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Phytochemical Screening and Antioxidant Activity of *Artemisia vulgaris* (mugwort)

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Abstract: Alzheimer is one of the most dangerous brains disorder the affect the elderly people. An under diagnosed and undertreated illness is giving rise to a serious public health concern. The disease is due to the lack of cholinergic neurons in the brain, ultimately due to the deterioration of Acetylcholine (ACh) concentration. Acetylcholinesterase is an enzyme responsible for breakdown of Acetylcholine. Inhibition of AChE, is the most significant therapeutic target of AD therapy pathways. The present study revealed that the total weights of *Artemisia vulgaris* plant (aerial) used were 500 gm. In the pharmacognostic evaluation of *Artemisia vulgaris* (aerial) we determine total ashvalue, water soluble ash, acid insoluble ash, water extractive value, alcoholic extractive value, and loss on drying. Antioxidant plays a major role in protecting our body from disease by reducing the oxidative damage to cellular component caused by Reactive Oxygen Species. The determination of the total phenolic and flavonoids *Artemisia vulgaris* (aerial) content of hydro alcoholic extracts were investigated. Recent investigations suggest that the plant origin antioxidants with free-radical scavenging properties may have great therapeutic importance in free radical mediated diseases like diabetes, cancer, neurodegenerative disease, cardiovascular diseases, aging, gastrointestinal diseases, arthritis, and aging process. The antioxidant activity of plant extracts was determined by different in vitro methods such as the DPPH assay. In this investigation, the in-vitro antioxidant effect of *Artemisia vulgaris* were evaluated.

Keywords: *Artemisia vulgaris*, Anti- Alzheimer's Drugs, Herbal, In-vitro activity, Quantitative estimation, Anti-oxidant activity, Qualitative activity.

1. Introduction

Alzheimer is one of the most dangerous brain disorder the affect the elderly people. An under diagnosed and undertreated illness is giving rise to a serious public health concern..Over the past ten years, there has been a steadily increasing attempt to determine the cause of the condition and develop medication remedies¹. Improved clinical diagnostic standards and better behavioural and cognitive disorders therapy

are recent breakthroughs. Randomized, double-blind, placebo-controlled, parallel-group studies evaluating performance-based assessments of cognitive function, activities of daily living, and behaviour have been used to clinically evaluate symptomatic treatment that primarily focuses on cholinergic therapy. Patients with Alzheimer's disease are advised to use cholinesterase inhibitors, such as donepezil, tacrine, rivastigmine, and galantamine, to address cognitive impairment².

The disease is due to the lack of cholinergic neurons in the brain, ultimately due to the deterioration of Acetylcholine (ACh) concentration. Acetylcholinesterase is an enzyme responsible for breakdown of Acetylcholine. Inhibition of AChE, is the most significant therapeutic target of AD therapy pathways. The disease is caused by a deficiency of cholinergic neurons in the brain, which in turn results in a decline in the concentration of acetylcholine (ACh). Acetylcholine is broken down by an enzyme called acetylcholinesterase. The most important therapeutic target in AD treatment routes is AChE inhibition. While irreversible AChE activities are linked to negative consequences, reversible, competitive, or incompetent AChE inhibitors are primarily used therapeutically. There is no indication that any drug can prevent or delay the onset of illness³.

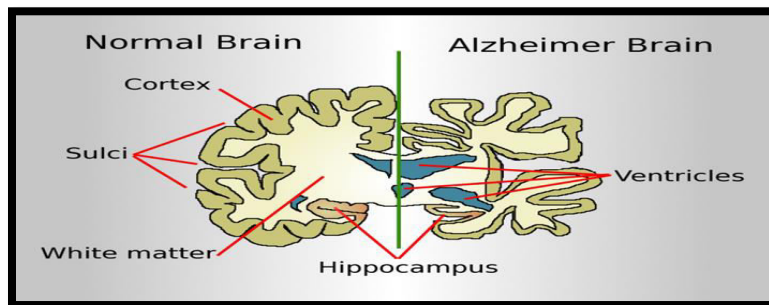


Figure 1: The regions, transmitters and circuit implicated in pathophysiology of Alzheimer³.

1.2. Etiology of Alzheimer's disease

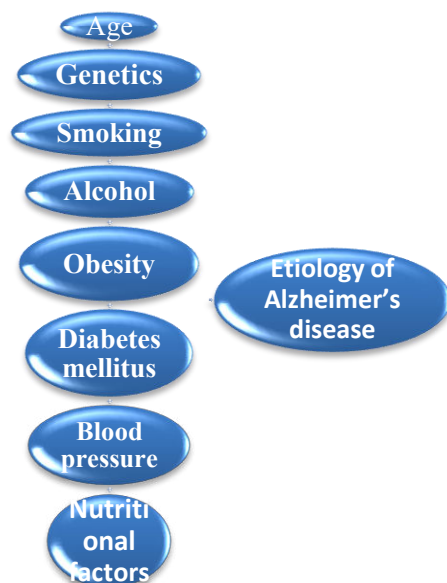


Figure 3: Etiology of Alzheimer's disease⁵.

1.2. Anti- Alzheimer's Drugs

Table 1: Classes of drug with its side effect⁶

Class of drugs	Examples of drugs	Side effects
Cholinesterase inhibitors	Tacrine, Donepezil, Rivastigmine	Nausea, Fatigue, Vomiting, diarrhea. Hepatotoxicity and muscle cramps
Cholinesterase inhibitors	Galantamine	Nausea, diarrhea , Anorexia, Agitation and vomiting
NMDA receptor antagonists	Memantine	Dizziness, constipation, confusion, agitation and headache.
Antioxidants	Garlic extract, Curcumin, Gink biloba, Vitamin E and Green tea	Hemorrhage, skin allergies , headaches, GI distress and hematoma

1.3. Herbal plants used to treat Alzheimer

Table 2: Herbal plants used to treat Alzheimer⁷.

Name of Plant	Plant part used	Description
Camellia sinensis	Leaves	<ul style="list-style-type: none"> ➤ Lowers Oxidative stress ➤ Improves memory
Curcuma longa	Roots or Rhizome	➤ Alpha secretase stimulatory effect.
Bugula neritina	Roots or rhizome	➤ Alpha secretase stimulatory effect by protein Kinase C
Physostigma venenosum	leaves	➤ Beta secretase stimulatory effect.
Embeliaribes	Fruit	➤ Beta secretase stimulatory effect.
Rhodiola rosea	Resin	➤ cholinergic neurotransmission, improving coronary blood flow, decline in neuro-inflammation, apoptosis, and free radicals load
Taraxacum officinale	Whole Plant	➤ reduced LPS-mediated TNF- α , IL-1 β generation, and activation of NF-kB

1.4. Artemisia vulgaris:

Artemisia vulgaris, family Compositae or Asteraceae commonly called Mugwort pollen (Hindi). Mugwort pollen is one of main sources of hay fever and allergic asthma, in North Europe, North America and in parts of Asia. The fern like leaves of many species are covered with white hairs. The stem is thin woody and the plant produced in an annual aromatic north and south Indian plants. Mugwort pollen is an aggressive and invasive plant. Most of the species are found growing wild and abundantly all over the temperate and cold temperate zones of the world. It is slightly toxic and many Pharmacological activities of *Artemisia vulgaris* have been reported: Prolonged dosage can damage the nervous system. All parts of the plant are anthelmintic, antiseptic, antispasmodic, carminative, cholagogue, diaphoretic, digestive, emmenagogue, expectorant, nervine, purgative, stimulant, slightly tonic and used in the treatment of women's complaints.⁸

1. Materials and Methods

2.1. Activity (In-vitro Anti-oxidant Activity)

2.1.1. DPPH Radical Scavenging Activity

2.1.1.1. Preparation of DPPH reagent

0.1mM solution of 2, 2-Diphenyl-1-picrylhydrazyl (DPPH) in methanol was prepared.

2.1.1.2. Preparation of Sample/Standard

Freshly 1 mg/ml methanol solution of extracts/standard was prepared. Different volume of extracts/standard (20 – 100 μ l) was taken from stock solution in a set of test tubes and methanol was added to make the volume to 1 ml. To this, 2 ml of 0.1mM DPPH reagent was added and mixed thoroughly and absorbance was recorded at 517 nm after 30 minutes incubation in dark at room temperature.

2.1.1.3. Preparation of control

For control, 3 ml of 0.1mM DPPH solution was taken and incubated for 30 min at room temperature in dark condition. Absorbance of the control was taken against methanol (as blank) at 517 nm⁹.

Percentage antioxidant activity of sample/standard was calculated by using formula:

$$\% \text{ Inhibition} = [(\text{Ab of control} - \text{Ab of sample} / \text{Ab of control} \times 100]$$

2.2. Pharmacognostical evaluation

2.2.1. Total ash value

About 5 g of powdered parts were accurately weighed and taken separately in silica crucible, which was previously ignited and weighed. The powder was spread as a fine layer on the bottom of crucible. The powder was incinerated gradually by increasing temperature to make it dull red hot until free from carbon. The crucible was cooled and weighed. The procedure was repeated to get constant weight. The percentage of total ash was calculated with reference to the air dried powder.

$$\% \text{ Ash content} = \frac{\text{Weight of crucible + ash} - \text{Weight of crucible}}{\text{Weight of crucible + sample} - \text{Weight of crucible}} \times 100$$

2.2.2. Water soluble ash

The ash obtained as described for the total ash, was boiled for 5 minutes with 25 ml of water. The insoluble matter was collected on ash less filter paper and washed with hot water. The insoluble ash was transferred into silica crucible, ignited for 15 min and weighed. The procedure was repeated to get a constant weight. The weight of insoluble matter was subtracted from the weight of total ash. The difference of weight was considered as water soluble ash. The percentage of water soluble ash was calculated with reference to air dried parts respectively¹⁰.

$$\% \text{ Water soluble ash} = \frac{\text{Weight of crucible + ash} - \text{Weight of crucible}}{\text{Crude drug weight}} \times 100$$

2.2.3. Acid insoluble ash

The ash obtained as described above was boiled with 25 ml of 2N HCl for 5 minutes. The insoluble ash was collected on an ash less filter paper and washed with hot water. The insoluble ash was transferred into a crucible, ignited and weighed. The procedure was repeated to get a constant weight. The percentage of acid insoluble ash was calculated with reference to the air dried drug¹⁰.

$$\% \text{ Acid insoluble ash} = \frac{\text{Weight of crucible + ash} - \text{Weight of crucible}}{\text{Crude drug weight}} \times 100$$

2.2.4. Alcoholic extractive value

5g of powdered material was weighed into 250mL stopper conical flask containing 100mL of 90% ethanol and the stopper replaced. The flask and content was placed in a mechanical shaker for 6hrs and then allowed to stand for 18hrs. The mixture was filtered and 20mL of the filtrate was measured into an evaporating dish with a known weight, and evaporated to dryness. The constant weight of the residue was gotten after drying in the oven at 105°C for about 3 minutes¹¹. The extractive value was calculated.

$$\text{Alcohol soluble extractive value} = \frac{\text{Weight of residue}}{\text{Weight of the drug}} \times 100$$

2.2.5. Water extractive value

The procedure was the same as above except that water used in place of 90% ethanol^{11, 12}.

$$\text{Water soluble extractive value} = \frac{\text{Weight of residue}}{\text{Weight of the drug}} \times 100$$

2.2.6. Loss on drying

Place 2 to 6 g of the sample into a weighing bottle which has been accurately weighed, and weigh it accurately. Then, dry it at 105 °C for 5 - 6 hours and cool it in desiccators with silica gel. When the material is dried to a constant weight, the percent of loss on drying is determined¹³.

LOD % = $\frac{\text{Wt. of petridish + crude drug} - \text{After drying Wt. of petridish + sample}}{\text{Weight of crude drug}} \times 100$

Weight of crude drug

2.2.7. Soxhlet extraction:

Dried and powdered rhizome parts of aerial parts of *Artemisia vulgaris* were placed in a thimble of Soxhlet apparatus separately. The extraction was carried out using a solvent system like 80 % hydroalcoholic at a temperature of 40-60°C on the heating mantle for 8-10 hours. After the extraction process, the samples' extracts were filtered and concentrated to dry. Obtained extracts were evaporated using a rotary vacuum evaporator at 40°C. Extracts were collected in an airtight container¹⁴. The extraction yields of all extracts were calculated using the equation below:

Formula of Percentage yield = $\frac{\text{Actual yield}}{\text{Theoretical Yield}} \times 100$

2.3. Qualitative Phytochemical Estimation of Extracts

Detailed phytochemical testing was performed to identify presence or absence of different phytoconstituents in Hydroalcoholic extracts of *Artemisia vulgaris* using standard procedures¹⁴. The extracts were subjected to following tests:

2.3.1. Tests for carbohydrates:

2.3.1.1 Molisch test: To 1ml of extract, 2-3 drops of alcoholic α -naphthol solution was added. Conc. sulphuric acid was added along the side of the test tube. The appearance of purple ring at the junction of two liquids was observed, which confirms the presence of carbohydrates in the test samples.

2.3.1.2 Fehling's test: To 1 ml of extract, similar quantity of Fehling's solution A and B was added and heated on a water bath for few minutes. The development of brick red precipitate was observed.

2.3.1.3 Benedict's test: Equal volume of Benedict's reagent and extract were mixed in a test tube and heated in the water bath for 5-10 minutes. Solution appears green, yellow or red depending on the amount of reducing sugar present in the test solution which indicated the presence of reducing sugar.

2.3.1.4 Barfoed's test: 1 ml of extract and Barfoed's reagent were mixed in a test tube and heated on water bath for 2 minutes. Red colour due to formation of cupric oxide indicates the presence of monosaccharide.

2.3.2. Test for alkaloids:

All the test extracts were first treated with dil. hydrochloric acid separately and filtered. The filtrate of all the test extracts was exposed to following tests:

2.3.2.1. Mayer's test: To 2-3 ml of filtrate, few drops of Mayer's reagent were added along sides of tube. Formation of white or creamy precipitate indicates the presence of alkaloids.

2.3.2.2. Hager's test: To 1-2 ml of filtrate, few drops of Hager's reagent were added in a test tube. Formation of yellow color precipitate indicates the presence of alkaloids.

2.3.2.3. Wagner's test: To 1-2 ml of filtrate, few drops of Wagner's reagent were added in a test tube. Formation of reddish-brown precipitate indicates the presence of alkaloids.

2.3.3. Test for flavonoids:

2.3.3.1. Lead acetate test: The extract was treated with few drops of lead acetate solution. Formation of yellow precipitate may indicate the presence of flavonoids.

2.3.3.2. Alkaline reagent test: The extract was treated with few drops of sodium hydroxide separately in a test tube. Formation of intense yellow color, which becomes color less on addition of few drops of dilute acid, indicate presence of flavonoids.

2.3.4 Test for glycosides:

2.3.4.1 Borntrager's test: To 3 ml of extract, dilute sulphuric acid was added, boiled for 5 minutes and filtered. To the cold filtrate, equal volume of benzene or chloroform was added and shake it well. The organic solvent layer was separated and ammonia was added to it. Formation of pink to red color in ammonical layer indicates presence of anthraquinone glycosides.

2.3.4.2 Legal's test: 1 ml of extract was dissolved in pyridine. 1 ml of sodium nitropruside solution was added and made alkaline using 10% sodium hydroxide solution. Formation of pink to blood red color indicates the presence of cardiac glycosides.

2.3.4.3 Keller-Killiani test: To 2 ml of extract, 3 ml of glacial acetic acid and 1 drop of 5% ferric chloride were added in a test tube. Add carefully 0.5 ml of concentrated sulphuric acid by the side of the test tube. Formation of blue color in the acetic acid layer indicates the presence of cardiac glycosides.

2.3.5. Test for protein and amino acids:

2.3.5.1. Biuret's test: The extract was treated with 1 ml of 10% sodium hydroxide solution in a test tube and heated. A drop of 0.7% copper sulphate solution was added to the above mixture. The formation of violet or pink colour indicates the presence of proteins.

2.3.5.2. Ninhydrin test: 3 ml of the extract was heated with 3 drops of 5% Ninhydrin solution in a water bath for 10 minutes. Formation of blue colour indicates the presence of amino acids.

2.3.6. Test for saponins:

2.3.6.1. Froth test: 1 ml of extract was dissolved in 20 ml of distilled water and shaken for 15 min in a graduated cylinder. Formation of persistent foam around 1 cm layer was observed.

2.3.7. Test for triterpenoids and steroids:

2.3.7.1. Salkowski's test: The extract was treated with chloroform and filtered. The filtrate was added with few drops of concentrated sulphuric acid, shaken and allowed to stand. If the lower layers turn red, sterol are present. Presence of golden yellow layer at bottom indicates the presence of triterpenes.

2.3.7.2. Libermann-Burchard's test: The extract was treated with chloroform. To this solution few drops of acetic anhydride were added, boiled and cooled. Concentrated sulphuric acid was added through the sides of the test tube. Formation of brown ring at the junction of two layers, if upper layer turned green, indicate presence of steroids and formation of deep red color indicate presence of triterpenoids.

2.3.8. Test for tannin and phenolic compounds:

2.3.8.1. Ferric chloride test: Some amount of extract was dissolved in distilled water. To this solution 2 ml of 5% ferric chloride solution was added. Formation of blue, green or violet color indicates presence of phenolic compounds.

2.3.8.2. Lead acetate test: Some amount of extract was dissolved in distilled water. To this solution few drops of lead acetate solution was added. Formation of white precipitate indicates presence of phenolic compounds.

2.3.8.3. Gelatin Test: Into the distilled water some quantity of extract was dissolved. To this solution 2 ml of 1% gelatin solution containing 10% sodium chloride was added. Development of white precipitate depicts the presence of phenolic compounds.

2.4. Quantitative Phytochemical estimation

2.4.1. Spectrophotometric Quantification of Total Phenolic Content:

The total phenolic content of plant extract was determined using the Folin-Ciocalteu Assay. Hydro alcoholic extracts of *Artemisia vulgaris* (0.2 mL from stock solution) was mixed separate in test tubes with 2.5 ml of Folin-Ciocalteu's phenol reagent. After 5 min, 2 ml of a 7.5% Na_2CO_3 solution was added to the mixture and volume make up to 7 ml with deionized distilled water and mixed thoroughly. The mixture was kept in the dark for 90 min at 25°C, after which the absorbance was read at 760 nm. The TPC was determined from extrapolation of calibration curve which was made by preparing gallic acid solution (20 to 100 µg/ml). The estimation of the phenolic compounds was carried out in triplicate. The TPC was expressed as milligrams of gallic acid equivalents (GAE) per g of dried sample¹⁵.

2.4.2. Spectrophotometric Quantification of Total Flavonoid Content:

The flavonoid content was determined using Aluminium chloride method [15]. In a 10 ml test tubes, 0.5 ml of Hydro alcoholic extracts *Artemisia vulgaris*, 0.15 ml of NaNO_2 (5%) and 0.15 ml of $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$ (10%) was mixed separate in test tubes. After 5 min, 2 ml of NaOH (4%) was added and volume up to 5ml with deionized distilled water. The solution was mixed well and the absorbance was measured against the reagent blank at 510 nm. The standard curve for total flavonoid was made using rutin standard solution (20 to 100 µg/ml) under the same procedure as earlier described. The total flavonoid was expressed as milligrams of rutin equivalents per g of dried fraction¹⁶.

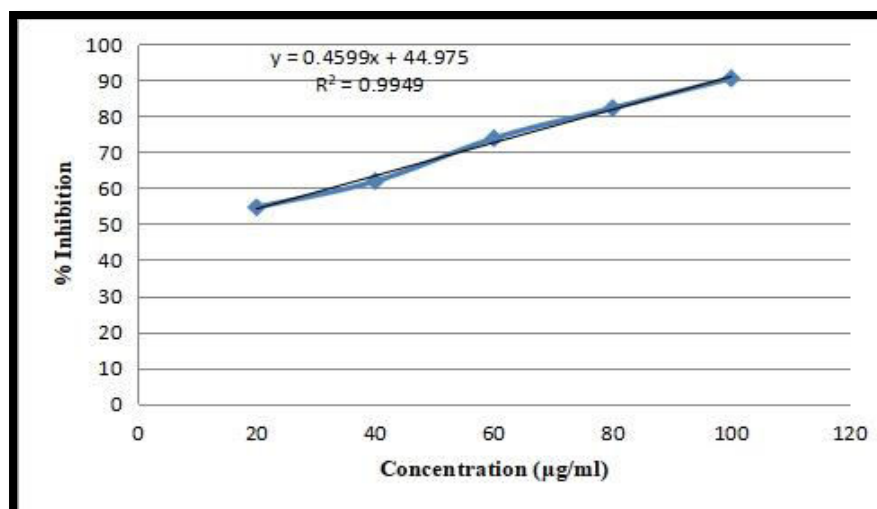
2. Results

3.1. Anti-oxidant activity

3.1.1. DPPH Assay

Table 3: DPPH radical scavenging activity of Ascorbic acid

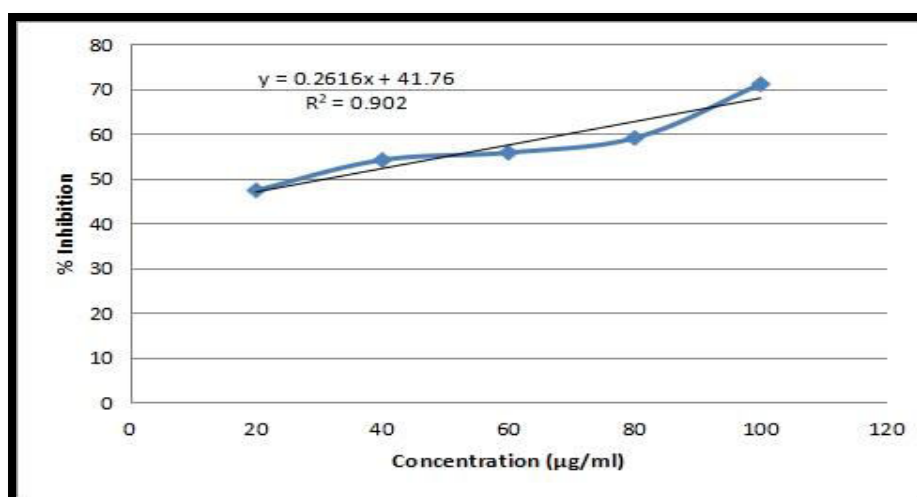
Concentration (µg/ml)	Absorbance	% Inhibition
20	0.431	54.593
40	0.362	61.862
60	0.249	73.767
80	0.169	82.195
100	0.091	90.412
Control	0.9492	
IC50 10.958		



Graph 1 Graph represents the Percentage Inhibition Vs Concentration of Ascorbic acid

Table 4: DPPH radical scavenging activity of Hydroalcoholic extract of Artemisia vulgaris

Concentration (µg/ml)	Absorbance	% Inhibition
20	0.499	47.345
40	0.435	54.108
60	0.419	55.759
80	0.388	59.028
100	0.274	71.049
Control	0.9492	
IC50 31.570		



Graph 2 Graph represents the Percentage Inhibition Vs Concentration of Hydroalcoholic extract of Artemisia vulgaris

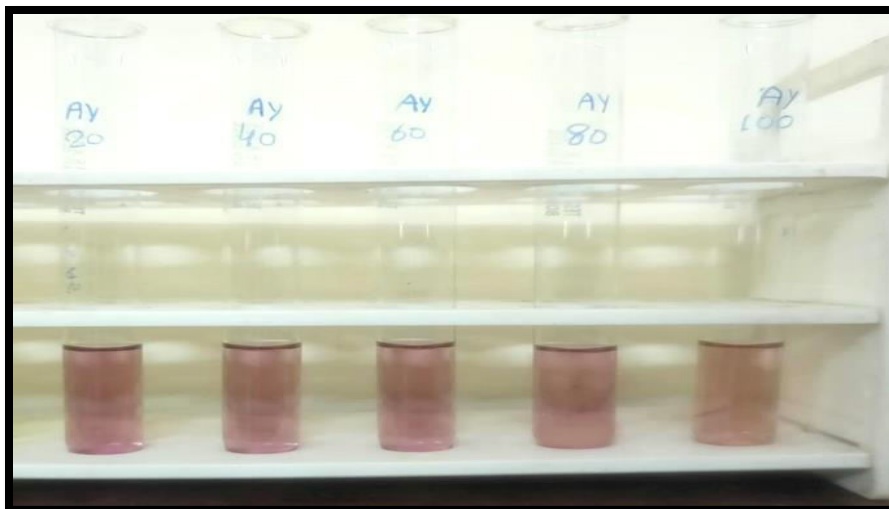


Figure 4: DPPH radical scavenging activity of Hydroalcoholic Extracts of *Artemisia vulgaris*

3.2. Pharmacognostical evaluation

Table 5: Pharmacognostical evaluation of *Artemisia vulgaris* plant sample

Parameters	Value in percentage (%)
	<i>Artemisia vulgaris</i>
Total ash value	2.03
Water soluble ash	0.85
Acid insoluble ash	0.76
Water extractive value	0.32
Alcoholic extractive value	0.24
Loss on drying	0.36


3.3. Plant Collection

Table 6: Plant collection of *Artemisia vulgaris*

Plant name	Plant part used	Weight
<i>Artemisia vulgaris</i>	Aerial	500 gm



Figure 5: Soxletation of *Artemisia vulgaris* with Hydro alcoholic solvent

<p><i>Artemisia vulgaris</i> (Hydro alcoholic)</p>	 <p>Figure 6</p>
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3.4. Percentage yield

Table 7: Percentage yield of *Artemisia vulgaris*

Plant name	Solvent	Color of extract	Theoretical weight (gm)	Yield (gm)	% Yield
<i>Artemisia vulgaris</i>	80% Hydro alcoholic	Dark Brown	400	9.330	2.33

3.5 Qualitative Phytochemical Analysis of extracts of *Artemisia vulgaris*

Table 8: Qualitative Phytochemical Analysis of extracts of *Artemisia vulgaris*

S. No.	Experiment	Result
		Hydro alcoholic
Test for Carbohydrates		
1.	Molisch's Test	+
2.	Fehling's Test	+

3.	Benedict's Test	+
4.	Bareford's Test	+
Test for Alkaloids		
1.	Mayer's Test	+
2.	Hager's Test	+
3.	Wagner's Test	+
Test for Terpenoids		
1.	Salkowski Test	+
2.	Libermann-Burchard's Test	+
Test for Flavonoids		
1.	Lead Acetate Test	+
2.	Alkaline Reagent Test	+
Test for Tannins and Phenolic Compounds		
1.	FeCl ₃ Test	-
2.	Lead Acetate Test	+
3.	Gelatine Test	+
Test for Saponins		
1.	Froth Test	+
Test for Protein and Amino acids		
1.	Ninhydrin Test	+
2.	Biuret's Test	-
Test for Glycosides		
1.	Legal's Test	+
2.	Keller Killani Test	-
3.	Borntrager's Test	+

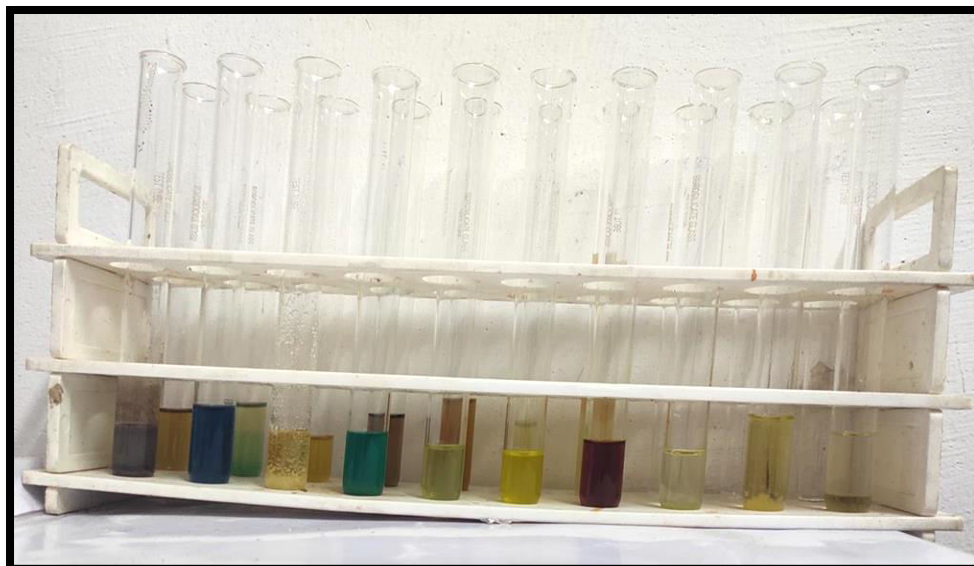


Figure 7: Phytochemical study of Hydro alcoholic Extract of *Artemisia vulgaris*

3.6. Solubility determination of Hydro alcoholic extracts of *Artemisia vulgaris*

Table 9: Solubility determination of Hydro alcoholic extracts of *Artemisia vulgaris*

S. No.	Solvent	Result
1.	Water	Sparingly Soluble
2.	Ethanol	Soluble
3.	Ethyl Acetate	Partially Soluble
4.	DMSO	Soluble
s5.	Petroleum Ether	Partially Soluble
6	Methanol	Soluble
7	Chloroform	Soluble
8	Acetone	Partially Soluble

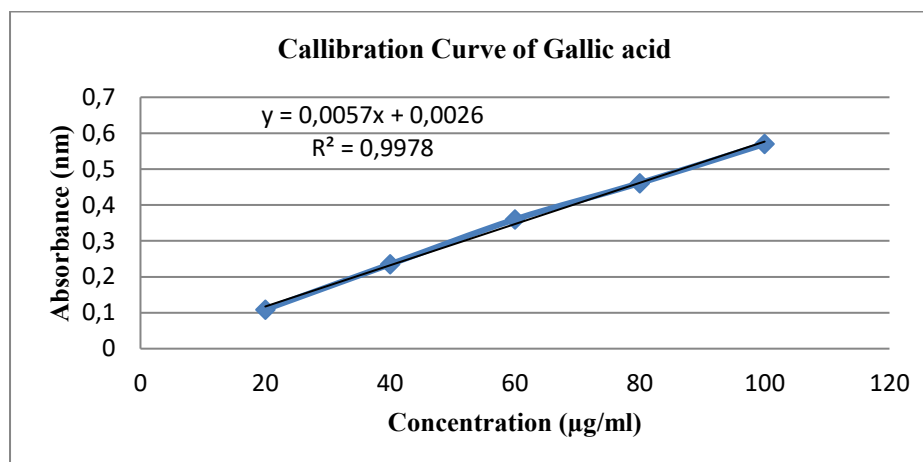
3.7. Quantitative Phytochemical analysis of extracts of *Artemisia vulgaris*

3.7.1. Total Phenolic Content (TPC) Estimation

Table 10 Standard table for Gallic acid

S. No.	Concentration ($\mu\text{g/ml}$)	Absorbance (nm)
1.	20	0.109
2.	40	0.235
3.	60	0.360

4.	80	0.461
5.	100	0.570



Graph 3 Graph represent standard curve of Gallic acid

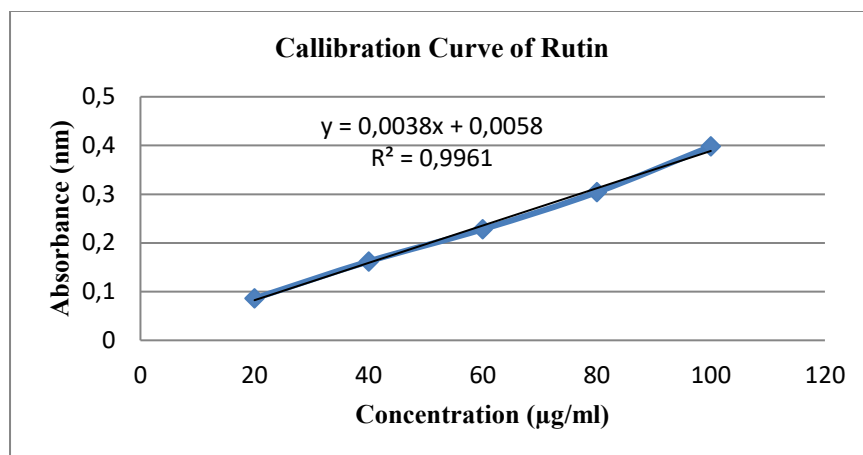
Table 11 Total Phenolic Content in Artemisia vulgaris extracts

Total Phenolic content (mg/gm equivalent to Gallic acid)	
Extracts	Artemisia vulgaris (Hydro alcoholic)
Absorbance Mean \pm SD	0.4279 \pm 0.002
TPC	85.18

3.7.2. Total Flavonoid Content (TFC) Estimation:

Table 12 Standard table for Rutin

S. No.	Concentration (µg/ml)	Absorbance (nm)
1.	20	0.086
2.	40	0.162
3.	60	0.228
4.	80	0.304
5.	100	0.398



Graph 4 Graph represent standard curve of Rutin

Table 12: Total Flavonoid Content in *Artemisia vulgaris* extracts

Total Flavonoid content (mg/gm equivalent to Rutin)	
Extracts	<i>Artemisia vulgaris</i> (Hydro alcoholic)
Absorbance Mean \pm SD	1.2578 \pm 0.002
TPC	417.60

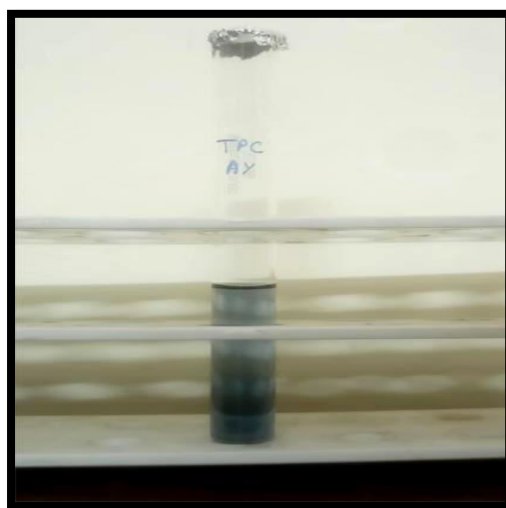


Figure 8: Quantitative Analysis (TPC) of Hydro alcoholic extracts of *Artemisia vulgaris*

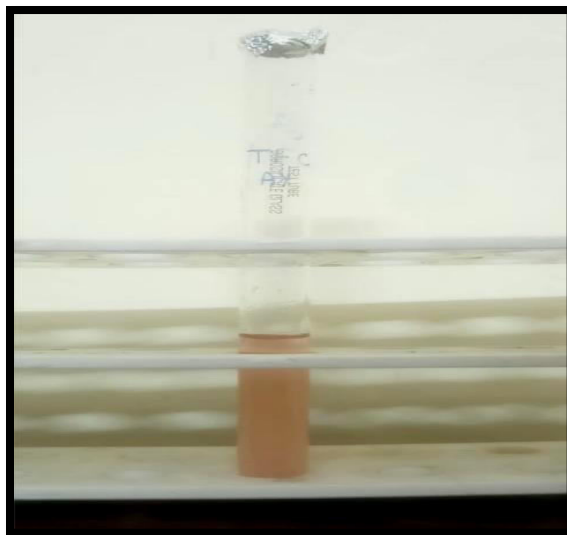


Figure 9: Quantitative Analysis (TFC) of Hydro alcoholic extracts of Artemisia vulgaris

4. Summary and Conclusion

The present study revealed that the total weights of *Artemisia vulgaris* plant (aerial) used were 500 gm. After performing extraction of *Artemisia vulgaris*, the percentage yield of extracts in 80% hydroalcoholic solvent was found to be 2.333% (9.330 gm), respectively.

In the pharmacognostic evaluation of *Artemisia vulgaris* (aerial), total ash value (2.03), water soluble ash (0.85), acid insoluble ash (0.76), water extractive value (0.32), alcoholic extractive value (0.24), and loss on drying (0.36).

The hydroalcoholic extracts of *Artemisia vulgaris* (aerial) contain phytochemical constituents like carbohydrates, alkaloids, flavonoids, terpenoids, steroids, glycosides, proteins and amino acids, tannins, phenols, saponins, and compounds by phytochemical investigation with respect to chemical tests. The determination of the total phenolic content of hydroalcoholic extracts of *Artemisia vulgaris* (aerial) showed content values of 85.18 mg/g, respectively. The total flavonoids content of the hydroalcoholic extracts of *Artemisia vulgaris* (aerial) showed content values of 417.60 mg/g, respectively.

The antioxidant activity of plant extracts was determined by different in vitro methods such as the DPPH assay. In this investigation, the in-vitro antioxidant effect of *Artemisia vulgaris* were evaluated. DPPH radical scavenging activity of Hydroalcoholic extracts of *Artemisia vulgaris* exhibited percent inhibition 71.049 % and its IC_{50} value was found to be 31.570 μ g/ml.

Reference

1. Schachter, Armand S., and Kenneth L. Davis. "Alzheimer's disease." *Dialogues in clinical neuroscience* 2.2 (2000): 91-100.
2. Förstl H, Besthorn C, Burns A, Geiger-Kabisch C, Levy R, Sattel A. Delusional misidentification in Alzheimer's disease: a summary of clinical and biological aspects. *Psychopathology*. 1994 Feb 10; 27(3-5):194-9.
3. Scannevin RH. Therapeutic strategies for targeting neurodegenerative protein misfolding disorders. *Current opinion in chemical biology*. 2018 Jun 1; 44:66-74.
4. Rowland D, Lyons B. Medicare, Medicaid, and the elderly poor. *Health care financing review*. 1996; 18(2):61.
5. Grant WB, Campbell A, Itzhaki RF, Savory J. The significance of environmental factors in the etiology of Alzheimer's disease. *Journal of Alzheimer's disease*. 2002 Jan 1; 4(3):179-89.
6. Guzior N, Wieckowska A, Panek D, Malawska B. Recent development of multifunctional agents as potential drug candidates for the treatment of Alzheimer's disease. *Current medicinal chemistry*. 2015 Jan 1; 22(3):373-404.
7. Kim MiHye KM, Kim Sung Hoon KS, Yang Woong Mo YW. Mechanisms of action of phytochemicals from medicinal herbs in the treatment of Alzheimer's disease.
8. Ashok PK, Upadhyaya K. Evaluation of analgesic and anti-inflammatory activities of aerial parts of *Artemisia vulgaris* L. in experimental animal models. *Journal of Biologically Active Products from Nature*. 2013 Feb 1; 3(1):101-5.
9. Kedare SB, Singh RP. Genesis and development of DPPH method of antioxidant assay. *Journal of food science and technology*. 2011 Aug; 48:412-22.
10. Gami B, Parabia MH. Pharmacognostic evaluation of bark and seeds of *Mimusops elengi* L. *Int J Pharm Pharm Sci*. 2010;2 (Suppl 4):110-3.
11. Egharevba HO, Kunle FO. Preliminary phytochemical and proximate analysis of the leaves of *Piliostigma thonningii* (Schumach.) Milne-Redhead. *Ethnobotanical leaflets*. 2010; 2010 (5):2.
12. Alara OR, Abdurahman NH, Ukaegbu CI, Kabbashi NA. Extraction and characterization of bioactive compounds in *Vernonia amygdalina* leaf ethanolic extract comparing Soxhlet and microwave-assisted extraction techniques. *Journal of Taibah University for Science*. 2019 Dec 11; 13(1):414-22.
13. Kokate CK. *Practical Pharmacognosy*. 3rd ed. New Delhi. V.P.B.N. 1991; 3:107-11.
14. Saeed N, Khan MR, Shabbir M. Antioxidant activity, total phenolic and total flavonoid contents of whole plant extracts *Torilis leptophylla* L. *BMC complementary and alternative medicine*. 2012 Dec; 12:1-2.
15. Chang CC, Yang MH, Wen HM, Chern JC. Estimation of total flavonoid content in propolis by two complementary colorimetric methods. *Journal of food and drug analysis*. 2002 Jul 1; 10(3).