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Evaluation of antioxidant activity of aerial part of *Argemone mexicana* linn

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ABSTRACT

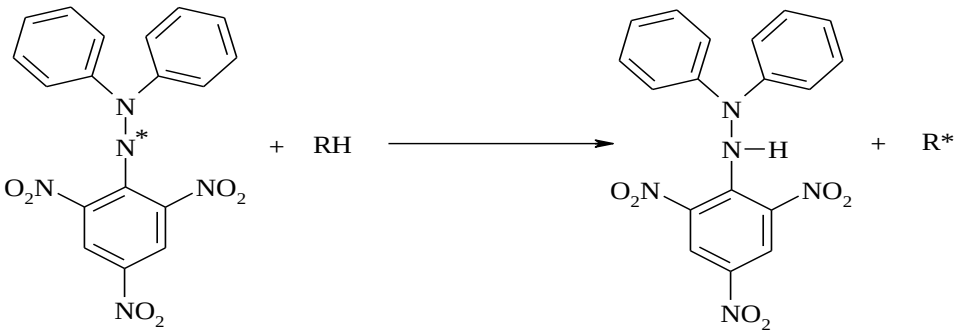
Antioxidant compounds in food plays an important role as a health protecting factor. Scientific evidence suggests that antioxidant reduce risk for chronic diseases including cancer and heart diseases. Primary source of naturally occurring antioxidants are grains, fruits and vegetables. Plant sourced food antioxidants like vitamin C, vitamin E, carotenes, phenolic acids, phytate and phytoestrogens have been recognized as having the potential to reduce disease risk. Most of the antioxidant compounds in a typical diet are derived from plant sources and belong to various classes of compounds with a wide variety of physical and chemical properties. The free radical scavenging activity was done by DPPH-scavenging model and Hydrogen-peroxide scavenging model. The Hydrogen-peroxide scavenging showed the 87.1% which is comparable to the standard Ascorbic acid (90.5 %). It was found that the ethanolic extract of *Argemone mexicana linn* (EEAM) showed the maximum percentage inhibition of 61% whereas the aqueous extract (AEAM) showed the least inhibition i.e. 19.2. The antioxidant activity of the plant extracts was expressed as IC_{50}. The IC_{50} value is defined as the concentration (in µg/ml) of extracts that inhibits the formation of DPPH and hydrogen peroxide radicals by 50 %. All the tests were performed in triplicate and the graph was plotted with average of three observations.

Keywords: Antioxidant activity, *Argemone mexicana*, Aerial part, Ethanolic extract.

INTRODUCTION

The main characteristic of an antioxidant is its ability to trap free radicals. Highly reactive free radicals and oxygen species are present in biological systems from a wide variety of sources. These free radicals may oxidize nucleic acids, proteins, lipids or DNA and can initiate degenerative diseases. Antioxidant compounds like phenolic acids, polyphenol and flavonoid scavenge free radical such as peroxide, hydro-peroxide or lipid peroxyl and thus inhibit the oxidative mechanism that lead to degenerative diseases.

Antioxidant compounds may be water-soluble, lipid-soluble and insoluble or bound to cell walls. Hence, extraction efficiency is an important factor in quantification of antioxidant activity of foods.



DPPH **Antioxidant** **Reduced DPPH** **Free radical**

Fig 1 Reaction of the free radical formation

MATERIAL AND METHODS

A simple method that has been developed to determine the antioxidant activity of food utilizes the stable 1, 1-diphenyl-2-picrylhydrazyl (DPPH) radical. The odd electron in the DPPH free radical gives a strong absorption maximum at 520 nm and is purple in colour. The colour turns from purple to yellow as the molar absorptivity of the DPPH radical at 520 nm reduces from 9660 to 1640 when the odd electron of DPPH radical becomes paired with hydrogen from a free radical scavenging antioxidant to form the reduced DPPH. The resulting decolourization is stoichiometric with respect to number of electrons captured.

Diphenyl-1-Picryl Hydrazyl (DPPH) Radical Scavenging Method

The free radical scavenging capacity of ethanolic and aqueous extract extracts of both Oxalis species was determined by DPPH method. DPPH solution (0.004 %), plant extracts and standard (ascorbic acid) was prepared in methanol. Plant extracts and standard (ascorbic acid) solution were prepared in different concentrations 10, 20, 40, 60, 80 and 100 µg/ml. 0.5ml of different concentrations of standard solution or plant extracts was taken in different test tubes and then 0.5 ml of DPPH (0.004 %) solution was added and kept in dark for 30 min. and absorbance was recorded at 517 nm. The decrease in absorbance of the DPPH radical caused by antioxidant was due to the scavenging of the radical by hydrogen donation. It was visually noticeable as a color change from purple to yellow. The percentage inhibition activity was calculated using the formulae below:

$$\frac{\textbf{Absorbance}_{\text{Control}} - \textbf{Absorbance}_{\text{Sample}}}{\textbf{Absorbance}_{\text{Control}}}$$

Where: Control – DPPH in methanol
Sample - Standard or extract solution in methanol

Scavenging of Hydrogen Peroxide

The antioxidant activity of the ethanol and aqueous extract extracts of both species was assessed on the basis of their hydrogen peroxide scavenging ability. The standard, ascorbic acid and the extracts were prepared in phosphate buffer, pH 7.4. Sample and standard (0.5 ml) were taken in different test tubes and to each test tube; 0.6 ml hydrogen peroxide solution (2 mM hydrogen peroxide in phosphate buffer, pH 7.4) was added. A control was prepared by replacing the sample/standard with phosphate buffer. These solutions were kept at room temperature for ten min. The absorbance was measured at 230 nm against the blank solution containing phosphate buffer without hydrogen peroxide. All the samples were prepared and assayed in triplicate and averaged. The antioxidant activity was measured using the formulae below:

$$\frac{\text{Absorbance}_{\text{Control}} - \text{Absorbance}_{\text{Sample}}}{\text{Absorbance}_{\text{Control}}}$$

Where:

Control – Hydrogen peroxide in phosphate buffer

Sample - Standard or extract solution in methanol

The antioxidant activity of the plant extracts was expressed as IC_{50}. The IC_{50} value is defined as the concentration (in µg/ml) of extracts that inhibits the formation of DPPH and hydrogen peroxide radicals by 50 %. All the tests were performed in triplicate and the graph was plotted with average of three observations.

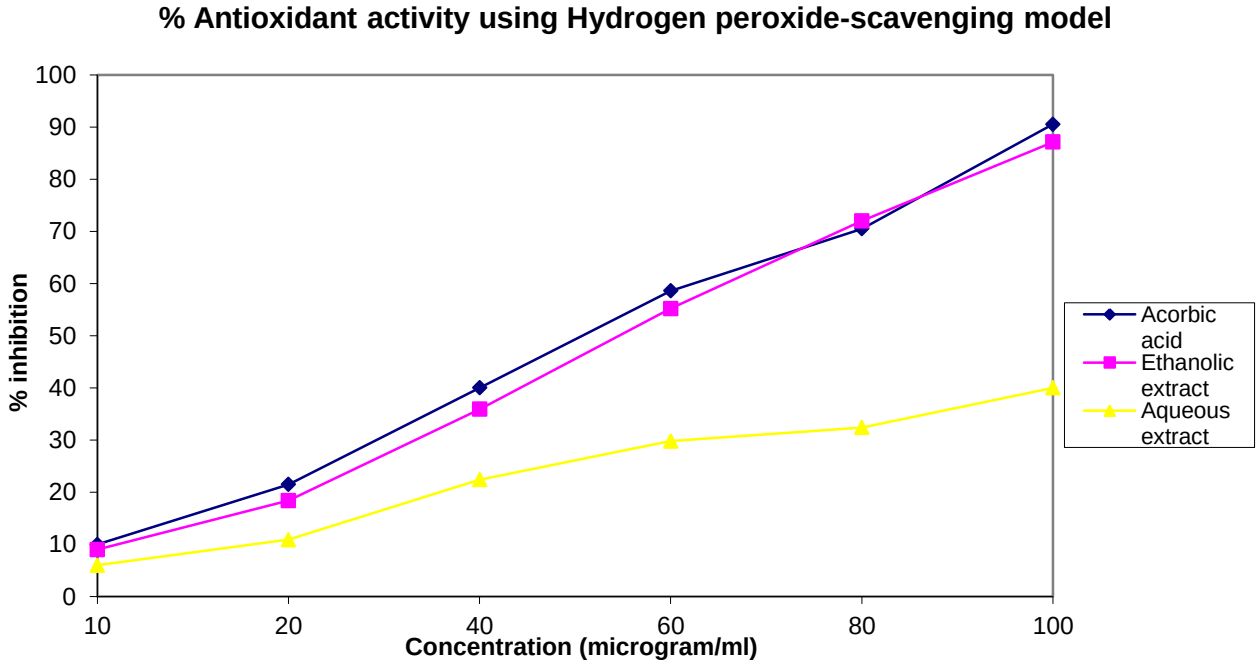
RESULTS AND DISCUSSION

Table 1 Antioxidant activity of *Argemone mexicana linn* using Hydrogen peroxide-scavenging model

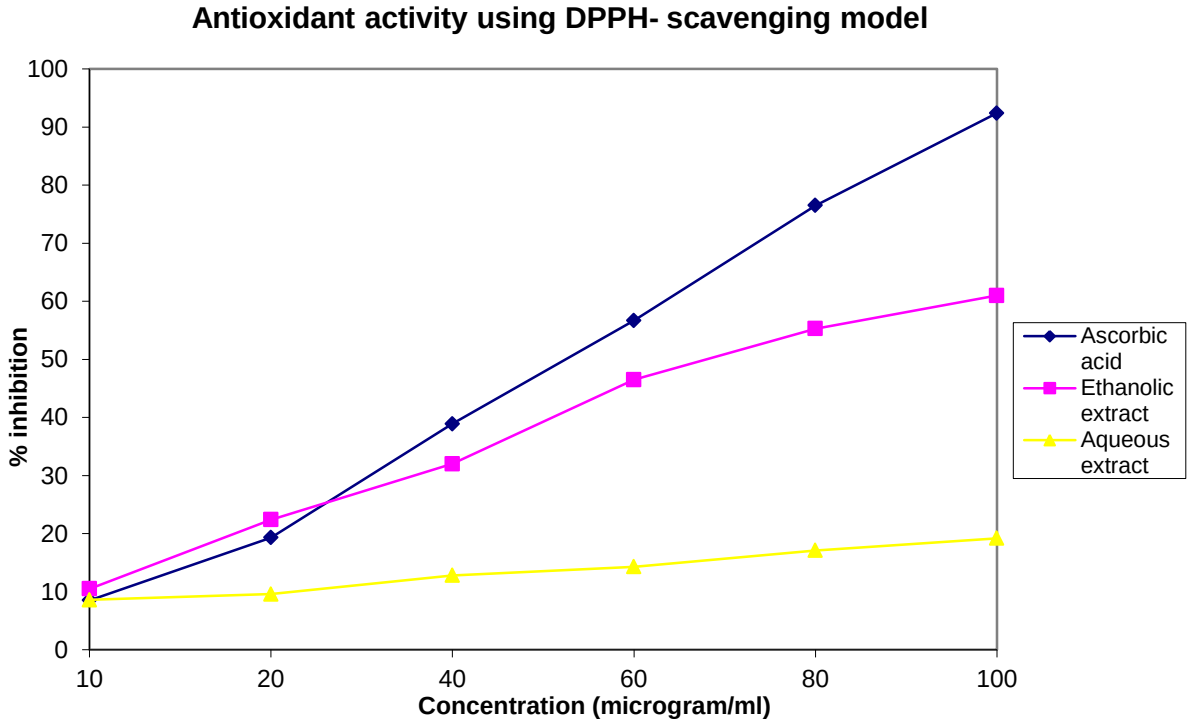
Concentration (µg/ml)	% Antioxidant activity		
	Ascorbic acid	*Argemone mexicana linn*	
		Ethanolic extract	Aqueous extract
10	10	9	6
20	21.5	18.4	10.9
40	40	35.9	22.4
60	58.6	55.2	29.8
80	70.5	72	32.4
100	90.5	87.1	40

Table 2 Antioxidant activity of *Argemone mexicana linn using DPPH- scavenging model*

Concentration (µg/ml)	% Antioxidant activity		
	Ascorbic acid	*Argemone mexicana linn*	
		Ethanolic extract	Aqueous extract
10	8.5	10.5	8.6
20	19.3	22.4	9.6
40	38.9	32	12.8
60	56.7	46.5	14.3
80	76.5	55.3	17.1
100	92.4	61	19.2



Graph 1 – Graphical representation of Hydrogen peroxide-scavenging model



Graph 2 – Graphical representation of DPPH-scavenging model

Antioxidant activity was carried out for ethanolic and aqueous extracts with DPPH-scavenging and Hydrogen peroxide-scavenging model. In DPPH-scavenging model, the ethanolic extract of *Argemone mexicana linn* showed the highest 61% (100µg/ml) scavenging of DPPH followed by 55.3% (80µg/ml) and aqueous extract of *Argemone mexicana linn* and least scavenging was done by ethanolic extract of 19.2% (100µg/ml). In Hydrogen peroxide-scavenging model, ethanolic extract showed high scavenging (87.1%) of hydrogen peroxide which further followed by (72%) and least scavenging was done by aqueous extract of *Argemone mexicana linn.*

After comparison with the standard (Ascorbic acid) ethanolic extract showed the comparative result by using. It has been reported that Flavonoid, isoflavone, coumarin, lignan, anthocyanin, flavone, isocatechin and vitamin-C are responsible for antioxidant activity in many plants and it was detected that both plants consist of flavonoid, vitamin-C which could be responsible for antioxidant activity. From this it was concluded that ethanol extract of aerial parts of *Argemone mexicana linn* showed high scavenging activity.

CONCLUSION

The free radical scavenging activity was done by DPPH-scavenging model and Hydrogen-peroxide scavenging model. The Hydrogen-peroxide scavenging showed the 87.1% which is comparable to the standard Ascorbic acid (90.5 %). It was found that the ethanolic extract of *Argemone mexicana linn* (EEAM) showed the maximum percentage inhibition of 61% whereas the aqueous extract (AEAM) showed the least inhibition i.e. 19.2. The antioxidant activity of any drug is due to the presence of the phenolic compound present in them. Thus the exact mode of physiological or biomedicial mechanisms responsible for the medicinal effect is yet to be studied.

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