory characteristics, their presence may be responsible for the antipyretic action of certain plant species[33]–[36]. High concentrations of flavonoids and tannins are among the several phytoconstituents found in the acetone extract of S. asoca seeds.

Therefore, the seed extract's antipyretic action might be attributed to these bioactive ingredients. This study medication has potential applications as an effective, affordable, non-toxic, and natural antipyretic. It is widely recognized that the pathophysiology of fever is mediated by several mediators or multi-processes, and that blocking any one of these mediators may have an antipyretic effect. It is thus necessary to do more research on additional significant pharmacological actions in addition to isolating and characterizing the active principle ingredients that are accountable for the antipyretic activity that has been reported.

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