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Phytochemical Profile of Valuable Herb Satyanashi (*Argemone Mexicana L.*) with Reference to its Economic Importance and Medicinal Properties

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Abstract: ***Many plants are considered wild or weed with no economic value, Argemone mexicana L. is one such widely growing neglected weed in almost all the regions of India. Argemone mexicana, aka; Satyanashi commonly known as prickly poppy, is a spiny plant native to subtropical regions and widely recognized for its medicinal properties. It has been traditionally used in Ayurvedic, Unani, Siddha, and Homeopathic medicine for several years. Each part of the plant contains bioactive compounds that contribute to the treatment of various ailments, including HIV, malaria, ringworm infections, fungal diseases, and cancer. These therapeutic effects have been examined through both in vivo and in vitro studies, with findings supporting its medicinal potential. The leaves, stem, latex, roots, and seeds of* **Argemone mexicana** *L. exhibit diverse pharmacological properties. Several phytochemical compounds extracted from its seeds have shown effectiveness in treating chronic diarrhea, dysentery, peptic ulcers, and respiratory infections. This study has outlined the medicinal uses, phytochemical composition, and potential adverse effects associated with the plant.***

Keywords: Medicinal plants, phytochemicals, phytochemical constituents, Pharmacological applications, Antimicrobial (Antifungal/ Antibacterial/ Antiviral) activity

I. INTRODUCTION

Medicinal plants have been utilized for healing purposes since ancient times. These plants contain specific components that contribute to disease treatment. Over half of the medicines used in clinical settings today originate from natural sources. Herbal medicines are valued for their accessibility, affordability, and minimal side effects. The therapeutic potential of plants comes from bioactive phytochemical compounds that influence physiological processes in the human body. Some significant phytochemicals include alkaloids, flavonoids, tannins, saponins, glycosides, and phenolic compounds. These compounds are categorized into primary and secondary constituents—primary ones involve essential sugars, amino acids, proteins, and chlorophyll, whereas secondary ones include alkaloids, flavonoids, tannins, and phenolic compounds. Argemone mexicana, commonly known as Mexican poppy or prickly poppy, belongs to the Papaveraceae family. It is widely found in tropical and subtropical regions across the globe. Argemone Mexicana L. has been scientifically acknowledged for its diverse medicinal benefits, including its analgesic, antispasmodic, detoxifying, emetic, antipyretic, sedative, and wound-healing properties. Despite these advantages, the plant is often mistakenly believed to be highly toxic and responsible for epidemic dropsy. However, this adverse effect results from the adulteration of edible oils rather than the plant itself. Different regions worldwide utilize Argemone Mexicana to treat conditions such as tumours, warts, skin disorders, inflammation, rheumatism, jaundice, leprosy, infections, and malaria. Additionally, its fatty acids and phytochemical compounds exhibit antibacterial, antifungal, anti-inflammatory, and antimycotic properties, making it a valuable component in natural medicine.

II. PLANT MORPHOLOGY

Scientific Classification

Kingdom –	Plantae (Plants)
Subkingdom-	Tracheobionta (Vascular plants)
Super division –	Spermatophyta (Seed plants)
Division-	Magnoliophyta (Flowering plants)
Class-	Magnoliopsida (Dicotyledons)
Subclass-	Magnoliidae
Order-	Papaverales
Family-	Papaveraceae – (Poppy family)
Genus-	Argemone L. (Prickly poppy)
Species-	Argemone mexicana L.

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Argemone mexicana is an upright annual herb with a spiny structure and a greyish-white stem that secretes yellow latex. It typically reaches a height of 12 to 30 cm. Its leaves are alternate, sessile, deeply lobed, and cauline, displaying unicostate reticulate venation with thorny edges. The plant produces a thorny poricidal capsule containing blackish-brown seeds. The flowers of *Argemone mexicana* are large, complete, hypogynous, and pedicellate, exhibiting actinomorphic symmetry. They are hermaphroditic and ebracteate. The calyx consists of three separate sepals with twisted aestivation, while the corolla is yellow with six distinct, deciduous petals displaying imbricate aestivation. The stamens are numerous (polyandrous), featuring complete, inward-facing yellow anthers. The gynoecium consists of 4–6 fused carpels, forming a unilocular superior ovary with parietal placentation. The plant has long, subcylindrical roots and yields a light-yellow fat oil obtained through seed pressurization. This oil has a raw taste and a slightly unpleasant odor but is easily saponified.



(Fig.1 Argemone Mexicana L.)

III. MORPHOLOGY

Argemone mexicana is a spiny, erect annual herb with a greyish-white stem that secretes yellow latex. It typically grows between 12 and 30 cm tall. Its leaves are sessile, alternate, deeply lobed, and cauline, featuring unicostate reticulate venation and thorny edges. The plant bears thorny poricidal capsules that contain blackish-brown seeds. The flowers are large, complete, hypogynous, and pedicellate, displaying radial symmetry. They are hermaphroditic and lack bracts. The calyx consists of three separate sepals with twisted aestivation, while the corolla is bright yellow with six distinct, deciduous petals exhibiting imbricate aestivation. The numerous stamens have inward-facing yellow anthers. The gynoecium is composed of 4–6 fused carpels, forming a unilocular superior ovary with parietal placentation. The plant has long, subcylindrical roots and produces a light-yellow fat oil extracted through seed pressurization. This oil has a raw taste and a slightly unpleasant odor but is easily saponified.

IV. MEDICINAL AND PHARMACOLOGICAL APPLICATIONS

Argemone mexicana L. is known for its medicinal properties, including its analgesic, narcotic, antispasmodic, and sedative effects. In India, it holds a significant place in Ayurveda, where it has been traditionally used to treat ailments like jaundice, scabies, skin disorders, and dropsy. Extracts from its leaves and seeds contribute to improved blood circulation and cholesterol regulation. Additionally, different plant components exhibit anti-venom properties. The flowers of *Argemone mexicana* function as expectorants, making them useful in cough treatment. In Brazil, where it is called 'cardo-santo,' it has been utilized for various health issues. The seeds serve as purgatives, laxatives, and digestive aids, while the latex is applied to conjunctivitis. Historically, its pharmacological importance has been acknowledged in multiple therapeutic applications, including antifertility effects, antimalarial properties, antifungal activity, cytotoxic effects, molluscicide properties, anti-HIV potential, anti-inflammatory and antioxidant benefits, and treatment for chronic diseases such as leprosy. The aerial parts of the plant display antiparasitic properties, with each component contributing to medicinal benefits in different ways. While its bioactive compounds are largely considered harmless, concerns about toxicity arise specifically from Argemone oil, which has undergone evaluation. Due to its vast pharmacological potential, all parts of the plant—including the stem, leaves, flowers, fruits, and seeds—possess therapeutic value tailored to specific health conditions.

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V. ANTIMICROBIAL (ANTIFUNGAL/ ANTIBACTERIAL/ ANTIVIRAL) ACTIVITY

Argemone Mexicana L. has demonstrated antimicrobial properties, effectively inhibiting the growth of various pathogens, including viruses, bacteria, and fungi. Bacteria, being highly adaptable unicellular organisms, are commonly transmitted through soil, water, air, and food, leading to numerous infections in both humans and animals. Many of these diseases can be treated using natural compounds derived from medicinal plants. Similarly, turmeric has also been found to suppress the growth of bacteria, fungi, and parasites. Several scientific studies have explored the role of *Argemone Mexicana* in microbial inhibition. Rahman et al conducted research on different stem extracts of the plant, including hexane, chloroform, ethyl acetate, and ethanol, to evaluate their antibacterial activity. Using in vitro methods such as agar diffusion and minimum inhibitory concentration (MIC) analysis, they tested the effectiveness of these extracts against ten food-borne pathogenic bacteria, comprising five Gram-positive and five Gram-negative strains.

VI. ANTI- – OXIDANT ACTIVITY

Various extracts derived from the leaves and roots of *Argemone mexicana* have shown significant scavenging activity. The root extracts have been evaluated for their antioxidant potential against DPPH (85.17%), ABTS (75.27%), and H_2O_2 (84.25%) radicals, demonstrating considerable effectiveness. Additionally, the leaves have exhibited superoxide anion scavenging activity, as assessed using the Nitro Blue Tetrazolium assay. These findings highlight the plant's strong antioxidant properties, suggesting potential therapeutic applications.

VII. ECONOMIC IMPACT OF ARGEMONE MEXICANA L. AS A WEED

Argemone Mexicana L. is a troublesome weed that affects a wide range of cropping systems, including millets, cereals, vegetables, legumes, fibre-producing crops like sisal and cotton, as well as perennial crops such as coffee and sugarcane. Any crop growing within its natural habitat is at risk of contamination. In addition to its impact on staple crops, it poses a significant threat to poultry and grazing animals. The plant produces toxic aflatoxins, which are harmful to herbivorous animals and can even be detected in contaminated cattle milk, eggs, and mutton-based products. Its presence in agricultural landscapes leads to a reduction in biodiversity. Furthermore, *Argemone Mexicana* releases allelochemicals that interfere with seed germination, hinder growth, and affect the concentration of photosynthetic pigments in neighbouring plants within native ecosystems.

VIII. PHYTOCHEMICAL SCREENING

Standard qualitative tests were conducted to identify the phytochemicals present in the plant. Fresh plant parts, including leaves, stems, and roots, were thoroughly washed with running tap water, air-dried in shade, and ground into a fine powder. The powdered samples were stored in airtight bottles for preservation. A ten-gram portion of the finely ground plant material was placed in a clean, sterile Soxhlet apparatus and extracted using 150 ml of methanol, ethanol, and water. After the extraction process, the obtained plant extracts were subjected to phytochemical screening to analyse their bioactive components.

1) Test for alkaloids (Dragendorff"s test): A drop of extract was spotted on a precoated TLC plate and it was then sprayed with Dragendorff's reagent. Appearance of orange spot confirmed the presence of alkaloids.
2) Test for Cardiac glycosides (Kellar-Kiliani test): 50 mg of methanolic extract was dissolved in 2 ml of chloroform. After this sulphuric acid was added to form a layer. A brown ring at the interphase confirmed the presence of cardiac glycosides.
3) Test for Flavonoids (Shinoda test): A piece of magnesium ribbon was added to 2-3 ml of methanolic extract followed by 1 ml of concentrated hydrochloric acid. The red coloration of solution confirmed the presence of flavonoids.
4) Test for Steroids (Liebermann-Burchardt test): To 1 ml of methanolic extract, 1 ml of chloroform was added. To this, 2-3 ml of acetic anhydride and 1-2 drops of concentrated sulphuric acid was added which turned the colour of the contents to dark green indicating the presence of steroids.
5) Test for Tannins (Braemer's test): To methanolic extract of plant sample, 10% ferric chloride was added (1:1 ratio). Appearance of dark blue colour of solution confirmed the presence of tannins.
6) Test for Terpenoid (Liebermann-Burchardt test): To 1 ml of methanolic extract, 1 ml of chloroform was added. To this, 2-3 ml of acetic anhydride and 1-2 drops of concentrated sulphuric acid was added which turned the colour of the contents to red indicating the presence of terpenoids.
7) Test for Saponins: 2 g of powdered plant sample was boiled together with 20 ml of distilled water in a water bath and filtered. 10 ml of this filtered sample was mixed with 5 ml of distilled water in a test tube and shaken vigorously to obtain a stable persistent froth. The frothing was then mixed with 2-3 drops of olive oil which resulted in formation of emulsion indicating the presence of saponins.

8) Test for Reducing Sugars (Fehling test): 25 ml of diluted sulphuric acid was added to 5 ml of water extract in a test tube and was boiled for 15 minutes. Then it was cooled and neutralised with sodium hydroxide and 5 ml of Fehling solution. Appearance of brick red precipitate confirmed the presence of reducing sugar.

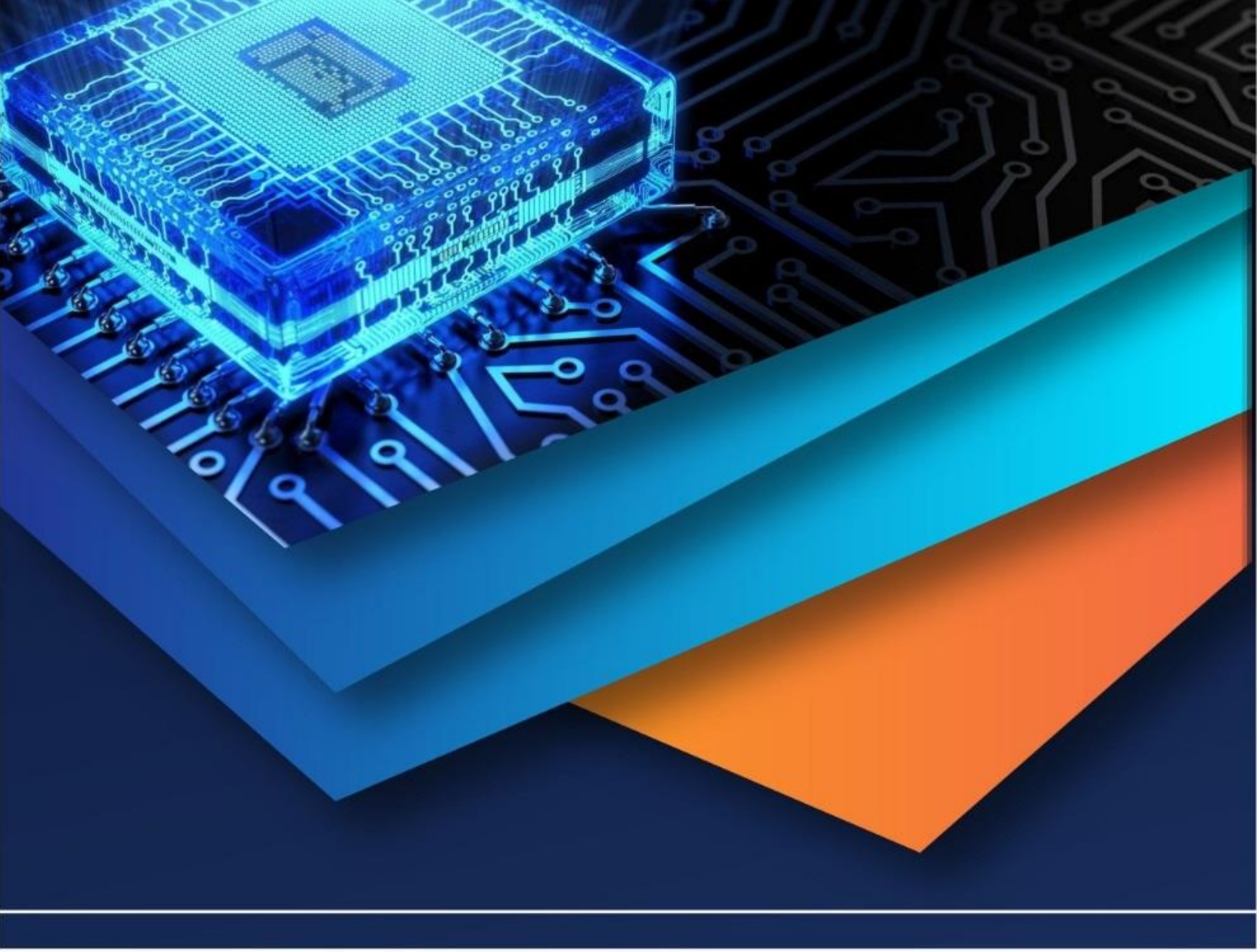
IX. CONCLUSION

Phytochemical analysis of *Argemone mexicana* has identified the presence of secondary metabolites such as alkaloids, flavonoids, tannins, terpenoids, steroids, and glycosides. These bioactive compounds play a crucial role in medicinal applications. Further extensive research on the plant's pharmacological properties is necessary to isolate and evaluate its active phytochemicals, potentially leading to the development of significant plant-based pharmaceutical products. A weed can serve as a valuable medicinal resource if its properties and effects are well understood. Continuous research and development are essential to fully explore its qualities and therapeutic applications. Based on numerous studies, *Argemone mexicana* L. despite often being overlooked, has demonstrated significant potential in addressing various health concerns. This resilient plant, native to arid regions, offers a wide array of benefits and serves as an important source of diverse chemical compounds with various medicinal properties.

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