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A review study on some medicinal uses of *Abrus precatorius* L.

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Abstract

One of the main herbs in the Fabaceae family, *Abrus precatorius*, is also referred to as Indian liquorice. According to reports, it has a wide range of therapeutic effects, including anti-inflammatory, anti-spasmodic, anti-bacterial, anti-fungal, anti-tumor, analgesic, anti-diabetic, anti-serotonergic, and anti-migraine properties. It is also used to treat inflammation, ulcers, wounds, throat scratches, and sores. Although more information needs to be updated, it is now regarded as a valuable source of distinctive natural ingredients for the development of industrial products as well as medications against various ailments. Thus, the goal of the current review is to gather the most recent information while emphasizing the unique aspects of its therapeutic properties for a range of illnesses.

Key words : *Abrus precatorius,* Medicinal Use, Ethnobotany.

Nowadays, more individuals trust traditional medicine, like Ayurveda, than they do commercially available synthetic medications. Traditional medicine includes ancient, natural health care, tribal customs, Ayurveda, Sidha, and Unani. For many decades, the people of this subcontinent have been practicing ayurveda medicine. According to the traditional medical system, medicinal plants are crucial for human health care. Nearly 80% of the world's population uses herbs, which are the basis for the majority of traditional remedies. *Abrus precatorius* L., also known as Ratti or Gumchi in Hindi, is a native plant of the East and West Indies as well as the Indian subcontinent. It belongs to the family Leguminoseae and subfamily Papalionaceae. In the ayurvedic medical system, plant parts like leaf extracts are used to treat leucoderma, abrin-containing seeds are used as purgatives and abortives, and root extracts are used to treat coughs.

Ethnobotanical uses of *Abrus precatorius :*

A. precatorius L. has long been used to treat and prevent rabies and tetanus. Some traditional medical practices advise using the herb to treat leucoderma, scratches, sores, and wounds caused by mice, cats, and dogs[7]. The

herb has significant therapeutic benefits and is extensively used in Ayurvedic formulations. According to Ayurveda, gunja should only be consumed following Shodhana, or the purification procedure, which involves the use of various media like Godugdha (cow's milk), Kanji (sour gruel), etc. Some traditional practitioners purify gunja seeds using *Nimba swarasa* (lemon juice) in addition to traditional methods[19].

The roots are used to treat jaundice and hemoglobinuric bile. In addition to treating stomach discomfort and tumours, root paste is used for abortion. As a treatment for snake bites, chewing roots works. Hepatitis and bronchitis are treated with dried root decoction. Fresh root extracted in hot water possesses anti-malarial and anti-convulsant qualities. It is used to treat fractures in veterinary medicine. In addition to being used to treat worm diseases, seeds have the potential to be potent insecticides and antibacterial agents. Many African tribes utilize powdered seeds as oral contraceptives. Additionally, it is used to treat tuberculosis and uncomfortable swellings.

Charming seeds have beautiful colours, are used to produce jeweler, and are especially appealing to children. Purgative, emetic, tonic, antiphlogistic, aphrodisiac, and anti-ophthalmic actions are among the qualities of seeds. Although seeds are quite toxic, boiling is said to make them toxic. In some parts of India, people eat boiling seeds because they are nutrient-dense. Because seeds consistently weigh one tenth of a gramme, they are used as a weighing unit. According to Garaniya and Bapodra[7], leaves are used in Ayurvedic medicine as a laxative, expectorant, and aphrodiasic. They are also used to treat urticaria, eczema, stomatitis, conjunctivitis, alopecia areata, migraines, dysmenorrhea, lymphomas, and leukaemia. Additionally, leaves are chewed as a mouth refresher and used as a pan ingredient[6]. In China, *A. precatorius* is used as a folk remedy to treat hepatitis, laryngitis, and bronchitis[17].

Therapeutic uses :

Numerous studies have provided experimental evidence for *A. precatorius* medicinal uses and other health claims.

Antioxidant activity :

Using a variety of antioxidant assays, Gul *et al*.,[8] investigated the antioxidant activity of many leaf extracts, including hexane extract (APH), ethyl acetate extract (APE), ethanol extract (APA), and water extract (APW). The findings showed that the level of free radical scavenging activity varied among the extracts. The highest DPPH radical scavenging activity was demonstrated by APE and APW extracts, whereas the maximum scavenging activity was demonstrated by APE and APA extracts for OH• and H_2O_2 radicals, respectively. Furthermore, APE extract was able to scavenge the greatest superoxide radical. Jain *et al*. conducted a study of a similar nature in 2015, and positive results were obtained. The antioxidant properties of *A. precatorius* leaves have also been demonstrated by numerous other researchers[17,24].

Antimicrobial activity :

Different sections of A. precatorius were tested for their antimicrobial activity

Fig. 1. *Abrus precatorius* L.

against a variety of gram-positive and gram-negative bacteria as well as certain fungi. Mistry *et al*.[13] first tested the antibacterial properties of petroleum ether and methanolic extracts of leaf, root, and seed parts against a variety of microorganisms; only the root extracts produced favourable results. Additionally, Alli *et al*.[1] discovered that methanolic and aqueous leaf extracts had moderate antibacterial activity against *Salmonella typhi* (*S. typhi*), *Escherichia coli* (*E. coli*), *Bacillus subtilis* (*B. subtilis*), and *Pseudomonas aeruginosa* (*P. aeruginosa*). The antibacterial testing of *A. precatorius's* methanolic aqueous extract against a wide variety of bacteria was recently evaluated by Alayande and colleagues in 2017. The findings demonstrated significant efficacy against every gram-positive and gram-negative bacterium that was examined.

Anti-cancer activity :

In 2013, Sofi and colleagues observed that inducing apoptosis has an inhibitory effect on the proliferation of the breast cancer cell line (MDA-MB-231). However, using ethyl acetate and ethanol extracts of *A. precatorius* leaves, Gul *et al*.[8] demonstrated antiproliferative activity against four distinct human tumour cell lines: retinoblastoma cancer cells (Y79), colon adenocarcinoma cells (Colo-205), hepatocellular carcinoma cells (HepG2), and leukaemia cells (SupT1). They appeared to be able to prevent tested human cancer cell lines from surviving. Ethanolic and ethyl acetate extracts were also used in a cytotoxic

investigation employing the MTT technique in mouse peritoneal macrophages.

According to the results, plant extracts had little inhibitory impact, were almost harmless to peritoneal macrophage cell multiplication, and reduced cell survivability only slightly. When *A. precatorius* aqueous extract was tested against a mastocytoma tumour cell line, a weak in vitro anticancer activity (IC_{50} = 200µg/ml) was observed[12]. Additionally, cytotoxicity testing has been carried out using the Brine Shrimp Lethality Test (BSLT). *A. precatorius* was recommended for use in chemotherapeutics after data analysis revealed the toxicity of the methanolic extract[2]. According to Naduchamy *et al*.[16], *precatorius* were non-toxic to normal cell lines but cytotoxic to neuroblastoma cell lines.

Anti-inflammatory activity :

The Wistar albino rat model was used to determine the anti-inflammatory efficacy of *A. precatorius* extracts. Two triterpenoid saponins were extracted from the aerial parts of *A. precatorius*, and their acetate derivatives were tested for anti-inflammatory activity using the croton oil ear model[3]. The results indicated that the acetate derivatives had higher anti-inflammatory activity.

Additionally, studies conducted by Georgewill and Georgewill[9] demonstrated that *A. precatorius* water extract had anti-inflammatory properties and significantly reduced (67.10 + 2%) rat ear inflammation. In 2013, Khadse *et al*.[11] evaluated the anti-inflammatory properties of several methanolic extract fractions in rat paw oedema produced by carrageenan. The results show that at 400 mg/kg body weight, the methanol: water (9:1 v/v) fraction (FR-II) and the methanol: water (1:9 v/v) fraction (FR-III) significantly inhibited rat paw oedema at the end of 4 hours, by 51.92% and 46.34%, respectively.

Anti-diabetic activity :

Rabbits with alloxan-induced diabetes were used to test the extract from *A. precatorius* seeds' ability to prevent diabetes in vivo. The drop in blood sugar levels indicates that the extract containing trigonelline has anti-diabetic properties (Monago and Nwodo, 2010). Additionally, alloxan monohydrate-induced diabetic rats were used to evaluate the in vivo anti-diabetic potential[20]. Serum glucose and liver glycogen levels were assessed in this investigation following treatment with the isolated lectin from *A. precatorius* seed extract. The anti-diabetic potential of *A. precatorius* leaf extract on the specific activities of α-glucosidase and α-amylase was investigated *in vitro* by Alayande *et al*.[2] in 2017.

The results showed that at both the lowest and maximum concentrations tested, the extract significantly ($p<0.05$) inhibited the activity of the enzyme. Consequently, the extract could be considered a potential source of novel lead molecule or compounds for the development of new oral diabetic drugs. In dexamethasone-induced insulin-resistant mice, Boggula *et al*.[5] found that a chloroform extract of *A. precatorius* leaves shown strong anti-diabetic effects. They also suggested using *A. precatorius* leaves in medication formulation to treat illnesses.

Anthelmintic activity :

In *Caenorhabditis elegans*, aqueous seed extract showed a moderate level of activity. An aqueous extract of *A. precatorius's* stem and root was also tested for its anthelmintic properties. While extracts of the roots (0.6 mg/ml) and stems (1.5 mg/ml) had the highest results against Schistosomules, the observation revealed a deadly effect against cestodes[21].

Anti-ulcer activity :

Treatment with leaf extract was found to significantly improve rats' stomach ulcers caused by acetic acid[15]. Additionally, female wistar rats were tested for stomach ulcers caused by ethanol and hydrochloric acid using an ethyl acetate extract of *A. precatorius* seeds. Standard procedures were used to measure the messenger ribonucleic acid (mRNA) expression, histological alterations, and stomach ulceration score. According to the results, the extract's antiulcer activity is described to its ability to reduce inflammatory reactions[18].

Nephroprotective activity :

After cisplatin and acetaminophen were administered to the HEK 293 cell line, the aqueous leaf extract of *A. precatorius* was examined to determine the healing effect. *A. precatorius* had the best amelioration effect, according to the assay, and can be used to prevent or treat renal diseases[23].

Neuroprotective effect :

The neuroprotective effects of petroleum ether extract from aerial parts of *A. precatorius* at different concentrations (100 mg/ml and 200 mg/ml kg body weight) were assessed using a rat model with hypoxic neurotoxicity. In comparison to hypoxic rats, the extract markedly improved spatial behaviour at the tested dose levels. Glutamate, dopamine, and acetylcholinesterase levels that have been decreased can be restored when the extract is taken orally[4].

In light of the aforementioned, the current study was started in order to carry out thorough investigations into the phytochemistry and therapeutic potential of toxic medicinal plants that involve biological shapes. In order to improve health, the current work aims to separate and characterize bioactive compounds utilizing hyphenated analytical techniques that incorporate herbal studies into pharmaceuticals. Additionally, the study focused on filling in the knowledge gap about the genetic diversity of *A. precatorius* in the Indian state of Gujarat.

The use of plants, or herbs, to treat illness and improve health is known as herbal medicine. Anxiety, arthritis, depression, high blood pressure, insomnia, hormone imbalances, migraines, skin conditions including dermatitis, and other conditions are all treated using herbal medication. There are numerous medications that are regarded as traditional medicine and have gained entry into the global market through the investigation of ethno-pharmacological activity. This review reveals that *A. precatorius* is a unique and adaptable plant due to its many medicinal qualities, including antidiabetic, neuro-protective, antibacterial, analgesic, and

others. It is also an exclusive source of several essential phytochemicals. Consequently, there has been a new demand for thorough investigation on this highly therapeutic plant material. Utilising *Abrus precatorius*'s therapeutic potential to fight against a variety of illnesses is long overdue. Because of its strong potential for pharmacognostical and pharmacological applications, *Abrus precatorius* is a good option as a multipurpose medicinal agent, according to the analysis of the literature gathered above.

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