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A REVIEW: ARGEMONE MEXICANA IS AN INDIGENOUS HERB

R. J. Pawar^{*}, S. A. Govilkar, S. B. Ahire and V. A. Bairagi

Department of Pharmacognosy, K.B.H.S.S. Trust's Institute of Pharmacy, Malegaon, Nashik - 423105, Maharashtra, India.

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Correspondence to Author:

R. J. Pawar

Department of Pharmacognosy, K.B.H.S.S. Trust's Institute of Pharmacy, Malegaon, Nashik-423105, Maharashtra, India.

E-mail: rp506851@gmail.com

ABSTRACT: *Argemone mexicana* is an indigenous herb commonly known as Prickly poppy. It belongs to the family Papaveraceae. *Argemone mexicana* is noted to possess medicinal benefits in the traditional system of medicine. Various parts of the plant were widely used in Ayurveda, Siddha, Unani and Homeopathic medicines. It is reported to have antimicrobial Activity, wound healing property, larvicidal and chemo sterilant activity, nematicidal and allelopathic potential, anti-malarial, antibacterial and antifungal, molluscicidal, anti-cancer, hepatoprotective, anti-HIV and neuro-pharmacological activity. Beyond pharmaceutical efficacies, certain plant parts also show toxic effects as well. Argemone Mexicana oil adulteration poses a serious threat to human health and should be checked by appropriate regulatory measures. Hence, up-to-date information on the chemical and pharmacological knowledge on this plant may be helpful to guide researchers anticipating to undertake further investigations in these directions.

INTRODUCTION: Plants have been used in medicines since time immemorial. India has a rich heritage of using medicinal plants in traditional medicines, as in the Ayurveda, Siddha, and Unani systems besides folklore practices. The plant kingdom is a virtual goldmine of biologically active compounds, and it is estimated that only 10-15% of existing species of higher plants have been surveyed. Many plants have been successfully used in the treatment of various diseases. The ancient record is evidencing their use by Indian, Chinese, Egyptian, Greek, Roman, and Syrian dates back to about 5000 years.

In India, around 20,000 medicinal plant species have been recorded recently, but more than 500 traditional communities use about 800 plant species for curing different diseases¹. The plant *Argemone mexicana* belonging to the family Papaveraceae, is a widely distributed plant throughout the sub-tropical and tropical regions of the world.

Mexican, known as Mexican poppy or Mexican prickly poppy, is a species of poppy found in Mexico and now in the United States, India and Ethiopia. In India, around 20,000 medicinal plant species have been recorded recently, but more than 500 traditional communities use about 800 plant species for curing different diseases. *Argemone mexicana* is extensively used as traditional medicine for the treatment of numerous diseases. Fresh yellow, milky seed extract containing protein-dissolving substances is effective for the treatment of warts, cold sores, skin diseases, itching

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and jaundice². *Argemone mexicana* has been investigated in terms of modern pharmacology for its antimalarial Activity. WHO had given the information that traditional medicines are safe for the treatment of infections originated from microbial and non-micro-bial origin^{3,4,5}.

Different Names of *Argemone mexicana*:^{6,7}

TABLE 1: NOMENCLATURE OF ARGEMONE MEXICANA IN DIFFERENT

Languages	Names
Bengali	Siyal-Kanta
Hindi	Satyanashi, Bharband
Kannada	Datturigidida
Konkani	Phirangidhuro
Malayalam	Ponnummattu
Malayalam	Khomthongpee
Marathi	Firangidhotra

TABLE 2: SCIENTIFIC CLASSIFICATION

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida Dicotyledons
Subclass	Magnoliidae
Order	Papaverales
Family	Papavaraceae
Species	<i>Argemone mexicana</i>

Morphology:



The plant is an erect prickly annual herb of about 1 m high; leaves are usually 5 to 11 cm long, and more or less blotched with green and white, glaucous broad at the base, half-clasping the stem prominently sinuate-lobed and spiny⁸.

The flowers of this plant having a 2-3 foliaceous bracts. Sepals of this 8-12 mm long and 5-7 mm broad and acute in shapes, prickly is outside. Petals are 4-6 obovate in shapes and 2.5-3.5 cm long and (1.5-) 2-2.5 cm in broad and bright yellow colour. Stamens are indefinite, 8-12 mm long curved after flowering.

Ovary ovate is 8-10 mm long and 3-5 mm broad covered with long soft spines. Fruits are capsules, prickly and oblong ovoid. Seeds are numerous, globose, netted, and brownish-black. Pollen is tritetracolporate. The flowers become 4 to 5 cm in diameter and are terminal, yellow, and scentless⁹.

Phyto-chemistry: Higher plants are warehouses of assorted bioactive constituents or phytochemicals which find ample use in the pharmaceutical industry. About a quarter of all prescribed pharmaceuticals in advanced countries contain compounds that are directly or indirectly derived from plants. Phytochemicals or secondary metabolites usually occur in complex mixtures that differ among plant organs and stages of development. Knowledge of the phytochemical constituents is essential to enable investigation of the actual effectiveness of the plant in medicine.

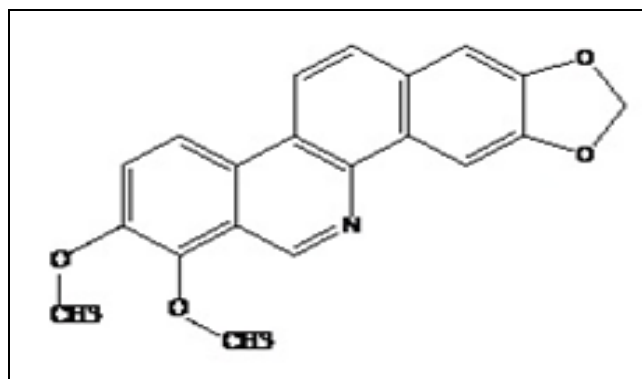


FIG. 1: STRUCTURE OF NORCHELERYTHRINE¹⁵

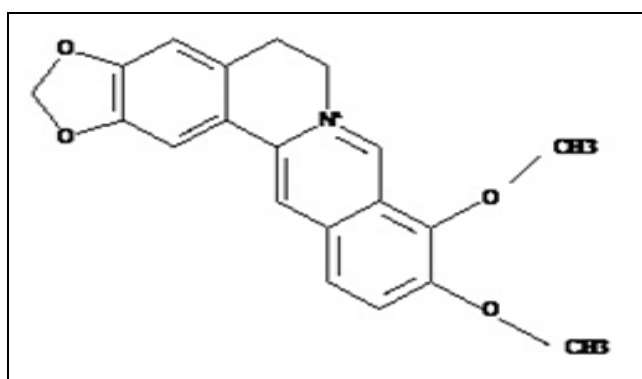


FIG. 2: STRUCTURE OF BERBERINE¹⁶

Argemone mexicana is known to possess a wide range of phytochemical constituents, which are mentioned below. The table gives the details of the phytochemical constituents that have been reported from different parts of *Argemone mexicana*¹⁰. *Argemone mexicana* is reported to possess alkaloids^{11, 12}, amino acids, phenolics and fatty

acids as major phytochemical groups. A series of bioactive compounds have been reported, and some of them are isolated from different parts of *Argemone mexicana*.

The whole plant of *Argemone mexicana* was reported to possess isoquinoline alkaloids such as berberine, cheilanthi foline, coptisine, muramine, scoulerine, stylopine, cryptopine, thalifone, sanguinarine, protopine, optisine, chelerytherine and benzyl-isoquinoline alkaloids^{13, 14} Alkaloids such as berberine, tetrahydroberberine, protopine, and Benzophenanthridines have been isolated from the plant. Seed oil, otherwise called Argemone Mexicana oil reported containing sanguinarine and dihydrosanguinarine. It also contains palmitic, myristic, oleic, and linoleic acids. Some of the structures of isolated compounds of this plant are shown in Fig. 1 and 2.

Biological Activity: Reports on biological activities are many. The alkaloid Sanguinarine has been reported to prolong ventricular refractoriness, and this property may be useful in the treatment of ventricular arrhythmias. Plants are known to produce a variety of compounds that have evolved as defense compounds against microbes and herbivores. The elaboration on the biochemically active ingredients and the medicinal properties of *Argemone mexicana* elicits queries on the effect of plant extracts on other biological organisms. *Argemone mexicana* showed promise as an effective bio-control agent. The extracts of *Argemone mexicana* possess inhibitory, deterrent or lethal Activity on biological agents that cause disease and damage to other organisms. Table 3 summarises the effect of *Argemone mexicana* on different pathogens and pests¹⁷.

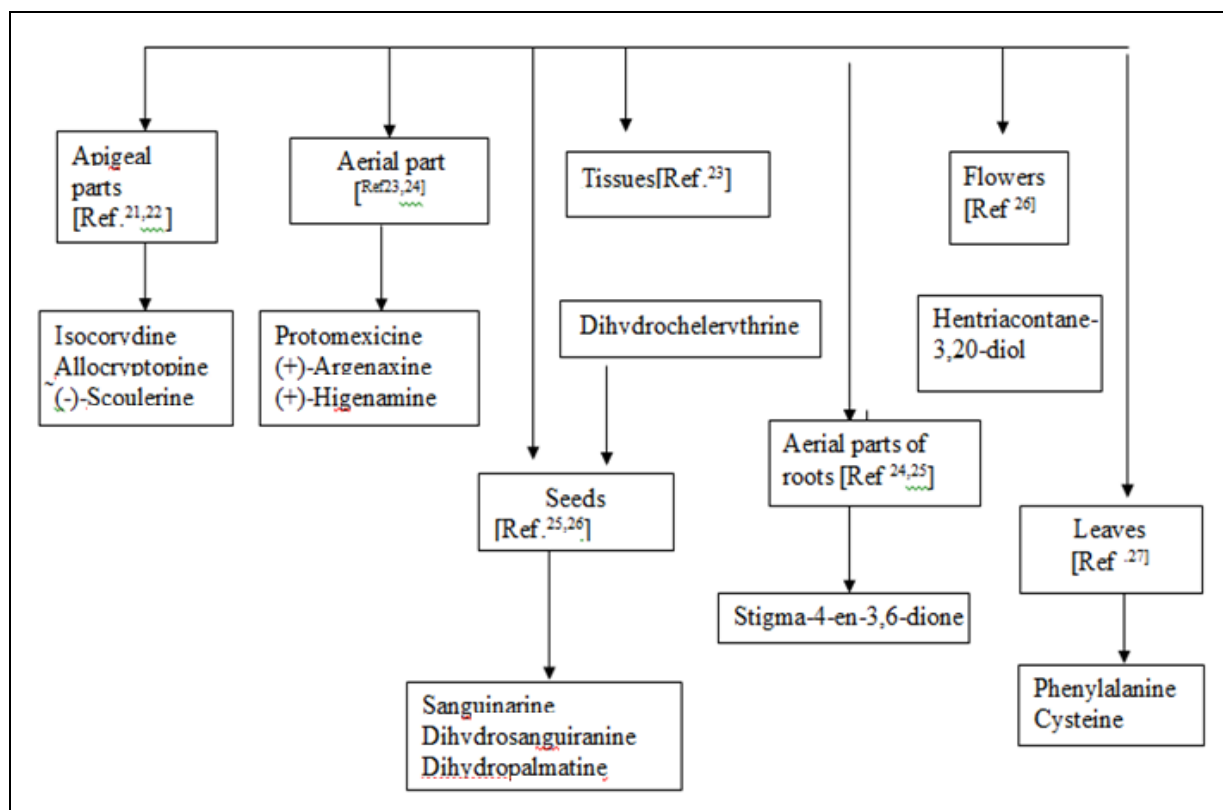


FIG. 3: PHYTOCHEMICAL CONSTITUENTS OF DIFFERENT PARTS OF ARGEMONE MEXICANA

TABLE 3: ACTIVITY OF ARGEMONE MEXICANA EXTRACTS ON BIOLOGICAL PATHOGENS AND PESTS^{18, 19}

Activity	Action against
Anti-fertility	Spermatogenesis in dogs
Anticancer	Human cancer cell lines such as HeLa-B75 (48%), HL-60(20.15%) and PN-15 (58.11%), HeLa and MCF-7 Cancer cell lines
Anti-termite	Formosan subterranean termite pest, <i>Coptotermes formosanus</i> Shiraki
Wound healing	Animals, albino rats, Wistar albino rats
Larvicidal	2 nd instar larvae of <i>Aedes aegypti</i> ,
Analgesic, Locomotor	Wistar albino mice

Medicinal Uses:²⁰**TABLE 4: MEDICINAL USES OF ARGEMONE MEXICANA**

Anti-Diabetic Activity	Fever
Anti-hepatotoxic Activity	Antidote
Anti-HIV Activity	Jaundice
Oral care activity	For cleaning
Anti-fertility Activity	Skin diseases
Expectorant	Hepatoprotective Activity

Fever: Roots of *Argemone mexicana* are ground with *Piper nigrum*. The latex is useful in malarial fever. One spoonful of the obtained extract is given twice a day for 5 days²¹.

Scabies: Seeds are roasted on the hot iron pan to get ash applied regularly till the cured²².

Skin Diseases: Along with the pounded seeds of *Argemone mexicana* the pate prepared and applied on the skin. The oil is useful for skin diseases.

The fresh yellow extract also used for skin diseases. The whole plant parts used in skin diseases.

Antidote: The fresh yellow, milky seed extract contains protein-dissolving substances effective in the treatment of antidote to various poisons. A paste of 20 g root of *Argemone mexicana* along with 20 g petiole of Maharukh (*Ailanthus excels* Roxb.) is applied on the snake bite area as an antidote²³.

Expectorant: They are expectorant and can be used in the treatment of coughs and other chest complaints. The alkaloid fractions of the root are reported to possess anti-inflammatory Activity and strong uterine stimulant effect.

Tooth Ache and Gastric Problems: Extract applied into the tooth activity extract uncooked with the river water and black pepper taken as an orally.

Wound: The fresh seed can be used for wound healing problems. Yellow-colored latex extracted from the fresh stem of *Argemone mexicana* is used to cure wounds²⁴.

Jaundice: Plant juice of *Argemone mexicana* is used orally. 2-3 spoons daily for one week is used to cure jaundice. Tea from dried leaves is used to quit smoking and drug abuse²⁵.

For Curing Injuries and to Kill Worms: *Argemone mexicana* (Papaveraceae) Sathyanashi. 1. Oil is extracted from seeds of *Argemone mexicana*. It is applied to injuries. 2. Seeds of *Argemone mexicana* are burnt, and the fumes are passed on gums to kill worms²⁶.

For Cleaning Body: The series of sonera-mexicouse the entire plant both fresh and dried. An infusion is made to relieve kidney pain, to help expel a torn placenta, and in general to help cleanse the body after parturition²⁷.

Malaria: An *Argemone mexicana* tea is used by traditional healers in Mali to treat malaria. The whole plant is used to make a tea, and as much tea as possible is drunk until symptoms disappear. This use has been studied clinically for the treatment of uncomplicated malaria^{28, 29, 30}.

Anti-fertility Activity: seeds of *Argemone mexicana* were evaluated to have inhibitory activity against spermatogenesis in dogs at stage XII of late spermatids on administration³¹.

Cytotoxic Activity: line. At a dose of 200 µg/mL, protomexicine and 13-oxoprotopine exhibited mild cytotoxicity (~24–28%), whereas dehydrocorydalmine showed moderate cytotoxicity (~48%). 8-Oxyberberine was mildly cytotoxic (~27%) at 24 h but was more potent (~76%) at 48 h. Jatrorrhizine and 8-methoxydihydrosanguinarine were most potent (~95– 100%) in inhibiting the human colon cancer cell proliferation showing a complete reduction in cell viability³².

Antimicrobial Activity: Pharmaceutical and toxicological studies of the root essential oils can be done in the future to identify its pure compound and elucidate the components responsible for these antimicrobial activities³³.

Anti-diabetic Activity: Aqueous extract of aerial parts of *Argemone mexicana* at a dose of 200 and 400 mg/kg body weight was reported to have hypoglycemic efficacy in alloxan-induced diabetic rats; significant reduction in blood glucose levels, plasma urea, creatinine, triacylglyceride, cholesterol values and recovery in body weight compared to diabetic control rats and the standard drug-treated rats are found when treated with the aqueous extract at a dose of 400 mg/kg body weight³⁴.

Anti-HIV Activity: Thebenzo [c] phenanthridine alkaloid, (\pm)-6-acetyl dihydrochelerythrine isolated from the methanolic extract of air-dried whole plants of *Argemone mexicana* was found to exhibit potent anti-HIV activity³⁵.

Anticancer Activity: The ethanol extract of *Argemone mexicana* was reported to exhibit inhibitory activity against human cancer cell lines such as HeLa-B75 (48%), HL-60 (20.15%) and-15 (58.11%)³⁶.

Anti-hepatotoxic Activity: Das et al., (2009) showed promising antihepatotoxic Activity of aqueous extract of *A. mexican* stem in carbon tetrachloride-induced hepatotoxic male Albino Wistar rats in oral administration³⁷.

Neuropharmacological Activity: Reported on neuropharmacological applications of *Argemone mexicana*. According to that, in Wistar albino mice at an oral dosage of 100, 200, and 400 mg/kg b.w, the ethyl acetate and methanol extract of the whole plant of *Argemone mexicana* exhibited analgesic, locomotor, and muscle relaxant activity.

Both extracts exhibited significant activities, but methanol extract at a dosage of 200 mg/kg body weight was found to be more potent for central nervous system activities such as analgesic, anxiolytic and sedative effects³⁸.

Oral Care Activity: the whole plant of *Argemone mexicana* is used for common dental disorders³⁹.

Hepatoprotective Activity: Showed very insignificant changes instead of producing toxicity compared to the normal group. That is the percent of the increase of SGPT and SGOT for *Argemone mexicana* were 79.77% and 4.4%, respectively⁴⁰.

Adulteration: Consumption of adulterated mustard oil (*Brassica nigra*) with argemone oil (*Argemone mexicana*) even for a short duration leads to epidemic dropsy.

In humans, adulteration of mustard oil with Argemone oil causes oxidative stress and death of red blood cells via met-hemoglobin formation by altering pyridine nucleotide (s) and glutathione redox potential. Argemone oil contamination poses a serious threat to human health⁴¹.

Poisoning: Sanguinarine and dihydrosanguinarine, the inter-convertible alkaloids, are the toxic etiological agents of argemone oil⁴². The electrophilic nature of the iminium group in sanguinarine is responsible for binding to DNA by interaction with GC rich regions^{43, 44}. argemone oil and isolated sanguinarine alkaloid cause DNA damage in the liver, bone marrow, and blood cells. *Argemone mexicana* oil contamination poses a serious threat to human health⁴⁵. Suspected cases of epidemic dropsy have been investigated by Dr. R.E. Meaker in the North-western Cape districts.

In all aspects, the disease resembled the Indian epidemic dropsy. In experiments conducted upon fowls with the seed of the Mexican poppy collected from the lands on which the wheat is eaten by the victims was grown, symptoms and histological lesions similar to those seen in the human epidemic were produced. With the information at our disposal, we can come to no conclusion other than that the said outbreak in the Carnarvon district was epidemic dropsy caused by the consumption of wheat contaminated with the seed of the Mexican poppy⁴⁶.

CONCLUSION: The broad survey of literature reviewed that *Argemone mexicana* has some significant medicinal activity but also cause significant toxicity. Few isolated novel chemical constituents show anti-HIV properties also. Further, evaluation needs to be carried out on *Argemone mexicana* in order to explore masked areas, which can be used for the wellbeing of the manhood. There is a possibility to identify the new compound and check claimed pharmacological Activity by eliminating toxic effects.

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