Review Article

Therapeutic Uses of *Abrus precatorius*: A Review

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ABSTRACT

Herbal medicines referred to as botanical medicine or phytomedicine is defined as the use of whole plant or part of plants to prevent or treat illness. India is one of the most medico culturally diverse countries in the world where the medicinal plant sector is part of a time-honored tradition that is respected even today. Here, the main traditional systems of medicine include Ayurveda, Unani & Siddha. Abrus precatorius leaf commonly known as Indian Liorice, has been used in folk remedies by Tribes for over many years, and is reported to have a broad range of therapeutic effects, like antibacterial, antifungal, antitumor, analgesic, anti-inflammatory, antispasmodic, anti-diabetic, antiserotonergic, anti-migraine, including treatment of inflammation, ulcers, wounds, throat scratches and sores. It is now considered as a valuable source of unique natural products for development of medicines against various diseases and also for the development of industrial products. Hence, an attempt has been made to address a bird's eye view mainly on the phytochemistry and pharmacological activities of leaf of Abrus precatorius.

Keywords: *Abrus precatorius,* Phytochemistry, Pharmacology.

INTRODUCTION

The search for new pharmacologically active agents from natural resources, such as plants, animals and microbes led to discovery of many clinically useful drugs over the past two decades. *Abrus precatorius* plant has been used in Hindu medicine from very early times, as well as in China and other ancient cultures. In certain tribal regions people chew leaf of *Abrus precatorius* for the relief of the month ulcer[1]. It also contains tri-terpenoid saponins and used in the treatment of inflammation, ulcers, wounds, throat scratches and sores.

Plants are rich in a wide variety of secondary metabolites such as tannins, alkaloids and flavonoids, which have been found in vitro to have antimicrobial properties. For thousands of years, natural products have been used in traditional medicine all over the world and predate the introduction of antibiotics and other modern drugs[2]. The antimicrobial efficacy tribute to some plants in treating diseases has been beyond belief. It is estimated that local communities have

used about 10% of all flowering plants on Earth to treat various infections, although only 1% have gained recognition by modern scientists[3].

Abrus precatorius is belongs to family fabaceae. It grows in tropical climates such as India, Sri Lanka, Thailand, the Philippine Islands, South China, tropica Africa and the West Indies. It also grows in all tropical or subtropical areas. The most poisonous part of the plant is the seed. The seed contains the toxic poison abrin which is close relative to ricin. Ingested seeds can affect the gastrointestinal tract, the liver, spleen, kidney, and the lymphatic system. Infusion of seed extracts can cause eye damage after contact. The most poisonous parts of the plant involved in poisoning are the small, scarlet seeds that have a black eye at the hilum. The roots, stems, and leaves also contain glycyrrhizin. The seeds were also used to treat diabetes and chronic nephritis. The plant is also used in some traditional medicine to treat scratches and sores, and wounds caused by dogs, cats and mice and are also used with other ingredients to treat leucoderma. They are ground with lime and applied on acne sores, boils, and abscesses. The plant is also traditionally used to treat tetanus, and to prevent rabies. Various African tribes use powdered seeds as oral contraceptives[4]. Boiled seeds of A. precatorius are eaten in certain parts of India. The objective of this research was to evaluate the potentiality of A. precatorius on standard microorganism strain and clinically important bacteria[5].

Botanical Description

High-climbing, twining, or trailing woody vine with slender herbaceous branches. Leaves alternate, petioled, 5-13 cm (2-5 in) long, even-pinnately compound with 5-15 pairs of leaflets, these oval to oblong, to 1.8 cm (< 1 in) long, with margins entire. Flowers shaped like pea flowers, white to pink or reddish, small, in shortstalked dense clusters at leaf axils. Fruit a short, oblong pod, splitting before falling to reveal 3-8 shiny hard seeds, 6-7 mm (< 1 in) long, scarlet with black bases.

Class:	Magnoliopsida
Order:	Fabales
Family:	Fabaceae (Leguminosae)
Common Names:	Rosary pea, crab's eyes, precatory pea, licorice vine
Origin:	India, and perhaps other parts of tropical Asia

Chemical constituents

Seed - The seeds contain toxic protein; abrusic acid, abrine alkaloid, abraline a glucoside; haemaglutannin, some urease and glycine-like active abrin albuminoid. Seeds potency gets inerted when they are boiled.

Root – The roots contain glycyrrhizin 15 percent and glycerol B present.

Leaf – The leaves contain glycyrrhizin 10 percent and abrin.

Seed coat - The seeds coat contains a red colouring substance.

THERAPEUTIC USES

Antibacterial Activity

Seven bacterial strains has been isolated from the soil named Escherichia coli, Pseudomonas aeruginosa, Salmonella typhi, Salmonella paratyphi A, Salmonella paratyphi B, Klebsiela pneumonia and Staphylococcus aureus. Antimicrobial activity of different parts of *A. precatorius* like roots, seeds and leaves were studied against all above mentioned bacterial strains[6]. Root extract of *A. precatorius* was found to be active against the Gram positive organism Staphylococcus aureus. Root extracts possess good antibacterial potential particularly against Staphylococcus aureus. The Minimum Inhibitory Concentration (MIC) of the Petroleum ether extract against Staphlococcus aureus was found to be 0.44 mg/ml (440 µg/ml) and of Methanolic extract was found to be 0.40 mg/ml (400 µg/ml) against same. It was considered that if the extracts displayed an MIC less than 100 µg/ml, the antimicrobial activity was good; from 100 to 500 µg/ml the antimicrobial activity was moderate; from 500 to 1000 µg/ml the antimicrobial activity was weak; over 1000 µg/ml the extract was considered inactive. Thus, the antimicrobial activity of the root extract is moderate.

Diuretic activity

The diuretic activity was studied in male rats after oral administration of ethanol/water (1:1) extract of the aerial parts at a dose of 250 mg/kg and showed non-significant results. Another study was investigated in Sprague dawley wistar rats induced renal damage when orally administered alcohol (1.6g/kg). The crude extract (200mg/kg) in addition to alcohol for six weeks with normal feeds and water showed decrease significant elevation of potassium, sodium, creatinine and malondialdehyde in serum levels. Histological studies confirmed with structural alterations in renal tubules, glomerular infiltration when compared with chronic inflammatory cells induced renal damage by alcohol. Concurrent administration of same doses of alcohol and seed extract of Abrus precatorius resulted in a suppression of alcohol induced renal injury. Measurement of malondialdehyde level indicated that this effect is related to the attenuation of alcohol induced lipid peroxidation by the seed extract ($p<0.05$). It was concluded that seed extract of Abrus precatorius could protect the kidney against alcohol-induced parenchymal injury[7].

Nephroprotective activity

Arial parts of aqueous extract were investigated to determine the recovery effect after administration of cisplatin and acetaminophen induced nephrotoxicity on HEK 293. The assay showed that Abrus precatorius had best recovery effect and can be used for the prevention or treatment of renal disorders[8].

Neuroprotective effect

The neuroprotective effects of petroleum ether extract from aerial parts of Abrus precatorius Linn at different concentration (100 mg/kg and 200 mg/kg) was evaluated in hypoxic neurotoxicity induced rats. The extract at tested doses promoted spatial behavior significantly when compared with hypoxic rats[9]. The extract restored the decreased levels of enzymes such as glutamate, dopamine and acetylcholinesterases, showing neuroprotective effects when given orally.

Memory enhancer activity

Abrus precatorius has been studied in Alzheimer's disease model by identification of glycohistochemically the microglial cells (MGC) activation in autoptic brain samples. Abrus precatorius agglutinin recognizes MGC in the cerebral white matter showed rod-like cells and appear to be particularly dense in those areas proximal to an oligodendroglial cell. Active constitutent lectin from Abrus precatorius plant has been used to histochemically identify the microglial cells activation in autopic brain samples from Alzheimer's disease subjects[10].

Anti-diabetic activity

The anti-diabetic effect of chloroform–methanol extract of *A. precatorius seed* (50mg/kg) was studied in alloxan diabetic rabbits. The percentage reduction of blood glucose was found after treatment with chloroform – methanol extract at different intervals which shows that the chloroform – methanol extract of *A. precatorius* seed has anti-diabetic properties having Trigoneline similar to that of chlopropamide[11]. Different observation was found in another study on rat model after treated with Ethanol/water (1:1) extract of the aerial parts of *A. precatorius* at a dose of 250 mg/kg which was shown to reduce only 30% blood sugar level.

Bronchodilator activity

The methanol extract of the leaves of *Abrus precatorius* was evaluated for possible bronchodilator activity by using various *in vivo* and *in vitro* models in guinea pigs. The extract offered a maximum degree of protection of 41.62% which was comparable to that of salbutamol 47.52%. The effect of the methanol extract of the leaf exhibited muscle relaxant activity. The results revealed that the methanol extract produced dose-dependent bronchodilator activity, thus justifying to some extent the traditional use of the plant *Abrus precatorius* in asthma[12].

Effect on Neuromuscular

Some neuromuscular effects of the crude extracts of the leaves of *Abrus precatorius* assessed through ethanol extract. The ethanol extract of leaves inhibits muscle preparations, like toad rectus abdominals and rat diaphragm. The effects were reversible and depending on the contraction[13].

Immunomodulating activity

The immunomodulating activity was done by various researchers and one of the activities reported the effect of abrin on the cellular immune responses in normal and tumor-bearing animals. Natural killer cell activity was enhanced significantly by abrin in both the normal (49.8% cell lysis on day 9) and the tumor-bearing group (51.7% cell lysis on day 9), and it was found to be earlier than the control. Antibody dependent cellular and complement mediated cytotoxicity was also enhanced in the abrin treated tumor-bearing group on the ninth day (44% cell lysis) as well as 15 day ((27.6% cell lysis) which confirmed the immunomodulatory property of abrin.

Anti-oxidant activity

An ethanol seed extract of *A. precatorius was* evaluated using in-vitro method to determine anti-oxidant activity. Total phenolic compound in ethanol seeds extract of *A. precatorius* was found to be 95 mg/g of extract calculated as gallic acid equivalent (r2=0.9976) and total flavonoids compound was found to be 21 mg/g of extract calculated as rutin equivalent (r2=0.9985). *A. precatorius* seeds ethanol extract possess potent antioxidant activity in different enzymes levels when compared with reference compound butylated hydroxytoluene (BHT)[14] .

***In vitro* cytotoxic activity**

The coarse dried leaf powder was extracted with chloroform and ethanol using soxhlet. HPTLC studies have been evaluated for ethanol extract. Both the extract was screened for in-vitro cytotoxic activity by MTT assay method using human cancer cell lines, (A549) lung cancer, (hepG2) liver cancer, (HCT116) colon cancer, (HeLA) cervical cancer. Doxorubicin was used as a standard. The ethanol extract showed better cytotoxic effect than chloroform extracts against the above mentioned cancer cell lines.

Antimicrobial activity

Methanol extracts exhibited antibacterial activity towards almost all the bacterial microorganisms. The hexane and chloroform extracts of three plants showed less or no antibacterial activity. On the other hand, the methanolic crude extracts showed maximum antibacterial activity on *Klebsilla pneumonia*, followed by *Staphylococcus aureus*, *Streptococcus mitis* and *Micrococus luteus*, respectively. The studied plants were most active against all the bacteria tested. The significant antibacterial activity of the active plant extracts was comparable to the standard antibiotic Streptomycin (10µg/disc).

Anticonvulsant activity.

Ethanol (70%) extract of fresh root, administered intraperitoneally to mice of both sexes at variable dosage levels, was active vs metrazoleinduced convulsions and inactive vs strychnine-induced convulsions. Ethanol/ water (1:1) extract of the aerial parts, administered to mice intraperitoneally at a dose of 500.0 mg/kg, was inactive vs electroshock-induced convulsions[15].

Antispasmodic activity

The ethanol (95%) extract of dried leaves, was active on the phrenic nerve-diaphragm of rats against nerve stimulation. The petroleum ether extract, was inactive on rat phrenic nerve-diaphragm against nerve stimulation and direct muscle stimulation and on toad rectus abdominus muscle against ACh-induced contractions, respectively[16]. The ethanol/water (1:1) extract of the aerial parts was inactive on guinea pig ileum against ACh- and histamine-induced spasms[16].

Anti -migraine activity

Anti-migraine activity of *Abrus precatorius* proved by using male Wister albino rat and frog fundus muscle preparations using Sherrington rotating drum. Muscle contraction effect of petroleum ether and ethyl acetate crude extracts of *Abrus precatorius* performed on both muscle preparations.

Anti-depressant activity

The anti-depressant activity was shown after treatment with ethanol (70%) extract of fresh root of *A. precatorius* on mice of both sexes at variable dosage levels.

Anti-malarial activity

An isoflavanquinone, abruquinone, was isolated from the extract of aerial parts and exhibited anti-malarial activity. Antiplasmodial activity and cytotoxicity in the assessment of antimalarial activity was evaluated and *A. precatorius* extract presented an IC 50 value below 20 g/ml.

CONCLUSION

From the birth of humans, the plants are being employed by the people for their therapeutic uses and still we tend to have faith in their precatorius Linn.) is taken into account as a toxic plant, it has been used for thousands of years in Ayurvedic medication after purification. Gunja (Abrus precatorius Linn.) was introduced in Europe during sixteenth century; however it was chiefly used as animal poison at that time. Later, the European countries discovered its medicinal actions and Gunja (Abrus precatorius Linn.) became a wonderful medication to treatment of many diseases. It also possesses analgesic and anti-inflammatory, nephro-protective, wound-healing properties. It is additionally used as an aphrodisiac, nerve tonic. However, only a few works has been done on this plant and there is a large scope of investigation for researchers. Hence, it is required to explore its potential in the field of medicinal research and pharmaceutical sciences for novel and fruitful applications of medicinal plants.

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