

Argemone mexicana

General description

Scientific Name with Author

Argemone mexicana L.

Synonyms

Argemone leiocarpa Greene; *Argemone ochroleuca* Sweet; *Echtrus trivialis* Lour.; *Echtrus mexicanus* (L.) Nieuwl.; *Argemone vulgaris* Spach; *Argemone versicolor* Salisb.; *Argemone spinosa* Moench; *Argemone sexvalis* Stokes; *Argemone mucronata* Dum. Cours. ex Steud.; *Argemone mexicana* var. *typica* Prain; *Argemone mexicana* var. *parviflora* Kuntze; *Argemone mexicana* var. *ochroleuca* (Sweet) Lindl.; *Argemone mexicana* var. *lutea* Kuntze; *Argemone mexicana* fo. *leiocarpa* (Greene) G.B. Ownbey (Pires, 2009).

Family

Papaveraceae

Vernacular Names

Mexican poppy, prickly poppy, yellow thistle, Mexican thistle (En). Argémone, pavot épineux, pavot du Mexique, tache de l'œil, chardon du pays (Fr) (Bosch, 2008)

Botanical Description

Argemone mexicana is an annual herb, growing up to 150 cm with a slightly branched tap root. Its stem is branched and usually extremely prickly. It exudes a yellow juice when cut. It has showy yellow flowers. **Leaves** are thistle-like and alternate, without leaf stalks (petioles), toothed (serrate) and the margins are spiny. The grey-white veins stand out against the bluish-green upper leaf surface. The stem is oblong in cross-section. **Flowers** are at the tips of the branches (are terminal) and solitary, yellow and of 2.5-5 cm diameter. **Fruit** is a prickly oblong or egg-shaped (ovoid) capsule. Seeds are very numerous, nearly spherical, covered in a fine network of veins, brownish black and about 1 mm in diameter (Nacoulma, 1996; Bosch, 2008).



Photo LABIOCA 1. *Argemone mexicana*

Origin and Distribution

Argemone mexicana is native in Mexico and the West Indies, but has become pantropical after accidental introduction or introduction as an ornamental. It is naturalized in most African countries, from Cape Verde east to Somalia, and south to South Africa (Bosch, 2008).

Distribution: Africa, Northeast Tropical Africa, Ethiopia, Socotra Asia-Temperate, Arabian Peninsula, North Yemen, Oman, Saudi Arabia, South Yemen Europe, Middle Europe, Austria, Germany, Switzerland , Southeastern Europe, Bulgaria , Southwestern Europe, France, Portugal, Spain Southern America, Brazil, Piaui , Northern South America, Venezuela , Southern South America, Paraguay , Western South America, Bolivia, Colombia, Ecuador

Plant Part Used

Whole plant; Seeds; Seed oil; Flowers; Latex; Roots; Leaves



Photo LABIOCA 2. Sample of *Argemone mexicana*

Ethnobotanical information

Major Ethnopharmacological Uses

The plant cures leprosy, skin diseases, inflammation and bilious fevers. Roots are useful in guinea-worm infestation, skin diseases, leprosy, pruritus, blennorrhagia, inflammations, all type of poisoning, constipation, flatulence, colic, malarial fever and vestibular calculus. The leaves are useful in cough, wounds, ulcers and in skin diseases. Juice is used to cure ophthalmia and opacity of cornea. Seeds are purgative and sedative. Seeds are also useful in vitiated conditions of cough, asthma, pertussis, skin diseases, leprosy, wounds, odontalgia, dentalcaries, constipation, rheumatalgia, colic and flatulence. The latex is useful in dropsy, jaundice, skin diseases, leprosy, blisters, conjunctivitis, inflammation, burning sensation and malarial fever. The oil is useful in indolent ulcers, wounds, leprosy and skin diseases, constipation, flatulences, colic and rheumatalgia. In Homeopathic system of medicine the drug prepared from this herb is used to treat the problem caused by tape worm. (Nacoulma, 1996; Bosch, 2008; Rajvaidhya et al., 2012)

Chemical constituents

Whole plant: berberine, protopine, sanguinarine, chelerytherine, pancorine, (+)-argenaxine, angoline, aronttianamide, dihydrocheilantifoline, allocryptopine, coptisine, jatrorrhizine, columbamine, oxyberberine, N-demethyloxysanguinarine (Chang et al., 2003). **Seed oil:** myristic, palmitic, oleic, linoleic acids. **Yellow juice:** berberine. **Leaves:** mexicanol, mexicanic acid. **Seeds:** dihydropalmitine hydroxide; berberine, protopine, ferulic acid, tannic acid, caffeic acid, benzoic acid, cinnamic acid (Singh et al., 2010; Rajvaidhya et al., 2012). **Leaves:** protomexicine, mexitin, 8-methoxydihydrosanguinarine, 13-oxoprotopine, rutin, quercitrin, eriodictyol (Singh et al., 2012; Koumari et al., 2013)

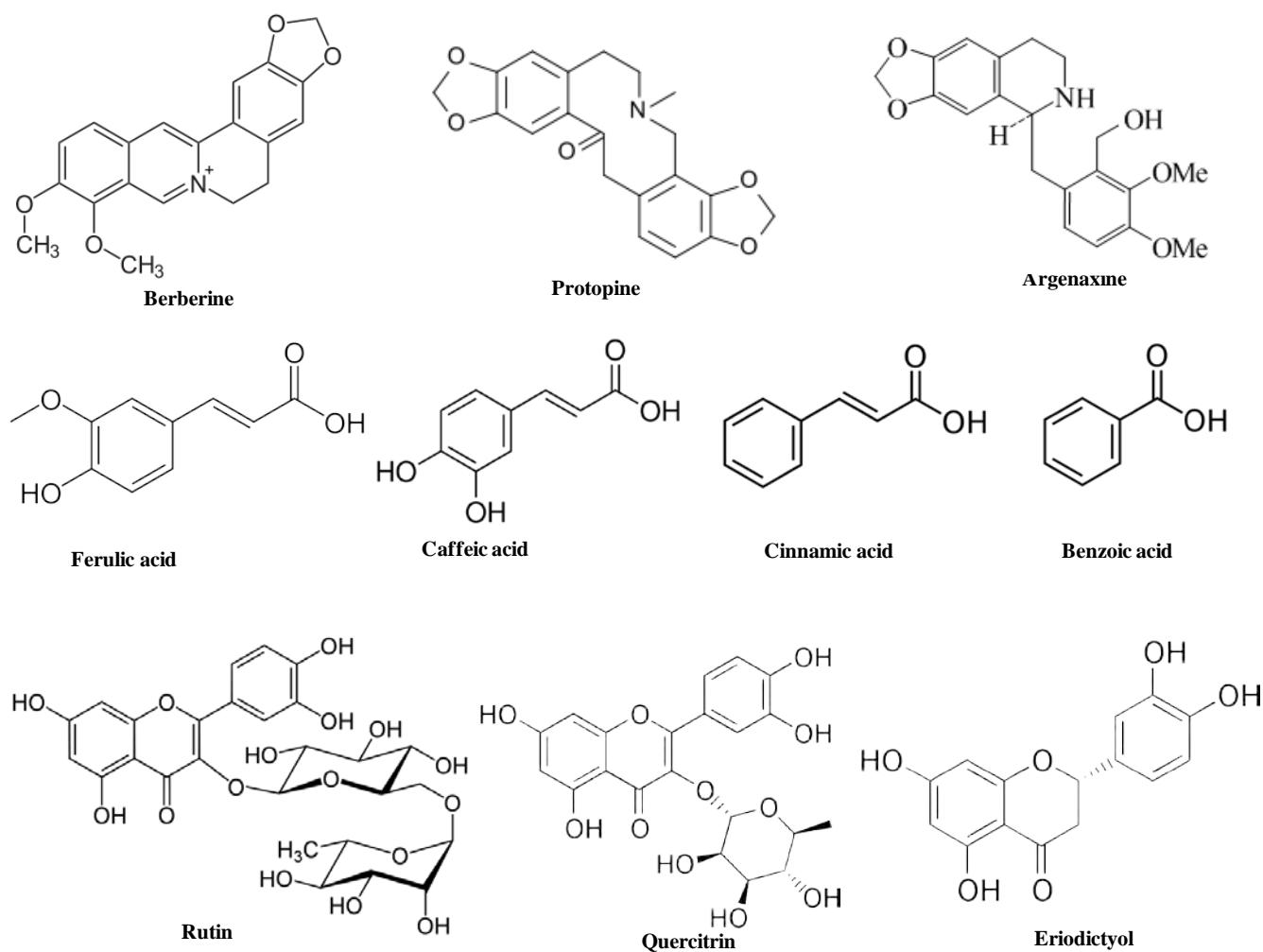


Figure 1. Structure of some identified compounds from *Argemone mexicana*

Quality control

Organoleptic Properties

Medium grin, tasteless, smell similar to those of the tobacco leaves

TLC

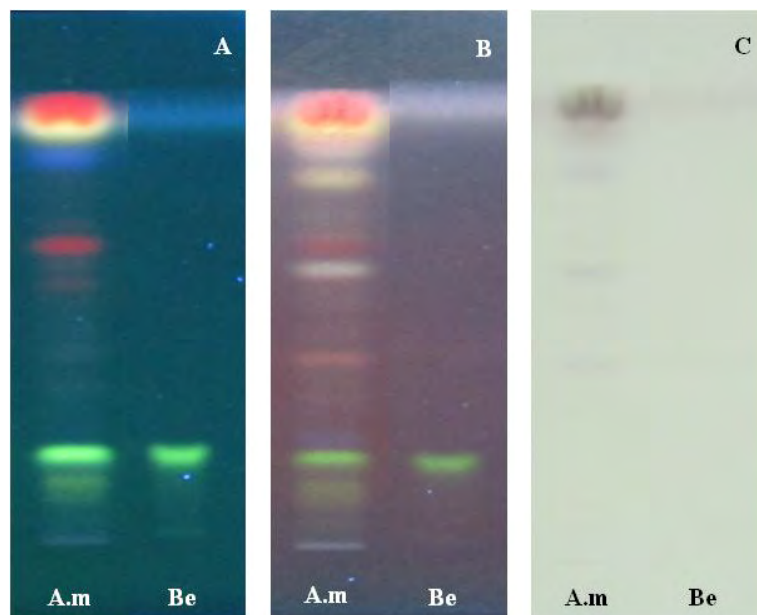


Figure 2. Chromatograms of acetone extract of *Argemone mexicana*

System: EtOC/MeOH/H₂O (77/13/10)

A: UV 366nm light

B: Anisaldehyde/UV 366nm light

C: Anisaldehyde/visible light

A.m: *Argemone mexicana*

Be: Berberine

Pharmacological properties

In Vitro Experiments

Antimalarial activity

Some compounds isolated from the active fraction of *Argemone mexicana* decoction were considered to be highly active against *Plasmodium falciparum*. These compounds are protopine (IC₅₀ 0.32 µg/mL), allocryptopine (IC₅₀ 1.46 µg/mL), sanguinarine (IC₅₀ 7.02 µg/mL). (Avello, 2009).

Antibacterial activity

The leaves aqueous extracts exhibited moderate antibacterial effects against *Enterococcus faecalis* and *Staphylococcus aureus* with inhibition zone of 20 and 10 mm respectively at 250 µg/disc concentration. With *Proteus mirabilis* and *Klebsiella pneumoniae* the inhibition zone was 16 mm at 250 µg/disc concentration. The aqueous extract of the leaves exhibited antifungal activity at 500 µg/disc concentration only against *Cryptococcus neoformans* and did not show any antifungal activity on *Aspergillus fumigatus*. The methanolic extract of the leaves exhibited significant antimicrobial activity at 125, 250 and 500µg /disc (zone of inhibition, 10-20mm) against *Proteus mirabilis*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Aspergillus fumigatus*, *Cryptococcus neoformans* (Kumari et al., 2013). Acetone extract of seeds inhibited the growth of *Klebsiella oxytoca* (MIC 0.02 m g/disc), *Vibrio damselle* (0.01 mg/disc), *Enterobacter aerogenes* (MIC 0.01 m g/disc), *Escherichia coli* (MIC 0.005 mg/disc) (Kempraj & Bhat, 2010). The chloroform fraction (CH3) of seeds was significantly active at 4 to 64 mg/mL against *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* (Bhattacharjee et al., 2010).

Antioxidant activity

The flower methanolic extract showed a dose dependent scavenging activity and free radical inhibition of total antioxidant (IC₅₀ 280 µg/mL), hydrogen peroxide (IC₅₀ 290 µg/mL), reducing power assay (IC₅₀ 250 µg/mL), nitric oxide (IC₅₀ 280 µg/mL) comparable to free radical scavenging activity of ascorbic acid (Kasthuri & Chitra, 2014). The ethyl acetate and methanol extracts of the leaves exhibited an interesting DPPH free radicals scavenging with IC₅₀ values of 39.31 µg/mL and 65.56 µg/mL, respectively (Apu et al., 2012).

In Vivo Experiments

Hepatoprotective activity

The protective effects of the aqueous extract of *Argemone mexicana* whole plant, against CCl₄ induced hepatic failure in male albino rats (wistar strain) was investigated. The administration of aqueous extracts (250mg/kg and 150mg/kg of body weight) for 7 days, elicited protective action since the elevated levels of marker enzymes (AST, ALT, ALP) of liver functions were found to be decreasing progressively in a dose dependent manner with net weight gain. In the aqueous extract 250mg/kg treated rat group all the marker enzymes were analyzed to be decreasing significantly (p<0.001), (AST, 272.77±24.08; ALT, 189.15±7.16; ALP, 97.15±6.54) and the final body weight was

also significantly ($p < 0.001$) increased (6.16 ± 1.01) when compared with the toxic control group (Willcox et al., 2007).

Das et al. (2009) showed promising antihepatotoxic activity of aqueous extract of *A. mexicana* stem in carbon tetrachloride-induced hepatotoxic male Albino Wistar rats; oral administration of 150 and 250 mg/kg body weight of the extract decreased serum aspartate transaminase, alanine aminotransferase and alkaline phosphatase levels. Another research group (Sourabie et al., 2012) also investigated the anti-icterus activity of crude leaf powder of the plant against CCl_4 -induced hepatotoxicity in Wistar rats; the investigators observed significant increase in the levels of ASAT/GOT (aspartate aminotransferase), ALAT/GPT (alanine aminotransferase) and ALP (alkaline phosphate) while decrease in total bilirubin (TBIL) and direct bilirubin (DBIL) level tested at different doses of 125, 250 and 500 mg/kg b.w.

Antidiabetic activity

Aqueous extract of aerial parts of *A. 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 weight (Nayak et al., 2011). The hydro-alcoholic extract of aerial parts of *A. mexicana* also reduces fasting blood glucose levels in Streptozotocin-induced hyperglycemic Wistar albino rats at a dose of 200 and 400 mg/kg body weight (Rout et al., 2011).

Wound healing activity

The wound healing effects of the leaf extract (50% ethanol) and latex were investigated on albino rats using both excision and incision wound models. Topical application of the extract and latex, respectively, gave 67.08 and 57.86% healing after 12 days in the excision model and increased tensile strength to 188.50 and 154.61 gm in the incision model (Rajvaidhya et al., 2012).

Clinical Studies

A prospective, dose-escalating, quasi-experimental clinical trial was conducted with a traditional healer using a decoction of *Argemone mexicana* for the treatment of malaria. The remedy was prescribed in three regimens: once daily for 3 days to group A; twice daily for 7 days to group B; and four times daily for the first 4 days followed by twice daily for 3 days to group C. Thus, 80 patients were included, of whom 80% were aged < 5 years and 25% were aged < 1 year. All presented to the

traditional healer with symptoms of malaria and had a *Plasmodium falciparum* parasitaemia > 2000/ μ l but no signs of severe malaria. The proportions of adequate clinical response (ACR) at day 14 were 35%, 73% and 65% in Groups A, B and C, respectively (P = 0.011). At day 14, overall proportions of ACR were lower in children aged < 1 year (45%) and higher in patients aged > 5 years (81%) (P = 0.027). Very few patients had complete parasite clearance, but at day 14, 67% of patients with ACR had a parasitaemia < 2000/ μ l (Willcox et al., 2007).

Safety data

Single Dose Toxicity

MDA-MB-435S (Breast ductal carcinoma cells): IC₅₀ = 1.82 mg/mL (Uddin et al., 2011)

NIH/3T3 (Normal mouse fibroblast cells): IC₅₀ = >2.50 mg/mL (Uddin et al., 2011)

AGS (Gastric adenocarcinoma cells): IC₅₀ = >2.50 mg/mL (Uddin et al., 2011)

HT29 (Colorectal adenocarcinoma cells): IC₅₀ = >2.50 mg/mL (Uddin et al., 2011)

Key (proposed) usage

Therapeutic Indications

Malaria, Ear aches, Wounds

Trade information

Nature of plant material

Décembre-Mars

Conservation status

Vulnerable

Processing and Storage

Sun drying

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