E-ISSN: 2706-8927
P-ISSN: 2706-8919
www.allstudyjournal.com
IJAAS 2024; 6(10): 18-25
Received: 02-08-2024
Accepted: 06-09-2024

Abuthaheer Thajudeen
Department of Chemistry, Government Arts College, (Affiliated to Bharathidasan University-Tiruchirappalli), Kumbakonam, Tamil Nadu, India

K Devika
Department of Chemistry, MASS college of arts and science (Affiliated to Bharathidasan University Tiruchirappalli) Kumbakonam Tamil Nadu, India

G Anburaj
Department of Chemistry PRIST Deemed to be University Thanjavur Tamil Nadu, India

R Manikandan
Department of Chemistry, A.V.V.M Sri Puspham College, (Affiliated to Bharathidasan University Tiruchirappalli) Thanjavur Tamil Nadu, India

Corresponding Author:
G Anburaj
Department of Chemistry PRIST Deemed to be University Thanjavur Tamil Nadu, India

Argemone mexicana Linn. Flower extracts have been studied for phytochemical content and antioxidant activity employing UV-VIS, FTIR for short, or HPLC analysis

Abuthaheer Thajudeen, K Devika, G Anburaj and R Manikandan

DOI: https://doi.org/10.33545/27068919.2024.v6.i10a.1278

Abstract
The current work focuses on analyzing plants' HPLC, FT-IR, and UV-VIS spectra. The extraction process used methanol, an organic solvent. The floral element is *Argemone mexicana* Linn. The UV-VIS profile revealed various peaks with comparable rates of absorption between 200 and 800 nm. The leaf methanol extract contained alcohol, alkenes, allenes, cyclical alkenes, alky halides, aromatic molecules, metabolites, and alkaline chemicals, all validated by the FTIR spectrum. The GC-MS analysis's findings reveal several peaks for dissolved leaf extract. The leaf extract's primary ingredients are Quercetin, gallic acid, apigenin, resorcinol, caffeic acid, cyanidin-3-O-glucoside, (-)-epicatechin, and kaempferol. Therefore, this plant might have included bioactive components.

Keywords: Chemical compound, control antioxidants their in-vitro antidiabetic UV, FT IR, HPLC, *Argemone mexicana* Linn

1. Introductions

Argemone mexicana L., often known as Ghamoya, is a plant that is extensively distributed in many tropical and subtropical nations, including West Africa [6]. It belongs to the classroom: Magnoliopsida Dicotyledons; subclass: Magnoliidae; order: Papaverales; Family: Papaveraceae. Leprosy, skin conditions, inflammation, and bilious fevers have all been treated with the plant. (Ajaghaku & Okafor, 2022) [14]. The Indian system of alternative medicine known as Ayurveda has been used for over two thousand years [1, 2]. Some infections don't respond well to antibiotic therapy. To combat this, a fixed-dose medicine combination is used to treat various microbiological diseases such as tuberculosis, H, IV, and hepatitis C viruses. In 2016 (Argemone *et al.*). Additionally, a variety of solvent solutions were used to assess the bactericidal activity of plant crude extracts against the investigated microorganisms. The anti-bacterial chemicals chelerythrine and berberine, which were isolated from plant root and leaf extracts, displayed significant impact, with the strongest activity being on Gram-positive bacteria (Ayele *et al.*, 2022) [3], to provide further background. The purpose of the current study was to identify in the laboratory several plant pharmacological qualities that were mentioned by numerous traditional healers during various ethnobotanical investigations. The plant's ability to be both antipyretic and antihepatotoxic has been the focus of the current monographical survey. The efficacy of the sample medicine against CCl4-induced liver injury in rats was tested for hepatoprotective activity, and liver functions were determined by the activities of liver marker enzymes such as ASAT/GOT, ALAT/GPT, and ALP. Plants' antipyretic effects were investigated utilizing yeast induced pyrexia method (Source, 2014).

In diabetes patients, the enzymes -amylase and -glucosidase break down the carbs and raise the postprandial glucose level. These two enzymes can be inhibited to manage postprandial hyperglycemia and lower the likelihood of developing diabetes. One of the key medicinal plants used to treat diabetes patients' postprandial hyperglycemia was a bitter gourd, also known as balsam pear. However, there is little evidence of the existence of substances that inhibit -amylase and -glucosidase. These protein extracts from the fruits of the mushrooms (*Momordica charantia*) var. character (MCC) and *M. charisma* var. the species (MCM) were examined for their ability to inhibit amylase and glucosidase *In vitro* and to lower blood

sugar levels when given orally in animals. 2016 (Poovitha & Parani). Due to abnormalities in insulin synthesis or activity, the balance of lipid and glucose metabolism is disrupted in diabetes mellitus. It is a serious, not transmissible, metabolic disorder with a high mortality rate and substantial medical costs. According to estimates, 387 million people worldwide have diabetes, which alone resulted in 4.9 million fatalities in 2014. 2016's Poovitha & Parani.

2. Plant Materials

2.1 Collection and Authentication of Plant Material

The Rapinat Herbarium and Centre for Molecular organized, St. Joseph's College (Autonomous), Tiruchirappalli, Tamil Nadu, India, gathered the *Argemone mexicana* plant from Thanjavur District, Tamil Nadu, South India, and taxonomically classified it.

3. Preparation of Alcoholic extract

3.1 Plant Sample Preparation

The dried leaves were blended to a fine powder using an electronic blender after the mature plant material was collected, shaded, and kept at room temperature for a week. Until needed, plants were kept at room temperature in a closed container. The plant powder was extracted using a Soxhlet device and a variety of solvents, including ethanol, water, chloroform, petroleum ether, and acetone. The involved crude extracts were then preserved and utilized in additional research after the solvents were finally evaporated using a rotary vacuum evaporator.

3.2 UV and FTIR Spectroscopic Analysis

For proximate analysis, the extract was analyzed using visible and UV light. The substance being extracted was spun up at 3000 x g for 10 minutes to filter it through the Whatman No. 1 filter paper while utilizing a high-pressure vacuum pump for Ultraviolet and FTIR spectrophotometer analysis. With the same solvent, the sample was reduced to a ratio of 1:10. Using a Perkin Observer Spectrophotometer, the extract was imaged in the wavelength range of 260- 900 nm, and distinctive peaks were found. The Perkin Elmer Spectrophotometer equipment was employed for the FTIR study, which helped to identify the distinctive peaks between 400 and 4000 cm and their functional groups. The FTIR and UV peaks were both recorded. Every analysis was carried out twice to confirm the spectrum.

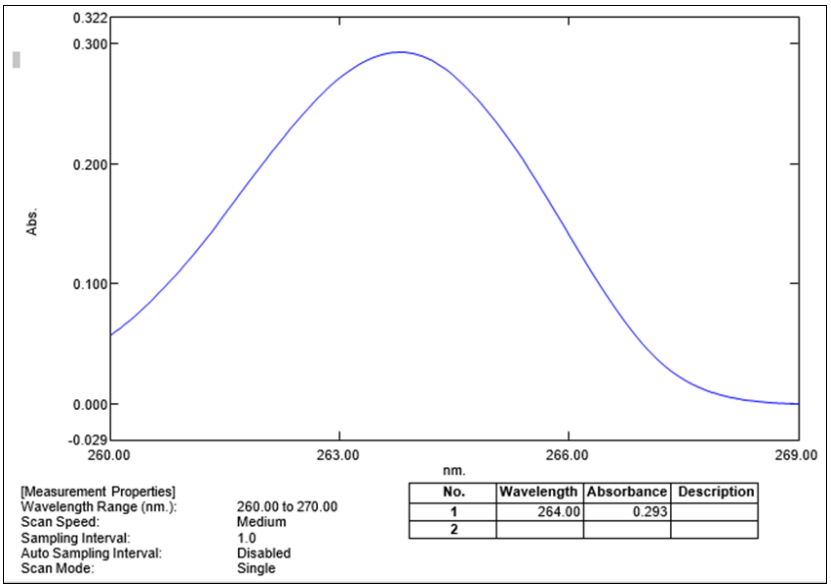
3.3 Determination of In-vitro Antioxidant Activity

DPPH radical-scavenging activity was measured using the Shimada, *et al*., (1992) technique. identification of The Fenton reaction was used to assess the hydroxyl radical scavenging activity according to the technique of (An, 2008). By using the phosphor molybdenum method to the guidelines of (Mag *et al*., 2011) [9] (and Bawazeer *et al*., 2021) [4], the extract's overall antioxidant activity was assessed. The technique of (Kardile, 2018) [7] was used to test the scavenging activity of superoxide anion radicals. According to the method of (Muruke, 2014) [12], the binding capacity of the extract for ferrous ions Fe2+ was determined. According to the approach described by (the International Magazine of Advanced Studies in Biological Sciences, 2014), nitric oxide activity in scavenging radicals was measured.

4. Results and Discussion

4.1 UV-VIS spectral analysis of *Argemone mexicana* Linn Extract

Many different substances are produced by plants, and they serve important functions such as allelopathic agents, UV protectants, signal molecules in the creation of nitrogen-fixing nodules in the roots of legumes, attracting bees and seed-dispersing animals, and protecting plants from herbivores. Although these substances have long been disregarded in terms of nutrition, interest in their role and relative significance for human health is growing. The goal of the current study was to learn more about the antioxidant and phytochemical properties of plants the sun's non-ionizing radiation, as well as radiation from manmade sources and technology. The peak at 264 nm in the UV spectrum represents a flavonoid signal. In the UV spectra of the majority of flavonoids, the primary absorbance maxima, and band at 240-285 nm, accordingly, are visible (see Fig. 1). Flavonoids are present because the mixture becomes yellow when they are present. The sample's absorbance will then be determined using a UV-Vis spectrophotometer with a 432 nm wavelength. From the previously observed quercetin calibration curve, total flavonoid concentrations were determined utilizing a linear regression equation. In Makuasa and Ningsih *et al*. 2020 [10].



4.2 Fourier Transform Infra-Red Spectroscopy Analysis of *Argemone mexicana* Linn Extract

This method is employed to distinguish between natural materials, polymer functional groups, and occasionally inorganic materials. For the characterization and identification of chemicals or functional groups (chemical bonds) contained in an unidentified combination of plant extracts, FTIR has proven to be a useful tool. Additionally, pure compound FTIR spectra are frequently so distinctive that they resemble a molecular "fingerprint" (Wei & Mohamed, n.d.). Alcohol, alkaline compounds, carboxylic acids, aldehydes, allenes, cyclic alkenes, alky halides, aromatic compounds, isothiocyanates, and alkenes are among the substances found in the plants' methanol extract that were confirmed by the FTIR spectrum. The O-H group's stretching vibration is represented by the band at 3392 cm1 (Bhattacharjee *et al*., 2006). 2013 (Yuchang & Shao).

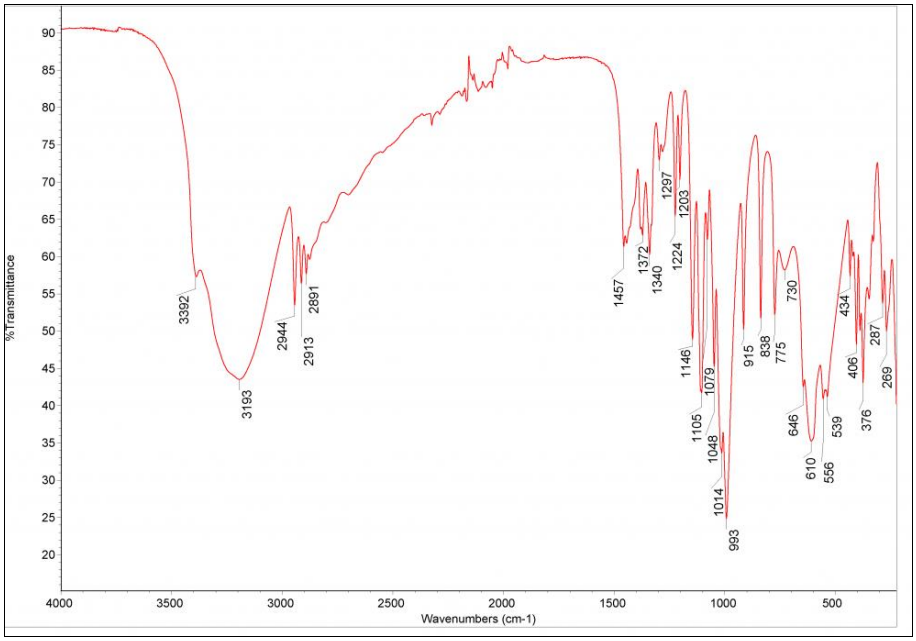


Table 1: Frequency range

Frequency Range	Absorption (cm^{-1})	Appearance	Group	Compound Class
3392	3400-3300	medium	N-H stretching	aliphatic primary amine
3193	strong, broad	O-H stretching	carboxylic acid	usually centered on 3000 cm^{-1}
2944	weak, broad	O-H stretching	alcohol	intramolecular bonded
2913	medium	C-H stretching	alkane	
1457	medium	C-H bending	alkane	methylene group
1340	medium	O-H bending	alcohol	-
1048	Trong, broad	CO-O-CO stretching	anhydride	-
838	medium	C=C bending	alkene	trisubstituted
775	strong	C=C bending	alkene	disubstituted (cis)
646	strong	C-Br stretching	halo compound	-
646	strong	C-Br stretching	halo compound	-

4.3 HPLC analysis of your *Argemone mexicana* Linn Extract

It is standard procedure to use a variety of separation techniques, including thin-layer chromatography (TLC), column-based chromatography, flash chromatography, and Sephardim chromatography (HPLC), to isolate these bioactive compounds and obtain pure compounds (HPLC is versatile and dependable; Naqvi *et al*., 2005).

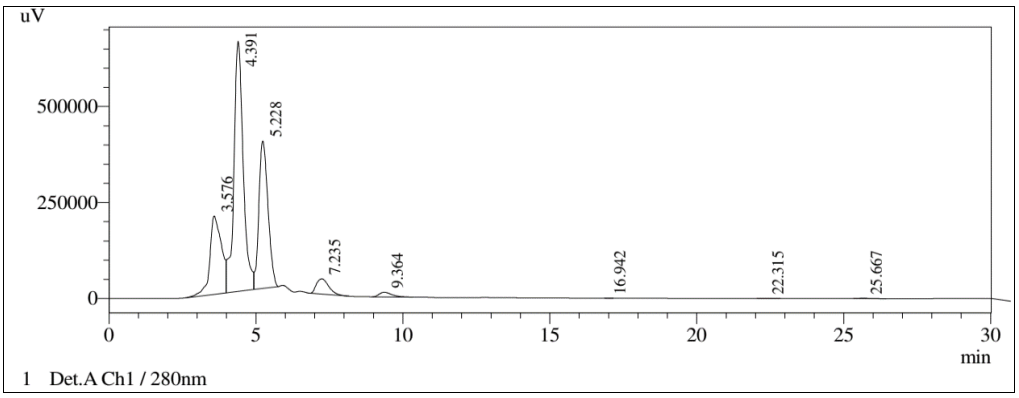


Fig 1: HPLC analysis of your sample table

Table 2: Column-based chromatography, flash chromatography, and Sephardim

Peak#	Ret. Time	Area	Height	Area %	Height %	Compounds identified by literature*
1	3.576	5646975	204074	18.819	15.790	Quercetin
2	4.391	14458315	651188	48.184	50.385	Gallic Acid
3	5.228	14458315	384109	27.780	29.720	Apigenin
4	7.235	14458315	39956	3.908	3.092	Resorcinol
5	9.364	369061	12170	1.230	0.942	Caffeic Acid
6	16.942	137	14	0.000	0.001	Cyanidin -3-O-glucoside
7	22.315	2508	98	0.008	0.008	(-)-Epicatechin
8	25.667	20927	813	0.070	0.063	Kaempferol
Total		30006529	1292422	100.000	100.000	

*(Tapan Seal, 2016; Baram Ahmed Hamahameen and Banaz Jamal, 2013; Paranthaman *et al*., 2012)

Fig. 4: HPLC analysis of your samples method that is frequently used to isolate natural compounds. In phytochemical or analytical chemistry, HPLC is a chromatographic technology that can separate a mixture of substances and is used to identify, measure, and purify each component of the combination (Nalini & Anuradha, 2017) [13]. The individuality of a component is confirmed by the high-performance liquid chromatography (HPLC) analysis of plant extracts, which also provides the necessary quantitative results and tracks the development of illness therapy. HPLC is one of the most widely utilized high-precision analytical methods. Its primary objective is to provide exact, reproducible results. A sample must be properly prepared to be loaded right away onto an HPLC column. To achieve this, your sample needs to be dissolved in the appropriate solvent. It's a useful method to 3.576-Quercetin 4.391-Gallic Acid 5.228-Apigenin 7.235-Resorcinol 9.364-Caffeic Acid 16.942-Cyanidin -3-O-glucoside 22.315-(-) forecast flavonoid by calculating Ret. Time.-Epicatechin, 25.667-Kaempferol Finally, isolate the component and give it an activity because this is the substance found in the plant extract.

4.3 Antioxidant Activity of *Argemone mexicana* Linn Extract

4.3.1 DPPH Radical Scavenging Activity

These compounds have the highest activity of antioxidant due to their redox properties (Kumar *et al*., 2019) [8] DPPH radical scavenging activity of plant extract of SRLE and standard ascorbic acid are presented in Fig 3. The half inhibition concentration (IC_{50}) of *Argemone mexicana* Linn plant Extract and ascorbic acid were leaves 49.44µg/mL^{-1} roots 49.98 µg/mL flower 48.82 and 47.83 µg/mL respectively. The *Argemone mexicana* root extract exhibited a significant dose-dependent inhibition of DPPH activity (Table 4.7). The potential of L-ascorbic acid to scavenge DPPH radical is directly proportional to the concentration. The DPPH assay activity is near to standard as ascorbic acid.

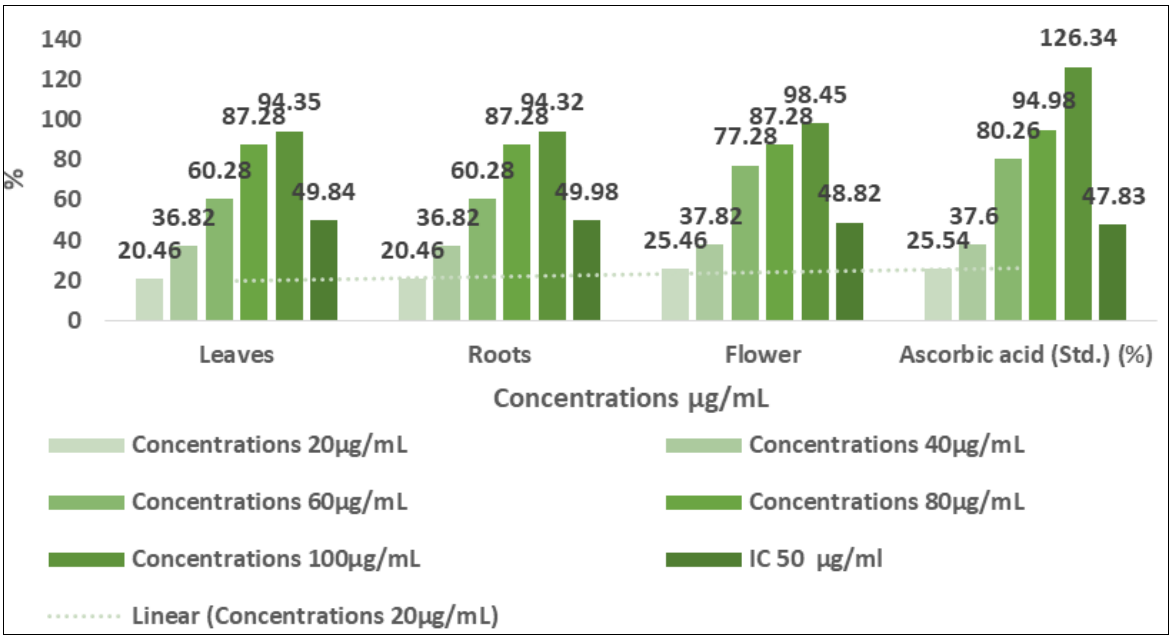


Fig 2: DPPH radical scavenging activity *Argemone mexicana* linn Extract

4.3.2 Antioxidant Activity General Extract from *Argemone mexicana* Linn

The yield of *Argemone mexicana* Linn's ethanol extract and its overall antioxidant capacity are shown in Fig. 4. According to the study, the extract's antioxidant activity rises with concentration (Table 2). Ascorbic acid and plant extract had IC50 values of 49.97 g/mL^{-1}, 47.96 g/mL for roots, 48.34 g/mL for flowers, and 47.64 g/mL for plant extract.

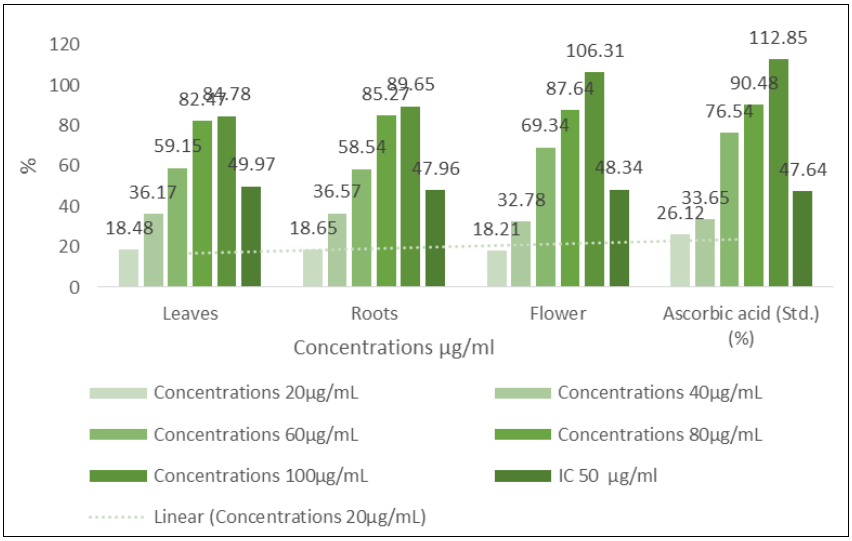


Fig 3: Total Antioxidant Activity *Argemone mexicana* linn Extract

4.3.3 Nitric oxide scavenging activity *Argemone mexicana* Linn Extract

Fig. 8 depicts the nitric oxide scavenging activity of *Argemone mexicana* Linn Extract. *Argemone mexicana* Linn extract's nitric oxide-scavenging ability improved with dosage (Table 6). *Argemone mexicana* Linn Extract's half-inhibition concentration (IC50) was 49.96 g/mL-1 for the leaves, 48.84 g/mL for the roots, and 47.98 g/mL for the flowers, respectively.

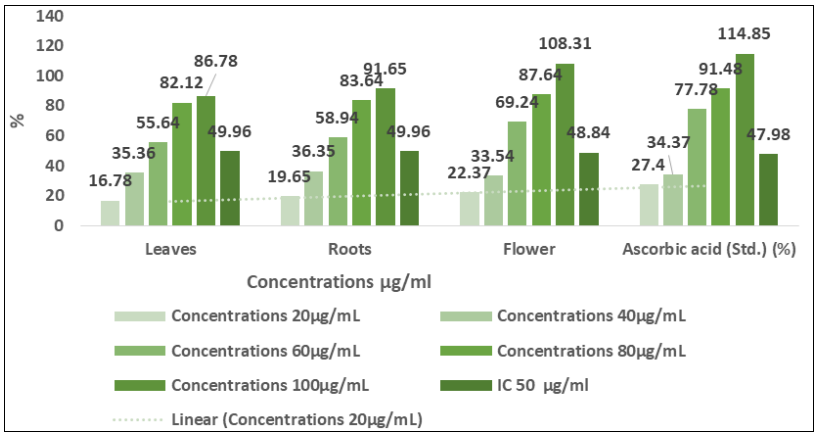


Fig 4: Nitric oxide scavengingactivity *Argemone mexicana* linn Extract

4.3.4 Scavenging of hydroxyl radicals by *Argemone mexicana* Linn Extract

The hydroxyl radical-scavenging capacity of the *Argemone mexicana* Linn extract is shown in Fig. 7. *Argemone mexicana* Linn extract's capacity to scavenge hydroxyl radicals increased with concentration (Table 5). *Argemone mexicana* Linn Extract's half-inhibition concentration (IC50) was 49.96 g/mL^{-1} for the leaves, 48.84 g/mL for the flower, and 47.98 g/mL for the flower, respectively. *Argemone mexicana* Linn Extract is close to the standards and may have hydroxyl radical scavenging action.

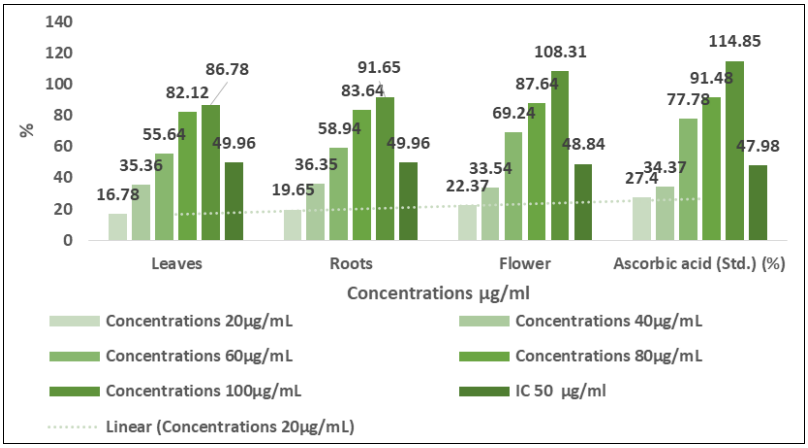


Fig 5: Hydroxyl radical scavengingactivity *Argemone mexicana* linn Extract

4.3 *Argemone mexicana* Linn Extract's ability to chelate ferrous ions: A water-soluble extract of *Argemone mexicana* Linn Extract prevents the formation of the ferrozine-Fe2+ complex, showing that it exhibits chelating action based on the IC50 value of leaf 49.91 g/mL^{-1}, roots 49.86 g/mL, flowers 48.13 g/mL, and flower 47.88 g/mL, correspondingly (Fig. 6, Table 4).

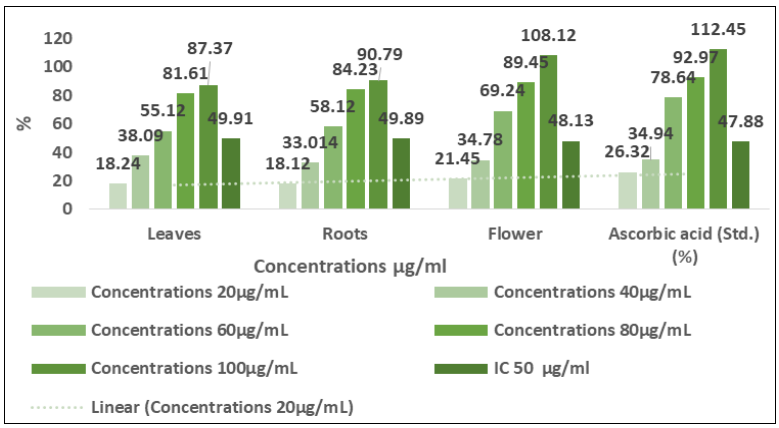


Fig 6: The ferrous ion chelating activity of root extract of *Argemone mexicana* linn Extract

4.3.6 Activity to scavenge superoxide Extract of *Argemone mexicana* Linn: Fig. 5 displays an extract from *Argemone mexicana* Linn Extract's superoxide anion radical scavenging activity as measured by the PMS-NADH method. With an increase in concentration, *Argemone mexicana* superoxide scavenging activity improved noticeably (Table 3). *Argemone mexicana* Linn Extract's half-inhibition concentration (IC50) was 49.94 g/mL^{-1} for the leaves, 49.87 g/mL for the roots, 47.84 g/mL for the flower, and 45.24 g/mL for the flower, respectively.

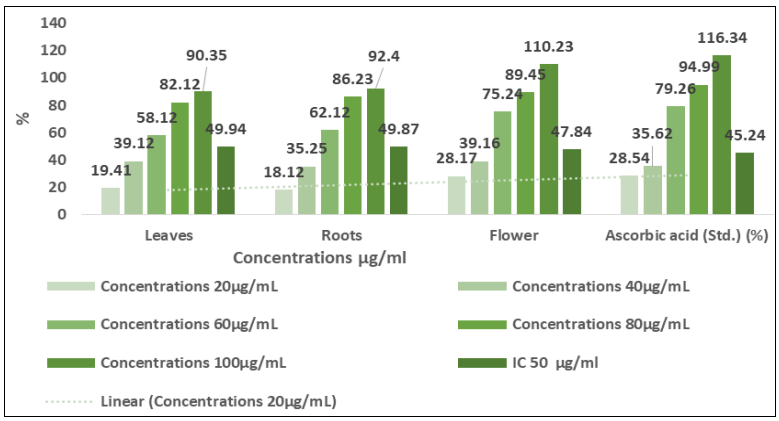
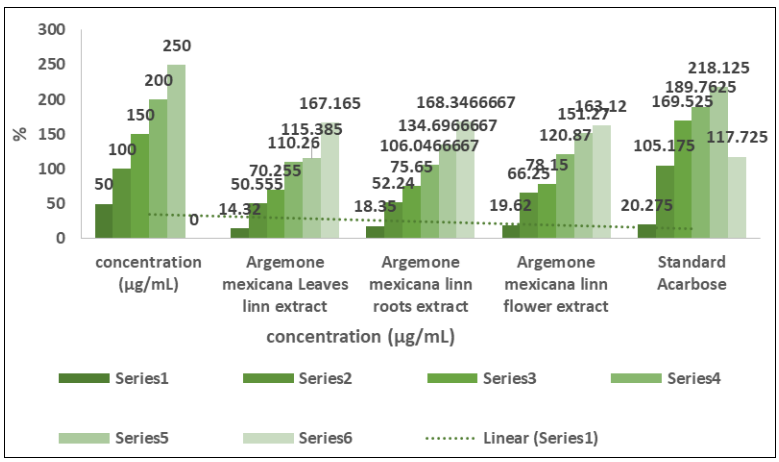


Fig 7: Superoxide scavenging activity *Argemone mexicana* linn Extract

4.4 *In vitro* α-amylase inhibiting

4.4.1 *Argemone mexicana* Linn Extract's Potential to inhibit amylase *In vitro* study: According to accepted procedures, the inhibitory activity was assessed (Sharma *et al*., 2021) [16].



*Values are means of three independent analysis ± Standard Deviation (n=3)

Fig 8: *In vi*tro α-amylase inhibiting activity of *Argemone mexicana* linn extract

The enzyme alpha- is largely present in saliva and pancreatic juice and is one of the more important enzymes in the process of digestion because of its significant contribution to the digestion of polysaccharides. One approach to reducing excessive postoperative blood glucose is to target and inhibit this enzyme. by 2021 (Mechchate *et al*.)

4.4.2. *Argemone mexicana* extracts have *In vitro* glucosidase inhibitory action.

One further vital enzyme for digestion is the -glucosidase enzyme, which is found in the small intestine's mucosal brush boundary. Its function is to digest and degrade the *Argemone mexicana* Linn Extracts *In vitro* glucosidase inhibitory action.

The common method (Sharma *et al*., 2021) [16] for breaking down complicated carbs into tiny, simple, and absorbable ones was used to measure the -glucosidase inhibitory activity. Its inhibition is a useful method for delaying glucose absorption and preventing excessive nocturnal blood glucose levels, which may likely slow the development of diabetes. by 2021 (Mechchate *et al*.)

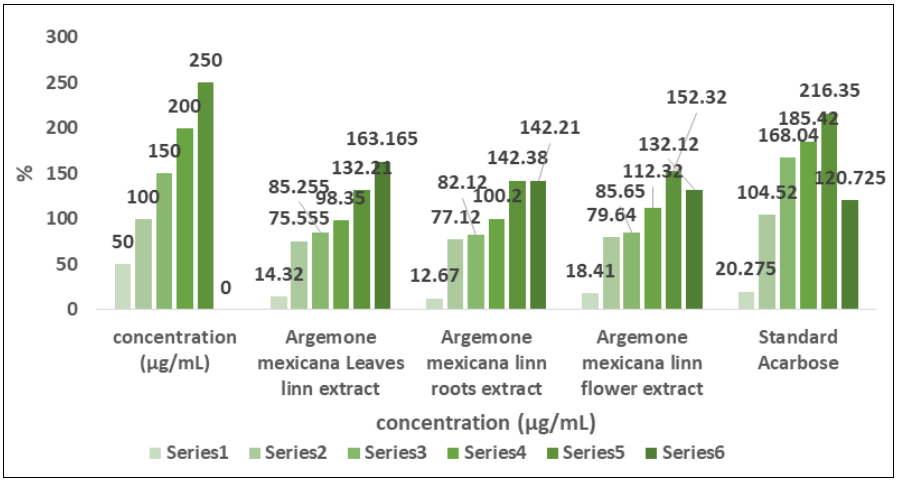


Fig 9: *In v*itro α-glucosidase inhibiting activity of *Argemone mexicana* linn extract

5. Conclusion

The current study used UV-FT-IR spectrum analysis to look at the plant *Argemone mexicana*. The presence of flavonoid and flavonoid compounds, which have an array of medicinal uses and can treat ailments like cancer, diabetes, and many others, was discovered by Linn's extract. When used conventionally, the plant extract works wonders at reducing urinary infections. The iron-binding activity (iron chelator and iron depleting violence) and steel-binding chelating action (cell-strengthening DPPH as well as an overall antioxidant with anion-binding superoxide dioxide exploration, nitric oxide scavenging, and hydroxyl radical scavenging activities) controlled various pathophysiologies of diseases, such as cancer, developing, and so forth. The extract of methanol was shown to contain significant amounts of bioactive compounds in anti-cancer trials, therefore quality standards are required for further study.

6. Availability of Data

The corresponding author can supply the data that were utilized to support the study's conclusions upon request.

7. Competing interests

It is stated by the authors because they have no competing interests.

8. Acknowledgments

We want to thank the administration of A.V.V.M. Sri Pushpam College (Autonomous), Poondi, for giving us the help and resources we needed to finish this project.

9. References

1. An KELI. Free-radical scavenging capacity using the Fenton reaction with Rhodamine B as the; c2008 .p. 730-735.
2. Argemone L, More NV, Kharat AS. Antifungal and anticancer potential of. Medicines; c2016 .p. 1–10. DOI:10.3390/medicines3040028.
3. Ayele TM, Abebe EC, Muche ZT, Agidew MM, Yimer YS, Addis GT, *et al*. Evaluation of *in vivo* wound-healing and anti-inflammatory activities of solvent fractions of fruits of *Argemone mexicana* L. (Papaveraceae); c2022.
4. Bawazeer S, Rauf A, Shah SUA, Shawky AM, Al-Awthan YS, Bahattab OS, *et al*. Green synthesis of silver nanoparticles using *Tropaeolum majus*: phytochemical screening and antibacterial studies. Green Process Synth. 2021;10(1):85–94. DOI:10.1515/gps-2021-0003.
5. Bhattacharjee I, Chatterjee SK, Chatterjee S, Chandra G. Antibacterial potentiality of *Argemone mexicana* solvent extracts against some pathogenic bacteria. Int J Adv Res Biol Sci. 2006;101(July):645–648.
6. International Journal of Advanced Research in Biological Sciences. 2014;1(6):331–336.
7. Kardile P. Studies on superoxide anion radical scavenging activity, antioxidant activity, and reducing power of methanolic and aqueous extracts of different medicinal plants; c2018.
8. Kumar RS, Anburaj G, Subramanian A, Vasantha S. *In vitro* antioxidant potential of leaf extracts of *Capparis zeylanica* Linn. 2019;8(4):176–181.
9. Mag P, Wan C, Yu Y, Zhou S, Liu W, Tian S. Antioxidant activity and free radical-scavenging capacity of *Gynura divaricata* leaf extract at different temperatures. 2011, 7(25). DOI:10.4103/0973-1296.75900.
10. Makuasa DAA, Ningsih P. Analysis of total flavonoid

levels in young leaves and old soursop leaves (*Annona muricata* L.) using UV-Vis spectrophotometry methods. 2020, 2(1).
11. Mechchate H, Es-Safi I, Louba A, Alqahtani AS, Nasr FA, Noman OM, *et al*. *In vitro* alpha-amylase and alpha-glucosidase inhibitory activity and *in vivo* antidiabetic activity of *Withania frutescens* L. foliar extract. Molecules. 2021, 26(2). DOI:10.3390/molecules26020293.
12. Muruke MH. Evaluation of antioxidant and iron chelating activities of a wild edible oyster mushroom *Pleurotus cystidiosus* from Tanzania. 2014;18–29.
13. Nalini R, Anuradha R. Isolation and HPLC quantitative analysis of flavonoids from flower extract of *Punica granatum* L. 2017;3(4):139–144.
14. Okafor UU, Ajaghaku AA. Antitrypanosomal activity of *Argemone mexicana* extract and fractions in the animal model of Trypanosoma brucei brucei infection; c2022 .p. 20–34.
15. Poovitha S, Parani M. *In vitro* and *in vivo* α-amylase and α-glucosidase inhibiting activities of the protein extracts from two varieties of bitter gourd (*Momordica charantia* L.). BMC Complement Altern Med. 2016;16(Suppl 1):1–8. DOI:10.1186/s12906-016-1085-1.
16. Sharma R, Bolleddu R, Maji JK, Ruknuddin G, Prajapati PK. *In vitro* α-amylase, α-glucosidase inhibitory activities and *in vivo* anti-hyperglycemic potential of different dosage forms of Guduchi (*Tinospora cordifolia* [Willd.] Miers) prepared with Ayurvedic Bhavana process. Front Pharmacol. 2021;12(May):1–14. DOI:10.3389/fphar.2021.642300.
17. Sourabie TS. Monographic survey of pharmacological potentials of *Argemone mexicana* L. (Papaveraceae), a plant of Burkina Faso pharmacopoeia: determination of antihepatotoxic and antipyretic activities. 2014;1(2):1–10.
18. Wei CK, Mohamed AR. Investigation on antioxidant compounds composition contained in *Leucaena leucocephala* (Petai belalang). 3–9. DOI:10.1088/1757-899X/551/1/012016.
19. Yuchang S, Shao X. Synthesis, characterization, and tribological behavior of oleic acid–capped calcium borate hydrate; c2016. DOI:10.1080/10402004.2013.763392.