**Abrus precatorius**: A comprehensive insight into the phytochemical, pharmacological, therapeutic activities and safety

Aswin Rafis Khairullah1, Tridiganita Intan Solikhah2, Arif Nur Muhammad Ansori1, Gabvira Amadea Puspitarani3, Dina Dewi Anggraini4, Gabrielle Ann Villar Posad5

1 Doctoral Program in Veterinary Science, Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya, Indonesia
2 Division of Veterinary Clinic, Faculty of Veterinary Medicine, Universitas Airlangga, Surabaya, Indonesia
3 Infectious Diseases and One Health, Royal (Dick) School of Veterinary Studies and the Roslin Institute, University of Edinburgh
4 Midwifery Study Program, Poltekkes Kemenkes Semarang, Semarang, Indonesia
5 School of Environmental Science and Management, University of the Philippines Los Banos, Los Banos, Philippines

**Article Info**

**Abstract**

*Abrus precatorius* L., belonging to the family of Fabaceae is one of the potential herbal plants to be used as natural medicine. *A. precatorius* is capable of growing in tropical and subtropical areas of the world. The leaves of *A. precatorius* contain nitrol tetterpene glycosides, glycyrrhizin, and alkaloids. The leaves of *A. precatorius* can also treat leucoderma, skin diseases, itching, eye pain, and wounds. The seeds of *A. precatorius* contain flavonoids, steroids, alkaloids, anthocyanins, lectins, and fixed oils and can treat skin diseases, ulcers, and nervous system disorders. The roots of *A. precatorius* contain glycyrrhizin and alkalioid compounds and are able to treat rheumatism, alexiteric, sore throat, and vomiting. *A. precatorius* shows several therapeutic activities such as antimicrobial, anti-helminthics, antimalarial, antifungal, nephroprotective, immunomodulatory, neuromuscular, antiabietic, anti-inflammatory, antifertility, antiserotonergic, antidiarrheal, antitumor, antisepsic, and memory enhancing properties. Inappropriate dose of *A. precatorius* will cause toxic effects. Thus *A. precatorius* can be a good potential herbal plant to be used as a natural medicine.

**Keywords**: *Abrus precatorius*, Fabaceae, Medicine, Pharmacology, Phytochemistry.

**Introduction**

Since the beginning of human civilization, herbal plants have often been used to cure various diseases. Herbal plants have been an ancient tradition much older than contemporary pharmacology, medicine, and chemistry. The World Health Organization reported that around 75% of the world’s population still uses medicinal methods derived from herbal plants. In addition, medicines from herbal plants are widely used because they are cheaper, safer, and have various pharmacological activities.

*A. precatorius*, a plant belonging to the Fabaceae family, has good potential to be used as herbal medicine. This plant is commonly known as Indian licorice, Crab’s eye, Jequirity, and Rosary pea. This plant is known as Gunja in Sanskrit and Ratti in Hindi. *A. precatorius* is native to India; however, it can be found in all tropical and sub-tropical regions around the world. *A. precatorius* was first described as a medicinal plant by William Boericke in the Homoeopathic Materia Medica entitled Jequirity. This plant is traditionally used to treat cuts, wounds from animal bites, and several other diseases such as rabies, tetanus, and leucoderma. This plant is also effective in treating dysentery and diarrhea. In addition, this plant also shows efficacy as a tonic, aphrodisiac, emetic, and laxative. *A. precatorius* is believed to have various pharmacological activities such as antibacterial, anthelminthic, antidiabetic, and antitumor.

Given the efficacious of the *A. precatorius* plant as a medicinal plant, this review offers a comprehensive insight into the phytochemical, pharmacological, therapeutic activities, and safety of *A. precatorius*, and demonstrates that it can be used as a reliable source for preparation of new drugs.
**Origin Names**

This plant in Indonesia is called Saga or Weglis; in Philippines Jequirity; in Nepal Rati gedi or Crab’s eye; in Egypt Rosary pea; in Pakistan Gunchi; in USA Precatory bean 10.

**Taxonomy**

Kingdom: Plantae  
Division: Magnoliophyta  
Class: Magnoliopsida  
Order: Fabales  
Family: Fabaceae  
Genus: Abrus  
Species: *Abras precatorius* L. 16

**Plant description**

*A. precatorius* is a twisted woody vine capable of growing up to 6 meters. The leaves resemble feathers, compound, alternate, pinnae with small oval leaflets. The branches are greenish-yellow. The flowers are abundant and appear in the leaf axils along the stem. The flowers are small and clustered with a length of 3 cm to 8 cm. The flowers are white or purple. The fruits have a nut-like shape with a length of about 3 cm containing hard ovoid shiny seed in black, dark red, with a length of about 1 cm. The seeds are red with a black spot covering one end. The roots are tortuous and branched 17. The morphology of *A. precatorius* can be seen in Figure 1.

![Figure 1: Abrus precatorius L.](image)

**Geographical distribution**

*A. precatorius* grows in tropical and subtropical areas of the world. The plant can be found in China, India, South Africa, and Brazil, and commonly found throughout the plains of India, from the Himalayas to South India and Ceylon. This plant is able to grow at an altitude of 1200 m in the Himalayas 11. In addition, it is also widely cultivated in Nigeria and Southeast Asian countries 19.

**Phytocchemistry**

The phytochemical content of the parts of *A. precatorius* plant are as follows:

**Leaves**

*A. precatorius* leaves contain pinitol, triterpene glycosides, glycyrrhizin up to 10%, and alkaloids such as haphaphotine, precatorine, abrine, choline 11. Triterpene glycosides consist of abusosides A, B, C, and tree glycosides based on abrutigenin and cycloartane type aglycones 20. Other active compounds found in *A. precatorius* leaves are abruslactone A, tritepenes abrugenic acid, methyl abrusgenate, liquiritigenin-7-diglycosides, liquiritigenin-7-monoglycosides, toxfolin-3-glucoside, and the flavonoid vitexin 21.

**Seeds**

*A. precatorius* seeds contain carbohydrates (42.42%), fat (3.92%), ash (5.38%), moisture (5.06%), crude protein (39.20%), and crude fiber (9.08%) 22. The active compounds found in the seeds of *A. precatorius* are flavonoids, steroids, alkaloids, anthocyanins, lectins, and fixed oils 23. Alkaloids from the seeds of *A. precatorius* contain choline, haphaphotine, precatorine, and abrine 11. *A. precatorius* seed oil contains a lot of linoleic and oleic acid 24. Steroids from the seeds of *A. precatorius* contain stigmasterol, -sitosterol, abricon, 5β-cholanic acid, cholesterol, and linoleic 25. The red color of *A. precatorius* seeds is due to the presence of pelargonidin, delphinidin, abranin glycosides, and cyanide 26. Several other compounds such as sophoradial, sapogenol, heterogenin methyl ether, abrisapogenol J, kaikasaponin II, methyl ester, flavones such as alonane and abrectorin are other major constituents of *A. precatorius* seeds 27. The main constituents of *A. precatorius* seeds are lectins and abrins. Lectins are toxic (abrin) and non-toxic (abrus agglutinin). Abrin is denoted by abrin a, b, c, and d consisting a large β-polypeptide chain and a short polypeptide chain linked by disulfide bonds 28.

**Root**

The roots of *A. precatorius* contain glycyrrhizin compounds and alkaloids such as precasine and abrasives in addition to abrine and related bases 29.

**Medicinal benefits**

The medical benefits of parts of the *A. precatorius* plant are as follows:

**Leaves**

The leaves of *A. precatorius* can be used as a tonic and aphrodisiac. The leaves of *A. precatorius* can also be used to treat leucoderma, skin diseases, itching, eye diseases, and wounds 26. In addition, the leaves of *A. precatorius* are also efficacious to treat stomatitis, asthma, dental caries, migraine, fever, and tuberculosis 30. *A. precatorius* leaves soaked in warm oil are applied to the surface of the skin, experiencing rheumatic pain 26. *A. precatorius* leaves juice mixed with oil can be applied over a bloating stomach 31. *A. precatorius* leaves powder mixed with sugar are used to treat menorrhagia and leucoderma 32. *A. precatorius* leaves can also be used to treat gastritis, diarrhea, insomnia, cancer, kidney disease, and heart disease 33.

**Seeds**

*A. precatorius* seeds can be used to treat skin diseases, ulcers, and nervous system disorders 34. *A. precatorius* seeds that are processed into a paste can be applied to the skin to treat shoulder joint stiffness, sciatica, bruises, and paralysis 35. Seeds of *A. precatorius* can be used as a laxative, but it should be noted that in large doses, it will be toxic and cause cholera-like symptoms 36. *A. precatorius* seeds can also be used as a natural contraceptive 37.

**Root**

*A. precatorius* roots can be used to treat rheumatism, alexiteria, laryngitis, and vomiting 38. *A. precatorius* root extract can be used to treat coughs 10. In addition, the root can also be used to treat cancer, gastritis, diarrhea, insomnia, kidney disease, and heart disease 39. *A. precatorius* roots has its own uses in treating jaundice, gonorrhea, and other infections 32.
Traditional uses

*A. precatorius* has anti-suppurative properties; the *A. precatorius* plant ground with lime can be used to treat abscesses and ulcers.

Oral decoction of *A. precatorius* leaves can cure colds and coughs. The root of *A. precatorius* is useful for treating hemoglobinuric bile and jaundice. The root paste can be used to cure stomach aches, prevent abortion, and recover from tumors. The roots of *A. precatorius* powder mixed with pure butter can be utilized to cure coughs.

The bright red color of *A. precatorius* seeds attracts children’s attention, so there are cases when children in rural areas who do not have knowledge of the *A. precatorius* plant eat its seeds which are poisonous when consumed.

Boiled *A. precatorius* seeds are often eaten by residents in several parts of India. *A. precatorius* seeds also have several active compounds that are a source of insecticides and antimicrobials.

*A. precatorius* is considered a diuretic, expectorant, antidote, laxative, febrifuge, anodyne, aphrodisiac, hemostat, refrigerant, vermifuge, antimicrobial, emollient, vomiting reliever, sedative, laxative, and abortifacient.

In addition, *A. precatorius* is also used to cure hemorrhoids, cancer, colic, seizures, diarrhea, headaches, ulcers, gastritis, ophthalmia, malaria, and chronic nephritis.

Soaked in hot water, *A. precatorius* seed extract can be taken orally to treat malaria. Dry *A. precatorius* seed powders are used by various African ethnic groups as a natural contraceptive.

In addition, *A. precatorius* seeds can be used to treat tuberculosis and painful swelling.

Some of therapeutic uses

*A. precatorius* has many therapeutic activity as listed in below:

Antimicrobial activity

The antimicrobial activity of the leaf, stem, and seed oil extracts of *A. precatorius* is quite effective in inhibiting the growth of several bacteria such as *Klebsiella pneumoniae*, *Bacillus subtilis*, *Corynebacterium spp*, *Enterococcus faecalis*, *Staphylococcus aureus*, *Streptococcus solidus*, *Staphylococcus epidemidis*, and *Escherichia coli* through agar well diffusion techniques. *A. precatorius* roots extract also showed antimicrobial activity on various types of bacteria tested.

Different solvent concentrations or fractions showed inhibitory activity against thirteen gram-positive and gram-negative bacteria. Through bioautography tests, it has been established that the antimicrobial activity of the *A. precatorius* extract is localized to specific chromatophores in the chloroform fraction.

Antihelmintic activity

The aqueous extracts of the roots and stems of *A. precatorius* were observed for their antihelmintic activities against schistosomes and cestodes. The aqueous extract of *A. precatorius* root indicated lethal antihelmintic activity combating cestodes at a concentration of 103 mg/ml.

Meanwhile, aqueous extract of *A. precatorius* root at a concentration of 0.6 mg/ml and aqueous extract of *A. precatorius* stem at a dose of 1.5 mg/ml showed lethal antihelmintic activity against schistosomes. Tannins, steroids, terpenes, flavonoids, and alkaloids from *A. precatorius* may play a role in this antihelmintic activity.

Antimalarial activity

Isoflavonone-abruquinone compound isolated from *A. precatorius* extract showed antimalarial activity. Assessment of antimalarial activity was then carried out based on cytotoxicity and antiplasmodial activity. Cytotoxicity activity was evaluated in melanoma cells, whereas antiplasmodial activity was evaluated by micro-radioactive methods.

The assay of the *A. precatorius* extract was carried out at three diverse times in triplicate in 96-plate culture with the culture mostly at the ring stage at 0.5-1% parasitemia. The *A. precatorius* extract showed IC50 values below 20 g/ml.

Antifungal activity

Dry *A. precatorius* seed extract at a concentration of 1% effectively inhibited the growth of *Cryptococcus neoformans*.

Nephroprotective activity

The evaluation of the nephroprotective activity of the aqueous extract of the stem of *A. precatorius* was carried out to specify the restoring effect of acetaminophen and cisplatin-induced nephrotoxicity. The restoring effect of *A. precatorius* on HEK 293 cells damaged by acetaminophen and cisplatin was evaluated by the mitochondrial activity assay of MTS. The test results indicated that the water extract of the *A. precatorius* stem had the best recovery effect and could be utilized for the prevention or medication of kidney distraction.

Immunomodulatory activity

Abrus agglutinin is one of the compounds dissociated from the seed extract of *A. precatorius*. This compound is similar to ML-1 with regard to the specificity of carbohydrates [gal (β1 → 3) gal / Nac], observed both in native (NA) and heat denatured (HDA) conditions for NK cell activation, cytokine secretion, murine splenocyte proliferation, and thymocyte proliferation in vitro with the aim of assessing its potential as an immunomodulator. HDA and NA activated splenocytes and induced the production of cytokines such as IFN-γ, IL-2, TNF-α, and TNF-β, which could exhibit a type of Th1 immune response. Native agglutinin abrasive and HDA-induced conditioned media of adherent splenocytes can stimulate non-adherent splenocytes and vice versa. Heat denatured abrasive agglutinin and induced NK cell activation at a much lower concentration than NA concentration, but the rate of NK cell activation was higher for NA. Thymocyte proliferation by HDA and NA was also evaluated. This study showed that Abrus agglutinin could be a potential immunomodulator in the original form as well as in the hot form.

Neuromuscular activity

The neuromuscular activity of the ethanol extract of *A. precatorius* leaves was evaluated using isolated frog abdominal rectus muscles and phrenic nerve-diaphragm muscle preparations of rats and chicks. Ethanol extract of *A. precatorius* leaves hampered acetylcholine-induced contraction in rectus abdominis toad and rat phrenic nerve diaphragm muscle preparations. The effect depended on the dose of the ethanol extract of *A. precatorius* leaves.
addition, the ethanolic extract of *A. precatorius* leaves caused paralysis when injected intravenously into chicks and had no effect on direct electrical stimulation of the diaphragms of mice. The inhibitory effect on the diaphragm preparation of rat phrenic nerves from ethanol extract of *A. precatorius* leaves is strengthened in the presence of increased magnesium ions, reduced calcium ions, or decreased potassium ions. Thus, the ethanolic extract of *A. precatorius* leaves shows similarity to D-tubocurarine chloride in terms of the neuromuscular block pattern. Neither the petroleum ether nor the aqueous extract of the leaves of *A. precatorius* showed any significant changes in the skeletal muscle used in this study. Therefore, the nerve toxic component of *A. precatorius* leaves is particularly in the ethanol extract of *A. precatorius*.

**Antidiabetic activity**

An ethno-botany survey in five districts of the Nigerian state of Lagos was carried out by filling out a well-known semi-structured questionnaire for diabetes treatment. In the survey, about 100 people answered, most of the respondents came from the Yoruba tribe. About half of the respondents had 20-30 years of experience in medicating diabetes by utilizing herbal plants (96%) without conventional treatment for diabetes. Among them, most of the men (76%) had knowledge of traditional diabetes treatment. They also developed an effective and easily recognizable diagnostic tool for diabetes. In the survey, fifty multi-component herbal recipes were covered, consisting mostly of liquid preparations. The drug in liquid form was often given orally without showing any serious side effects (92%). The main antidiabetic plants include *A. precatorius*, *Blighia sapida*, and *Alchornea cordifolia*. The leaves of these plants must be well squeezed in water until they release the juice, then the decoction can be used as a treatment for diabetes by using it as an infusion.

**Anti-inflammatory activity**

Two triterpenoid compounds, namely saponin 1 and saponin 2, and their derivatives namely acetate 3 and acetate 4 isolated from the *A. precatorius* plant were evaluated for their anti-inflammatory activity utilizing the croton oil ear model. The ear tissue parts of mice treated with anti-inflammatory agents were compared with the test treatment group. The results showed reduced inflammation in the ears of the mice tested. Triterpenoid compounds from *A. precatorius* showed anti-inflammatory activity but acetate indicated greater inhibition at concentrations of 300 µg and 600 µg. The acetate derivative of triterpenoid compounds was more effective at a concentration of 600 µg among all test treatment groups.

**Antifertility activity**

Evaluation of the antifertility activity of *A. precatorius* seed extract managed intraperitoneally to adult male albino mice BALB/c strain on the integrity of spermatozoa DNA and sperm production. Daily sperm production was measured by calculating testicular spermatids in the Horwell chamber while DNA decay to epididymal spermatozoa was specified by comet test within 20 days of the experimental procedure. The administration of ethanol seed extract of *A. precatorius* (20 and 60 mg/kg) intraperitoneally caused a very significant mitigation in daily sperm production. Reversal in sperm production was monitored in all medicated animals after 20 days of therapy interruption. Similarly, a very significant increase in DNA damage was monitored in all medicated mice and no significant reversibility in DNA damage was monitored during the therapy period. This study proved that precatorius seed extract acted as an anti-fertility or contraceptive agent with a risk of DNA decay to spermatozoa and could cause teratogenic effects.

**Antiserotonergic activity**

The antiserotonergic activity of the ethyl acetate extract of *A. precatorius* leaves was examined on frog fundus strips utilizing sumatriptan as the standard drug. The ethyl acetate extract of *A. precatorius* leaves was effective in treating migrane headaches. The leaves of *A. precatorius* on soxhlet extraction with ethyl acetate showed the appearance of protein, saponins, amino acids, carbohydrates, tannins, alkaloids, as well as antiserotonergic activity on the frog fundus strips, which were shown (Graded dose response) compared to sumatriptan as a standard drug. In another research, the anti-migraine activity of *A. precatorius* was demonstrated using fundus muscle preparations of Wister albino mice and male frogs using a Sherrington rotating drum. The muscle contraction influence of crude ethyl acetate and petroleum ether *A. precatorius* extract was carried out on both muscle preparations.

**Antidiarrheal activity**

Dry seed chromatography fraction of *A. precatorius* (10 mg/kg) was administered intragastrically to castor oil induced rats. This chromatographic fraction showed significant antidiarrheal activity.

**Antitumor activity**

Ethanol extract of *A. precatorius* leaves given intraperitoneally on mice showed inactive results in Sarcoma 180 (ASC) AP074. Aqueous extract of *A. precatorius* seeds administered intraperitoneally to mice showed active results in Sarcoma (Yoshida solid and ASC). Aqueous extract of *A. precatorius* seeds given subcutaneously to mice indicated inactive results in Sarcoma (Yoshida ASC) AP012.

**Antispasmodic activity**

The chromatographic fraction of *A. precatorius* seeds at a dose of 0.2 mg/ml given to epinephrine-induced mice actively affected ACh, PGE-2, oxytocin- and epinephrine-induced contractions.

**Memory enhancer activity**

The therapeutic potential of *A. precatorius* has been studied in a model of Alzheimer’s illness by identifying glycochemical microglial cell activation (MGC) in autopic brain samples. *A. precatorius* agglutinin confess MGC in the white matter of the brain, which exhibits stem-like cells and appears very dense in the proximal region of oligodendroglial cells. Lectin compounds from the *A. precatorius* plant have been studied to identify histochemically the activation of microglia cells in autopic brain samples from Alzheimer’s illness subjects.

**Toxicological activity**

Although *A. precatorius* has many therapeutic properties, it should be noted that inaccurate dosage or intake can lead to life-threatening toxicity. *A. precatorius* seeds could cause toxic effects at doses of 90 to 120 mg. In addition, *A. precatorius* seeds contains abrin, which in doses of 0.0001 to 0.0002 mg/kg could be a natural poison. The poisoning effects of ingested *A. precatorius* seeds can influence the kidneys, gastrointestinal tract, spleen, lymphatic and liver system. Exposure to *A. precatorius* seed extract causes conjunctivitis, eye damage, and blindness. Another symptom of poisoning is acute gastroenteritis with vomiting.
nausea and diarrhea leading to shock, seizures, and dehydration.  

**Conclusion**

*A. precatorius* is a potential herbal plant that is good for use as a natural medicine. The stems, seeds, and roots of the *A. precatorius* plant each has their own traditional uses. In addition, the use of *A. precatorius* with an incorrect dose will cause toxic effects.

**References**

1. Safira A, Savitri SL, Putri ARB, Hamonangan JM, Safinda B, Solikhah TI, et al. Review on the pharmaco logical and health aspects of Hylocereus or Puya: An update. J Drug Deliv Ther. 2021; 11(6):297-303. https://doi.org/10.22270/jddt.v11i6.5181

2. Khairullah AR, Solikhah TI, Ansori ANM, Kharisma VD, Solikhah TI. Medicinal properties of Muntingia calabura L.: A Review. Res J Pharm Technol. 2021; 14(8):455-08.

3. Ansori ANM, Kharisma VD, Solikhah TI. Medicinal properties of Muntingia calabura L.: A Review. Res J Pharm Technol. 2021; 14(8):455-08.

4. Khairullah AR, Solikhah TI, Ansori ANM, Fadholy A, Ramandimanto SC, Ansharieta R, et al. A review of an important medicinal plant: Alpinia galanga (L.) Willd. Syst Rev Pharm. 2020; 11(1):387-95. https://doi.org/10.34172/jrp.2021.32

5. Solikhah TI, Solikhah GP, Susilo RJK. Aloe vera and Virgin Coconut Oil (VCO) accelerate healing process in domestic cat (Felis domesticus) suffering from scabies. Iraqi J Vet Sci. 2021; 15(5):431-4.

6. Martin-Herrera D, Abdala S, Benjumea D, Gutierrez-Luis J. Diuretic activity of some Withania aristata Ait. fractions. J Ethnopharmacol. 2008; 117(3):496-9. https://doi.org/10.1016/j.jep.2008.03.004

7. Khairullah AR, Solikhah TI, Ansori ANM, Hidayatullah AR, Hartadi EB, Ramandimanto SC, et al. Review on the Pharmacological and Health Aspects of Apium graveolens or Celery: An Update. Syst Rev Pharm. 2021; 12(1):606-12.

8. Solikhah TI, Setiawan B, Ismukada DR. Antidiabetic activity of papaya leaf extract (Carica papaya L.) isolated with maceration method in alloxan-induced diabetic mice. Syst Rev Pharm. 2020; 11(9):774-8.

9. Solikhah TI, Solikhah GP. Effect of Muntingia calabura L. leaf extract on blood glucose levels and body weight of alloxan-induced diabetic mice. Pharmaco J. 2021; 13(6):1450-5. https://doi.org/10.5530/pj.2021.13.184

10. Bhatia M, Siddiqui N, Gupta S. Abrus precatorius (L.): An evaluation of traditional herb. J Pharm Res. 2013; 3:329-315.

11. Garaniya N, Bapodra A. Ethno botanical and Phytopharmacological potential of Abrus precatorius L.: A review. Asian Pac J Trop Biomed. 2014; 4:S27-34. https://doi.org/10.12960/APJTB.4.2014C1609

12. Tabasum S, Khare S, Jain K. Spectrophotometric quantification of total phenolic, flavonoid, and alkaloid contents of Abrus precatorius L. seeds. Asian J Pharm Clin Res. 2016; 9(2):371-4.

13. Tabasum S, Khare S, Jain K. Establishment of Quality Standards of Abrus precatorius Linn. Seeds. Indian J Pharm Sci. 2018; 80(3):541-6. https://doi.org/10.4103/pharmaceutical-sciences.6.1000389

14. Shourie A, Khra K. Analysis of phytochemical constituents and pharmacological properties of Abrus precatorius L. Int J Pharma Bio Sci. 2013; 4:91-101.

15. Monago CC, Alhumain E. Anti-diabetic effect of chloroform-methanol extract of Abrus Precatorius Linn Seed in alloxan diabetic rabbit. J Appl Sci Environ Mgmt. 2005; 9(1):85-8.

16. Attael AR, Otari KV, Shete R V, Upasani CD, Nandgude TD. Abrus precatorius Linnus: a phytopharmacological review. J Pharm Res. 2010; 3(11):285-7.

17. Okhale SE, EM N. Abrus Precatorius Linn (Fabaceae): pharmacochemistry, ethnomedicinal uses, ethnopharmacology and pharmacological activities. Int J Pharm Sci Res. 2016; 1:37-43.

18. Solanki A, Zaveri M. Pharmacognosy, phytochemistry and pharmacology of Abrus precatorius leaf: A review. Int J Pharm Sci Res. 2012; 13(2):71-6.

19. Prabha M, Perumal C, Kumar P, Soundararajan, Srinivasan S R. Review Article Pharmacological activities of Abrus precatorius (L.) seeds. Int J Pharm Med Res J Homoeop. 2015; 3(2):195-100.

20. Bahrami Y, Franco CMM. Acetylated triterpene glycosides and their biological activity from holothuroidea reported in the past six decades. Mar Drugs. 2016; 14(8):147. https://doi.org/10.3390/md14080147

21. Ragava CY, Lorena GS, Mandia EH, Raga DD, Shen C-C. Chemical constituents of Abrus precatorius. Amer J Essent Oils Nat Prod. 2013; 1(2):7-10.

22. Das A, Jain V, Mishra A. A brief review on a traditional herb: Abrus precatorius (L.). Int J Forensic Med Toxicol Sci. 2016; 1(1):1-10. https://doi.org/10.18231/jijftms.2016.001

23. Pal RS, Ariharasivakumar G, Giripunje K, Upadhyay A. In vitro antioxidative activity of phenolic and flavonoid compounds extracted from seeds of Abrus precatorius. Int J Pharm Pharm Sci. 2009; 1(2):360-10.

24. Obeta JC, Agu CV, Nkouk OU, Okonkwo CC, Ananduaka EG. Potentials of non-edible Abrus precatorius seed oil towards biodiesel production. Afr J Biotechnol. 2014; 13(44). https://doi.org/10.5897/AJB2014.13979

25. Yonemoto R, Shimada M, Gunawan-Puteri M K, Kato E, Kawabata J. α-Amylase inhibitory triterpene from Abrus precatorius leaves. J Agric Food Chem. 2014; 62(33):8411-4. https://doi.org/10.1021/jf502667z

26. Bhakta S, Das SK. The medicinal values of Abrus precatorius: a review study. J Adv Biotechnol Exp Ther. 2020; 3(2):84-91. https://doi.org/10.5455/jabet.2020.d111

27. Verma S. Phytochemical and pharmacological study on Abrus precatorius. Asian J Plant Sci Res. 2016; 6(2):24-6.

28. Herrmann MS, Behnke WD. A characterization of abrin from the seeds of the Abrus precatorius plant. Biochim Biophys Acta (BBA)-Protein Struct. 1981; 667(2):397-410. https://doi.org/10.1016/0005-2795(81)90206-3

29. Verma D, Tiwari SS, Srivastava S, Rawat AJS. Pharmacognostical evaluation and phytochemical standardization of Abrus precatorius L. seeds. Nat Prod Sci. 2011; 17(1):51-7.

30. DeFilipps RA, Krupnick GA. The medicinal plants of Myanmar. Phytore view. 2018; 102:1-341. https://doi.org/10.3897/phytokeys.102.24380

31. Balamurugan S, Vijayakumar S, Prabhu S, Yahesh JEM. Traditional plants used for the treatment of gynecological disorders in Vedaranam taluk, South India-an ethnomedicinal survey. J Tradit Complement Med. 2018; 8(2):308-23. https://doi.org/10.34172/jtcme.2017.06.009

32. Janghel V, Patel P, Chandel SS. Plants used for the treatment of icterus (jaundice) in Central India: A review. Ann Hepatol. 2019; 18(5):658-72. https://doi.org/10.1016/j.ajokep.2019.05.003

33. Kubiatowicz R, Benson L. Oh no! Ethnobotany. The safe handling and storage of hazardous ethnobotanical artifacts. In: Collection forum. 2003. p. 59-73.
used in Ebiraland. Bayero J Pure Appl Sci. 2011;4(1):10-6. https://doi.org/10.4314/bajosp.v4i1.2
52. Mølgaard P, Nielsen SB, Rasmussen DE, Drummond RB, Mackaz N, Andreasen J. Anthelmintic screening of Zimbabwean plants traditionally used against schistosomiasis. J Ethnopharmacol. 2001; 74(3):257-64. https://doi.org/10.1016/S0378-8741(00)00377-9
53. Ménán H, Ranzouiri-T, Hecqoette A, Pélisier Y, Blache Y, Koné, M, et al. Antiplasmoidal activity and cytotoxicity of plants used in West African traditional medicine for the treatment of malaria. J Ethnopharmacol. 2006; 105(1-2):131-6. https://doi.org/10.1016/j.jep.2005.10.027
54. Sirsi M. In vitro study of the inhibitory action of some chemotherapy agents on a freshly isolated strain of Cryptococcus neoformans. Hindustan Antibiot Bull. 1963; 6(2):39-40.
55. Sohn S-H, Lee E-Y, Lee J-H, Kim Y, Shin M, Hong M, et al. Screening of herbal medicines for recovery of acetaminophen-induced nephrotoxicity. Environ Toxicol Pharmacol. 2009; 27(2):225-30. https://doi.org/10.1016/j.etap.2008.10.009
56. Sohn S-H, Lee H, Nam J, Kim S-H, Jung H-J, Kim Y, et al. Screening of herbal medicines for the recovery of cisplatin-induced nephrotoxicity. Environ Toxicol Pharmacol. 2009; 28(2):206-12. https://doi.org/10.1016/j.etap.2009.04.005
57. Tripathi S, Maiti TK. Immunomodulatory role of native and heat denatured agglutinin from Abrus precatorius. Int J Biomed Chem Biol. 2005; 37(2):451-62. https://doi.org/10.1016/j.ijbgb.2004.07.015
58. Bhutia SK, Mallick SK, Maiti TK. In vitro immunomodulatory properties of Abrus lecints derived peptides in tumor bearing mice. Phytomedicine. 2009; 16(8):776-82. https://doi.org/10.1016/j.phymed.2009.01.006
59. Wambece C, Amosun SL. Some neuromuscular effects of the crude extracts of the leaves of Abrus precatorius. J Ethnopharmacol. 1984; 11(1):49-58. https://doi.org/10.1016/0378-8741(84)90095-3
60. Ojewole JA. Laboratory evaluation of the hypoglycemic effect of Anacardium occidentale Linn (Anacardiaceae) stem-bark extracts in rats. Methods Find Exp Clin Pharmacol. 2003; 25(3):199-204. https://doi.org/10.1055/mf.2003.25.376940
61. Ojewole JA. Antinociceptive, anti-inflamatory and antidiabetic effects of Bryophyllum pinnatum (Crassulaceae) leaf aqueous extract. J Ethnopharmacol. 2005; 99(1):13-9. https://doi.org/10.1016/j.jep.2005.01.025
62. Jouad H, Haloui M, Rhiouani H, El Hilaly J, Eddouks M. Ethnomedical plants used for snakebite in India: a brief review. J Med Plants Res. 2009; 3(10):809-15. https://doi.org/10.5897/JMPR.09.011
63. Osadebe PO, Okide GB, Ikhuonu IL, Eddouks M. In vitro screening of the antidiabetic potential of the detoxified extract. J Ayurveda Integr Med. 2014; 6(2):167-73. https://doi.org/10.4103/ijccm.IJCCM_35_13
64. Gbola OJ, Akinlade IA, Olayinka SO. Studies on anti-inflammatory activities of crude methanolic extracts of Loranthus micranthus (Linn.) sourced from five different host trees. J Ethnopharmacol. 2001; 77(2):175-82. https://doi.org/10.1016/S0378-8741(00)00377-9
65. Anam EM. Antiplasmoidal activity of plants used in the treatment of schistosomiasis in the western region of Nigeria. J Ethnopharmacol. 2003; 87(2):135-9. https://doi.org/10.1016/j.jep.2003.03.013
66. Anam EM. Anti-inflammatory activity of compounds isolated from the aerial parts of Abrus precatorius (Fabaceae). Phytotherapy. 2001; 8(1):24-7. https://doi.org/10.1016/S0944-7113(00)0001
67. Jahan S, Rasool S, Khan MA, Ahmad M, Arshad MZM, Abbasi AM. Antifertility effects of ethanolic seed extract of Abrus precatorius L. on sperm production and DNA integrity in adult male mice. J Med Plants Res. 2009; 3(10):809-14.
67. Choudhari AB, Sayyed N, Khairnar AS. Evaluation of antiserotonergic activity of ethyl acetate extract of Abrus precatorius leaves. J Plant Res. 2011; 4(3):570-2.

68. Khairnar AS, Parthasarthy V, Nazim S, Ahmed MH, Borase L, Chaudhari A, et al. Determination of antimigraine property of leaves extracts of Abrus precatorius by serotonergic receptor agonist activity. J Pharm Res. 2011; 4(4):1000-3.

69. Ibrahim AM. Anthelmintic activity of some Sudanese medicinal plants. Phyther Res. 1992; 6(3):155-7. https://doi.org/10.1002/ptr.2650060312

70. Itokawa H, Hirayama F, Tsuruoka S, Mizuno K, Takeya K, Nitta A. Screening test for antitumor activity of crude drugs (III). Studies on antitumor activity of Indonesian medicinal plants. Shoyakugaku zasshi. 1990; 44(1):58-62.

71. Reddy VVS, Sarsi M. Effect of Abrus precatorius L. on experimental tumors. Cancer Res. 1969; 29(7):1447-51.

72. Lalithakumari H, Reddy V V, Rao GR, Sarsi M. Purification of Proteins From Abrus Precatorius L. & Their Biological Properties. Indian J Biochem. 1971; 8(4):321-3.

73. Nwodo OFC, Botting JH. Uterotonic activity of extracts of the seeds of Abrus precatorius. Planta Med. 1983; 47(04):230-3. https://doi.org/10.1055/s-2007-969994

74. Nenov VD, Marinov P, Sabeva J, Nenov DS. Current applications of plasmapheresis in clinical toxicology. Nephrol Dial Transplant. 2003; 18(suppl_5):v6-8. https://doi.org/10.1093/ndt/gfg1049

75. Tam CC, Henderson TD, Stanker LH, He X GLW. Abrin toxicity and bioavailability after temperature and ph treatment. Toxins (Basel). 2017; 9(10):320. https://doi.org/10.3390/toxins9100320

76. Wooten IV, Pittman CT, Blake TA, Thomas JD, Devlin JJ, Higgerson RA et al. A case of abrin toxin poisoning, confirmed via quantitation of L-abrine (N-methyl-L-tryptophan) biomarker. J Med Toxicol. 2014; 10(4):392-4. https://doi.org/10.1007/s13181-013-0377-9

77. Patil MM, Patil SV, Akki AS, Lakhkar B BS. An arrow poison (Abrus precatorius) causing fatal poisoning in a child. J Clin diagnostic Res JCDR. 2016; 10(3):SD03-4. https://doi.org/10.7860/JCDR/2016/18234.7439

78. Karpurashetti NB, Hiremath SK, Manjulabai KH KS. A review of gunja (Abrus precatorius. linn) on both aspect of medicine as well as poison. Asian J Pharm Res Dev. 2014; 2(1):66-7.

79. Alhamdani M, Brown B NP. Abrin poisoning in an 18-month-old child. Am J Case Rep. 2015; 16:146-8. https://doi.org/10.12659/AJCR.8992917