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Phytochemical Characterization and Antioxidant Activity of Argemone mexicana

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KEYWORDS

Antioxidant Activity, Phytochemical characterization, Argemone Mexicana

ABSTRACT:

Argemone mexicana, a plant widely used in traditional medicine, has garnered significant interest due to its potential health benefits, particularly its antioxidant properties. This study aimed to characterize the phytochemical constituents of Argemone mexicana and evaluate its antioxidant activity. The findings suggest that Argemone mexicana possesses substantial antioxidant properties, supporting its traditional use and potential therapeutic applications. Further research is recommended to isolate specific compounds and explore their mechanisms of action.

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 [1-9]. The earliest inscription of the medicinal uses of plants is found in the “Rigveda”, which is one of the oldest repositories of human knowledge. Fairly comprehensive information on the curative properties of some herbs has been found recorded in “Charak Samhita” and “Sushruta Samhita”. 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 [13-17]. 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 diseases [18-21]. Currently, 80% of the world population depends on plant-derived medicine for the first line of primary health care for human alleviation. A. mexicana, 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. The plant is pantropic in distribution and it is a weed in waste places. It is native to America and naturalized throughout India [22-26].

Argemone Mexicana **(AM)** is an unexplored medicinal herb commonly used by indigenous people in the management of various health complications besides there is enough documental evidence sating the tribes of Sri Lanka, Malaysia, and India especially people of Assam, Visakhapatnam, Paderu forest region of Andhra pradesh use it in their traditional home remedies but unaware of the scientific rationale behind it. Therefore, it is worthwhile to investigate AM *as per* existing knowledge [27-29].

The aim of the current research is to conduct a phytochemical and pharmacological investigation of *Argemone mexicana*.

Material and Methods

The chemicals, solvents, and reagents used in the study are of analytical grade or HPLC grade. Ethanol, Quercetin, Gallic Acid, Methanol, Protein kit assay, Sodium carbonate, Follin ciocalteau reagent, 2,2-diphenyl-1-picrylhydrazyl (DPPH), Ferric chloride, Phosphate buffer, Trichloroacetic acid, Potassium ferricyanide, Carboxy methyl cellulose, Ascorbic acid, Chloroform, Ethyl acetate, n-butanol, Methanol.

Pharmacognostic Investigations of *Argemone Mexicana*

Collection and authentication of plant materials

The whole plants *Argemone Mexicana* were collected from Prayagraj (Uttar-Pradesh) in the month of

Journal of Chemical Health Risks
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November- December 2023.

Preliminary phytochemical evaluation

The various qualitative chemical tests had been performed on extracts of various parts of selected plant using standard procedures to identify major phytoconstituents [30-31].

Phytochemical investigations on rhizome of *Argemone mexicana*

Preparation of plant extracts

For the preparation, the plant's powdered rhizomes were used. We extracted 5 kg of powdered rhizomes three times using a Soxhlet apparatus and liquids hexane, ethyl acetate, and methanol. This was done by hot percolation over 48 hours. The filtrates that were left over were combined and dried out using a rotary evaporator (Buchi R-210, Switzerland) under reduced pressure and 400C heat. The extracts were then gathered and stored in a desiccator for further phytochemical and pharmacological studies [32-34].

Evaluation of in vitro Antioxidant activity of MEAM extracts and isolated compound from rhizome of *Argemone Mexicana*

DPPH radical-scavenging activity

A sample extract solution of 20, 40, 60, 80, 100µg / mL was applied separately for each five mL, and permitted to remain at 27ºC for 20 min. After incubation, each solution was absorbed with a spectrophotometer at 517 nm. Ascorbic acid has been used as standard. The accompanying blank reading was taken and the following calculation was used to measure the DPPH [35-38]

Statistical Analysis

All the data was shown as the guy mean ± SEM, and it was analyzed using one-way ANOVA, which is what the Turkey study does. The statistical analysis was done with software called Graphpad Prism (Version 5, U.S.A.). It was thought that $P < 0.05$ was statistically significant [39].

Results and Discussion

Table 1: Physical properties of rhizome of *Argemone mexicana*

Properties	Rhizome
Colour	brown to dark brown on the outside, white to pale yellow on the inside
Odour	Mild, earthy
Taste	Bitter s
Size	10 to 30 cm in length
Shape	Thick, tapering primary taproot with finer, fibrous secondary roots

Preliminary phytochemical evaluation

The plant material was first tested for phytochemicals by being extracted with a series of different solvents that became more polar. This was done to get a range of polar and nonpolar phytoconstituents with different solubility patterns. These were then put through a series of chemical tests to find out what chemicals they contained. Chemical tests were done on different solvent extracts, including chloroform, methanol, and water. The results showed that the plants had saponins, tannins, flavonoids, steroids, glycosides, alkaloids, and volatile oils. Phytochemical factors can help separate and clean up medicinally important compounds even more. From the above findings the rhizome part of selected plant was identified as the presence of secondary metabolites like terpenoids, phenols,saponins, alkaloids, flavonoids and glycosides while compared to other parts.

Table 2: Phytochemical analysis of various extracts of *Argemone Mexicana* rhizome

S No	Phyto constituents	Method	Methanolic Extract	Aqueous Extract
1	Alkaloids	Dragendroffs Test	-	+
		Wagner Test	-	+
		Mayers Test	-	+

Journal of Chemical Health Risks
www.jchr.org
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		Hager's Test	-	+
2	Sterols	Liebermann buchard test	-	-
3	Triterpinoids	Salkowski test	-	-
4	Tannins And Phenols	$Fecl_3$ Test	+	-
		Potassium dichromate test	+	-
5	Flavanoids	Shinoda Test	-	-
		Zn Hydrochloride test	-	-
		Lead acetate Test	-	-
6	Glycosides	General test	-	+
7	Amino Acids	Ninhydrin test	+	-
8	Volatile Oil	Stain test	-	-
9	Saponins	Foam test	+	+
10	Mucilage	Alcohol test	-	-
11	Carbohydrates	Molisch's test	+	+
12	Fats and oils	5% Aq. KOH	-	-

"+" Presence, "–"Absence"

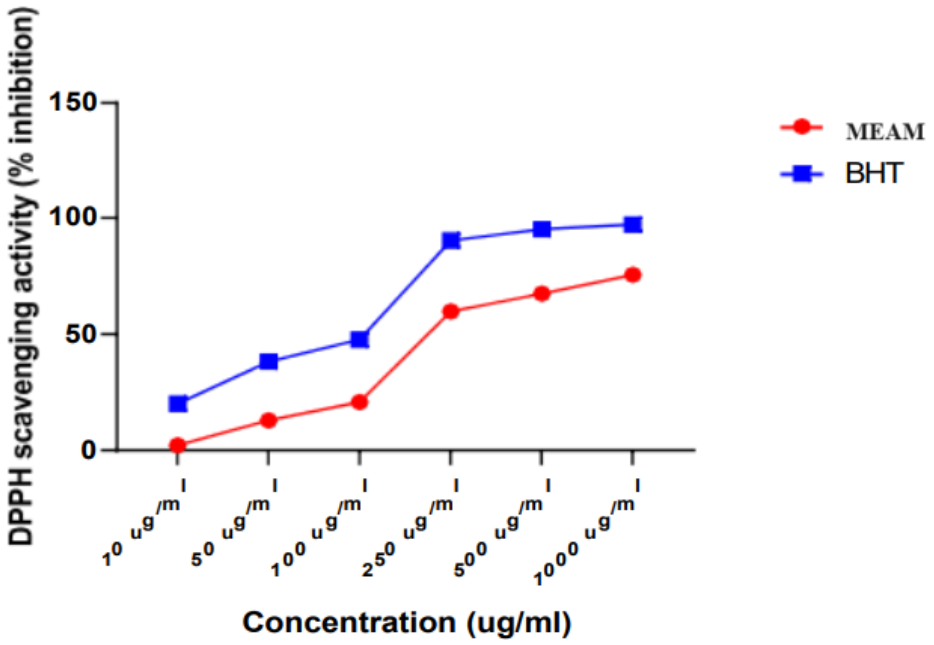

Figure 1: Graph Showing inhibition of DPPH radical by methanolic extracts (MEAM) and BHT.

Journal of Chemical Health Risks

www.jchr.org

JCHR (2024) 14(4), 289-293 | ISSN:2251-6727

Summary and Conclusion

A look at Argemone mexicana's leaves and fruit showed that it is different. It has spiny leaves, yellow flowers, and spherical fruit. A lot of trichomes, calcium oxalate crystals, and parenchyma cells were seen. It is very important to be able to correctly identify *A. mexicana* and tell it apart from other species by these small physical traits. The testing of the antioxidant activity of methanol extract (MEAM) of rhizomes showed that the extract had very good at getting rid of free radicals. Because they had a lot of phenolics, the methanol extracts had the highest antioxidant ability. Isolated compounds, like chlorogenic acid, showed strong antioxidant properties that supported their promise as medicines. In vivo studies should be the focus of future research to learn more about these compounds' pharmacological actions and safety profile. Additionally, studying how the isolated chemicals work together could give us more information about how they work.

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