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CHAPTER 11

Pharmacological Properties of *Abrus precatorius* (L.) from Fabaceae family

Dhole N. A.[a,b] **and Surwase B. S.**[b]

[a]Department of Botany, Digambarrao Bindu Arts, Commerce and Science College, Bhokar Dist. Nanded 431801 Maharashtra, India

[b]School of Life Science, Swami Ramanand Teerth Marathwada University Nanded 431606 Maharashtra, India

Corresponding author Email: nageshdhole2019@gmail.com

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Abrus precatorius (L.)

An indispensable herb in traditional medicine is *Abrus precatorius* Linn, sometimes called Indian liquorice. Appearing in tropical regions worldwide, it is a member of the Fabaceae family. This chapter will cover the current usage of *Abrus precatorius* L in medicine and pharmacology. This plant species' seeds and leaves have long been valued in many cultures for their use as food, medicine, decorative plants, beverage sweeteners, liquorice substitutes, jewelry, beads, weighing devices, and other customary, cultural, and religious purposes. *Abrus precatorius* was utilized in almost all regions of worldwide for millennia as an ancient plant-based remedy for a broad spectrum of ailments.

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The tribes people in the Bundelkhand region of Madhya Pradesh apply powdered root to snakebite areas and use it as an emetic (37). The rhizome of ginger (*Zingiber officinale* Rose) and vasumbu (*Acorns calamus* L.) are combined with the root of A. precatorius in an infusion made by ancient tribes in the Western Ghats region of South India to treat coughs (19). The root decoction is used by Rajasthani tribal people to enhance men's sexual vitality. Additionally, roots are used to treat skin conditions, colic, coughs, colds, and night blindness (39). The people who live in the Ganjan Region of Orissa think that tying the roots of *A. precatorius* on a thread and putting it around the animal's neck will cure cataracts in cattle (17). The Nicobarese tribe cures severe coughs using a leaf juice and water combination (5). The tribes of Western Madhya Pradesh region use a mixture of leaves and castor oil topically to treat rheumatism. Leaf juice is ingested twice a day to treat urinary issues (34).

The seeds are used as a purgative and expectorant by the tribes in Madhya Pradesh, together with boiling ginger and milk. The seeds are employed as an abortifacient and are thought to have a strong toxic effect on the neurological system. The white version of the seed powder is used twice a day by the tribal people of Uttar Pradesh's Mirzapur area to alleviate arthritis (13). The seeds of *A. precatorius* yield stigmasterol and p-sitosterol when isolated with benzene. Delphinindin-3, 5-diglucoside and, pelargonidin-3-glucoside, constituted the anthocyanins that were separated from the seed coat. Scientists investigated the seeds' steroidal components. Studying quinines from the roots was another thing (16).

Researchers examined the neuromuscular activity of *A. precatorius* leaf extracts in isolated toad abdominal muscles and rat nerves of the diaphragm muscle arrangements, as well as in chicks. They discovered that the ethanol extract's neuromuscular blocking action was comparable to that of d-tubocurarine. Neither the petroleum extract nor the aqueous extract had any discernible impact on the skeletal muscles. In albino rats, a fifty percent ethanolic extract of the seeds of *A. precatorius* (250 mg/kg) caused complete sterility in the males for thirty and sixty days, however it was reversible (33). A methanol extract of the seeds was washed using human spermatozoa to test its spermicidal and antimotility properties. The findings indicated that the extracts had sperm antimotility activity at an EC 50 value of 2.29 mg/ml. Studies have also been conducted on isolated guinea pig and rat uterine strips to examine the oxytocic action of the essential oil derived from the seeds. It has been reported that the active ingredient in the seeds was isolated to have antidiarrheal effects in rats (21).

Drugs may be helpful for female contraception, as shown by the impact of seed powder made of *Abrus precatorius*, and used against on the ovarian and uterine lustoarchitecture of female albino rats at dosages of 50, 75, and 100 mg/kg/day for 30 days, which resulted in complete uterine degeneration (32). The effects of petroleum ether seed extract on the behavior of albino rats of both sexes were examined. Body weight extracts were given to rats for 7, 14, and 21 days. While the male albino rat had a drop in excretion latency and intromission frequency during courting, both of which were deemed uninteresting after the initial courtship ended, the female albino rat exhibited no discernible alterations. Studies on cytological and histochemical alterations were also conducted. Research on A. cantoniensis and other plants' constitution and hepatoprotective qualities are discussed (20).

The cytoagglutinating activity of abrin-b, which was extracted from *Abrus precatorius* seeds, was examined using spectroscopy in relation to leukemic cells. China uses A. cantoniensis as a traditional remedy for hepatitis. Research has been done on the antihepatotoxic properties of soyasaponin I, kaikasaponin III, and triterpenoid saponins that were extracted from the whole A. cantoniensis plant. At the maximum dosage (500 jig/ml), soyasaponin I and kaikasaponin III exhibited moderate toxicity, however glycyrrhizin did not exhibit any toxicity at any level (18). It has been reported that a protein extract extracted from *Abrus precatorius* seeds has antineoplastic properties. The extract demonstrated effectiveness against a fibrosarcoma in mice and a solid and ascits type of Yoshida sarcoma in rats due to its direct cytotoxic action on the tumor cells. The subcutaneous approach is less successful than the intraperitoneal one. The substance was found to be nonhomogenous and composed of three separate components using electrophoretic examination. These fractions' isolation, characterisation, and biological activity investigation were published (31).

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Using a sepharose 4B affinity column, a galatose-specific lectin called abrin was isolated from *Abrus precatorius* seeds. When administered to mice at a sublethal dosage of 7.5 pg/kg every other day for ten days, it showed anticancer action. Abrin was shown to be efficient in suppressing the formation of solid tumor masses caused by Ehrlich's Ascites Carcinoma cells and Dalton's Lymphoma Ascites cells, both intralesional and intraperitoneally. Abrin sensitivity was higher in DLA cell line compared to EAC. When administered intraperitoneally, brin extended the life expectancy of mice with ascites tumors. When utilized in conjunction with tumor cells, abrin had the strongest antitumor impact. When administered to established tumor masses, abrin greatly decreased the tumor volume, particularly in tumors caused by DLA. Nevertheless, it was discovered that abrin administered prophylactically proved unsuccessful (28). Plant materials were frequently utilized as anti-inflammatory, tonics, purgatives, aphrodisiacs, and contraceptives (7). The secondary metabolites of *Abrus precatorius* Linn include alkaloids, flavonoids (including desmethoxycentaviridin-7-O-rutinoside, orientin, luteolin, isoorientin, and abrectorin), saponins, and steroids, additionally; the plant contains fixed oil, carbohydrates, protein, tannins, anthocyanins, and amino acids of various kinds. Using the agar well diffusion technique, the antibacterial activity of *Abrus precatorius* seed extracts was evaluated in vitro against 10 different bacterial species. It was shown that methanol extracts had antibacterial activity against almost all types of bacteria. The bactericidal activity of seed extracts in hexane and chloroform is negligible or absent. Methanolic crude extracts had the most antibacterial action against Klebsilla pneumonia, with subsequent orders of resistance being *Micrococcus luteus*, *Staphylococcus aureus*, and *Streptococcus mitis*. The plants under investigation proved to be the most potent against every tested germ. The antibacterial activity of the active plant extracts was on par with that of the prescription medication streptomycin. Thus, our study offers scientific validation for the long-standing practice of using solvent extracts from Abrus precatorius as a source of novel and potent herbal remedies to treat illnesses brought on by microbes resistant to several drugs (38)

The extracts of *Abrus precatorius* seed were assessed for possible antioxidant capabilities using tests such hydrogen peroxide scavenging potential, ferrous ion reducing power, and hydroxyl radical scavenging efficiency. In an in-vitro antioxidant test, the ethanol-based seeds extract of *Abrus precatorius* shown strong antioxidant capacity in comparison to the reference material butylated hydroxytoluene. Extract has the potential to be used in nutritional supplements to treat a wide range of human ailments and issues because of its potent antioxidant properties (30). The antibacterial activity of *Abrus precatorius's* roots, seeds, and leaves against several bacterial strains was investigated. The Gram-positive bacterium Staphylococcus aureus was discovered to be effectively confronted by the root extract of Abrus precatorius. Root extracts have antimicrobial properties, namely against Staphylococcus aureus. Consequently, the root extract's antimicrobial effect was rather moderate (12).

The anti-diabetic effect of a chloroform-methanol extract of *Abrus precatorius* seed was studied in alloxan-diabetic rabbits. The percentage drop in blood glucose after administration with chloroform-methanol extract at different intervals was found, suggesting that the chloroform-methanol extract of *Abrus precatorius* seed has anti-diabetic properties similar to those of chlorpropamide. A distinct result was found in another study using rat models that were treated with an ethanol and water extract of the aerial part of Abrus precatorius. As a consequence of the medication, blood sugar levels dropped by thirty percent (6). Male rats were used to test the diuretic efficiency of an ethanol extract of the aerial sections; however, the findings were not statistically significant. Another research examined the possibility of renal damage in Sprague Dawley Wistar rats given alcohol orally. Serum levels of potassium, salt, creatinine, and malondialdehyde were significantly reduced after six weeks of using the crude extract along with alcohol, regular meals, and water. Histological analyses demonstrated glomerular infiltration and structural alterations in renal tubules when compared to chronic inflammatory cells, suggesting that alcohol induces renal damage. When alcohol and *Abrus precatorius* seed extract were administered at the same dosages, alcohol-induced kidney damage was inhibited. It has been discovered that *Abrus precatorius* seed extract shields the kidney from parenchymal damage brought on by alcohol (14).

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The effect of arial portions of aqueous extract on restoration was investigated after cisplatin administration and acetaminophen-induced nephrotoxicity. *Abrus precatorius* was shown to have the greatest recovery effect and to be useful in the treatment or prevention of renal disease (35). The effectiveness of the anti-arthritic treatment was examined in a rat model of inflammation caused by croton oil. Two different quantities of water extracts from *Abrus precatorius* leaves were administered orally, and both extracts showed a decrease in paw inflammation. In a different investigation, rats with Freunds' complete adjuvant-induced arthritis were treated with white and red extracts from *Abrus precatorius* seeds. While the red seed's inflammation was dramatically reduced in the later phase, the white seed greatly reduced FCA-induced arthritis and enhanced paw withdrawal latency, suggesting a preventative effect against arthritis. It was discovered that the white seed treatment's anti-arthritic properties significantly slowed the disease's development. In cases of pyrexia caused by brewer's yeast, both extracts had significant antipyretic effects (36). The anti-inflammatory activity of Abrus precatorius concentrate has been studied on inflammation caused by croton oil in a rat ear model. After six hours, the rat ear treated with *Abrus precatorius* extract in addition to croton oil showed less inflammation than the rat ear treated with croton oil alone. The extract decreased the inflammatory response by 2% as compared to the group that received croton oil alone. This finding explains why the leaves of this plant have been utilized to treat inflammatory disease conditions by traditional healers. Using the same paradigm, another study was carried out using the triterpenoid, saponins, and their acetate derivatives that were extracted from the active components. Different test compounds shown a decrease in inflammation (8).

An isoflavanquinone called abruquinone was extracted from aerial parts extract and had antimalarial properties. Anti-plasmodial activity was measured in order to ascertain antimalarial activity. The extract from *Abrus precatorius* has strong antimalarial properties against Plasmodium (15). Strong anti-allergic effects have been shown in abruquinones A. Similar to how histamine, serotonin, bradykinin, and substance Plasma prevented plasma-induced invasion in ear oedema more than diphenhydramine and methysergide did. The potential for healing of wounds in red and black colored seeds of methanol impermeable fractions may be attributed to the presence of gums, mucilages, tannins, or phenolic compounds. This supports the efficacy of seed extracts and components to treat the condition (4). Fundus muscle solutions from albino rats and frogs were tested for their anti-serotonergic properties. While ethyl acetate extract only shown the initial rise when compared to Sumatriptan at different dosages, petroleum ether extracts demonstrated smooth muscle contraction at varied concentrations and the response increased with the dose. Using an a mixture of extract of the aerial sections (500 mg/kg), the body temperatures was determined and shown to be unresponsive (3). The exact same seed extract was shown to have an additional antispasmodic effect on rat contractions of the uterus. When examined on the small intestine, a chromatographic proportion of dried seeds were shown to exhibit intestinal fluid retention, intestinal motility inhibition, and anti-diarrheal effectiveness (21). The isoflavoquinones and abruquinones significantly inhibited platelet aggregation. Agglutinin activity was found in human lymphocytes cultured in water seed extract cells. According to a different research, the medication did not affect the red blood cells of the human A, B, or O groups or any of the fifteen other animals. The following species' red blood cells responded well to the water seed extract: ants, buffalo, cats, chickens, dogs, ducklings, guinea pigs, horses, lambs, mice, pigeons, rabbits, rats, and oxen; goats showed no reaction, while cows and adult humans showed very minor activity. The *Abrus precatorius* plant's methanol and methylene chloride fractions were evaluated for their anti-thrombin properties (10). A subcutaneous delivery of a chloroform/methanol extract of seeds to female mice demonstrated favorable efficacy. The same thing happened when male mice received intragastric injections of seed ethanol extract for 60 days. There were no pregnancies among the 20 females who matched the 10 men. An inert ethanol extract of seeds was fed to female rats. Conversely, petroleum ether showed signs of active inhibition. The antifertility effect was inert whether female mice were administered petroleum ether extracts of leaves, water, or 95% ethanol. There are a lot fewer pregnant ladies now than there were. Abrus precatorius were among the extracts mixed with the hot water extract of dried plant that was given orally to females at an amount of 0.28 g/person every two hours for 20 days beginning on the second day of menstruation. The biological

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activity of this plant has been registered for patent. In female mice, it has also been shown that this plant seed oil inhibits fertility. Another research examined the DNA content of spermatozoa in older male albino mice as well as the generation of sperm with extract from the seeds of Abrus precatorius. All of the animals who were treated had an increase in the generation of sperm after 20 days of treatment with the ethanol seed extract of Abrus precatorius, which had previously caused a very significant decline in daily sperm output. In a similar vein, all of the treated animals had a considerable increase in DNA damage throughout the course of the therapy, with no indication that this damage was reversible. The results of this research suggest that Abrus precatorius seed extract may have potential use as a contraceptive or anti-fertility medication; nevertheless, there is a risk that the extract may alter spermatozoa's DNA, which might have teratogenic consequences. Seed oil extracts made from petroleum ether have been shown to have anti-fertility effects by other studies (11). An aqueous seed mixture led 51% of the rats to get pregnant between day one to eleven days. The activity decreased when the same dosage was administered from day six to fifteen day. Positive outcomes were obtained by giving mice extracts of seeds (water extract) and methanol. An ethanol extract of seeds given orally to pregnant mice was efficient; however it had no impact on hamsters. Another research discovered that giving mice oral ethanol (95%) root extract had an anti-estrogenic effect. The petroleum ether extract had no effect on the mice. Mice in pregnancy that received intragastrical water-soluble extracts of dried seeds also showed no activity (24). After being administered different dosages of seed extract, female mice were discovered to remain dormant. Female mice treated with 1 mg/kg of chloroform seed extract subcutaneously showed satisfactory results. The same outcomes at other dosages (10, 5, and 2 gm/kg) were seen in additional studies, with no discernible effect on uterine weight. It was shown that feeding mice an oral ethanol (95%) dry seed extract inhibited gonadotropin production (25).

Chloroform extract of seeds treatment of pregnant mice resulted in anti-implantation action. The roots of *Abrus precatorius* was extracted with petroleum ether and ethanol, which were both active; the extract from water seeds and ethanol was inactive. Ethanol (95%) root extract showed significant effects when administered orally to mice, whereas ethanol (95%) seed extract showed significant effects in both mice and hamsters. Another research that used oral ethanol (95%), water, and petroleum ether extracts of leaves did not see any effect in female mice. Chloroform seed extract, which suppressed luteal flow, was administered to rats. There was evidence of semen coagulation in rat semen that had been exposed to ethanol extract (29). Male mice given ethanol extract of seeds intragastrically for 60 days showed little effects. Dried seed extract of ethanol/water (1:1) has a beneficial effect on mice. There were no significant histological changes in the testes or the amount of sperm after 60 days. The results were outstanding when the dried seeds sterol fraction was administered intramuscularly (2). Rats with Yoshida sarcoma and mice with fibrosarcoma have shown an anticancer effect of a protein extract from the seeds of *Abrus precatorius*. The extract directly damages tumor cells by producing vacuolation, chromosomal abnormalities, disruption of the cytoplasm, and karyolysis. A separate investigation discovered that the pure extract of agglutinin protein from Abrus precatorius seeds have strong anti-tumor properties. It was discovered that when administered to mice, it stopped roughly 90% of tumor development. Experiments on sugar-binding inhibition in mice showed variations in binding sites that prevented sarcoma. Abrus agglutinin, a hetero tetrameric specific lectin extracted from *Abrus precatorius* seeds, was shown to suppress Dalton's lymphoma ascites cell growth in vitro (23). Researchers looked at how N-nitrosodiethylamine and *Abrus precatorius* affected hepatocellular carcinoma in Swiss albino mice. An aqueous/ethanol extracts of *Abrus precatorius* exhibited a significant level of cytotoxicity on HepG2 cells. The extract-treated group's mean and relative liver weights were lower at a dosage than those of the control group. Similar outcomes were obtained when individuals with sarcoma received an intraperitoneal dose of aqueous extract. The agglutinin protein that was precipitated from the seeds exhibited potent anticancer action (23).

It was discovered that fresh seed water extract was ineffective against human lymphocyte mitogenic potential. Results from ethanol extract of the dried stem and methanol extract on Salmonella typhimurium TM677 were comparable. Two further extracts from dried seeds (water and methanol) on Sarcoma yoshida and the cell culture strain CA-9KB show potential. A aqueous extract from seeds activated Poecilocera picta testes.

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Abrus precatorius seeds were used to extract the chemical abrin, which has been shown to have anticancer properties in both vitro and animal models (9). Numerous investigators have examined the immunomodulatory properties of abrin; one study reported on abrin's impact on cellular immune responses in mice with and without tumors. In both the tumor-bearing and healthy groups, abrin significantly elevated natural killer cell activity, and it was observed to occur earlier than in the control group. The immunomodulatory effects of abrin were confirmed by an increase in complement-mediated and antibody-dependent cytotoxicity of cells in the tumor-bearing group treated with the drug. Abrus agglutinin's effects on heat-denatured murine splenocyte expansion, cytokine production, NK-cell activation, and thymbocyte proliferation were examined in a different research. This research suggests that *Abrus* agglutinin may be an immunomodulator when it is heat-denatured (27). Glycol-histochemical investigations of microglial cell activation in atopic brain tissues have been used to investigate *Abrus precatorius* in a model of Alzheimer's disease. Using an active ingredient lectin from the *Abrus precatorius* plant, the histochemical identification of microglial stimulation of cells in atopic brain tissues from Alzheimer's disease participants was made (40). Following administration of an ethanol (70%) extract from freshly harvested Abrus precatorius root at different dosage levels, mice of both male and female sex exhibited antidepressant action (1). Dried *Abrus precatorius* leaves were extracted with 95% ethanol, and the resulting 0.5g/mL extract showed blocking action on the spiral nerve-diaphragm (39). Male and female mice were given different doses of an extract made from ethanol of fresh Abrus precatorius root through the abdomen, and the extract significantly reduced metrazole-induced convulsions but did not affect strychnine-induced tremors. In the same experiment, there was no statistically significant difference in the electroshock-induced convulsions caused by the ethanol/water (1:1) extract of aerial portions of *Abrus precatorius* (29). The neuroprotective properties of petroleum ether extract from aerial parts of *Abrus precatorius* were investigated at different dosages in rats that were given hypoxia neurotoxicity. The extract significantly enhanced spatial behavior at the examined levels as compared to hypoxic rats. Orally administered, the extract showed neuroprotective effects by raising reduced levels of glutamate, dopamine, and acetylcholinesterase (26). Rat phrenic nerve-diaphragm skeletal muscle, biceps abdominis, and extracted tissue from young chicks were among the tissues evaluated for crude extracts from *Abrus precatorius* leaves. An ethanol-based extract of the leaves decreased contractions caused by acetylcholine in the rectus abdominis and rat phrenic nerve-diaphragm muscle groups. Concentration determined the effects, which were reversible. Acute paralysis was caused by the extract when it was injected intravenously into young chickens. The rat diaphragm was stimulated electrically directly, but the ethanol extract had no impact. Ethanol extract was shown to provide neuromuscular inhibition comparable to that of d-tubocurarine (39). As a nerve tonic, leaves are used to wounds, edema, and mouth ulcers. Roots are used to treat hemoglobinuria, gonorrhea, and jaundice. The fixed oil in seeds is thought to contribute in the formation of hair. Dried root infusion is used as a treatment for hepatitis and pneumonia (4). Traditional medicine uses Indian licorice (*Abrus precatorius*) to treat a wide range of human problems instead of *Glycyrrhiza glabra* L. The herb that is being studied has many different medicinal uses.

References

1. Adesina SK. (1982). Studies on some plants used as anticonvulsants in Amerindian and African traditional medicine. Fitoterapia 53,147-162.
2. Agarwal et al., (1970). Antifertility activity of the roots of *Abrus Precatorius*. Pharmacological Research Communication 2, 159-164.
3. Chinnappan et al., (2011). Studies on Wound Healing Activity of Red and Block Coloured Seed, White Coloured Seed Extracts of *Abrus Precatorius* L. International Journal of Pharma and Bio Sciences 2(1).
4. Chukuo et al., CM. (1995). Potent anti-platelet, antiinflammatory, and antiallergic isoflavanquinones from the roots of *Abrus Precatorius*. Plant Medica 61 (4), 307-312

ISBN: 978-93-95369-85-5

5. Dagar et al., (1996). Ethnobotanical studies of the Nicobarese of Chowra Island of Nicobar group of islands. Journal of Economic and Taxanomic Botany 12, 385.
6. Dhawan et al., (1977). Screening of Indian plants for biological activity, Indian Journal of Experimental Biology, 15, 208-219.
7. Elisabetsky et al., (1992). Traditional Amazonian nerve tonics as antidepressant agents. A case study. *Journal of Herbs, Spices & Medicinal Plants*, 1, 125-162.
8. Georgewill OA. (2010). Anti-arthritic activity of Abrus Precatorius in albino rats. The Internet Journal of Laboratory Medicine, 4-1.
9. Hussein et al., (1982). Screening of plants in Sudan folk medicine for anticancer activity. Fitoterapia 53, 119-123.
10. Itokawa et al., (1990). Screening test for antitumor activity of crude drugs (III). Studies on antitumor activity of Indonesian Medicinal Plants. Shoyakugaku Zasshi. 44(1), 58-62.
11. Jahan et al., (2009). Antifertility effects of ethanolic seed extract of Abrus Precatorius L. on sperm production and DNA integrity in adult male mice. Journal of Medicinal Plant research. 3, 809-814.
12. Kalpesh et al., (2010). Determination of Antibacterial Activity and MIC of Crude Extract of *Abrus precatorius* L., Advanced Biotechnology, 10 -2.
13. Khanna et al., (1996). Unreported Ethnomedicinal users of plants from Mirzapur District, Uttar Pradesh, Journal of Economic and Taxanomic Botany 12, 113.
14. Ligha et al., (2009). Protective Effect of *Abrus Precatorius* Seed Extract following Alcohol Induced Renal Damage, European Journal of Scientific Research 25 (3), 428-436
15. Limmatvapirat et al., (2004). Antitubercular and antiplasmodial constituents of *Abrus Precatorius*. Planta medica, 70, 276-278.
16. Lupi et al., (1979). Abruquinones: New natural isoflavoquinones . Gazzetta Chemica Italians., 109, 9-12.
17. Malaya et al., (1998). Veterinary use of plants among Tribals of Orissa. Ancient Science of Life, 17, 214-219.
18. Miyao et al., (1998). Kaikasaponin III and soyasaponin I, major triterpene saponins of Abrus cantoniensis, act on GOT and GPT: influence on transaminase elevation of rat liver cells concomitantly exposed to CC1 4 for one hour, Planta Medica. 64, 5-7.
19. Nagendra et al., (1996). Ethnobotany of the Kanikkars of South Tamilnadu-1. Journal of Economic and Taxanomic Botany 12, 293.
20. Nohara et al., (1997). Leguminous glycosides effective for hepatitis. In Advances in plant glycosides, Chemistry and Biology. Proceedings of the international symposium on plant glycosides.
21. Nwodo et al., (1991) Studies on *Abrus Precatorius* seeds II Antidiarrhoeal activity. Journal of Ethnopharmacology 31(3), 395-398.
22. Panneerselvam et al., (2000). Crystallization of agglutinin from the seeds of *Abrus Precatorius*. Acta Crystallographica Section D Biological Crystallography. 56(7), 898-899.
23. Prakash et al., (1976). Screening of Indian plants for antifertility activity. Indian Journal of Experimental Biology 14, 623-626.

ISBN: 978-93-95369-85-5

24. Prakesh et al., (1980). Effect of oral doses of *Abrus Precatorius* Linn. Seeds on the oestrus cycle, body weight, uterine weight and cellular structures of uterus in albino rats. Journal of ethanopharmacology, 19, 286-292

25. Premanand et al., (2010). Neuroprotective effects of *Abrus Precatorius* Linn. Aerial extract on hypoxic neurotoxicity induced rats. International Journal of Chemical and Pharmaceutical Science. 1-1.

26. Ramnath et al., (2002). Antitumour effect of abrin on transplanted tumours in mice. *Indian Journal of Physiology* and *Pharmacology*. 46: 69-67.

27. Ramnath et al., (2006). Effect of abrin on cell mediated immune responses in mice. Immunopharmacol. Immunotoxicol, 28 (2), 259-268.

28. Ranju et al., (2007). In-Vitro Antioxidative activity of Phenolic and Flavonoid compounds extracted from Seeds of *A. precatorius*. International Journal of Pharmacy & Pharmaceutical Science. 1 -2.

29. Reddy et al., (1969). Effect of *Abrus precatorius* L. on experimental tumors. Cancer Research 29, 1447-1451.

30. Singh et al., (1991). Effect of a herbal preparation on reproductive organs of female albino rats. Himalayan Journal of Environment and Zoology. 5, 82-86.

31. Sinha, R., (1990). Post-testicular antifertility effects of *Abrus precatorius* seed extract in albino rats. Journal of Ethnopharmacology 28, 173-181.

32. Siwakoti et al., (2000). Ethnomedicinal uses of plants among the Satar tribe of Nepal. Journal of Economic and Taxanomic Botany 23, 323-333.

33. Sohn et al., (2009). Screening of herbalmedicines for the recovery of acetaminophen induced nephrotoxicity, Environmental Toxicology and Pharmacology, 27, 225-230.

34. Sudaroli et al., (2007). Evaluation of red and white seed extracts of *Abrus Precatorius* Linn. against freund's complete adjuvant induced arthritis in rats. Journal of Medicinal Plants Research, 1(4), 086-094.

35. Suman et al., (1992). Ethnomedicinal Herbal Legumes of Bundelkhand Region, Madhya Pradesh. Journal of Economic and Taxanomic Botany, 10, 106.

36. Varaprasad et al., (2009). *Abrus Precatorius* L. Seed Extracts Antimicrobial Properties Against Clinically Important Bacteria, International Journal of Pharmacy research and Technology, 1 (4), 1115-1118.

37. Vedavathy et al., (1997). Tribal Medicine of Chittoor District, A.P. (India). Herbal Folklore Research Centre, with the aid from IDRC, Ottawa, Canada, 13-14.

38. Wambebe et al., (1984) some neuromuscular effects of the crude extracts of the leaves of *Abrus Precatorius*. Journal of Ethnopharmacology 11(1), 49-58.

39. Wambebe et al., (1984) some neuromuscular effects of the crude extracts of the leaves of Abrus Precatorius. Journal of Ethnopharmacology 11(1), 49-58.

40. Zambenedetti et al., (1988). Histochemical Localization of Glycoconjugates on Microglial Cellsin Alzheimer's Disease Brain Samples by Using *Abrus Precatorius*, Maackia amurensis, Momordica charantia, and Sambucus nigra Lectins. Experimental Neurology 153(1), 167-171.

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