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Phytochemical Profiling of Argemone Mexicana

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Abstract: Argemone mexicana belonging to Papaveraceae family is an annual herb commonly known as prickly poppy or mexican poppy.It is popular to possess medicinal benefits in traditional system of medicine. It has been reported to possess antimicrobial, antidiabetic, antioxidant, antihelmintic, hepatoprotective properties. This study depicts the phytochemical and physico-chemical profiling of Argemone mexicana.

***Keywords**: Argemone mexicana, Papaveraceae, Phytochemical, Physico-chemical, Prickly poppy*

I. INTRODUCTION

Plants have been used for medicinal purposes since ancient times. Plants which have one or more of its parts having substances that can be used for treatment of diseases are called medicinal plants[1].More than 50% of all drugs in clinical use have a natural product origin[2].Medicines obtained from plants are famous due to easy availability, no side effects and low cost. The medicinal value of plant lies in bioactive phytochemical constituents that produce definite physiological action on human body[3].Some of the most significant bioactive phytochemicals are alkaloids, flavonoids, tannins, saponins, glycosides, phenolic compounds and many more[4].Phytochemicals are mainly divided into two groups, which are primary and secondary constituents according to their activity in plant metabolism. Primary constituents contain common sugars, amino acids, proteins and chlorophyll. While secondary constituents comprise of alkaloids, flavonoids, saponins, tannins, phenolic compounds and etc [5].

Argemone mexicana belongs to family papaveraceae. It is commonly distributed in tropical and subtropical regions of world. It is also known as Mexican poppy or prickly poppy.

II. PLANT MORPHOLOGY

It is an erect annual spiny herb with greyish white stem secreting yellow coloured latex. It grows to a height of 12 to 30 cm. Leaves are exstipulate, sessile, alternate, deeply lobed, cauline with unicostate reticulate venation with thorny margins. Fruit is thorny porcidal capsule having blackish brown seeds [6]. Flowers are large, complete, hypogynous, pedicillate, actinimorphic, hermaphrodite and ebracteate. Calyx has 3 sepals, polysepalous with twisted aestivation. Corolla is yellow in colour with 6 petals, polypetalous, deciduos and imbricate aestivation. Stamens are polyandrous, indefinite with complete, introse and yellow anthers. Gynoecium has 4-6 carpels, syncarpous with unilocular superior ovary and parietal placentation [7]. Roots are long and subcylindrical. Argemone mexicana contains light yellow coloured fat oil which is obtained by pressurizing the seeds. Argemone oil is raw tasted and slightly has nauseous odour which can be easily saponified [8].

A. Scientific Classification[9]

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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Fig. 1 Morphology of Argemone mexicana

III.PHYSICO-CHEMICAL ANALYSIS

Ash values and loss on drying parameters of the plant samples were determined as per World Health Organization (WHO) guidelines:

A. Total Ash value

About 2g of dried powder of plant sample accurately weighed in a previously ignited and tared crucible. The material was ignited by gradually increasing the temperature to 600ºC until it became white. The crucible was cooled in a desiccator and weighed, and then again ignited to constant weight. The content of total ash was calculated as mg/g of air-dried material and expressed as percentage. The experiment was carried out in triplicate.

B. Acid-Insoluble ash value

Twenty-five millilitres of HCl was added to the crucible containing the total ash, covered with a watch glass and boiled for 5 mins. The insoluble matter was collected with an ash less filter paper and washed with hot water until the filtrate was neutral. The filter was then transferred to the original crucible and ignited to constant weight. The content of acid-insoluble ash was calculated in mg/g of air-dried material and expressed as percentage. The experiment was carried out in triplicate.

C. Water- soluble ash value

Twenty-five millilitres of water was added to the crucible containing the total ash and boiled for 5 min. The insoluble matter was filtered using an ash less filter paper. The filter paper was washed with hot water and ignited in a crucible for 15 min. at a temperature not exceeding 450ºC. The crucible was then weighed to constant weight. Water-soluble ash was calculated by subtracting the residue weight in mg from the weight of total ash and expressed in percentage. The experiment was carried out in triplicate.

D. Loss on drying

About 2g of the sample was taken in a previously dried and tarred Petri dish. The sample was dried in an oven at 105ºC to constant weight, cooled and weighed. The experiment was repeated three times and the result was calculated as loss of weight in percent.

TABLE I
PHISICO- CHEMICAL STUDIES

Sn	Parameters	Values (%w/w)
1	Total Ash value	8.5
2	Acid-insoluble ash value	1.1
3	Water-soluble ash value	1.2
4	Loss on drying	7.0

TABLE II
PERCENTAGE YIELDS OF DIFFERENT EXTRACTS OF DIFFERENT PARTS OF ARGEMONE MEXICANA

S.n.	Solvent system	Stem	Leaf	Root
1	Hexane	10	13	10
2	Ethanol	12	17	09
3	Ethyl acetate	11	14	08
4	Methanol	12	19	11
5	Water	13	25	16

IV. PHYTOCHEMICAL SCREENING

Specific qualitative tests were performed to identify the phytochemicals present through standard methods. Fresh plant parts such as leaves , stem , roots were washed under running tap water, air dried in shadow and homogenized to fine powder and stored in air tight bottles. Ten grams of fine powdered plant sample was taken in clean sterile soxhlet apparatus and extracted with 150 ml of methanol, ethanol and water. After extraction the different plant extracts were used for phytochemical screening.

A. 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[10].

B. 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[10].

C. 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[10].

D. 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[10].

E. 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 [11].

F. 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[10].

G. 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 [4].

H. 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 [12].

TABLE III
PHYTOCHEMICAL ANALYSIS OF ARGEMONE MEXICANA PLANT PARTS

Sn	Phytochemical	Ethanol extract			Methanol extract			Aqueous extract		
		Root	Stem	Leaf	Root	Stem	Leaf	Root	Stem	Leaf
1	Alkaloid	-	+	+	-	-	+	-	-	-
2	Flavonoid	+	+	+	+	+	+	-	+	+
3	Tannin	+	+	+	+	+	+	+	+	+
4	Saponin	-	-	-	-	-	-	-	-	-
5	Terpenoid	-	-	+	-	+	+	-	+	+
6	Steroid	-	-	-	-	-	-	-	-	+
7	Glycoside	-	-	-	-	-	-	-	-	+
8	Reducing sugar	+	+	+	+	+	+	-	+	+

+ means present; - means absent

V. CONCLUSIONS

The phytochemical profiling of Argemone mexicana revealed the presence of alkaloids, flavonoids, tannins, terpenoids, steroids and glycosides which are popular secondary plant metabolites. Detailed investigations should be carried out on the plant for pharmacological activities, so that active phytochemicals could provide way to remarkable pharmaceuticals of plant origin.

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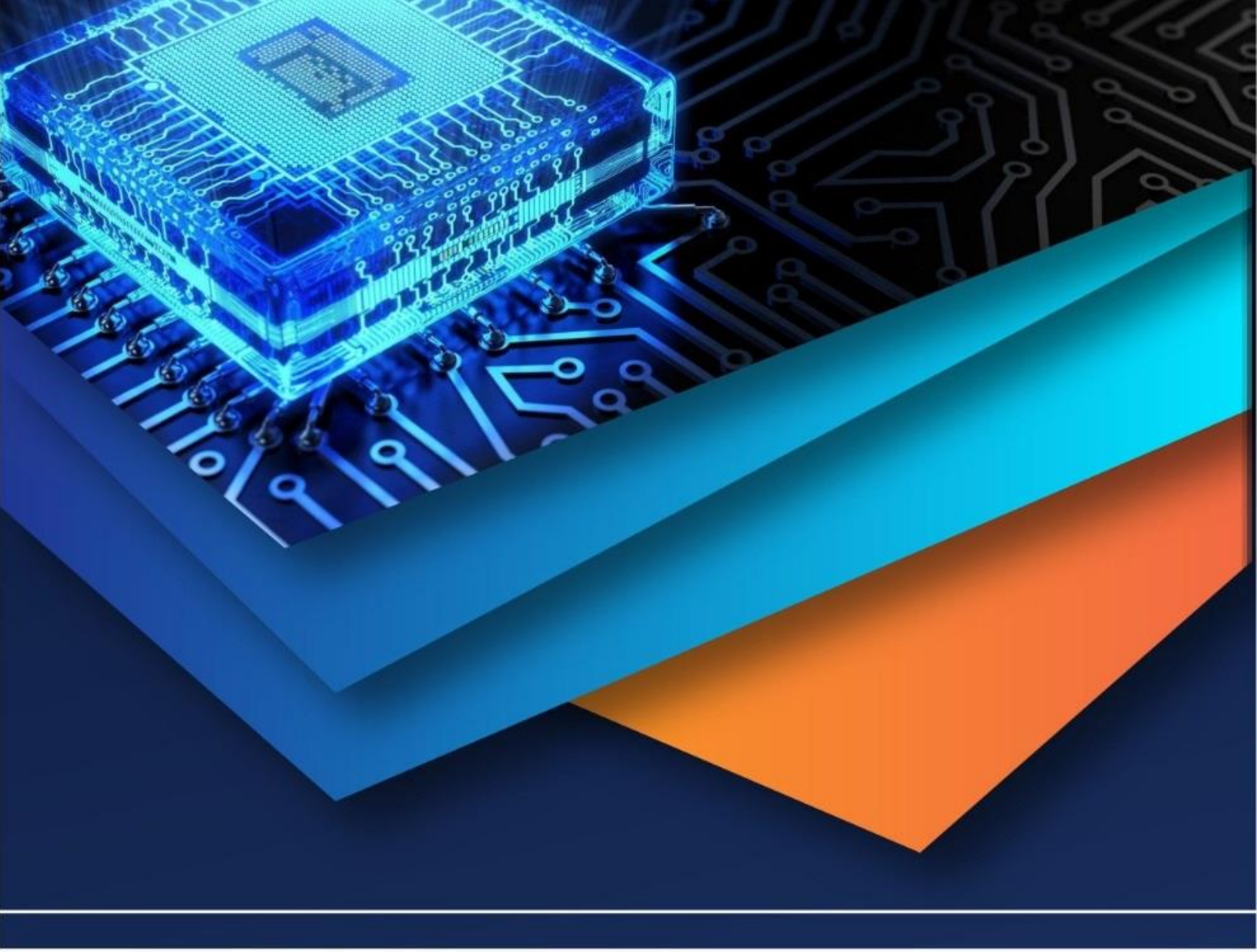

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