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Phytochemical Profile, Antibacterial Efficacy, and Antioxidant Potential of Eight Ethnomedicinal Plants: A Solvent-Dependent Study

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Abstract:
As the global challenge of antimicrobial resistance grows, the scientific validation of traditional plant-based medicines for novel therapeutic compounds has become increasingly vital. This study comprehensively evaluated the phytochemical profile, antibacterial efficacy, and antioxidant potential of five solvent extracts (methanol, ethanol, ethyl acetate, water, and DMSO) from eight Indian ethnomedicinal plants: *Macaranga peltata*, *Uvaria narum*, *Papaver somniferum*, *Colocasia esculenta*, *Cyperus rotundus*, *Cleome viscosa*, *Strychnos nux vomica*, and *Abutilon indicum*. The results demonstrated significant solvent-dependent bioactivity, with ethyl acetate extracts of *Colocasia esculenta* and *Strychnos nux vomica* exhibiting the most potent antibacterial activity, showing inhibition zones up to 26 mm against pathogens like *Pseudomonas aeruginosa* and *Streptococcus aureus*. Phytochemical screening confirmed the presence of key secondary metabolites such as flavonoids and tannins, with methanol proving most effective for broad-spectrum extraction and yielding the highest total phenolic content in *Macaranga peltata*. In antioxidant assays, the methanolic extract of *Colocasia esculenta* and the ethyl acetate extract of *Cyperus rotundus* displayed exceptional DPPH radical scavenging capacity, with some values surpassing the ascorbic acid standard. Overall, the investigation validates the ethnopharmacological uses of these plants, underscores the critical role of solvent selection, and identifies *Colocasia esculenta*, *Strychnos nux vomica*, and *Cyperus rotundus* as highly promising sources for developing novel antimicrobial and antioxidant therapeutics.

Keywords: Phytochemicals, Antibacterial Activity, Antioxidant Activity, Solvent Extraction, Ethnomedicine.

Introduction:

Medicinal plants have long been used in traditional medication as they harbour diverse active chemicals that possess wide range of biological properties (Ezez et al., 2023). About 80% of populations in developing countries are still using medicinal plants as their source of medicine due to its affordability and availability (Rokkam et al., 2022). Various antibiotic drugs were discovered in past few decades to treat bacterial diseases however the misuse of conventional antibiotics with inappropriate dosage levels and time spans has led the bacteria to resist the action of antibiotic drugs (Salam et al., 2023). This resulted in the emergence of antibacterial resistant, which is currently the most challenging problem.

Bacterial infections continue to pose global public health concern as common infections were becoming incurable thus outpacing the development of alternative methods to combat them (Negasa et al., 2024). Phytochemicals such as flavonoids, alkaloids, terpenoids, saponins, and phenolic acids, naturally present in plant tissues possess diverse bioactivities like antibacterial activity, antioxidant activities beneficial to human health (Balciunaitiene et al., 2021; Barbieri et al., 2017). Certain phytochemicals inhibit the proliferation of the bacteria by damaging the cell wall components (Sallam et al., 2021). Additionally medicinal plants are rich source of natural antioxidants that scavenge free radicals such as peroxide, hydroperoxide or lipid peroxyl thereby preventing from oxidative damage in biological system. Unlike synthetic antioxidants, these plant-based antioxidants offer better protection against oxidative stress, neuro-degenerative disorders, prevent aging without causing side effects thereby making them a safer alternative in long term use (Kumar et al., 2022).

This study focuses on eight ethnomedicinal plants—Macaranga peltata, Uvaria narum, Papaver somniferum, Colocasia esculenta, Cyperus rotundus, Cleome viscosa, Strychnos nux vomica, and Abutilon indicum—which have historically been used in treating inflammatory, microbial, and oxidative disorders (Elmosallamy et al., 2021; Jalil et al., 2020; Nizar et al., 2024; Sunil et al., 2023; Vikhe et al., 2024). Despite traditional knowledge highlighting their therapeutic efficacy, comprehensive scientific evaluations of their phytochemical constituents and bioactivities remain limited. For example, Papaver somniferum is renowned for its alkaloid content used in pain management, treating cancer (Bharti et al., 2023; Hedayati-Moghadam et al., 2022) while Cyperus rotundus and Cleome viscosa are employed in traditional systems for their anti-inflammatory and antimicrobial potential (Johari et al., 2016; Rocha et al., 2020; Sudhakar et al., 2006).

The current investigation aims to evaluate the phytochemical composition, antibacterial activity and antioxidant activity of selected medicinal plants. By integrating conventional phytochemical assays with bioactivity analysis, the study contributes to validating traditional knowledge and promoting sustainable, plant-based solutions for public health challenges.

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Materials and Methods:

Collection of Plant Materials:

The leaves of plants were collected from Tirunelveli and Kanyakumari District, Tamil Nadu. The plant specimens were authenticated by the Department of Plant Science, Manonmaniam Sundaranar University, Tirunelveli.

Preparation of Plant Extracts:

Healthy plant leaves were rinsed with distilled water, shade-dried at room temperature. The dried leaves are grounded into fine powder using mix and stored in airtight container. About 5 g of the powdered material was used for the extraction of bioactive compounds through percolation method using five different solvents viz., Methanol, ethanol, ethyl acetate, DMSO and water. The powder was soaked in 50 ml of each solvent separately in a beaker and incubated under room temperature for 3 days with occasional shaking. The extract was filtered using Whatman no. 1 filter paper, stored in clean bottle, sealed with parafilm and stored 4°c for using further studies.

Phytochemical Assessment:

Qualitative phytochemical analysis of the plant extracts were done by following standard method of Trease and Evans (1989) and Harborne (1998) to identify the different active constituents present in the extracts. The phytochemicals analysed were Alkaloids, Flavonoids, Tannins, Saponins, Glycosides, Steroids.

Test for alkaloid

1.Wagner's test

Few drops of Wagner's reagent (2g of iodine dissolved in 100ml of water) were added to 1ml of the extract. Development of reddish-brown precipitates indicated the presence of alkaloids.

2.Hager's test

To 1ml of acid extract, few drops of Hager's reagent (1g of picric acid dissolved in 100ml distilled water) were mixed. Development of yellow precipitate indicated the presence of alkaloids.

Test for flavonoids

1.Lead acetate test

To 2ml of alcoholic solution of each extract (0.5 extract in 10ml methanol) few drops of 10% neutral lead acetate were mixed. Development of a yellow precipitates indicated the presence of flavonoids.

2.Ferric chloride test

To 2ml of alcoholic solution of each extract (0.5g extract in 10 ml methanol) few drops of 10% neutral ferric chloride solution was mixed. Developmet of green colour indicated the presence of flavonoids.

Test for Tannin

Ferric chloride test

About 0.5 g of the dried powdered samples was boiled in 20 ml of water in a test tube and then filtered. A few drops 0.1 % ferric chloride was added and observed for brownish green or a blue- black coloration.

Test for saponin

Frothing test

About 5mg of each extract was dissolved in 5ml of water and was shaken. Persistence of froth indicated the presence of saponins.

Test for glycoside

Sodium hydroxide test

About 5mg of each extract was dissolved in 1ml of water and 5-6 drops of sodium hydroxide (10%) was added. Development of a yellow colour indicated the presence of glycoside.

Test for steroids

(Libermann Burchard test)

About 1ml of extract was dissolved in 10ml of chloroform. To this mixture equal volume of concentrated sulfuric acid was added by sides of the test tube. The upper layer becomes red white lower layer of sulfuric acid turns yellow in colour with green fluorescence indicating the presence of steroids.

Assessment of Phenolic Contents:

About 0.1 mL of different plant extracts (10 µg /mL) was added with 0.5 mL of Folin-Ciocalteu reagent (diluted 1:10 ratio with deionized water) and 1.5 mL of sodium carbonate. The mixture was vortexed for 15 sec were further incubated

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at 40 °C for 30 min. Following colour development, the absorbance was measured at 765 nm using, UV/visible light. Total phenolic ratio was expressed as mg/g gallic acid equivalent by using the calibration curve Y=0.0183x+0.101, where R2 =0.9338 where x is the absorbance and Y is the tannic acid equivalent in mg/g. The experiment was conducted in triplicates.

Antibacterial Activity:
The antibacterial activities of the plants were tested against six different bacterial strains viz., *Acenitobacter baumannii*, *Klebsiella pneumonia*, *Staphylococcus aureus* (Methicillin - resistant), *Pseudomonas aeruginosa*, *Salmonella typhi* and *Streptococcus aureus* following agar well-diffusion method (Valgas et al.2007). Sterile nutrient agar plates were swabbed with test bacteria and 5 mm sized well were made in the agar plates with the help of sterile cork borer, the wells were loaded with 100µl of the prepared solvent extract (DMSO, Ethanol, Ethyl acetate, Methanol, Water). All the plates were incubated at 37°c for 24-48 hours. After incubation, the plates were observed for formation of clear zone. The zone of inhibition was measured to determine the antibacterial activity.

Antioxidant Activity:
DPPH Radical Scavenging Activity:
The free radical scavenging potential of different plant extracts was measured by using 2, 2-diphenyl-1-picrylhydrazyl (DPPH) following method of Pandit et al., (2017). The reaction mixture of 3.0 mL, containing 1.0 mL of DPPH (0.3 mM), 1.0 mL of extract at different concentrations and 1.0 mL of methanol, was incubated for 10 minutes under dark condition, and the absorbance was recorded at 517 nm. Ascorbic acid was used as positive control and the assay was carried out in triplicate. The percentage of free radical inhibition by different plant extract was determined by comparing the results with control. Percentage of inhibition was calculated using the formula % Inhibition = ([B - A]/ B) X 100. Where, B is the absorbance of blank (DPPH and methanol); A is the absorbance of sample (DPPH, methanol and sample) and ascorbic acid is used as positive control.

Results and Discussion:
Antibacterial Activity:
The antibacterial activity of the medicinal plants extracted using five different solvents (methanol, ethanol, ethyl acetate, water, and DMSO) was evaluated against six bacterial pathogens: *Acinetobacter baumannii, Klebsiella pneumoniae, Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella typhi,* and *Streptococcus aureus*. The results were presented in table 1. The tables show the varied results of antibacterial activity based on the type of plant species and solvents used for the extraction. Among the plants extracts, the ethyl acetate extract of *Colocasia esculenta* and *Strychnos nux vomica* demonstrated the highest antibacterial activity with inhibition zones reaching up to 26 mm and 25 mm, respectively.

Plant Species	**Extract**	***Acinetobacter baumannii***	***Klebsiella pneumoniae***	***Staphylococcus aureus***	***Pseudomonas aeruginosa***	***Salmonella typhi***	***Streptococcus aureus***
Macaranga peltata	M	24	19	17	–	19	15
	E	18	16	17	–	16	14
	EA	19	18	11	18	17	16
	W	–	–	–	–	–	–
	DMSO	21	20	–	–	22	20
Uvaria narum	M	–	–	–	–	11	15
	E	–	9	–	–	12	–
	EA	–	22	17	19	12	17
	W	–	–	–	–	–	–
	DMSO	15	17	–	–	18	15
Papaver somniferum	M	–	–	–	–	–	–
	E	–	20	16	18	16	19
	EA	13	15	–	–	–	17
	W	17	16	17	16	20	20
	DMSO	–	–	–	–	9	–
Colocasia esculenta	M	–	11	–	–	–	–
	E	–	16	–	–	–	–
	EA	25	23	21	26	25	21
	W	–	10	10	–	–	–

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	DMSO	–	13	–	–	14	–
Cyperus rotundus	M	10	–	10	–	–	–
	E	13	11	–	15	11	9
	EA	12	–	–	11	–	–
	W	–	–	13	–	–	–
	DMSO	–	11	–	–	12	12
Cleome viscosa	M	–	–	10	13	–	10
	E	–	14	12	14	10	17
	EA	10	–	11	12	10	12
	W	–	–	–	–	–	–
	DMSO	–	–	–	–	–	–
Strychnos nux vomica	M	12	13	11	–	15	14
	E	13	–	12	14	18	16
	EA	22	20	19	21	22	25
	W	–	–	–	–	–	–
	DMSO	–	11	–	–	10	14
Abutilon indicum	M	15	10	–	19	–	10
	E	–	14	–	16	14	19
	EA	–	–	–	–	–	–
	W	–	–	15	–	–	–
	DMSO	14	15	–	15	16	15

Table 1: Antibacterial activity of plant extracts. M-Methanol, E-Ethanol, EA-Ethyl Acetate, W-Water (Aqueous), DMSO-Dimethyl Sulfoxide.

Generally, ethyl acetate is a strong solvent which has the capacity to extract wide variety of phytochemicals. Hence, the phytochemicals present in it might have showed strong bioactivity. Thus, the ethyl acetate extract of *Colocasia esculenta* exhibited strong activity against *Pseudomonas aeruginosa* (26 mm), *Acinetobacter baumannii* (25 mm), *Staphylococcus aureus* (21 mm), *Klebsiella pneumoniae* (23 mm) and *Salmonella typhi* (25 mm). Similarly, *Strychnos nux vomica* (EA extract) was highly effective against *Streptococcus aureus* (25 mm) and *Salmonella typhi* (22 mm). These results are consistent with prior studies that have documented the antimicrobial potential of ethyl acetate extracts, which tend to concentrate moderately polar bioactive compounds, including phenolic acids and terpenoids (Nascimento et al., 2000; Dhanani et al., 2017).

Methanol and ethanol extracts also displayed moderate activity, especially in *Macaranga peltata*, *Papaver somniferum*, and *Cleome viscosa*. Previous studies stated that methanol is a highly effective solvent for extracting a broad spectrum of antimicrobial compounds, including flavonoids and polyphenols (Do et al., 2014; Parekh & Chanda, 2007). In contrast, aqueous and DMSO extracts exhibited minimal or inconsistent antibacterial effects, indicating limited solubility or extraction of bioactive compounds in those solvents.

Methanol and ethanol extracts showed moderate minimal to moderate activity. Aqueous extract showed minimal to no inhibitory effects across most pathogens tested. This is likely due to water's limited ability to extract non-polar or moderately polar secondary metabolites with antimicrobial activity, as previously noted by Yadav & Agarwala (2011). DMSO extracts, although less commonly used in clinical settings due to toxicity concerns, showed notable antibacterial activity, particularly in Colocasia esculenta, reinforcing DMSO's ability to solubilize a wide array of bioactive compounds (Santos et al., 2018).

Phytochemical Profiling:

Plant Name	Extract Type	Alkaloid (Wagner's)	Alkaloid (Hager's)	Flavonoid (Lead acetate)	Flavonoid (Ferric chloride)	Tannin (Ferric chloride)	Saponin (Frothing)	Glycoside (NaOH)	Steroid (Liebermann-Burchard)
Macaranga peltata	M	–	+	+	+	+	+	+	+
	E	–	+	+	+	+	–	+	+
	EA	–	–	+	–	–	–	+	+
	W	+	–	+	+	+	+	–	+
	DMSO	+	–	+	+	+	–	–	+
Uvaria narum	M	–	–	+	+	+	–	+	–
	E	–	+	–	+	–	–	–	–
	EA	–	+	+	+	+	–	+	–
	W	–	+	+	–	–	–	+	–

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	DMSO	–	–	+	+	–	–	+	+
Papaver somniferum	M	–	+	–	–	–	+	–	+
	E	+	+	–	–	–	–	–	+
	EA	+	+	–	–	–	–	–	+
	W	–	+	–	+	–	–	+	+
	DMSO	+	+	–	–	+	–	–	+
Colocasia esculenta	M	+	–	+	–	–	–	+	–
	E	+	+	+	+	+	–	–	–
	EA	–	–	–	–	–	–	–	–
	W	+	+	+	–	–	+	+	+
	DMSO	–	–	+	–	–	+	+	+
Cyperus rotundus	M	–	+	+	+	+	+	+	+
	E	–	–	–	+	+	–	–	–
	EA	–	+	+	+	–	–	–	+
	W	+	+	+	–	–	+	+	–
	DMSO	+	+	+	+	+	–	+	+
Cleome viscosa	M	+	–	+	+	+	+	–	+
	E	–	–	+	+	+	+	–	–
	EA	+	+	–	–	–	–	+	–
	W	–	+	+	–	–	+	+	–
	DMSO	–	–	+	+	–	–	–	+
Strychnos nux vomica	M	–	–	+	–	–	+	–	–
	E	–	–	+	+	–	+	–	–
	EA	+	+	+	+	–	–	–	–
	W	–	+	+	–	–	+	+	+
	DMSO	–	–	+	+	+	+	–	+
Abutilon indicum	M	–	+	+	–	–	+	–	+
	E	+	+	–	–	–	–	–	–
	EA	+	+	–	–	–	–	–	–
	W	–	+	–	+	–	+	+	–
	DMSO	–	+	+	+	–	+	+	+

Table 2: Phytochemical test of the plant extracts. M-Methanol, E-Ethanol, EA-Ethyl Acetate, W-Water (Aqueous), DMSO-Dimethyl Sulfoxide.

The phytochemical profiling of various plant extracts showed significant variations in the presence of secondary metabolites, depending on the plant species and the type of solvent used for extraction (Harborne, 1998; Trease & Evans, 2009). Alkaloids were detected inconsistently across different tests, with Wagner's reagent showing positivity in *Colocasia esculenta* (methanolic, ethanolic, and aqueous extracts), *Papaver somniferum* (ethanolic, ethyl acetate, and DMSO extracts), and *Cleome viscosa* (methanolic and ethyl acetate extracts). In contrast, Hager's test produced more widespread alkaloid detection, particularly in *Macaranga peltata* (methanolic, ethanolic, and aqueous extracts), *P. somniferum* (all extracts), and *Cyperus rotundus* (methanolic, ethyl acetate, aqueous, and DMSO extracts).

Flavonoids were among the most consistently detected compounds, particularly in *M. peltata* (all extracts), *Uvaria narum* (methanolic, ethanolic, ethyl acetate, aqueous, and DMSO extracts), and *C. rotundus* (methanolic, ethanolic, ethyl acetate, and DMSO extracts). The widespread presence of flavonoids in these extracts may account for their previously reported antioxidant, anti-inflammatory, and antimicrobial activities (Cushnie & Lamb, 2005; Panche et al., 2016). Tannins were also widely distributed, with strong positivity in *M. peltata* (methanolic, ethanolic, and aqueous extracts), *C. rotundus* (methanolic and aqueous extracts), and *Strychnos nux vomica* (methanolic, ethanolic, aqueous, and DMSO extracts).

Saponins, detected via the frothing test, were prominent in *M. peltata* (methanolic, ethanolic, and aqueous extracts), *C. esculenta* (aqueous and DMSO extracts), and *Abutilon indicum* (aqueous and DMSO extracts). Glycosides, identified using the NaOH test, were most abundant in *M. peltata* (all extracts), *P. somniferum* (except ethanolic and ethyl acetate extracts), and *C. rotundus* (methanolic, ethyl acetate, and DMSO extracts). Steroids, tested via the Liebermann-Burchard reaction, were highly prevalent in *M. peltata* (all extracts), *P. somniferum* (all extracts), and *C. rotundus* (methanolic, ethyl acetate, aqueous, and DMSO extracts), indicating possible bioactive roles in hormone regulation or anti-inflammatory effects. Methanol's intermediate polarity allows it to effectively solubilize both polar and moderately non-polar compounds, resulting in higher yields of diverse metabolites such as flavonoids, tannins, glycosides, and steroids (Do et al., 2014; Dhanani et al., 2017).

The study also highlighted the influence of extraction solvents on phytochemical detection. Aqueous extracts often exhibited broader metabolite profiles, as seen in *M. peltata* and *C. rotundus*. Ethyl acetate extracts, such as those of *C. esculenta*, showed limited detection, likely due to its non-polar nature. This is consistent with studies suggesting that ethyl acetate selectively extracts moderately polar constituents such as certain flavonoids and terpenoids (Abubakar & Haque, 2020). The results for *P. somniferum* confirmed its well-documented alkaloid-rich composition, validating its historical

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use in pain relief and sedation. Meanwhile, *C. rotundus* demonstrated a diverse phytochemical profile, supporting its traditional applications in treating digestive disorders and inflammation. However, the methanolic and ethanolic extracts have wide array of phytochemicals.

These findings support the notion that methanol and ethanol are generally more suitable for comprehensive extraction of bioactive compounds from plant materials, whereas ethyl acetate, water, and DMSO may be better suited for targeted or selective extraction depending on the desired pharmacological or biochemical endpoints.

Total Phenolic Contents:

S.N	Plant extracts	Total phenolic content (µg/ml)							
		Macaranga peltata	Uvaria narum	Papaver somniferum	Strychnos nux vomica	Abutilon indicum	Cyperus rotundus	Cleoma viscosa	Colocassia esculenta
1	Water	1.27±0.05	0.42±0.14	0.38±0.18	0.18±0.06	0.14±0.06	0.61±0.04	1.53±0.17	0.63±0.03
2	Ethanol	1.22±0.02	0.62±0.19	0.92±0.04	0.18±0.03	0.38±0.08	1.19±0.23	1.39±0.31	0.23±0.08
3	Ethyl acetate	0.39±0.08	0.85±0.08	0.26±0.05	1.70±0.14	0.03±0.01	0.41±0.07	0.13±0.10	1.54±0.08
4	DMSO	1.22±0.28	0.77±0.08	0.19±0.08	0.83±0.13	0.47±0.07	0.35±0.09	0.57±0.14	0.72±0.09
5	Methanol	1.80±0.14	0.66±0.05	1.52±0.03	0.27±0.07	0.09±0.07	0.35±0.13	1.13±0.68	0.36±0.12

Table 3: Total Phenolic content

The total phenolic content (TPC) of the plant extracts was evaluated using five different solvents: water, ethanol, ethyl acetate, DMSO, and methanol. Among the tested extracts, methanol extract of *Macaranga peltata* showed the highest phenolic content (1.80 ± 0.14 µg/ml), followed closely by the methanol extract of *Papaver somniferum* (1.52 ± 0.03 µg/ml) and the ethyl acetate extract of *Strychnos nux-vomica* (1.70 ± 0.14 µg/ml). These findings are in agreement with previous studies, which highlight methanol's efficiency in extracting a wide range of polyphenols due to its intermediate polarity and hydrogen-bonding capacity (Do et al., 2014; Tiwari et al., 2011). The water extracts also exhibited moderate phenolic content, with *Cleome viscosa* (1.53 ± 0.17 µg/ml) and *Macaranga peltata* (1.27 ± 0.05 µg/ml) showing relatively high values compared to others. This indicates the presence of water-soluble phenolics in these plants, supporting their traditional use in water-based herbal formulations.

In contrast, ethyl acetate extracts generally exhibited lower phenolic contents in most plants, with the exception of *Strychnos nux-vomica* (1.70 ± 0.14 µg/ml) and *Colocasia esculenta* (1.54 ± 0.08 µg/ml). Studies suggest that certain plant matrices may contain non-polar to moderately polar phenolics that are better extracted using ethyl acetate, particularly flavonoid aglycones and phenolic acids (Nguyen & Nguyen, 2020). DMSO extracts showed variable results, with *Macaranga peltata* (1.22 ± 0.28 µg/ml) and *Strychnos nux-vomica* (0.83 ± 0.13 µg/ml) yielding higher values. DMSO has capability to dissolve both polar and non-polar compounds make it valuable for specific phenolic groups (Santos et al., 2018) but overall DMSO was less effective compared to methanol and ethanol.

Ethanol, being a relatively polar solvent, extracted moderate levels of phenolics across the species, with *Papaver somniferum* (0.92 ± 0.04 µg/ml) and *Cyperus rotundus* (1.19 ± 0.23 µg/ml) being notable examples. This supports previous reports that ethanol is a commonly preferred solvent in phytochemical studies due to its efficacy in extracting both polar and non-polar compounds. Overall, the results demonstrate that both plant species and solvent polarity significantly influence the phenolic extraction efficiency.

Antioxidant activity:

S.N	**Plant Name**	**Solvent**	**50 µg/ml**	**100 µg/ml**	**150 µg/ml**	**200 µg/ml**	**250 µg/ml**
1	Ascorbic Acid (Std.)	-	92.1	94.32	95.02	98.21	103.92
2	Macaranga peltata	M	97.6	116.5	210.3	236.7	239.1
3		E	65.2	89.4	93.7	100.7	102.9
4		EA	87.1	90.5	92.6	94.3	99.2
5		W	28.3	31.1	33.7	41.9	45.3
		DMSO	61.5	69.9	77.4	90.3	91.6
6	Uvaria narum	M	44.9	49.2	52.7	57.0	64.1
7		E	53.2	58.0	61.4	67.7	69.8
8		EA	79.1	81.7	84.5	89.6	92.1
9		W	5.3	6.8	8.0	10.7	13.5
		DMSO	19.7	20.1	21.8	23.6	28.9
10	Papaver somniferum	M	33.1	38.9	45.6	48.1	52.02
11		E	20.3	22.7	28.9	35.9	46.1
12		EA	41.3	47.9	52.1	53.6	58.4

13		W	16.8	20.4	25.9	28.1	33.5
		DMSO	15.7	20.1	27.5	30.2	31.9
14	Colocasia esculenta	M	209.5	211.9	212.1	213.2	215.4
15		E	50.9	52.8	53.2	55.0	57.1
16		EA	99.2	103.4	106.2	108.5	112.8
17		W	75.5	77.9	79.1	80.2	92.8
		DMSO	45.3	47.5	49.8	50.1	52.8
18	Cyperus rotundus	M	152.2	156.4	159.3	165.0	168.1
19		E	35.9	38.2	40.1	42.7	43.3
20		EA	171.8	175.5	176.7	179.9	181.2
21		W	15.4	19.7	21.5	22.9	23.2
		DMSO	6.1	8.5	9.4	12.8	15.3
22	Cleome viscosa	M	95.9	98.4	102.2	106.5	108.7
23		E	106.3	109.2	112.6	115.8	118.4
24		EA	40.6	42.8	44.2	46.1	48.4
25		W	163.9	166.7	168.2	170.9	172.3
		DMSO	36.1	38.4	39.1	40.3	41.2
26	Strychnos nux-vomica	M	59.2	61.1	68.6	71.7	76.9
27		E	76.1	80.7	83.9	87.0	89.4
28		EA	81.9	87.2	92.4	99.2	103.7
29		W	6.2	9.1	12.4	15.1	19.8
		DMSO	29.1	32.4	35.8	39.5	44.2
30	Abutilon indicum	M	21.6	25.3	27.2	32.5	36.8
31		E	28.9	30.6	33.7	36.1	41.2
32		EA	54.2	59.1	61.0	69.4	82.6
33		W	12.6	13.9	16.7	19.6	28.9
		DMSO	6.3	8.7	11.2	16.0	25.1

Table 4: DPPH Radical Scavenging activity. M-Methanol, E-Ethanol, EA-Ethyl Acetate, W-Water (Aqueous), DMSO-Dimethyl Sulfoxide.

The percentage of inhibition at various concentrations (50, 100, 150, 200, and 250 µg/ml) was used to assess the antioxidant activity of various solvent extracts from *Macaranga peltata*, *Uvaria narum*, *Papaver somniferum*, *Colocasia esculenta*, *Cyperus rotundus*, *Cleome viscosa*, *Strychnos nux-vomica*, and *Abutilon indicum*. Both the type of plant and the solvent employed have a major impact on the antioxidant activity of plant extracts.

Among all extracts, *Colocasia esculenta* (M) displayed the highest DPPH radical scavenging activity across all concentrations, peaking at 215.4% at 250 µg/mL, surpassing even the ascorbic acid standard (103.92% at 250 µg/mL). The ethyl acetate extract of *Cyperus rotundus* showed potent activity (181.2% at 250 µg/mL). This observation is in agreement with earlier reports where ethyl acetate was shown to effectively extract phenolic acids and flavonoids responsible for DPPH radical scavenging (Ghasemzadeh et al., 2012; Wong et al., 2006).

In general, methanolic extracts demonstrated stronger antioxidant potential compared to aqueous or ethanol counterparts. For instance, *Cleome viscosa* (M) exhibited increasing activity from 95.9% to 108.7%, while its water extract, though also active (up to 172.3%), showed a different kinetic profile. The ethyl acetate extract of *Strychnos nux-vomica* also displayed increasing scavenging activity (81.9% to 103.7%), highlighting the presence of medium polarity compounds effective against free radicals.

Water extracts, although typically less potent, demonstrated surprisingly high activity in certain plants such as *Cleome viscosa* (W), which reached 172.3%, indicating the possible presence of hydrophilic antioxidant constituents. In contrast, water extracts of *Uvaria narum*, *Strychnos nux-vomica*, and *Abutilon indicum* showed minimal activity (13.5%, 19.8%, and 28.9%, respectively), reinforcing the solvent-dependent nature of antioxidant extraction.

Uvaria narum (EA) was moderately active (92.1% at 250 µg/mL), while *Papaver somniferum* (EA) showed consistent but lower activity (58.4% at 250 µg/mL). Similarly, the methanolic extract of Abutilon indicum was weakly active (36.8% at 250 µg/mL), suggesting lower concentrations or absence of potent radical-scavenging phytochemicals in this plant or polarity mismatch with methanol.

In terms of solvent efficiency, methanol and ethyl acetate were the most effective in extracting antioxidants from plant matrices, followed by ethanol, while water extracts were less consistent and largely dependent on plant species. These findings confirm that certain species, particularly Colocasia esculenta, *Cyperus rotundus*, *Macaranga peltata*, and *Cleome viscosa*, possess considerable free radical scavenging activity.

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Conclusion:

The present investigation comprehensively evaluated the phytochemical composition, antibacterial efficacy and antioxidant potential of eight ethnomedicinal plants using different solvent extracts. Among the tested species, *Colocasia esculenta* (ethyl acetate and methanolic extracts) and *Strychnos nux-vomica* (ethyl acetate extract) demonstrated the most potent antibacterial activity, particularly against *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, and *Streptococcus aureus*. The solvent-dependent nature of phytochemical extraction was evident, with methanol and ethyl acetate emerging as the most effective in solubilizing diverse phytochemicals, including flavonoids, tannins, and glycosides, which likely contribute to both antimicrobial and antioxidant effects. Phytochemical screening revealed that flavonoids and tannins were widespread across most extracts, supporting their known bioactivity. Methanol extracts generally yielded the highest total phenolic content, notably in *Macaranga peltata* and *Papaver somniferum*, reinforcing methanol's efficiency in extracting polar phenolic compounds. The antioxidant assays (DPPH) identified *Colocasia esculenta* (methanolic extract) and *Cyperus rotundus* (ethyl acetate extract) as having exceptional radical scavenging capacity, with some values exceeding the ascorbic acid control. These results underscore the therapeutic potential of these plants in mitigating oxidative stress-related disorders. Collectively, this study validates the ethnopharmacological applications of the selected species and provides a scientific foundation for their potential development into plant-based antimicrobial and antioxidant therapeutics. Future work should focus on compound isolation, in vivo validation, and mechanistic studies to further characterize their pharmacological profiles.

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