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Research Article

PHYTOCHEMICAL, ANTIOXIDANT, HAEMOLYTIC AND ANTIMICROBIAL STUDIES OF THREE MEDICINAL PLANTS FROM NANDED DISTRICT (MS), INDIA

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ABSTRACT
The present study is concerned with ethanolic extract of *Astraea lobata* (L.) Klotzsch leaves *Swertia chirata* (Wall.) leaves, and *Clerodendrum phlomidis* L.f. leaves and stems revealed the presence of Alkaloids, Flavonoids, Saponins, Tannins, and Phenols. These plant extracts had potential antioxidant, haemolytic, antibacterial, and antifungal activity.

Keywords: *Astraea lobata* (L.) Klotzsch, *Swertia chirata* (Wall.), *Clerodendrum phlomidis* L.f.

1. INTRODUCTION

India is widely considered the botanical garden of the world since it is the largest producer of herbal medicinal plants [1]. Medicinal plants act as an indigenous source of novel compounds possessing therapeutic value and are also used in drug development. Nearly 80% of developing countries' population depend on traditional medicines for their primary health care needs as estimated by WHO [2]. A variety of medicinal plant species are used as a major ingredient for the preparation of modern phytomedicines, which have exploded in the last few years, and are still being collected from nature and play an important role in drug development. Recently, in an increasing population, people use natural herbal remedies which have become more popular in the treatment of various human ailments and are also much fruitful than others [3]. The ability to synthesize novel compounds by secondary metabolism possessing antimicrobial potential makes plants an invaluable source of pharmaceutical and therapeutic products [4]. The effectiveness of plant phytochemical extracts on various microorganisms has been studied worldwide [5-7].

The present study was, therefore, aimed at evaluating the phytochemical potential and antibacterial activity of *Astraea lobata* (L.) leaves, *Swertia chirata* (Wall.) leaves, and *Clerodendrum phlomidis* (L.) leaves and stem methanolic extract.

2. MATERIALS AND METHODS

2.1. Plant material and Preparation of Extracts

Fresh, healthy plant materials were collected from the campus of Swami Ramanand Teerth Marathwada University, Nanded (MS), India. Those were thoroughly washed with distilled water, dried in an oven at 40°C until constant weight, ground to a fine powder, and used to prepare ethanol extract using the Soxhlet extraction unit.

2.2. Qualitative and Quantitative Tests for Phytochemical Analysis

Ethanol extracts of the materials were tested for the presence of alkaloids, flavonoids, saponins, tannins, and phenols by previously described methods [8-11]. Total flavonoid content was determined by the aluminium chloride method [12], while total phenolic content was estimated as described by Bray and Thorpe [13].

2.3. Antioxidant of Plant Extracts

For the evaluation of antioxidant properties DPPH, reducing power assay, Hydroxyl (OH), Hydrogen peroxide, Nitric oxide radical scavenging activities were measured by following procedures previously mentioned by Kato [14-18].

2.4. Haemolytic Activity of Plant Extracts

Haemolytic activity was done by using human RBC, as an earlier reported method [19].

2.5. Antimicrobial Activity of Plant Extracts

The antibacterial and antifungal activities of the ethanolic extracts were determined against *Bacillus subtilis, Staphylococcus aurous, and Escherichia coli* in case of bacteria, while *Alternaria solani, Aspergillus flavus, Aspergillus niger,* and *Candida albicans* in case of fungi, by agar well diffusion method as outlined by Smania [20] by measuring the zone of inhibition (ZOI). After the application of the test and standard solutions in the well, the plates were incubated at 30℃ for 24 hrs. Evaluation of antibacterial and antifungal activity was done by measuring the diameter of inhibition zones against tested micro-organisms [21].

3. RESULTS AND DISCUSSION

3.1. Qualitative Tests for Phytochemical Analysis

The results obtained on phytochemical analysis revealed that ethanolic stem extract of *Clerodendrum phlomidis* L.f. contained all of the phytochemicals such as alkaloids, flavonoids, saponins, tannins, and phenols, whichever its leaves extract was devoid of saponins while tannins are absent in *Astraea lobata* (L.) Klotzsch. Ethanolic leaves extract of *Swertia chirata* (Wall.) shows the presence of alkaloids, flavonoids, and phenols.

3.2. Quantitative Tests for Phytochemical Analysis

The highest total phenolic content was observed in the ethanolic leaves extract of *Clerodendrum phlomidis* L.f. while lower in the leaves of *Astraea lobata* (L.) Klotzsch. On average the phenolic content fluctuated within the range of 0.246 to 0.494 mg/ml of ethanolic extracts. Higher flavonoid content was observed in ethanolic leaves extracts of *Swertia chirata* (Wall.), while lower in ethanolic leaves extracts of *Astraea lobata* (L.) Klotzsch.

3.3. Antioxidant activity

All selected medicinal plants showed good antioxidant activity, DPPH free radicle scavenging activity was maximum (56.87%) in ethanolic stem extract of *Clerodendrum phlomidis* L.f. and lower (22.87%) in case of leaves extract of *Astraea lobata* (L.) Klotzsch. against ascorbic acid (Vitamin-C). The highest (48.75%) percentage of hydroxyl (OH^-) radicle scavenging activity was found in ethanolic leaf extract of *Clerodendrum phlomidis* L.f. and lower (18.21%) in *Astraea lobata* (L.) Klotzsch. Hydrogen peroxide radicle scavenging activity is found to be higher (45.73%) in ethanolic leaves extract of *Swertia chirata* (Wall.), while nitic oxide radicle scavenging activity is higher (65.84%) in *Astraea lobata* (L.) Klotzsch extract (Table 1).

3.4. Haemolytic activity

Ethanolic stem extract of *Clerodendrum phlomidis* L.f. showed highest (45.54%) and *Swertia chirata* (Wall.) leaves extract shows lower (11.47%) haemolytic activity in comparison to 90% obtained for TritanX-100.

3.5. Antimicrobial activity of plant extracts

With regards to antibacterial activity, the extracts of *Astraea lobata* (L.) Klotzsch was found to be very active against *Bacillus subtilis*, *Staphylococcus aureus,* and *Escherichia coli.* Showing zone of inhibition (ZOI) 2mm, 3mm, and 6 mm respectively (Fig.1). Extracts of *Swertia chirata* (Wall.) and *Clerodendrum phlomidis* L.f. showed highest that is 3mm and 5mm antifungal activity against *Aspergillus niger* and *Candida albicans* respectively (Fig.2).

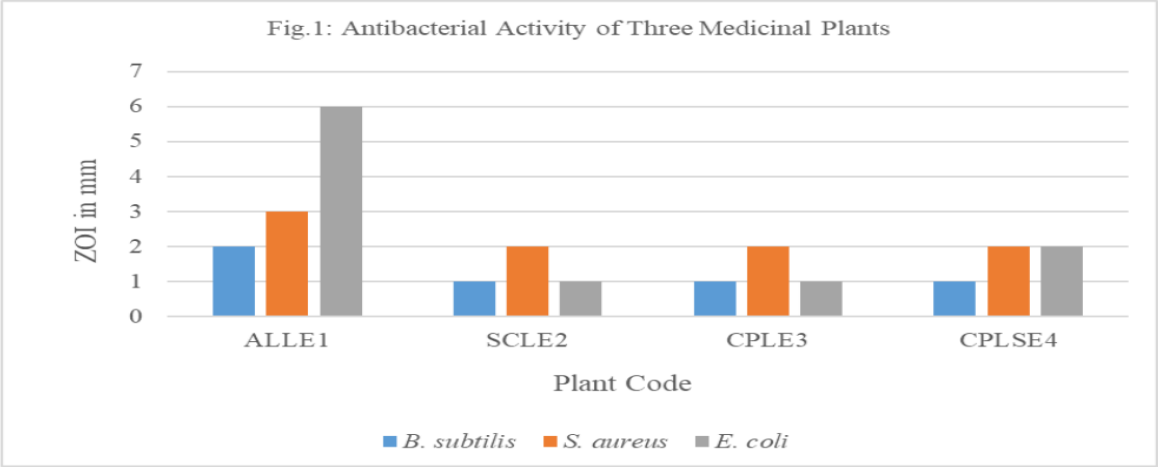

Fig.1: Antibacterial activity of three medicinal plants

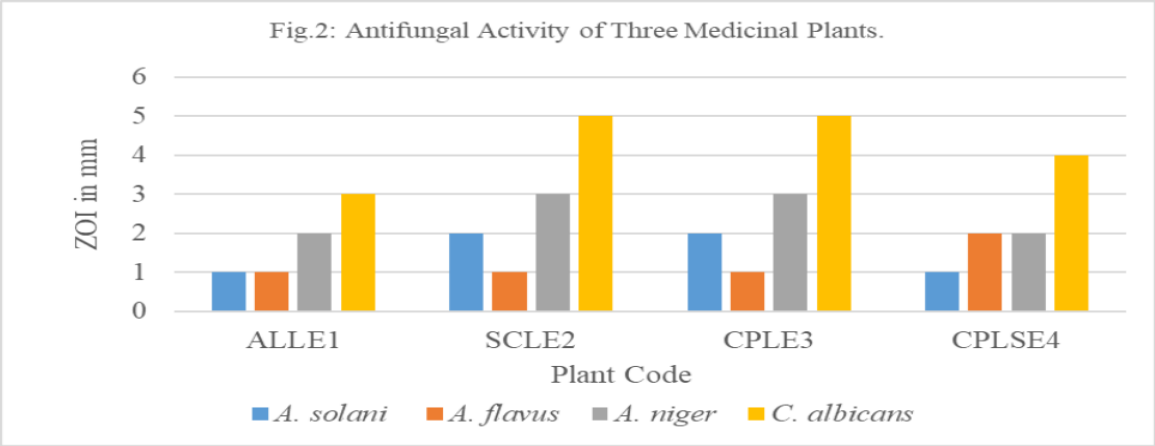

Fig. 2: Antifungal activity of three medicinal plants

Table 1: Phytochemical, Antioxidant, Haemolytic, and antimicrobial studies of three Medicinal Plants from Nanded district (MS), India.

Sr. No.	Phytochemical Tests		*Astraea lobata* (L.) Klotzsch	*Swertia chirata* Wall.)	*Clerodendrum phlomidis* L.f.	
1	Family		Euphorbiaceae	Gentianaceae	Lamiaceae	
2	Part Used		Leaves	Leaves	Leaves	Stem
3	Solvent system			Ethanol		
4	Plant code		ALLE1	SCLE2	CPLE3	CPLSE4
5	Yield (mg/15gm)		2.03	2.56	2.42	1.84
6	Qualitative Test	Alkaloids	+	+	+	+
		Flavonoids	+	+	+	+
		Saponins	+	-	-	+
		Tannins	-	-	+	+
		Phenols	+	+	+	+
7	Quantitative Test	Phenolic content (mg/ml)	0.246	0.473	0.494	0.478
		Flavonoid content (mg/ml)	0.421	0.534	0.528	0.498
8	Free Radicle Scavenging Activity (%)	DPPH	22.87	29.12	47.17	56.87
		Reducing power assay	45.74	45.76	39.87	21.98
		Hydroxyl radical	18.21	25.47	48.75	36.74
		Hydrogen peroxide	12.74	45.73	39.45	21.74
		Nitric oxide	65.84	61.84	56.84	21.65
9	Haemolytic (%) activity		21.87	11.47	23.47	45.54
10	Antibacterial activity (ZOI in mm)	*Bacillus subtilis*	2.0	1.0	1.0	1.0
		Staphylococcus aureus	3.0	2.0	2.0	2.0
		Escherichia coli	6.0	1.0	1.0	2.0
11	Antifungal activity (ZOI in mm)	*Alternaria solani*	1.0	2.0	2.0	1.0
		Aspergillus flavus	1.0	1.0	1.0	2.0
		Aspergillus niger	2.0	3.0	3.0	2.0
		Candida albicans	3.0	5.0	5.0	4.0

4. CONCLUSION

C. colocynthis (Linn.), P. juliflora Swartz and D. stramonium have the most medicinal values and are easily available for human applications. So, our main center of attraction was to evaluate the phytochemicals present in the ethanolic extract of given plants and to study the Antioxidant, Hemolytic, and Antimicrobial Activities. Many drug developing companies rely mainly on plant research as plant-derived antioxidants reduce the risk of chronic diseases like cancer and heart problems. In the current study, the phytochemical constituents like flavonoids, phenolic compounds, alkaloids, and other secondary metabolites were present in the plant extracts of ALLE1, SCLE2, CPLE3 and

CPLSE4 plants. Due to the presence of these phytochemical constituents, these plants exhibited antioxidant activity. The present investigation suggests that the bioactive principles which confer the antioxidant activity can be isolated and used in developing a drug for the diseases associated with oxidative stress. The plant extracts also contribute for antimicrobial activities. The ethanolic extracts of the plants show the high potential of antibacterial and antifungal activities against tested bacteria (*Bacillus subtilis, Staphylococcus aureus* and *Escherichia coli*) and fungi (*Alternaria solani, Aspergillus flavus, Aspergillus niger* and *Candida albicans*).

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Conflict of interest

Nil

6. REFERENCES

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