A REVIEW OF ABRUS PRECATORIUS (L.) BOTANICAL, PHARMACOLOGICAL STUDIES AND DISCUSS ITS MEDICINAL VALUE

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ABSTRACT

For preliminary health care, herbal medicines are in high demand because they have a wide range of medical properties without any adverse effects. Traditional medicine uses a wide range of species, which provides scientists with a wealth of opportunity to develop appropriate conservation and multiplication strategies. A wide range of therapeutic potentials, such as antibacterial, antifungal, analgesic and so on, have been attributed to the plant. This includes treatment of inflammation, ulcers and wounds, as well as the treatment of throat scratches and sores. This Indian subcontinent's native plant, Abrus precatorius, is employed in a variety of traditional Ayurveda treatments. A member of the pea family, Abrus precatorius (also known as Gunja or Jequirity) can be found in the plains of India from the Himalayas down to southern India and Ceylon. Because it contains unique natural compounds, the plant can be used to generate new treatments for a variety of ailments. Traditional folklore medicine relies on the roots, seeds, and leaves of the plant. Abrus precatorius has been the subject of extensive study. According to pharmacological investigations, Abrus precatorius has a wide range of bioactive properties that include nephroprotective and nephroprotective properties as well as antiserotonergic properties. The presence of the "abrin" component in this plant, which is lethal to humans, makes this plant both therapeutic and dangerous. Abrus precatorius's nature, pharmacological activities, chemical ingredients, toxicity, and forensic importance are all discussed in this article.

INTRODUCTION
People are increasingly turning away from commercially available synthetic medications in favour of more traditional ones like Ayurveda. Traditional medicine includes Ayurveda, sidha, and unani, as well as ancient, natural health care, tribal practises, and Ayurveda.[1] The ayurvedic methods of medicine have been practised in this region for many decades. According to the ancient medical system, medicinal plants play a crucial role in human health care. Almost 80 percent of the world's population relies on traditional treatments based on plants. Leguminoseae and Papilionaceae are subfamilies of Leguminoseae, which includes *Abrus precatorius L.*, a native of India and the East and West Indies known as Ratti or Gumchi in Hindi. To treat leucoderma, ayurveda practitioners utilise leaf extracts; seeds rich in the purgative and abortive compound abrin; and root extracts to treat coughs. Over the past two decades, scientists have been searching for novel pharmacologically active chemicals from natural sources like plants, animals, and microbes in order to develop new clinically relevant medications with medical properties.[2] Medicinal uses for the *Abrus precatorius* plant date back thousands of years, not just in this part of the subcontinent but also in China and other ancient cultures. *Abrus precatorius* leaves are chewed as a remedy for mouth ulcers in some tribal areas. As well as being utilised to alleviate inflammation, tri-terpenoid saponins are also found in this plant. It is indigenous to India and can be found in tropical and subtropical regions as high as 1200 metres above sea level in the outer Himalayas of that country. Perennial, deciduous, woody, thorny twining or climbing herb with many branches and narrow form. Brown, smooth-textured bark covers a cylindrical, wrinkled stem.[3-4] The leaves have many leaflets (12 or more) grouped in pairs, and they are pinnate and glabrous. Its oblong leaflets are 2.5 cm long and 1.5 cm wide, with a thickness of 1.5 cm. In the leaf axils along the stems, the flowers are abundant and appear in clusters 1 to 3 inches long, generally red to purple, or infrequently white. There are four to six peas in each of the plant's sturdy, short brownish pods, which curl back when they are opened. Around three centimetres in length, the legume fruit contains firm, ovoid seeds measuring one centimetre in length.[5-6]
Table 1: Plant Profile Taxonomical classification Abrus Precatorius.

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Plantae</th>
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<tr>
<td>Division</td>
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<td>Order</td>
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<td>Family</td>
<td>Fabaceae</td>
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<td>Abreae</td>
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<tr>
<td>Genus</td>
<td>Abrus</td>
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<td>Species</td>
<td><em>Abrus precatorius</em></td>
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Common names

In India it is known by several names like Gunj (Marathi); Ganchi, Gunchi, Rati (Hindi); Chunhali, Kunch (Bengali); Chanothi, Gunja(Gujarati); Ganji, Gul-Ganju, Guluganji, Madhuka(Karnataka); Kunni, Guruginia, Guruvenda (Telugu); Kunnikuru (Malayalam); Chanoti, Gunchi, Gunja (Marathi); Gundumani, Kuntumani (Tamil); Gunja, Runji (Oriya) Liluwani, Raturmani (Assam); Labrigunchi, Ratak(Punjab).\(^{7-8}\)
Chemical Composition

From the roots, abrasine, abrol, precol and pre-casine can be found, among other chemical elements. Abrin is the active ingredient in *A. precatorius* seeds. The amino acids alanine, serine, choline, valine, and methyl ester are found in abundance in seeds. Abrin, a protein toxin found in the seeds, is lethal even in small doses. Toxin concentrations of as little as 0.00015 percent per person have been observed to be lethal in humans. In addition to the toxic protein, a fat-splitting enzyme, the enzyme haemagglutinin and albuminous abrin, they contain ureas and the albuminous compound abrin.\(^9\) Ions such as calcium, magnesium, sodium, potassium, and so on. Triglyceride was found in the peduncle, while stigmasterol and -sitosterol were found in the seeds. In the leaves, abrusoside and glycyrrhizin, which are sweeter than sucrose and lower in caloric value, were found to be present.

Abrusogenin aglycone, found in abrusoside A-D, has a sweetness potency 30 to 100 times greater than sucrose. Abrusogenin. A series of triterpenes, abrusoside A-E and abrusogenin, were identified from *A. precatorius* L. Extraction from the leaves of Abrusprecatorius, known as Pterocarpan or 2,3,4,8-tetramethoxy-6a,11a-dihydro-6H benzo\(^{[4,5]}\) was used to isolate a
novel chemical. furo[3,2-c] chromene-7,9-diol.[10-12]

**Glycyrrhizin**

*Abrus precatorius* roots and leaves contain glycyrrhizin. An significant phytoconstituent of liquorice 24, glycyrrhizin, has been widely exploited in the pharmaceutical and food industries. Abrol, abraisone, precasine, precol, and certain proteins including abraline, abricin, delphinidin, gallic-acid, and picatorine are also found in the root of this plant. There are triterpenoids and saponins in the root and abrusosides a to d, as well as glycyrrhizin andoleanolic acid.[13-15]

![Fig. 4: Glycyrrhizin.](image)

![Fig. 5: Protein data structure of Agglutinin.](image)

**Pharmacological Activity**

The leaves, roots, and seeds of this medicinal herb can be utilised for a variety of
applications. Before it can be used as an ingredient in an ayurvedic treatment to heal wounds and scratches from dogs, cats, and mice, Gunja undergoes the process of sodhana. It is also used with other ingredients to treat leukoderma. Plant *Abrus precatorius* is utilised in Ayurveda, Homeopathy, Folk, Tibetan, Sidha, and Unani medicine, as well as in herbal remedies. Swellings, wounds, and mouth ulcers can be soothed by applying the leaves to them. Abortifacient, laxative, sedative, and aphrodisiac are among other uses for *Abrus precatorius*. Gonorrhoea, jaundice, and hemoglobinuric bile can all be treated with the roots. Human hair growth is claimed to be stimulated by seed oil. The leaves’ anti-supportive characteristics make them ideal for this use. Glycyrrhizin is an active phytoconstituent found in the plant.\textsuperscript{[16-19]}

**Antimicrobial Activity**

Roots, leaves, and seeds of *Abrus precatorius* were tested for their antimicrobial properties against a variety of microorganisms. Proven to be effective against Gram positive bacteria, the root extract of *Abrus precatorius* was found to be active. *Staphylococcus aureus* is very susceptible to root extracts' antibacterial properties. In vitro experiments using the agar well diffusion method tested *Abrus precatorius* seed extract for antibacterial activity against 10 different bacterial species. The antibacterial properties of methanol extract were found to be effective against a wide range of bacteria. There were four distinct antimicrobial activity levels: good, moderate, weak, and inactive. The lower the MIC, the more effective the antimicrobial activity was; the lower the MIC, the less effective the antimicrobial activity was; and the lower the MIC, the less effective the antimicrobial activity was. Thus, the root extract's antibacterial activity is low.\textsuperscript{[20-23]}

**Anti-diabetic activity**

Alloxan diabetic rabbits were used to test the anti-diabetic effects of a 50mg/kg chloroform–methanol extract of *A. precatorius* seed. This extract from *Abrus precatorius* seed showed antidiabetic activities with Trig one line identical to chlopropamide following treatment with chloroform – methanol extract at various intervals. The % reduction in blood glucose levels. Another study on rat models revealed a different result after treating the rats with a 250 mg/kg dose of Ethanol/water (1:1) extract of the aerial portions of *Abrus precatorius*, which only reduced blood sugar levels by 30%. Reduced alloxan hyperglycaemic blood glucose levels were achieved by the chloroform-methanol extract of *Abrus precatorius* Antidiabetic medication chlopropamide was found to be slightly more influential than extract. When
determining the potency, researchers looked at both the length of action time and the amount of blood glucose reduced. There are numerous plant-based anti-diabetic medicines that have been identified and used.[24-26]

**Anti-fertility activity**

Experiments on male rats exposed to aqueous extracts of *Abrus precatorious* for 18 days resulted in testicular degeneration defined by decreased epithelial cell count and decreased sperm cell count, respectively. At 100 mg/kg body weight for 60 days, the alcoholic seed extracts of *Abrus precatorious* considerably inhibited cauda epididymal sperm motility and reduced the levels of succinate dehydrogenase and ATPase in albino rats' epididymis, according to the study. After exposure to *Abrus precatorious* seed extracts, scanning electron microscopy examinations on sperm morphology demonstrated acrosomal destruction, decapitation, and the creation of bulges on the midpiece region of the sperm. The steroidal portion of seeds reduced testicular weight, sperm count, and spermatogenesis degeneration in the later phases of spermatogenesis in rats. *Abrus precatorious* seed extracts have been shown to have an irreversible effect on human spermatozoa motility, which may be attributed to a drop in cAMP and an increase in reactive oxygen species. According to Sinha, *Abrus precatorius* seeds contain a steroidal component that has been shown to have antifertility properties. Cauda epididymis motility was inhibited by the antifertility effects of this drug. *A. precatorius* has been shown to cause DNA damage when isolated ingredients from the seeds of *A. precatorius* are analysed. Because agglutinin and abrin cause fragmentation of DNA in vitro, they are known to promote apoptosis.[27-29]

**Anti-allergic activity**

There were considerable anti-allergy effects for Abruquinones A, B, D, and F. Rat neutrophils inhibited superoxide formation at less than 0.3 g/ml, but mast cell histamine inhibited superoxide creation at less than 1 g/ml. The effects of abruquinone A on polymyxin B-induced paw edoema were reversible in both normal and adrenalectomized animals. Diphenhydramine and methysergide were found to be less effective at reducing plasma extravasation than histamine, bradykinin, serotonin, and substance P. Red and black coloured seed and methanol insoluble fractions of white form have early wound healing activity, which may be related to the presence of gums, mucilages, tannins, or phenolic chemicals in the seedswound.’s healing activity. That seed extracts and fractions are effective in halting infection in vivo is corroborated by this.[30]
Anti-inflammatory activity

Abrus precatorius extract was tested for its anti-inflammatory properties against rat ear irritation induced by croton oil. When Abrus precatorius extract and croton oil were administered to the rat ear, the inflammatory reaction was reduced (observed after 6 hours compared with croton oil alone). This plant's leaves have been used by traditional healers to treat inflammatory illness conditions because of its ability to reduce the inflammatory response by 2 percent.[31]

Bronchodilator activity

Histamine-induced bronchoconstriction is a common immunological paradigm for airway blockage caused by antigens. This induces convulsions in guinea pigs, as well as powerful muscle contractions, hypotension and capillary dilatation in the cardiovascular system, as a result of histamine inhalation. Among the most common side effects of histamine are suffocation and death in the guinea pigs. Taking bronchodilators can help delay the onset of these side effects. In asthma, salbutamol, a well-known agonist of the -2 receptor, is commonly utilised in the treatment of broncho-constriction. Using Abrus precatorius leaf extract may have bronchodilator activity, which is consistent with its traditional use in asthma therapy, according to these findings. This suggests that Abrus precatorius leaf extract may have anti-histaminic or anti-cholinergic properties, based on a decrease or inhibition of contractions generated by histamine and acetylcholine. Traditionally, the leaves of Abrus precatorius have been used to treat asthma because of its bronchodilatory properties.[32]

Anti-arthritic activity

Croton oil-induced inflammatory rats were used to test the anti-arthritic properties. Oral administration of two distinct concentrations (200 and 400mg/kg) of water extract from Abrus precatorius leaves revealed a reduction in paw inflammation in both extracts. Abrus precatorius white (APW) and red (APR) seed extracts of Abrus precatorius were studied for their effects on Freund's complete adjuvant-induced arthritis in rats. While the FCA-induced arthritis was considerably (P<0.001) prevented by APW, the inflammation was significantly (P <0.05) lowered by APR at a later stage of the experiment, showing a protective effect against arthritis. Anti-arthritic effect of APW therapy greatly slowed the development phase of arthritis, as evidenced by its radiographic examination. There was less toxicity (no ulcerogenic) and greater efficacy (P <0.001) of APW treatment compared to APR treatment when used against adjuvant-induced arthritis in an experimental setting.[33]
Immunomodulating activity

Various studies conducted immunomodulating activities, one of which reported on the abrin's influence on the cellular immune responses of normal and tumor-bearing mice, respectively. Anti-tumor activity was shown to be greatly improved by abrin in both normal and tumor-bearing groups (49% cell lysis on day 9) and was found to be earlier than in the control group (51.7%). Abrin's immunomodulatory properties were validated on the 9th and 15th days of treatment, with 44% and 27% cell lysis, respectively, in the abrin-treated tumor-bearing group, respectively. As previously mentioned in this article, another study has examined how abrus agglutinin affects mouse splenocyte proliferation and the production of several types of immune-related molecules.\cite{34-35} This time, the effects of the protein on the native (NA) and heat-denatured conditions were examined. Splenocyte adhesion can be induced by native agglutinin and HDA-generated conditioned media from non-adherent splenocytes, and vice versa. Although NA had a greater ability to activate NK cells at a lower concentration, heat denatured agglutinin had a greater ability to activate NK cells at a lower concentration. There was also an increase in the proliferation of thymic cells by NA and HDA. Abrus agglutinin may be an immunomodulator in both its natural and heat-denatured forms, according to this study. Antibodies were activated by abrin, a non-toxic dosage (1.25 mg/kg body wt) that was administered consecutively for five days in normal mice.\cite{36} Spleen, thymus, circulating antibodies and antibody-forming cells were all found to be increasing in quantity, as were bone marrow cells that were positive for alpha-esterase. Abrin may be able to enhance the host's humoral immune response, according to the findings. Abrus lectin-derived peptide fractions (AGP and ABP) were tested in vitro in DL-bearing mice, and both AGP and ABP were found to be immune stimulants.\cite{37-38}

Future Prospects

Abrus L. and other medicinal plants like it are seeing an increase in use because people are increasingly relying on natural sources of medicine. The therapeutic efficacy of this herbal plant has already been demonstrated by a large number of researchers who have studied its many biological effects for the treatment of various disorders.\cite{39} This plant extract should be made available to the general public as soon as possible, so that people can use it to treat various illnesses. Commercial products of Abrus precatorius are expected to be developed in the near future that are free of hazardous or adverse effects for customers, paving the way for a new era of medicine.\cite{40}
CONCLUSION

The use of plants (herbs) to treat sickness and improve health is known as herbal medicine. Anxiety, arthritis, depression, high blood pressure, insomnia and hormone imbalances are just some of the conditions that can be treated with herbal medication. Herbs are as potent as pharmaceuticals, therefore they must be handled with caution. A herbalist or herbal therapist administers herbs. Despite the fact that some may consider herbal medicines to be hoaxes, they have a long history in medicine. To cure a wide range of diseases, ancient doctors meticulously compiled pharmacopoeias based on the information they gathered about herbs. More than a quarter of all currently available synthetic medications contain active compounds derived from plants that have been present since the beginning of time. Ethno pharmacological activity has led to the discovery of a number of indigenous medicines that have found their way onto the international market. There are numerous important phytochemicals found only in the *A. precatorius* plant that make it a valuable source of pharmacological qualities, including anti-diabetic, anti-microbial and analgesic capabilities. As a result, in-depth studies involving this plant material's exceptional medicinal grade are in high demand these days. Taking advantage of the medicinal properties of *Abrus precatorius* is long overdue. Because of this, *Abrus precatorius* is a good candidate for a multipurpose therapeutic agent because of its strong pharmacognostical and pharmacological uses. One of the most promising natural resources for the development of medications and pharmaceuticals against a wide range of ailments is *Abrus precatorius*. Traditional folklore medicine relies on the roots, seeds, and leaves of the plant. Ayurveda, folk medicine, homoeopathy, Siddha, Tibetan medicine, and Unani all make use of the plant *Abrus precatorius*. This plant has a wide range of pharmacological properties. The chemical contents of the *Abrus Precatorius* plant can be discovered using a variety of methods. Toxic lectins, including abrin (ABR) A-D, which is lethal to humans, are found in Abrus seeds. Abrus poisoning can be treated with a stomach wash and other supportive measures if it is caught early enough. The dangers of overusing or abusing plant therapeutic components must be taken into account.

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