International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

Ethnobotanical Survey in Anuvavi hills and Sustainable utilization of medicinal plants

Revathy M[1], Dr.J. Carolin Joe Rosario[2]

Research Scholar, Head of department,
Associate Professor
Department of Botany,
Nirmala College for Women, Coimbatore
[1]revravi2010@gmail.com, [2]cjoerosa@gmail.com

Abstract

Medicinal plants are useful in traditional and modern medicines. Traditional knowledge of herbal plants must be conserved, forests, hills and mountains are the dwelling places of medicinal plants. The present study abides with the ethnobotanic survey of medicinal plants in Anuvavi hills, Coimbatore District. The plants secrete secondary metabolites to save from predators. Secondary metabolites produced by plants are useful in medicinal world to discover medicines. Bioactive compounds present in plants are used as Antimitotic, Antiproliferative, Antioxidant, Antiallergic, Anti-inflammatory, Antimutagenic, Anticancer, disinfectant, Anti-bacterial, Antiviral, Antifungal, Gastroprotective, Antiulcer, Sedative, Hepatoprotective, Arthritis, Anti-pyretic, purgative and Anthelmintic. Plants are medicinally rich in antioxidants, phytochemicals, cytotoxins, antimitotic chemicals, enzymes, Glucosinolates, Lutein and Zeaxanthin. Phenolic compounds such as flavonoids, tannins, phenolic acids and Carotenoids such as lycopene, beta carotene, vitamin C and vitamin E are present in the medicinal plants. These chemical constituents are very useful for research to discover medicines. Ayur-informatics knowledge, which is the principle of ayurveda and bioinformatics can produce quality standard drugs to cure diseases for sustainable development. Thus, the present study is to conserve economically important medicinal plants. Innovative technology is enhanced to produce herbal medicines for sustainable future and to conserve biodiversity.

Keywords: Sustainable development, Biodiversity conservation, Indigenous knowledge, Drug designing

1. Introduction

Plants secrete secondary metabolites to save from predators. Secondary metabolites produced by plants are useful in medicinal world to discover medicines. Bio active compounds present in plants are useful as Antimitotic, Antiprolifereative, Antioxidant, Antiallergic,Antiinflammatory, Antimutagenic, Anticancer, disinfectant, Anti bacterial, Antiviral, Antifungal, Gastroprotective, Antiulcer, Sedative, Antiasthmatic, Diuretic, Antidiabetic, Rheumatism cure, Antihypertensive, Antivenom, Hemolytic, Antiurolithic, Hepatoprotective, Arthritis, Anti pyretic, purgative and Anthelmintic. Plants uses are numerous. Nature gives us lot of medicinal herbs which has to be conserved for sustainable future. Most of the medicinal plants are in the way of extinction due to Human greediness. Indigenous knowledge of

people around the hilly areas to be conserved for the next generation. Proper harvesting technique must be practiced to conserve the plants for the sustainable future and for the research in medicine.

Materials and methods

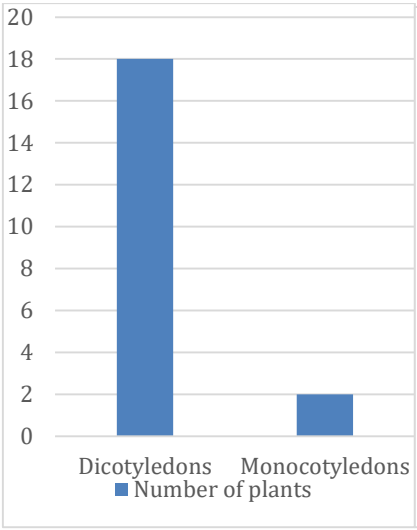
- Ethnobotanical Survey conducted in Anuvavi hills in Coimbatore to find medicinal plants available in the area for pharmacological studies. Around 35 plants have medicinal value. Parts which are useful for medicines and the medicinal property in these were studied. Plants were collected and herbarium preparation done for these plants. Three plants which are most available in survey area were given to Botanical survey of India to find Genus name and Species name. Medicinal value of these plants are being studied for pharmacological use. Women role in sustainable development of the nation were discussed. Visited Anuvavi hills, CMC College, Coimbatore, ESI College, Botanical Survey of India.Medicinal value of the available plants were collected. Plants which are anticancerous are known. Phytochemical analysis of three selected plants were done for further studies. Nearly 35 plants collected, 21 plants are medicinally useful to cure Human diseases, Visited Anuvavi hills in the month of January 2024, July 2024, November 2024 and December 2024.

Plant collection & Herbarium Preparation

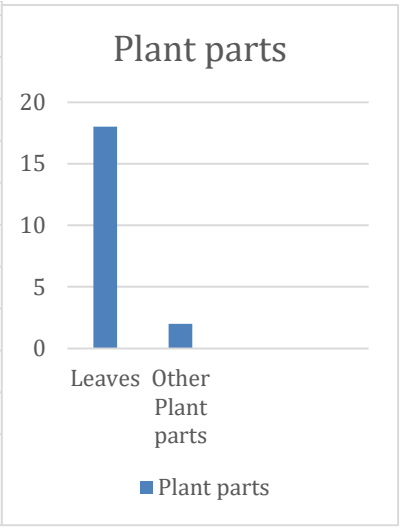
Medicinal plants

Plants are medicinally rich in antioxidants, phytochemicals, cytotoxins, antimitotic chemicals, enzymes, Glucosinolates, Lutein, Zea xanthin, Phenolic compounds such as flavonoids, tannins, phenolic acids, Carotenoids such as lycopene, beta carotene, vitamin C and vitamin E. These chemical constituents are very useful for research to discover medicines. Medicinal plants collected in Anuvavi hills are represented graphically in graph 1. Number of medicinal plants are more in dicotyledons, 90% of plants belongs to dicotyledons, 10% belongs to monocotyledons. Plant parts which are medicinally useful were leaves compared to other plant parts such as root, stem and bark which is represented graphically in graph 2. Plants which were collected were classified based on the family. 4 plants belongs to Fabaceae. 2 plants belongs to Malvaceae, Acanthaceae, Poaceae and Lamiaceae which is represented in graph 3.

Graph 1

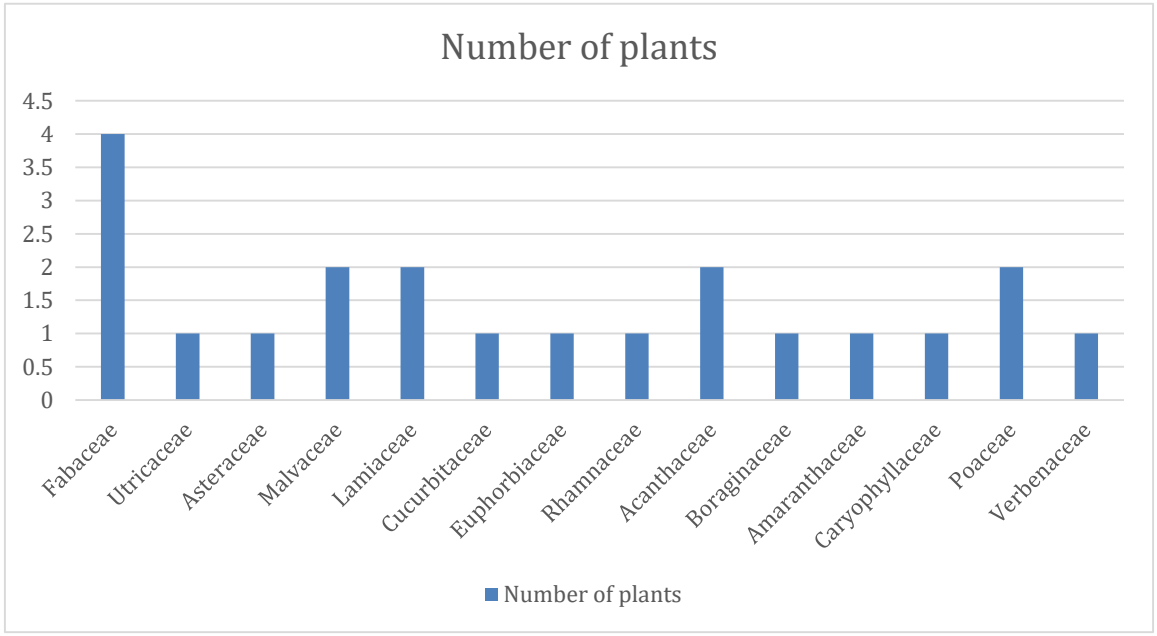


Graph 2



Graph 3

Medicinal plants - Family



Plants selection

Sida acuta, Ehretia microphylla, Pouzolzia zeylanica are the three medicinal plants selected for further studies. Plant leaves were dried in room temperature. Leaves were powdered and three samples of leaf powder with Sida acuta, Ehretia microphylla, Pouzolzia zeylanica were prepared. Plant leaf extracts were prepared with Phenyl acetate, Ethanol and Aqueous solution. Phytochemical analysis of plant extracts were done and analyzed. Antibacterial and Antifungal analysis reveals Plant extract can reduce the growth of Bacteria and Fungi. Plants Sida acuta, Ehretia microphylla & Pouzolzia zeylanica plant collection for Phytochemical analysis

Plant leaves were dried, grinded and leaf powder were prepared to prepare plant Extracts

Medicinal plants collection for Phytochemical analysis

Phytochemical analysis plants are given in Table 2

Table 1

Phytochemical analysis

S No	Botanical Name	Class	Family name	Common name	Parts used	Uses- Medicinal peoperties
1	Sida Acuta Burm. F	Dicotyledons	Malvaceae	Morning mallow	Leaves Aerial parts	Diuretic, Anthelmintic, Antimicrobial, wound healing properties Anti cancer
2	Ehretia micophylla Lam.	Dicotyledons	Boraginaceae	Scorpion Bush	Leaves	Antimicrobial Anti cancer
3	Pouzolzia zeylanica (L) Benn	Dicotyledons	Urticaceae	Graceful pouzolz' s bush	Leaves Whole plant Roots	Skin Ulcer Antifungal activity Gastric problems, deworming

Phytochemical analysis :

Phytochemical analysis of three selected plants were done to know the chemicals present in these plants. Comparative study reveals that all the three plants have anticancerous property. Phytochemical analysis of three plants are given in Table 2

Table 2: Phytochemical screening

Phytochemicals	A			B			C		
	E.A	E	A	E.A	E	A	E.A	E	A
Carbohydrates	+++	+++	+	++	+++	+	++	+++	+
Proteins	+++	++	+	+++	+++	+	+++	+++	+++
Amino acids	++	+	+	++	+	+	+++	+	+
Phenolic compounds	+++	+	++	++	+	+	+++	+	++

Tannins	+++	+	+	+++	+	+	+++	+	+
Glycosides	++	+	-	++	-	-	++	+	-
Saponins	-	-	+	-	-	+	-	-	+
Cardiac glycosides	+++	++	++	+++	++	++	+++	++	++
Phytosterols	+++	+	-	++	+	-	+++	+	-
Terpenoids	++	+	+	++	+++	+	++	++	+

E.A - Ethyl acetate, E - Ethanol, A - Aqueous

(+): Presence of chemical compound, (-): Absence of chemical compound

(+) < (++) < (+++): Based on the intensity of characteristic colour

Phytochemical analysis

Qualitative Phytochemical Screening

Plant leaf extracts were analyzed for the presence of major phytochemicals such as carbohydrates, proteins, amino acid, phenolic compounds, tannins, glycosides, saponins, cardiac glycosides, phytosterols and terpenoid according to standard methods (Raaman, 2006).

Carbohydrates

Molish's test (Ramakrishnan *et al*., 1994)

About 100 mg of the extract was dissolved in 5 mL of water and filtered. Two drops of alcoholic solution of α-naphthol were added to 2 mL of the filtrate and 1 mL of concentrated sulphuric acid was added slowly along the sides of the test tube and allowed to stand. A violet ring indicated the presence of carbohydrates.

Proteins

Biuret test (Gahan, 1984)

The extract (100 mg) was dissolved in 10 mL of distilled water and filtered through Whatman No. 1 filter paper. A 2 mL aliquot of the filtrate was treated with one drop of 2% copper sulphate solution. To this, 1 mL of 95% ethanol was added, followed by excess of potassium hydroxide pellets. Blue, violet or purple color in the ethanolic layer indicated the presence of proteins.

Amino acids

Ninhydrin test (Yasuma and Ichikawa, 1953)

Two drops of ninhydrin solution (10 mg of ninhydrin in 200 mL of acetone) was added to 2 mL of aqueous filtrate. The presence of amino acids was indicated by the presence of a characteristic purple colour.

Phenolic compounds

Ferric chloride test (Mace, 1963)

About 50 mg of the extract was dissolved in 5 mL of distilled water. To this, few drops of 5% neutral ferric chloride solution was added. Phenolic compounds were indicated by the presence of dark green colour.

Tannins

Potassium hydroxide test (Odebiyi and Sofowora, 1978; Williamson et al., 1996)

The extract (0.5 g) was added into 10 mL of freshly prepared 10% potassium hydroxide (KOH) in a beaker and shaken to dissolve. A dirty precipitate indicated the presence of tannin.

Glycosides

Borntrager's test (Evans, 1997)

50 mg of extract was hydrolyzed with concentrated hydrochloric acid for two h on water bath and filtered. To 2 mL of filtered hydrolysate, 3 mL of chloroform was added and shaken. The chloroform layer was separated and 10% ammonia solution was added to it. Pink colour indicated the presence of glycosides.

Saponins

Frothing test (Kokate, 1999)

The extract (50 mg) was diluted with distilled water and made up to 20 mL. The suspension was shaken in a graduated cylinder for 15 min. A two cm layer of foam indicated the presence of saponins.

Cardiac glycosides

Keller Killiani test (Ngbede et al., 2008)

Total 100 mg of extract was dissolved in 1 mL of glacial acetic acid containing one drop of ferric chloride solution. This was then underlayered with 1 mL of concentrated sulphuric acid. Blue colour obtained at the interface indicated the presence of a deoxy sugar characteristic of cardiac glycosides.

Phytosterols

Libermann and Burchard's test (Finar, 1986)

About 50 mg of extract was dissolved in 2 mL of acetic anhydride. To this, one or two drops of concentrated sulphuric acid were added slowly along the sides of the test tube. An array of colour changes showed the presence of phytosterols.

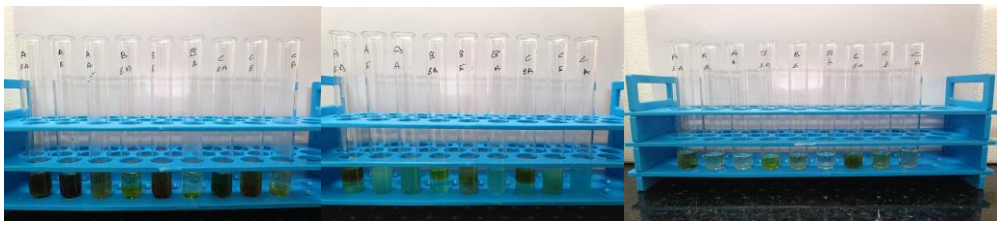
Terpenoid

Salkowski Test (Finar, 1986)

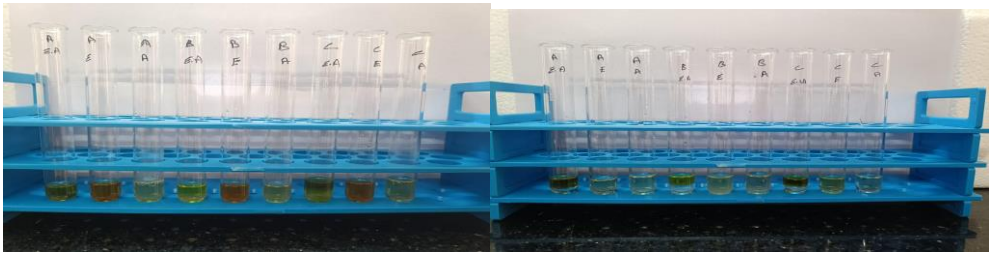
A classic chemical test for the detection of terpenoids, where a sample is mixed with chloroform and sulfuric acid. A reddish-brown color at the interface indicates the presence of terpenoids.

Phytochemical analysis

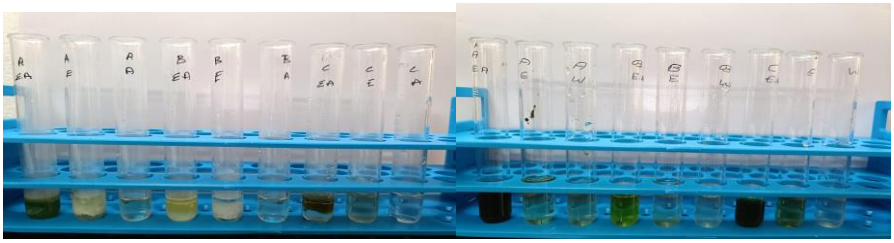
Carbohydrates	Proteins	Amino acids



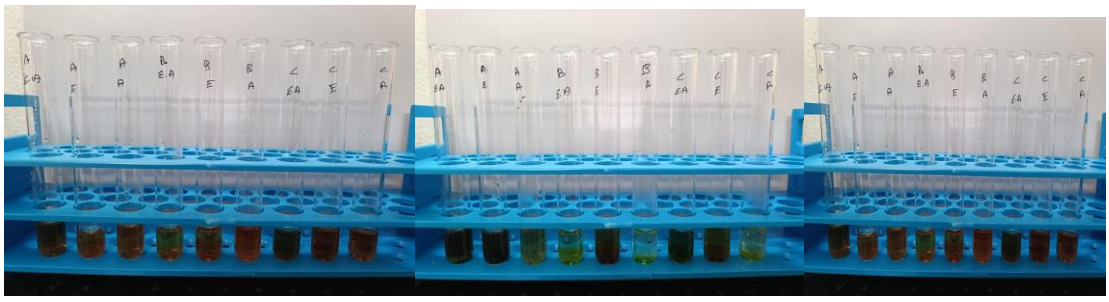
Phenolic compounds Tannins



Glycosides Saponins



Cardiac glycosides Phytosterols Terpenoids



Phytochemical analysis

Comparative study of Phytochemicals present in all the Plants Extract reveals that all the three plants have phytochemicals which can cure Human diseases. Phytochemical analysis reveals all the three extracts have potential to cure Human diseases. Phyto sterols, Terpenoids, Cardiac glycosides, tannins, Phenolic compounds are present in these extracts which can be used as antioxidant, anticancerous and antimitotic. Plants which have anti cancerous properties are Leucas aspera- Leaves, Sida acuta- Aerial parts, Diplocyclos palmatus- fruits, Jatropha gossipiifolia- Leaves, Ziziphus mauritiana- fruits, Triumfetta rhomboidei- Leaves, Asystasia gangetica- Leaves, Indigofera spicata-Twigs, Ehretia micophylla- Leaves,

Ruellia prostrata- Aerial parts, Achyranthus aspera- Leaves, Cynadon dactylon- Roots, Lantana camara – Leaves have anticancerous activity.

Anti microbial assay

Antibacterial and Antifungal assay conducted for two selected plants Sida acuta and Ehretia microphylla. Ethanol Plant extract were prepared from Plant leaf powder.

Principle

The antibacterial agents present in the leaf extracts were allowed to diffuse out into the medium and interact in a plate freshly seeded with the test organisms. The resulting zone of inhibition will be uniformly circular as there a confluent lawn of growth. The diameter of zone of inhibition can be measured in millimeters.

Muller Hinton Agar Medium

The medium was prepared by dissolving 38 g of commercially available Muller Hinton Agar Medium (HiMedia) in 1000ml of distilled water. The dissolved medium was autoclaved at 15 lbs pressure at 121°C for 15 minutes. The autoclaved medium was mixed well and poured onto 100mm Petri plates (25-30 mL/plate).

Agar-Well Diffusion Method

Petri plates containing 20ml of Muller Hinton agar medium were seeded with 24h culture of bacterial strains. Wells were cut and different concentration 10- 30µl of the ethanol and aqueous extract of leaf of Sample were added. The extracts were prepared for the well, such as it has the various concentrations of the leaf and stem (100- 1000µg/ml) to check the minimum inhibitory concentration. The plates were then incubated overnight at 37°C. The antibacterial activity was assayed by measuring the diameter of the inhibition zone formed around the well.

Anti fungal assay

Potato Dextrose Agar was utilized for *Candida tropicalis* and tested using the same procedure as mentioned previously. The zone of inhibitions created by sensitive organisms was marked by a circular area of clearing around plant extract impregnated discs. These were compared with the zone of inhibitions of standards (Fluconazole 1mg/ml) and control (DMSO).

Antibacterial Activity

Antibacterial activities of plant leaf extracts were studied. Four bacterial pathogenic strains were used in the present study. The bacterial strains used were 2 Gram positive positive bacteria Staphylococcus aureus and Streptococcus pneumoniae & 2 Gram negative bacteria Klebsiella pneumoniae and Enterobacter pneumoniae. The effect of various leaf extracts on the four bacterial pathogen strains were assayed by Agar well diffusion method (Eloff, 1999).

Antibacterial assay results

Antibacterial activity of Sida acuta and Ehretia microphylla plant Extract from Ethanol were analysed. 2 Gram positive positive bacteria Staphylococcus aureus and Streptococcus pneumoniae & 2 Gram negative

bacteria - Klebsiella pneumoniae and Enterobacter pneumoniae were tested with plant Extracts. Medicinal Plant Ehretia microphylla have more anti bacterial activity. Anti bacterial activity of Sida acuta plant extract is given in Table 4. Anti bacterial activity of Ehretia microphylla is given in table 5. Zone of inhibition of different bacterial strains were measured and comparative study conducted, Ehretia microphylla and sida acuta have potential to cure bacterial diseases.

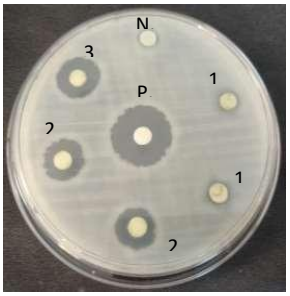
Antibacterial assay- Sida acuta - plant extract

Gram positive bacteria

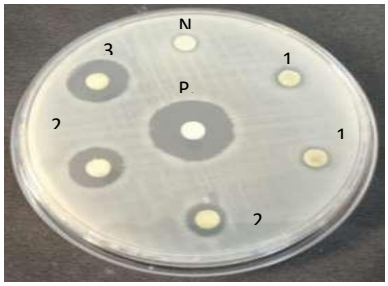
Staphylococcus aureus

Streptococcus pneumoniae

Gram negative bacteria



Klebsiella pneumoniae



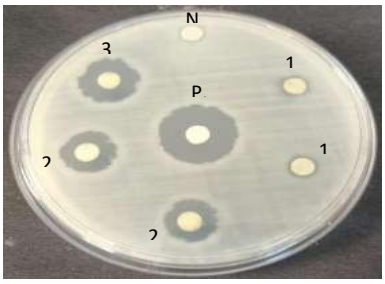
Enterobacter pneumoniae

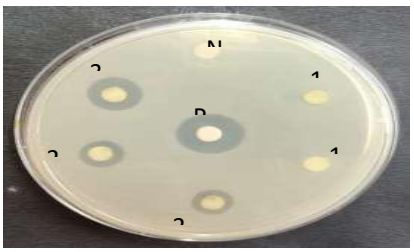
Table 3- Antibacterial assay- Sida acuta - plant extract

Sample Concentration (10mg/ml)	Zone of Inhibition (Staphylococcus aureus)	Zone of inhibition (*Streptococcus pneumoniae*)	Zone of inhibition (*Klebsiella pneumoniae*)	Zone of inhibition (*Enterobacter cloacae*)
Negative control (DMSO)	-	-	-	-
10 µl	-	-	-	-
15 µl	-	-	-	-
20 µl	10	10	12	11
25µl	9	13	15	12
30 µl	13	15	16	14
Positive control	16	20	19	20

(Streptomycin) mg/ml				

Anti bacterial assay – Ehretia microphylla- Plant Extract





Staphylococcus aureus **Streptococcus pneumoniae**

Enterobacter pneumoniae

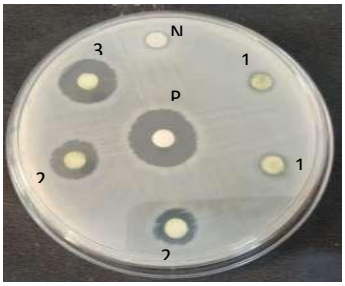


Table 4- Anti bacterial assay – Ehretia microphylla- Plant Extract

Sample Concentration (10mg/ml)	Zone of Inhibition (Staphylococcus aureus)	Zone of inhibition (*Streptococcus pneumoniae*)	Zone of inhibition (*Klebsiella pneumoniae*)	Zone of inhibition (*Enterobacter cloacae*)
Negative control (DMSO)	-	-	-	-
10 µl	-	-	-	-
15 µl	-	-	-	-
20 µl	7	11	6	9
25µl	9	13	14	12
30 µl	11	15	15	15
Positive control (Streptomycin) mg/ml	15	18	17	17

Antifungal Assay

Antifungal assay for disk diffusion assay 6 mm disc from one week old *Candida albicans* and Candida tropicalis were removed from the growing edges and kept upside down position. A sterile filter paper disc was impregnated with concentration 10 mg/ml of different extraction solution (0.1%) placed in opposite position to the culture disc. For control, sterile water was added. The plates were then incubated at room temperature for two weeks (Heatley *et al*., 1944). Experiments were done in triplicate and repeated twice.

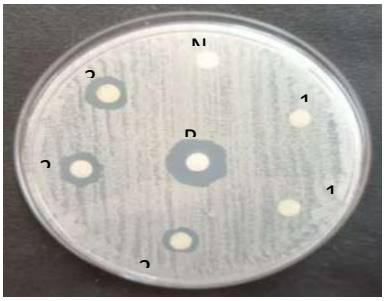
% of inhibition was calculated using the formula

$$\frac{\text{mycelial growth in control} - \text{mycelial growth in treatment}}{\text{mycelial growth in control}} \times 100$$

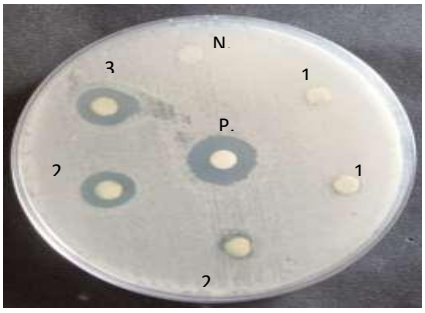
Antifungal assay results

Antifungal activity of two selected plants- Sida acuta and Ehretia microphylla plant Extract from Ethanol were analysed. Fungal pathogens Candida albicans and Candida tropicalis were analysed with selected Plant Ethanol Extract. Sida acuta antifungal results are given in Table 5. Ehretia microphylla antifungal results are given in table 6. They have potential to cure fungal diseases caused by these pathogens. Ehretia microphylla have more antifungal activity.

Antifungal assay- Sida acuta - plant extract



Candida albicans



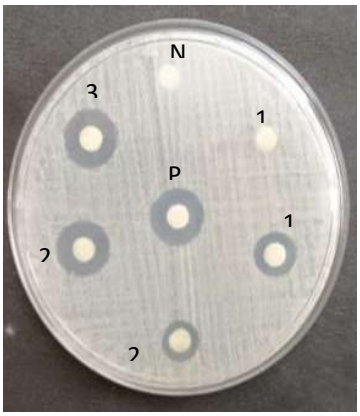
Candida tropicalis

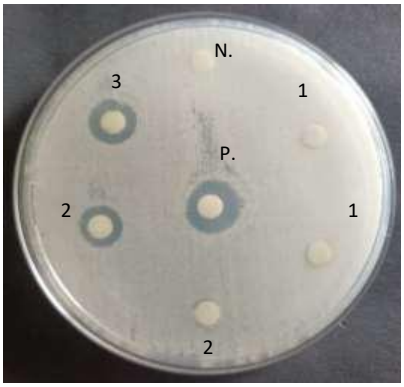
Table 5

Sample Concentration (10mg/ml)	Zone of inhibition (Candida albicans)	Zone of inhibition (*Candida tropicalis*)
Negative control (DMSO)	-	-
10 µl	-	-

15 µl	-	-
20 µl	7	4
25µl	10	10
30 µl	10	12
Positive control (Fluconazole)	15	15

Anti fungal assay – Ehretia mircrophylla- Plant Extract





Candida albicans **Candida tropicalis**

Table 6

Sample Concentration (10mg/ml)	Zone of inhibition (Candida albicans)	Zone of inhibition (*Candida tropicalis*)
Negative control (DMSO)	-	-
10 µl	-	-
15 µl	10	-
20 µl	9	-
25µl	12	8
30 µl	13	9
Positive control (Fluconazole)	14	13

Antidiabetic assay

Antidiabetic assay was conducted for Ehretia microphylla plant extract, *In vitro* anti-diabetic activity

Inhibition assay for α- glucosidase activity

α- Glucosidase (0.075 units) was premixed with the extract at various concentrations (50-200 µg/mL). 3 mM *p*-nitrophenyl glucopyranoside (pNPG) as a substrate was added to the reaction mixture to start the reaction (Miller, 1959). The reaction mixture was incubated at 37°C for 30 min and stopped by adding 2 mL of Na_2CO_3. The α- glucosidase activity was determined by measuring the *p*-nitrophenol release from pNPG at 400 nm. The IC_{50} value was defined as the concentration of α- glucosidase inhibitor to inhibit 50% of its activity under the assay conditions. Anti diabetic activity of Ehretia microphylla is given in graph 4.

Graph 4

Inhibition assay for α- glucosidase activity of Sample B

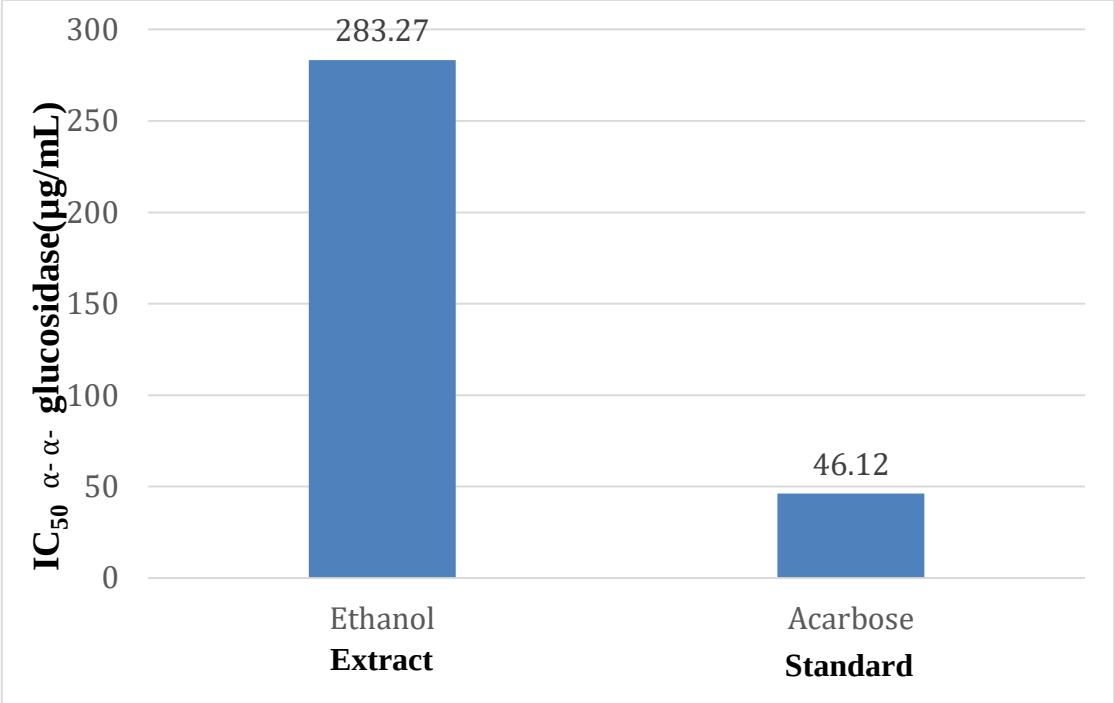


Table 8 – Antidiabetic activity

Samples	**Extracts**	**IC_{50} α- glucosidase(µg/mL)**
Ehretia microphylla	Ethanol	283.27
Standard	Acarbose	46.12

From this result it is evident Ehretia micophylla has Antidiabetic activity, Antifungal activity and Antibacterial activity.

Results and discussion

There are numerous herbal plants available in the world. Phytochemicals present in plants can be compared with databases for new drug discovery. Quality of herbal medicines are important. Modern medicines are incorporated with herbal plants phytochemicals. Proper conservation methods and harvesting methods has to followed for protecting these herbal plants. Phytochemicals proves that many human disease can be cured by plants. Herbal medicines are cost effective and it has to be prepared in large quantity with proper quality standards and it also helps to improve the socio - economic conditions of the people.

References:

1. A review of traditional uses, phytochemistry and pharmacology of the genus Indigofera, Journal od Ethnopharmacology, Volume 253, May 2020, Elise Gerometta, Isabella Grondin, Jacqueline Smadja, Michel Frederich, Anne Gauvin Bialecki, Phylogeny, Pharmaology, Traditional uses of Indigofera
2. Ageratum conyzoides L. and its Secondary Metabolites in the Management of different fungal pathogens, Rubal Chahal, Arun Nanda, Esra Kupeli Akkol, Eduardo Sobarzo, Sanchez, Ashani Arya, Deepak Kaushik, Rohit Dutt, Rashmi Bhardwaj, Md Habibur, Rahman and Vineet Mittal, 2021, PMCID: PMC8156077, PMID 34069197, traditional uses and antifungal activities are discussed, 2021, published online 2021, May 14, DOI: 10.3390/ molecules 26102933
3. Aluru Rammohan, Guda Mallikarjuna Reddy, Baki Vijaya Bhaskar, Duvvuru Gunasekar, Grigory V Zyryanov, Phytochemistry and pharmacological activities of the genus Rhynchosia, November 2019
4. Bioactivity- Guided Isolation of Antioxidant Compounds from Pouzolzia zeylanica (L) Benn, Lujun ang1, Oifeng Fu1, Kai Zhou2, Zhining Xia2, Departmemt of Pharmaceutical Analysis, School of Pharmacy, Southwest Medical University, Department of Pharmaceutical Analysis, School of Pharmacy, 2018
5. Dilp Kr Bhattachariya, Jeba Akhtar, Papari Deka and Ananya Bharadaj, August 2023, An Ethnobotanical survey on phytomedicines based on traditional knowledge in the Barpeta district, Assam, India
6. Ethno botanical approaches, pharmacological and phytochemical benefits of genus Sida used in traditional medicines Dushyant K Singh, Parikshit K. Singh, Rajesh K. Pandey, Rajneesh K. Agnihotri, Bundelkhand University, Jhansi, UttarPradesh, India, D.V. Nath P.G. College, DDU University, Gorakhpur, Uttar Pradesh. Journal of medical pharmaceutical and allied scieces, Volume 10. Issue 4, 1185, July – August 2021
7. Ethnomedicinal uses, phytochemistry and pharmacological study of Ocimum americanum L, Amos Luanda, Asha Ripanda, Mtabazi G Sahini, John J Makangara, Phytomedicine plus, Volume 3, Issue 2, May 2023
8. Evaluation of the anti-asthmatic property of Asystasia gangetica leaf extracts. Journal of Ethnopharmacology, Volume 89, Issue 1, November 2003, PanelP A Akah, A C Ezike, S V Nafor, C O Okoli, N M Enwerem
9. HR-LCMS based phytochemical analysis and anticancer activity of Triumfetta rhomboides. Journal of Applied Pharmaceutical Science, Volume 14, March 2024, Nutan Kendre, Mohini Salunke, Balaji wakure, Pravin Wakte, Universit Department of Chemical Technology, Dr. Babasaheb Ambedkar

Marathwada University, Aurangabad, India, Vilsrao Deshmukh Foundation, /group of Institutions, VDH School of Pharmacy, Latur, India.

10. IJPPR International Journal of Pharmacy and Pharmacological Research - Medicinal Properties of Ziziphus mauritiana, Farha Naaz, Nisha Agari, Amandeep Singh Dev Bhoomi institute of Pharmacy and Research, Dehradun, India, August 2020, Volume 19, Morphology, Taxonomy, Chemical constituents, Phytochemisry, Medicinal uses of Ziziphus mauritiana are described.
11. International Journal of Reseach and Chemistry, Diplocyclos palmatus. A Phytopharmacological review, Vadnere Gautam P, Pathan Aslam R, Kulkarni Bharti U and Abhay Kumar Snghai, Department of Pharmaceutical Sciences, /dr Hari /singh Gour Vishwavidyalaya, Madhya Pradesh, India. Antimicrobial, Antiinflammatory, Antiasthmatic acivity, Analgesic Activity of Diplocyclos palmatus.
12. Jatropha gossypiifolia L. A Review of traditional uses, Phytochemistry, Pharmacology and Toxicology of medicinal plant, Juliana Felix- Silvia, Raquel Brandit Giordanj, Arnobio Antonio da Silvana Maria Zucolotto and Matheus de Freitas Fernandes – Pedrosa- Chemical constitutents of Whole plant, Stem, Root and seeds are discussed. Medicinal uses of plant, Pharmacological studies are described.
13. Laldinfeli Ralte, Y Tunginba Singh, May 2024, Ethnobotanical survey of medicinal plants used by various ethnic tribes of Mizoram, India
14. Pharmacognostical studies on Tephrosia villosa (L.) Pers. Rea Saravana, Subramanian, M Padma Sorna, Research Jounal of Pharmacognosy and Phytochemistry, Rajabudeen, Ganthi, Volume 6, Issue 4, October -Decemer 2014, Physiochemical characters anf florescent analysis of Leaf, Stem and root
15. Phytochemistry and Pharmacological activities of Rhyncosia, PMID 31776671, Aluru Rammohan, Guda Mallikarjuna Reddy, Baki Vijaya Bhaskar, Duvvuru Gunasekar, Grigory V Zyryanov, traditional uses, isolated chemical compounds and pharmacological activities of Rhyncosia, Volume 51, article 9, 2020
16. Phytochemical and Invitro cytotoxic screening of Chloroform extract of Ehretia microphlla, Pooja Sharma, Richa Shri and Suresh Kumar, Department of Pharmaceutical sciences and drug research, Punjabi University, Patiala, Khalsa College of Pharmacy, Amritsar, Punjab, Invitro cytotoxicity and phytochemical screening.
17. Rajabudeen E ganthi, A Saravana, Subramanian, M. Padma Sorna, Research Journal of Pharmacognosy and Phytochemistry, Raipur Vol 6, December 2014, Pharmacognostical studies on Tephrosia Villosa
18. Wound healing potency of ethanolic extract of Leucas urticifolia in experimental animals, Sushil Suthar and Ritesh Patel, CMJ University, Shillong- 793003, Meghalya, India, Department of Pharmaceutics, SK Patel College of Pharmaceutical Education and Research, Ganapat University, Mehsana, Gujarat, India, IJPSR 2012, Volume 3, Issue 9.