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Qualitative Phytochemical Analysis and *In Vitro* Antioxidant Activity of the Whole Plant Extracts of *Vernonia Elaeagnifolia*

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ABSTRACT

In recent decades, there has been a growing interest among researchers in the study of medicinal plants, particularly in the assessment of antioxidant phytochemicals which have garnered increased attention for their potential contributions to the prevention of human diseases. With this view, the plant *Vernonia elaeagnifolia* was selected for our research. In the present study, the whole plant *V. elaeagnifolia* was collected, authenticated and dried in shade for powdering in mechanical grinder. The powdered plant material was extracted with soxhlet apparatus by using different solvents such as petroleum ether, chloroform, ethanol and water and the dried extract obtained was subjected to preliminary phytochemical evaluation and *in vitro* study of antioxidant activity by total antioxidant capacity, DPPH (2,2-diphenyl-1-picrylhydrazyl) assay, nitric oxide and ABTS (2,2-azino-bis-3 ethylbenzothiazoline-6-sulphonic acid) radical scavenging assays. In the preliminary phytochemical evaluation, presence of alkaloids, saponins, phenolic compounds, flavonoids, glycosides, quinones, terpenoids, fatty acids, sterols and tannins were found in different extracts. In the antioxidant activity evaluation, the ethanol extract showed a significant result in the phosphomolybdate assay comparing with other tested extracts. In DPPH, nitric oxide and ABTS radical scavenging assays, all the tested extracts showed a concentration dependent rise of percentage inhibition. The ethanol extract showed a significant percentage of inhibition in all these evaluation comparing with other tested extracts. In this study, the ethanol extract showed significant results that can be seen throughout the study from the beginning viz., yield of the extracts, then phytochemical screening and the evaluation of antioxidant activity. It may be due to the polarity of the solvent ethanol. Further studies in these extracts with focus on different pharmacological activities in the future may give more significant results which are useful for the development of novel chemotherapeutic agents.

KEYWORDS: *Vernonia elaeagnifolia*, Phytochemical evaluation, *In vitro* antioxidant activity

INTRODUCTION

Medicinal plants are commonly distributed all over the world, but, notably in tropical countries. Since the past, medicinal plants are continuously explored for their therapeutic potentials. According to World health organization (WHO), plants are one of the best sources for a variety of drugs and approximately, 25% of present-day medicines are derived directly or indirectly from higher plants (Kunle *et al.,* 2012; Rahman *et al.,* 2019; Sarita *et al.,* 2019). These medicinal plants contain a wide range of bioactive compounds that include alkaloids, flavonoids, tannins, phenolic compounds etc. which can be used to treat numerous chronic as well as infectious diseases (Veeramuthu *et al.,* 2006; Tasnuva Sharmin & Sukla Sarkar 2017; Pushpa *et al.,* 2019; Balabhaskar *et al.,* 2019). Plants used in the traditional healing system requires a systematic evaluation that may give more promising data about their medicinal value and may be useful to meet the rising demand of novel agents to combat the infections and diseases (Suleiman 2019). Ethno medicinal validation, together with the screening of phytochemical and biological activity, is an effective method for identifying new drugs from medicinal herbs (Sebastin *et al.,* 2019). In recent decades, there has been a growing interest among researchers in the study of medicinal plants, particularly in the assessment of antioxidant phytochemicals which have garnered increased attention for their potential contributions to the prevention of human diseases (Senguttuvan *et al.,* 2014). With this view, the plant *Vernonia elaeagnifolia* was selected for our research.

V. elaeagnifolia belongs to the family of Asteraceae. It is a creeper plant, commonly called as Toran vel and Curtain creeper. It is an extensive, perennial, woody, ornamental climber mostly cultivated in Asia and Europe. Young stem, slender, pendulous, glabrous, 0.4-0.6cm in thickness, becomes woody at maturity. The plant is frequently grown as an ornamental plant in houses and gardens, especially on fencing, compounds walls and buildings reaching up to 7-8m in height. Flowers pinkish-purple coloured in small auxiliary heads. Heads crowded terminally in paniculate cymes, 1.5cm in diameter and has single types of florets. Conventionally its leaves are being used as leech repellent. Generally, plants of Asteraceae family have medicinal properties against upper respiratory tract infections, stomach ulceration and skin infections. In the previous literatures, diverse pharmacological activities of the Vernonia plants were documented (Sultana *et al.,* 2017; Prasanna Kattekola 2020). In the present study, extraction, preliminary phytochemical screening and the evaluation of *in vitro* antioxidant activity were carried out as a part of our research on the different pharmacological activities of *V. elaeagnifolia.*

MATERIAL AND METHODS

Collection and Identification of Plant

The whole plant of *Vernonia elaeagnifolia* was collected from the rural locations of Parassala in Thiruvananthapuram district of Kerala. The collected plant was identified and authenticated by Dr. G. Rajkumar, Principal Scientist & Head, Plant Systematics & Evolutionary Science Division, Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Palode, Thiruvananthapuram, Kerala, India

Powdering and Extraction of Plant Material

Powdering and extraction of the collected whole plant material was done in reference with Sebastin *et al.,* 2019; Anoob Kumar *et al.,* 2020; Arun *et al.,* 2021; Kiran *et al.,* 2021; Thasneem *et al.,* 2022; Leslie *et al.,* 2022. The collected whole plant material suitably dried in shade for about two weeks was powdered by mechanical grinder and the coarse powder thus obtained was extracted successively with solvents of ascending order of polarity viz., petroleum ether, chloroform, ethanol and water using soxhlet apparatus.

For extraction, about 50gm of powdered plant material moistened with respective solvent was packed in the soxhlet extractor and extracted with 500ml of respective solvents individually. After each extraction, subsequent extraction was done by using the same dried marc. Each extract was filtered, distilled and the dried extract was collected and the percentage yield of each was noted and preserved for further study.

Preliminary Phytochemical Screening

Preliminary phytochemical screening was done in accordance with the procedure of Sebastin *et al.,* 2019; Anoob Kumar *et al.,* 2020; Arun *et al.,* 2021; Kiran *et al.,* 2021; Thasneem *et al.,* 2022.

Chemical Test for Alkaloids

Little quantity of crude extract with alcohol was shaken with dilute hydrochloric acid and filtered. The acidified filtrate was used to detect the presence of alkaloids by the following tests.

Mayer’s test

The acidified filtrate (2ml) was treated with Mayer’s reagent (1ml), shaken well and observed for the presence of creamy precipitate.

Wagner's test

The acidified filtrate (2ml) was treated with Wagner's reagent (1ml) and observed for the presence of reddish-brown precipitate.

Hager's test

The acidified filtrate (2ml) was treated with Hager's reagent (1ml) and observed for the presence of yellow precipitate.

Dragendorff's test

The acidified filtrate (2ml) was treated with Dragendorff's reagent (2ml) and observed for the presence of orange-red precipitate

Chemical Tests for Glycosides

Little quantity of crude extract was hydrolyzed with dilute hydrochloric acid on a water bath for a few hours and the hydrolysate obtained was used to detect the presence of glycosides by following tests.

Legal test

The hydrolysate (2ml) was dissolved in pyridine (2ml). Freshly prepared sodium nitroprusside solution (2ml) was added to it. Made the mixture alkaline with sodium hydroxide solution and observed for the formation of pink colour.

Baljet test

The hydrolysate (2ml) was treated with sodium picrate solution (1ml) and observed for the formation of a yellow to orange colour.

Chemical Tests for Phenolic Compounds and Tannins

Ferric chloride test

A small quantity of the dried extract was mixed with water and treated with dilute ferric chloride solution (5%) and observed for the presence of blue colour.

Gelatin test

The dried extract dissolved in the water was filtered. To the filtrate, a 2% solution of gelatin containing 10% sodium chloride was added and observed for the presence of milky white precipitate.

Lead acetate test

The dried extract dissolved in the water was treated with a 10% lead acetate solution and observed for the presence of bulky white precipitate.

Decolourisation test

The dried extract dissolved in water was treated with dilute potassium permanganate solution and observed for the decolourisation of potassium permanganate.

Chemical Tests for Flavanones and Flavonoids

Aqueous sodium hydroxide test

Aqueous sodium hydroxide solution was added to the little quantity of alcoholic extract and observed for the yellow colouration of the solution.

Ammonia test

The filter paper wetted with a small quantity of alcoholic solution of the extract was exposed to ammonia vapour and observed for the formation of yellow colour.

Shinoda test

Small quantity of extract mixed with alcohol was treated with magnesium or zinc and dilute hydrochloric acid and observed for the formation of orange-red or violet colour.

Chemical Test for Quinones

Each extract (2ml) was mixed with concentrated hydrochloric acid (3 or 4 drops) and observed for the formation of yellow colour precipitate.

Chemical Tests for Saponins

Foam (Froth) test

A small quantity of dried extract was diluted with distilled water (20ml) in a graduated cylinder. The suspension was shaken for 15min and observed for the formation of froth.

Haemolysis test

A drop of blood was placed in a slide and mixed with a small quantity of dried extract and observed for haemolysis.

Chemical Test for Terpenoids

Salkowski test

Little quantity of dried extract was dissolved in chloroform. An equal volume of concentrated sulphuric acid was added to it and observed for the appearance of red colour in the chloroform layer and greenish-yellow fluorescence in the acid layer.

Fatty acids

Extract (0.5 ml) was added to ether (5ml) and allowed it to evaporate on filter paper. Then the filter paper was dried and the appearance of transparency on filter paper is the indication of presence of fatty acids

Chemical Tests for Sterols

A little quantity of the alcoholic extract was refluxed with alcoholic potassium hydroxide solution until the saponification was observed. The mixture was diluted and extracted with solvent ether. The ethereal extract was evaporated and the residue obtained was used in the tests for sterols.

Liebermann – Burchard test

The residue was taken with dry chloroform (1ml) and then it was mixed with 2ml of specially distilled acetic anhydride followed by a few drops of concentrated sulphuric acid through the sides of the test tube and observed for the formation of green colour in the upper portion which changes to bluish violet.

Salkowski test

The residue was dissolved in chloroform and an equal volume of concentrated sulphuric acid was added to it and observed for the red colour in the lower layer.

***In vitro* Antioxidant Activity**

Antioxidant activity of all the extracts of *V. elaeagnifolia* was evaluated *in vitro* by total antioxidant capacity, DPPH (2,2-diphenyl-1-picrylhydrazyl) assay, nitric oxide and ABTS radical scavenging assays.

Total Antioxidant Capacity

Evaluation of total antioxidant capacity of the test extracts was done by phosphomolybdate assay method in accordance with the procedure of Mbinda *et al.,* 2019; Sebastin *et al.,* 2021 with slight modification.

Sample (1mg/ml) was mixed with 3ml of reagent solution (0.6 M sulfuric acid, 28 mM sodium phosphate and 4 mM ammonium molybdate). Ascorbic acid was used the standard and 1ml of varying concentration of standard combined with 3ml of reagent solution. The tubes containing the reaction mixture was incubated at 95°C for 90 min. Then, the absorbance of the solution was measured at 695 nm using a UV-VIS spectrophotometer against blank after cooling to room temperature. The total antioxidant activity is expressed as the number of gram equivalent of ascorbic acid. The calibration curve was prepared by mixing ascorbic acid with ethanol.

DPPH Assay

It was done in reference with Sebastin *et al.,* 2021; Savithamol *et al.,* 2016; El Jemli *et al.,* 2016; Anoob Kumar *et al.,* 2021. 50µl of test sample at various concentrations (1.56, 3.12, 6.25, 12.5, 25, 50,100,200,400,800 and 1000 µg/ml) was mixed with freshly prepared 0.1mM

solution of DPPH in ethanol (1ml) and kept in dark at room temperature for 30min. Then, the absorbance of the reaction mixtures was measured at 517nm, using ethanol as the blank, DPPH in ethanol as the control and ascorbic acid as the standard control. The inhibition percentage of DPPH radical by the tests was identified by

$$\%\ inhibition\ =\ \frac{Control\ Abs. - Sample\ Abs.}{Control\ Abs.}\ X\ 100$$

Percentage of inhibition against concentration was plotted as a graph. The IC_{50} values of the samples were assessed from the regression equation of the graph.

Nitric Oxide Radical Scavenging Assay

The nitric oxide radical scavenging potential of the tests was evaluated in reference with the procedure of Sebastin *et al.,* 2021; Anoob Kumar *et al.*, 2021; Awah *et al.,* 2010. The reaction mixture (5ml) was prepared by mixing sodium nitroprusside (5mM) in phosphate buffer (pH 7.3) and test extracts in different concentration. After the addition of 1ml of Griess reagent (1% sulphanilamide in 5% phosphoric acid and 0.1% naphthyl ethylene diamine dihydro chloride) to the reaction mixture, it was kept in 25°C (in front of 25W tungsten lamp) for 3h. The nitric oxide radical thus formed was interacted with oxygen to produce nitrite ion which was measured spectrophotometrically (546nm). Normal and standard control were prepared. Ascorbic acid was employed as the standard control. The percentage inhibition nitric oxide radical formation was determined by

$$\%\ inhibition\ =\ \frac{Control\ Abs. - Sample\ Abs.}{Control\ Abs.}\ X\ 100$$

ABTS (2,2-azino-bis-3-ethylbenzothiazoline-6-sulphonic acid) Radical Scavenging Assay

It was done in reference with Mbinda *et al.,* 2019; Re *et al.,* 1999. The reaction was initiated by the addition of 200µl of diluted ABTS to 1.56-1000µg/ml of different concentrations of sample extract and in control 50 µl of ethanol used instead of sample. Ethanol is used as blank. The absorbance was read at 734nm and the percentage inhibition was calculated by

$$\%\ inhibition\ =\ \frac{Control\ Abs. - Sample\ Abs.}{Control\ Abs.}\ X\ 100$$

RESULTS AND DISCUSSION

In the present study, the whole plant of *V. elaeagnifolia* was collected and made into coarse powder after proper drying and extracted with different solvents such as Petroleum ether, Chloroform, Ethanol and Water. The percentage yield, colour, consistency and the yield of the dried extracts is shown in Table 1. From the results it was found that the ethanol extract showed significant percentage of yield comparing with other extracts.

In the preliminary phytochemical evaluation, all the prepared extracts showed positive results in the test for alkaloids, saponins, phenolic compounds and tannins. Presence of flavonoids, glycosides, quinones were found in the chloroform, ethanol and aqueous extracts. Terpenoids was found in the petroleum ether, ethanol and aqueous extracts. Fatty acids and sterols were found in the ethanol and aqueous extracts. (Table 2).

In this study the antioxidant activity of the prepared extracts was evaluated by total antioxidant capacity by phosphomolybdate assay, DPPH assay, nitric oxide and ABTS radical scavenging assays. Result of the evaluation by phosphomolybdate assay is shown in Table 3. It was found that the ethanol extract of the whole plant *V. elaeagnifolia* showed a significant result comparing with other tested extracts. The ethanol extract showed the absorbance value of 1.971 and the concentration score of 149.84µg/mg. In DPPH, nitric oxide and ABTS radical scavenging assays, (Table 4, 5 & 6) all the tested extracts showed a concentration dependent rise of percentage inhibition. The ethanol extract showed a significant percentage of inhibition in all these evaluation comparing with other tested extracts such as petroleum ether, chloroform, and water. Particularly, in the ABTS assay, the ethanol extract showed a maximum percentage inhibition of 80.86 in the concentration of 1000µg/ml. The same concentration of standard ascorbic acid showed 97.24% inhibition (Table 6). Percentage inhibition produced by the standard ascorbic acid and test extracts (1000µg/ml) in ABTS assay is shown in Figure 3. In nitric oxide assay, the ethanol extract showed 50.44% inhibition in 100 µg/ml concentration. The standard ascorbic acid in same concentration showed 73.27% inhibition (Table 5). Percentage inhibition produced by the standard ascorbic acid and test extracts (100µg/ml) in nitric oxide radical scavenging assay shown in Fig. 2. In DPPH assay, 61.39% inhibition is shown by the ethanol extract in the concentration of 1000µg/ml. However, the standard ascorbic acid showed 94.95% inhibition in 800µg/ml concentration (Table 4). Percentage inhibition produced by the standard ascorbic acid (800µg/ml) and test extracts (1000µg/ml) is shown in Figure 1.

Table 1. Percentage yield of the whole plant extracts of *V. elaeagnifolia*

Solvents used	Weight of the sample (gm)	Colour of the dried extract	Consistency	Weight of the extract (gm)	Yield (%)
Petroleum ether	50	Greenish yellow	Sticky	1.92	3.84
Chloroform		Greenish yellow	Sticky	1.00	2.00
Ethanol		Dark brown	Sticky	8.39	16.78
Water		Dark brown	Sticky	4.42	8.84

Table 2. Qualitative phytochemical evaluation of whole plant extracts of *V. elaeagnifolia*

S. No.	Chemical Test	I	II	III	IV
1	**Alkaloids**				
a	Mayer's test	+	+	+	+
b	Wagner's test	+	+	+	+
c	Hager's test	+	+	+	+
d	Dragendorff's test	+	+	+	+
2	**Glycosides**				
a	Legal test	-	+	+	+
b	Baljet test	-	+	+	+
c	Borntrager's test	-	+	+	+
d	Modified Borntrager's test	-	+	+	+
3	**Phenolic compounds**				
a	Ferric chloride test	+	+	+	+
b	Lead acetate test	+	+	+	+
c	Gelatin test	+	+	+	+
4	**Flavanones and flavonoids**				
a	Aqueous NaoH test	-	+	+	+
b	Ammonia test	-	+	+	+
c	Shinoda test	-	+	+	+
5	**Terpenoids**				
a	Salkowski test	+	-	+	+

6	**Sterols**				
a	Libermann-Burchard test	-	-	+	+
b	Salkowski test	-	-	+	+
7	**Saponins**				
a	Foams test/froth test	+	+	+	+
b	Haemolysis test	+	+	+	+
8	**Quinones**	-	+	+	+
9	**Fatty acid**	-	-	+	-

I – Petroleum ether extract; **II** – Chloroform extract; **III** – Ethanol extract; **IV** – Water extract; (+) = Positive (Presence of Phytochemical detected qualitatively); (-) = Negative (Presence of Phytochemical not detected qualitatively)

Table 3. Antioxidant activity of test extracts by phosphomolybdate assay

Conc. (µg/ml)	**Std.**	**Test (1mg/1ml)**		**Conc. of antioxidants (µg/mg)**
	Absorbance	**Extracts**	**Absorbance**	
100	1.221	Petroleum ether	0.675	65.69
120	1.441	Chloroform	1.397	112.57
140	1.855	Ethanol	1.971	149.84
160	2.201	Water	1.720	133.55
180	2.467			
200	2.699			

Table 4. Antioxidant activity of test extracts by DPPH assay

Conc. (µg/ml)		**% inhibition**				
		Std.	**Test extracts**			
Std.	**Test**	**A. A**	**1**	**2**	**3**	**4**
1.56	1.56	3.36	1.69	3.24	5.80	5.76
3.12	3.12	11.61	3.13	4.56	8.14	7.38
6.25	6.25	17.22	4.12	7.16	14.58	14.12
12.5	12.5	32.98	5.84	9.98	20.34	19.21

25	25	44.26	7.83	14.24	26.02	23.13
50	50	82.19	10.17	17.21	31.71	28.63
100	100	88.75	13.60	20.45	38.68	35.67
200	200	89.75	16.61	24.75	44.33	40.34
400	400	92.11	20.11	18.17	48.32	46.67
800	800	94.95	25.76	32.30	55.29	53.11
-	1000	-	31.86	36.42	61.39	58.95
IC_{50}		28.19µg/ml	>1000µg/ml	>1000µg/ml	495.94µg/ml	588.08 µg/ml

Conc.–Concentration; Std.–Standard; A. A–Ascorbic acid; 1–Petroleum ether; 2–Chloroform; 3–Ethanol; 4–Water

Table 5. Antioxidant activity of test extracts by nitric oxide radical scavenging assay

Conc. of Std. & Test extracts (µg/ml)	**% inhibition**				
	Std. (A. A)	**Test extracts**			
		1	**2**	**3**	**4**
6.25	4.68	2.65	8.24	8.97	2.65
12.5	18.26	10.15	11.62	16.03	10.15
25	28.51	15.00	18.09	25.15	15.00
50	44.77	21.18	26.18	34.12	21.18
100	73.27	29.12	39.41	50.44	29.12
IC_{50}	65.79µg/ml	>100µg/ml	>100µg/ml	98.35µg/ml	>100µg/ml

Conc.–Concentration; Std.–Standard; A. A–Ascorbic acid; 1–Petroleum ether; 2–Chloroform; 3–Ethanol; 4–Water

Table 6. Antioxidant activity of test extracts by ABTS radical scavenging assay

Conc. of Std. & Test extracts (µg/ml)	**% inhibition**				
	Std. (A. A)	**Test extracts**			
		1	**2**	**3**	**4**

1.56	8.20	0.85	4.02	3.05	2.33
3.12	14.80	4.79	6.52	10.80	9.11
6.25	27.58	7.84	10.29	15.12	14.15
12.5	43.04	11.86	15.42	19.36	20.97
25	56.42	14.18	24.35	26.56	23.04
50	76.73	20.80	43.67	35.58	24.44
100	90.48	24.35	53.71	45.74	34.22
200	94.72	31.68	64.68	54.81	38.37
400	96.10	37.31	64.68	66.41	44.90
800	96.40	45.89	66.07	74.80	70.14
1000	97.24	49.47	70.10	80.86	75.35
IC_{50}	19.69µg/ml	>1000µg/ml	149.47µg/ml	87.08µg/ml	351.42µg/ml

Conc.–Concentration; Std.–Standard; A. A–Ascorbic acid; 1–Petroleum ether; 2–Chloroform; 3–Ethanol; 4–Water

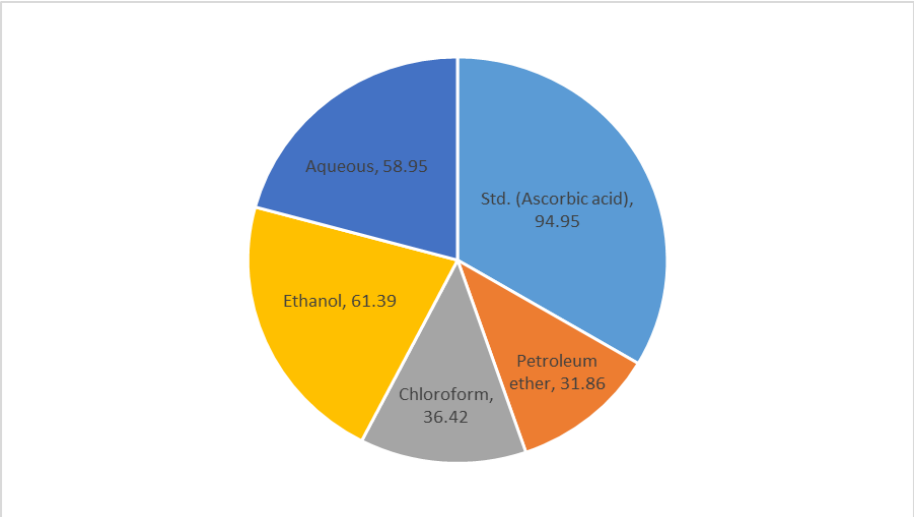

Figure 1. Percentage inhibition produced by the standard ascorbic acid (800µg/ml) and test extracts (1000µg/ml) in DPPH assay

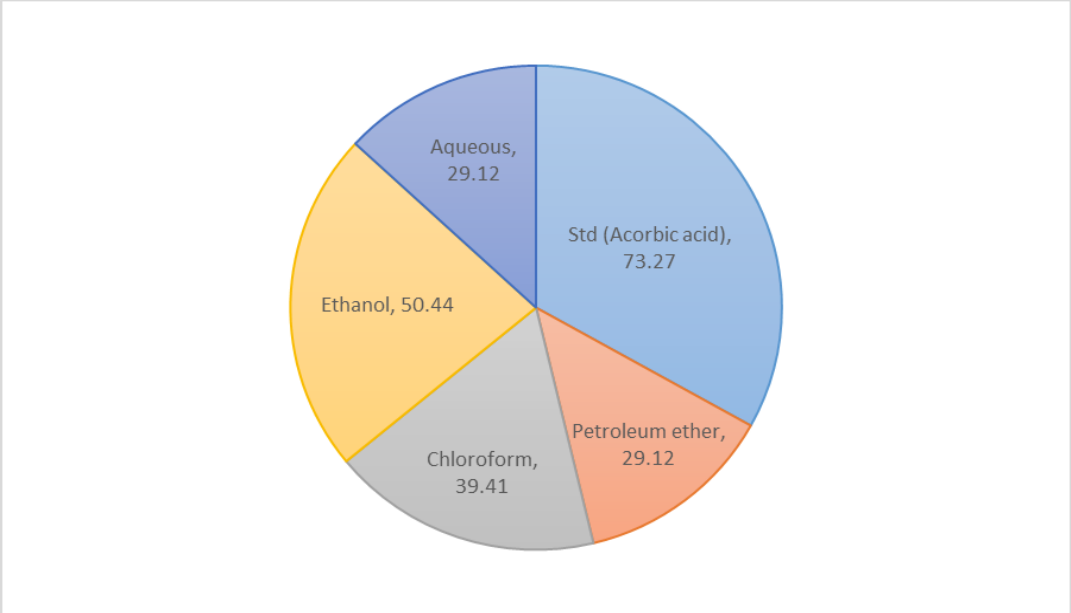

Figure 2. Percentage inhibition produced by the standard ascorbic acid and test extracts (100µg/ml) in nitric oxide radical scavenging assay

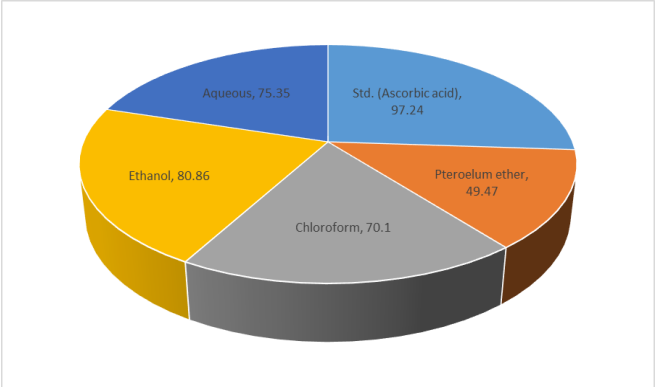

Figure 3. Percentage inhibition produced by the standard ascorbic acid and test extracts (1000µg/ml) in ABTS assay

Qualitative phytochemical analysis of petroleum ether, chloroform, ethanol and water extracts of the whole plant *V. elaeagnifolia*, a part of our ongoing research on this plant revealed the presence of alkaloids, saponins, phenolic compounds, tannins, flavonoids, glycosides, quinones, terpenoids, fatty acids and sterols in the tested extracts. Sultana *et al.*, 2017; Wulandari *et al.*, 2024; Nawale *et al.*, 2019) were documented the presence of these phytoconstituents including coumarins in the ethanolic and methanolic extract of *V. elaeagnifolia*. Importantly, the ethanol extract showed the presence of majority of phytochemicals identified in the present study. It may be due to the polarity of the solvent ethanol. Moreover, the phytoconstituents identified in the present study are well known for

their diverse biological activities. Dhyani *et al.,* 2022 reported that the alkaloids interfere with the cell division process, thus possess the anticancer property. Saponins one of the phytoconstituent found in the present study were well known for a range of important pharmaceutical properties, for example, anti-inflammatory, antifungal, antibacterial, anti-parasitic, anti-cancer and antiviral activities (Mugford & Osbourn 2012). Sultana *et al.*, 2017 reported that flavonoids are phenolic compounds enhances the process of fat metabolism. Saxena *et al.,* 2013 documented that the flavonoids have been reported to exert multiple biological property including antimicrobial, cytotoxicity, anti-inflammatory as well as antitumor activities but the best-described property of almost every group of flavonoids is their capacity to act as powerful antioxidants which can protect the human body from free radicals and reactive oxygen species. The capacity of flavonoids to act as antioxidants depends upon their molecular structure. The position of hydroxyl groups and other features in the chemical structure of flavonoids are important for their antioxidant and free radical scavenging activities. Terpenoids are well known for the anti-microbial, anti-allergic, anti-inflammatory anti-hyperglycemic, anti-spasmodic and immunomodulatory properties (Thoppil & Bishayee 2011). Cardiotonic, insecticidal and anti-microbial properties of sterols was documented by Sharma *et al.,* 2013. Sieniawska 2015 documented the in vitro antioxidant, antimicrobial, antiviral, cardioprotective and cytotoxic activity of tannins, also, in vivo anti-diabetic, anti-obesity, anti-ulcer and anti-inflammatory effects were reported. Quinones have several beneficial effects. Quinones are electron carriers playing a role in photosynthesis. As vitamins, they represent a class of molecules preventing and treating several illnesses such as osteoporosis and cardiovascular diseases. Quinones, by their antioxidant activity, improve general health conditions. Many of the drugs clinically approved or still in clinical trials against cancer are quinone related compounds (Najjar 2011). Of course, the outcome of this study and previous literature documentation would provide a base for further research which will be focused on the screening of different pharmacological activities of the extracts of this plant may give more valuable results.

CONCLUSION

Plants of Asteraceae family have medicinal properties and diverse pharmacological activities of the genus Vernonia plants were documented. As a part of our research on the plant *V. elaeagnifolia*, the present study focused on extraction, preliminary phytochemical screening and the evaluation of *in vitro* antioxidant activity. Initially, the whole plant was collected, authenticated and dried in shade for powdering in mechanical grinder. The coarse powder thus obtained was extracted by soxhlation using different solvents such as petroleum ether, chloroform, ethanol and water. The dried extract obtained was subjected to preliminary phytochemical evaluation and *in vitro* study of antioxidant activity by total antioxidant capacity, DPPH, nitric oxide and ABTS radical scavenging assays. In this study, the ethanol extract showed the presence of maximum phytochemicals among the identified comparing with other extracts. In the antioxidant activity evaluation, the ethanol extract showed a significant result in the phosphomolybdate assay comparing with other tested extracts. In DPPH, nitric oxide and ABTS radical scavenging assays, all the tested extracts showed a concentration dependent rise of percentage inhibition. However, the ethanol extract showed a significant percentage of inhibition in all these evaluation comparing with other tested extracts. Summarily, in this study, the ethanol extract showed significant results that can be seen throughout the study from the beginning viz., yield of the extracts, then phytochemical screening and the evaluation of antioxidant activity. It may be due to the polarity of the solvent ethanol. Further studies in these extracts with focus on different pharmacological activities in the future may give more significant results which are useful for the development of novel chemotherapeutic agents.

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CONFLICT OF INTEREST

No conflict of interest

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None

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