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Review Article

Pharmacological activities of *Abrus precatorius* (L.) seeds

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ABSTRACT

Abrus precatorius (L) is herbal plant belonging to the family of fabaceae (Leguminosae)- pea family. This plant is commonly known as Indian liquorices. This plant species has been found to display a wide variety of biochemical activities. All parts of the plants have medicinal properties so it is a very valuable medicinal plant which is utilized in traditional system of medicine. Seeds are used as a poultice in the vagina in Ayurvedic and Unani medicine as an abortifacient and it also reported to posses antidiarrheal, antifertility, antispasmodic, antiyeast, antidiabetic, embryo toxic, mitogenic activity, protease(HIV) inhibition, antigonadotropin, agglutinin activity, antibacterial, antioxidant, anticataractic and teratogenic effect. This crab's eye view mainly on the pharmacogostic characteristics and pharmacological actions of the plant.

1. Introduction

Abrus precatorius (L.) is a popular medicinal plant belonging to the family of fabaceae (Leguminosae)- pea family. Many medicinal uses are ascribed to this plant. The leaves, stem and roots are sweet-tasting due to the presence of glycyrrhizin, of which about 9–10 % is in the leaf and is an ornamental, twining, woody vine which grows to a height of 10 to 20 feet when supported by other plants. Leaves are alternate, compound, feather-like (pinnately divided), with small oblong leaflets. Flowers are numerous and appear in the leaf axils along the stems. They are small and occur in clusters 1 to 3 inches long, usually red to purple, or occasionally white. The fruit is a legume (pea shaped pod) about 3 cm long containing hard ovoid seeds about 1 cm long. This plant is commonly known as Indian liquorices. The most common variety of seed is glossy, bright scarlet, with the area around the hilum (point of attachment) being black. Most cases of poisoning involve the ingestion (inadvertently or deliberately) of these attractive red seeds. However, there are other less common varieties of this plant that produce different coloured seeds: for instance, black with a white spot, and white with a black spot**[1]**.

Abrus precatorius is a plant that originates from Southeast Asia and now can be found in subtropical areas of the world. The name *Abrus*, meaning beautiful or graceful, is used to describe the appearance of the seed. The seed is found in a variety of colors such as black, orange, and most commonly, red with a glossy appearance with the black band at the end that attaches to the plant. The seeds are used in a variety of jewelry, trinkets, and ornaments; the *Abrus* seed itself is known by a variety of names that include rosary pea, prayer bead, and jequirity bean. Precare (from which the species name is derived) meaning to pray, references its common use in rosaries.

The seeds of *Abrus precatorius* have been used through history in a variety of roles. Due to their uniform size and weight, they were once known as rati, and used as weights for weighing gold and silver. Formerly Indians used these seeds to weigh gold using a measure called a Ratti, where 8 Ratti = 1 Masha; 12 Masha = 1 Tola (11.6 Grams). The *Abrus* seeds have also been used for medicinal purposes, including the treatment of chronic eye disease. Arabic culture has purportedly used the seed as an aphrodisiac known as coq's eye. The toxicity of the *Abrus* seed was associated with its use as a fish poison as well as a homicidal agent.

The poisoning by the seeds of *Abrus precatorius* has been reviewed and reported often in literature. Death has been reported with twenty seeds bended with water. The symptoms included vomiting of blood, severe pain in the eyes and burning of ears. Death ensued in two days**[2]**. Death in children has been reported from ingestion of one or two seeds**[3]**. There are reports of fatal outcomes of men, who ate one or two beans only.

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Swallowing of intact beans is nearly harmless. Boiled seeds eaten by the residents of the Andaman Islands were harmless, too. They were analyzed for proteins, amino acid composition, minerals and antinutrional factors with positive results**[4]**. In the seeds the toxic principle is abrin, a mixture of at least five lectins, abrin A - D, and abrus-agglutinin. The abrins consist of two peptide chains connected by a disulfide bridge. Abrin A consists of an A-chain with N-glycosidase activity, which inhibits protein synthesis, and lectin-like B-chain responsible for binding with cell-surface receptors and penetrating of abrin-A molecule into the cell**[5]**.

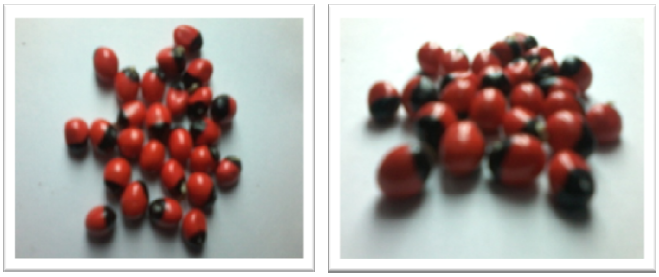

Figure 1: *Abrus precatorius* (L)

2. Pharmacological activities

Abortifacient effect

Chloroform/methanol extract of seeds, administered subcutaneously to rats at a dose of 50.0 mg/animal, was inactive. Water extract of dried seeds, administered intragastrically to pregnant rats at a dose of 125.0 mg/kg, was active**[11]**. Ethanol (95%) extract of seeds, administered orally at a dose of 200.0 mg/kg, was inactive on pregnant hamsters and active on pregnant rats**[12]**. Petroleum ether extract of seeds, administered orally to rats, was inactive**[13]**.

Agglutinin activity

Water extract of fresh seeds, in cell culture at a concentration of 2.0 microliters/ml, was active on human lymphocytes**[14]**.

Alkaline phosphatase inhibition

Petroleum ether extract of seed oil, administered orally, was active on the uterus of rats**[15]**.

Anthelmintic activity

Water extract of dried seeds produced weak activity on *Caenorhabditis elegans*, LC50 15.8 mg/ml**[16]**.

Antidiarrheal activity

Chromatographic fraction of dried seeds, administered intragastrically to rats at a dose of 10.0 mg/kg, was active vs castor oil-induced diarrhea**[17]**.

Antifertility effect

Chloroform/methanol extract of seeds, administered subcutaneously to female rats at a dose of 50.0 mg/ animal, was active**[18]**. Ethanol (80%) extract of seeds, administered orally and subcutaneously to female rats at a dose of 1.0 mg/animal, was inactive**[19]**. Ethanol (95%) and water extracts of seeds, administered orally to mice, were inactive, and petroleum ether extract was active**[20]**. Ethanol (95%), water and petroleum ether extracts of leaves, administered orally to female mice, were inactive**[20]**. Ethanol extract of seeds, administered intragastrically to male rats at a dose of 100.0 mg/kg for 60 days, was active. There was a significant decrease in the number of pregnant Female**[21]**. Ethanol/water (1:1) extract of dried seeds, administered by gastric intubation to male rats at a dose of 250.0 mg/kg, was active. No pregnancies were reported for the 20 females paired with 10 males treated for 60 days; mating probably occurred in all cases, but this is not entirely clear. Pregnancies were again reported after withdrawal of treatment**[22]**. Hot water extract of dried plant, administered orally to human females at a dose of 0.28 gm/person, was active. The extract was administered as a mixture of *Embelia ribes* (fruit), *Piper longum* (fruit), *Ferula assafoetida*, *Piper betele*, *Polianthes tuberose* and *Abrus precatorius*. One dose was taken, starting from the second day of menstruation, twice daily for 20 days. Sexual intercourse was avoided during the dosing period. The treatment is claimed effective for 4 months. The biological activity has been patented**[23]**. Seed oil, administered orally to female mice at a dose of 25.0 mg/ animal, to female mice, and to rats at a dose 150.0 mg/animal, was active. No control animal was used**[24]**.

Antigonadotropin effect

Ethanol (95%) extract of dried seeds, administered by gastric intubation to mice at a dose of 150.0 mg/kg, was active**[25]**.

Anti-implantation effect

Chloroform/methanol (2:1) extract of seeds, administered subcutaneously to pregnant rats at a dose of 50.0 mg/animal, was active**[18]**. Ethanol (95%) extract of seeds, administered orally to rats and hamsters at a dose of 200.0 mg/kg, was inactive**[12]**.

Antispasmodic activity

Chromatographic fraction (a gel filtration fraction from a methanol-water (1:1) extract) of seeds, at a concentration of 0.2 mg/ml, was active on the uterus of rats vs PGE-2-,ACh-, oxytocin- and epinephrine-induced contractions**[26].**

Antispermatogenic effect

Ethanol extract of seeds, administered intragastrically to male rats at a dose of 100.0 mg/kg for 60 days, was inactive**[21].** Ethanol/water (1:1) extract of dried seeds, administered by gastric intubation to rats at a dose of 250.0 mg/ kg, was active. Although no significant histologic changes in the testes were reported, sperm concentration was reported to be significantly decreased in both cauda epididymis and testes after dosing for

60 days[22]. Sterol fraction of dried seeds administered intramuscularly to rats was active. Testicular lesions marked by the cessation of spermatogenesis and a significant reduction in the diameter of the seminiferous tubules were also noted[23].

Antiyeast activity

Dried seeds at a concentration of 1.0% on agar plate were active on *Cryptococcus neoformans*[28].

Contraceptive and/or interceptive effect

Petroleum ether extract of seed oil, administered orally to rats, was active[15].

Embryotoxic effect

Ethanol (95%) extract of seeds, administered orally to pregnant hamsters and rats at doses of 200.0 mg/kg, was inactive[12]. Petroleum ether extract, administered orally to rats at a dose of 150.0 mg/kg, was inactive[13]. Water extract of dried seeds, administered intragastrically to pregnant rats at a dose of 125.0 mg/kg, was inactive[30].

Estrous cycle disruption effect

Seeds, administered orally to female rats at doses of 0.05, 0.5, and 5.0 mg/animal, were inactive[31]. Chloroform/methanol (2:1) extract of seeds, administered subcutaneously to rats at a dose of 1.0 mg/animal, was active[19]. Seeds, administered by gastric intubation to rats at doses of 10.0, 5.0, and 2.0 gm/kg, were active; 80, 50, and 25%, respectively, of the rats depicted extensive leukocytic smears, but with no significant effect on uterine weight[32].

Hemagglutinin activity

Water extract of seeds was active on the red blood cells of ant (leafcutter), buffalo, cat, chicken, dog, duckling, guinea pig, horse, human adult (blood groups A, B, and O), lamb, mice, pigeon, rabbit, rat, and ox; weakly active on cow and ewe and inactive on goat[23,24].

Insect sterility induction

Petroleum ether extract of dried seeds, applied externally at a concentration of 1.0 microliter, was active on *Dysdercus cingulatus*. The extract was active in males alone. The saline extract produced weak activity in both males and females[35].

Intestinal fluid retention effect

Chromatographic fraction of dried seeds, administered intragastrically to rats at a dose of 10.0 mg/kg, was active on the small intestine vs PGE2-induced enteropooling. Effect assayed 30 minutes after oral dose of PGE2[17].

Intestinal motility inhibition

Chromatographic fraction of dried seeds, administered intragastrically to rats at a dose of 10.0 mg/ kg, was active. Effect was not as great as that of an equal amount of atropine[17].

Luteal suppressant effect

Chloroform/ methanol (2:1) extract of seeds, administered subcutaneously to rats at a dose of 50.0 mg/animal, was active[18].

Mitogenic activity

Water extract of fresh seeds, in cell culture at a concentration of 2.0 microliters/ml, was inactive on human lymphocytes[36].

Protease (HIV) inhibition

Water and methanol extracts of dried seeds were inactive, IC50 > 500 mcg/ml[37].

Reverse transcriptase inhibition

Water and methanol extracts of commercial sample of seeds, in cell culture, were inactive on virus-avian myeloblastosis, IC50 > 1000 mg/ml[38].

Smooth muscle stimulant activity

Chromatographic fraction (gel filtration 4–9 of a methanol-water (1:1) extract of seeds, at a concentration of 0.2 mg/ml, was active on guinea pig ileum; a concentration of 0.5 mg/ ml, was active on the stomach of rats.[26] Seed oil, at a concentration of 1.8 mcg/ml, was active on the ileum of guinea pigs[39].

Spermicidal effect

Ethanol extract of seeds, administered intragastrically to male rats at a dose of 100.0 mg/kg for 60 days, was active. Impaired sperm motility and structural abnormalities of sperm were observed. Sperm ATPase level was decreased[21]. Ethanol/water (1:1) extract of dried seeds was active on the sperm of rats. There was a decrease in motility when sperm was mixed with the extract. When administered by gastric intubation, at a dose of 250.0 mg/kg, there was a large decrease in motility of sperm from the cauda epididymis of the rats given the extract for 60 days[22].

Teratogenic activity

Water extract of dried seeds, administered intragastrically to pregnant rats at a dose of 125.0 mg/kg, was active[30,11].

Toxic effect (general)

Seeds, administered orally to horses at a dose of 15.0 gm, were active. Tolerance developed when small, incrementally-

increased doses were given[40]. Seeds, at a concentration of 0.5% of diet in chicken, were active. Chickens were fed a mixture of *Abrus precatorius* seeds and *Cassia senna* fruit. Toxicity included catarrhal enteritis, hepatocellular necrosis, reduced weight, and anemia[41]. Ethanol (95%) extract of seeds, administered subcutaneously to male mice at a dose of 500.0 mg/kg, was active. One hundred percent mortality was observed within 48–49 hours AP028. Seeds, administered orally to human adults, were active. Severe gastroenteritis, multiple serosal hemorrhages, swelling and inflammation of the Peyer's patches, swelling and inflammation of retroperitoneal lymph nodes, focal necrosis in the liver and kidneys, retinal hemorrhages early in course of intoxication, nausea, vomiting, diarrhea, dehydration, convulsions, and collapse are possible symptoms. Symptoms may begin after delay of up to several days and may persist for as long as 10–11 days. Death in children has been reported from eating 1 or more seeds AP020. Two children who chewed seeds became irrational, had tetany, flushing of skin, widely dilated pupils, and appeared to hallucinate. Treatment with neostigmine and barbiturates was successfulAP042. Seeds, administered subcutaneously to male mice at a dose of 0.90 gm/kg, were active. Forty-four deaths were observed in 5–21 hours[42]. Seeds administered orally to cows at a dose of 0.09 gm/kg were active. Death was observed in 1 of 44 animals. Methanol (75%) extract of dried leaves, administered intragastrically to mice at a dose of 2.0 gm/kg, was inactive[45]. Leaf and stem, administered orally to cows at a dose of 15.4 gm/kg, was inactive[46]. Seeds, in the ration of livestock, were active; nitrate poisoning was observed[47]. Beans, ingested by human adult, produced pulmonary edema and hypertension[48].

Toxicity

Fatal incidents have been reported following ingestion of well-chewed seeds of *Abrus precatorius*. Because of its hard seed coat, it can pass through the gastrointestinal tract undigested and remain harmless. The unripe seed has a soft and easily broken seed coat and is thus more dangerous. It has been reported that poisoning has been experienced through a finger prick when stringing the seed. Symptoms may develop after a few hours to several days after ingestion. They include severe gastroenteritis with pronounced nausea and vomiting. Mydriasis will occur, as well, as muscular weakness, tachycardia, cold sweat, and trembling. There is no known physiological antidote. The treatment is essentially symptomatic. Since there is a long latent period associated with abrin poisoning, little value can be placed on induction of emesis or gastric lavage; these measures are useful only if ingestion has just occurred. Bismuth trisilicate may be given during poisoning by *Abrus precatorius* to reduce the degree of gastrointestinal damage. If the emesis and/or diarrhea become excessive, replacement fluids and electrolytes are advocated. If hemorrhage occurs, blood transfusion may be necessary.

Uterine relaxation effect

Chromatographic fraction (a gel filtration fraction from a methanol/water [1:1] fraction) of seeds, at a concentration of 1.1 mg/ml, was active on the uterus of rats[26].

Uterine stimulant effect

Chromatographic fraction (gel filtration fractions 4–9 of a methanol/water [1:1] extract) of seeds, at a concentration of 0.2 mg/ml, was active on the uteri of pregnant and no pregnant rats[26]. Ethanol (95%) extract of dried seed oil, administered intravenously to guinea pigs at a dose of 1000 mcg/ml, produced weak activity.[49] Seed oil, at a concentration of 3.6 mg, was active on the uteri of guinea pigs and rats. The action was blocked by indomethacin but not by atropine AP113. Water extract of seeds was active on the uterus of guinea pig[50].

Antidiabetic effect

Chloroform- methanol extract of seeds of Abrus precatorius produce antidiabetic effect in alloxan induced diabetic in rabbits. Blood glucose level was determined by o-toluidine method[51].

Anti microbial activity

An antimicrobial activity of *Abrus precatorius* seed extract was assayed by in vitro studies in agar well diffusion method against ten bacterial species. Methanol extract exhibited antibacterial activity towards almost all the bacterial microorganisms[52].

Anthelminitic activity

Ethanolic extract of seeds of *Abrus precatorius* shows good anthelminitic activity. Earth warm used for determining activity of anthelminitic activity[53].

3. Conclusion

The plant *Abrus precatorious Linn* produced different pharmacological activity eg. Antimalarial, Anidiabetic, Anti-inflammatory, Immunomodulator, Nephroprotectie etc. the plant also have traditional value such as aphrodisiac, remove biliousness, useful in eye diseases, cures leucoderma, itching, skin diseases and wounds. The above medicinal value of this plant is due to the presence of glycosides and alkaloids obtained from the various parts of this plant.

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