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A STUDY ON PHYTOCHEMICAL SCREENING AND ANTIUROLITHIATIC ACTIVITY OF *Aerva lanata* (L.) Juss. ex Schult. LEAVES EXTRACT

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ABSTRACT

Urolithiasis is the formation of stones in the urinary tract. Various phytochemicals and bioactive compounds are sourced from medicinal plants used to treat kidney stone. The aim of this study was to evaluate the phytochemical screening and antiurolithiatic activity of *Aerva lanata* leaves. The phytochemical screening of this ethanolic and aqueous extract revealed the presence of tannins, saponins, flavonoids, phenolic and coumarins. The quantitative analysis clearly showed that *Aerva lanata* leaves contains notable amount of phenolics and flavonoids. Ethanolic extract of *Aerva lanata* leaves was potential antiurolithiatic activity.

Keywords: *Aerva lanata* leaves, qualitative, quantitative and antibacterial activity.

INTRODUCTION

Urinary stones affect a large proportion of the population. Approximately 85% of urinary stones are calcium stones, which consist of oxalate and phosphate, either alone or in combination. Urolithiasis is the formation of stone in urinary tract. These stone belong to the group of biominerals, that is different organic and inorganic substances with a crystallin or amorphous structure. The mechanisms involved in the formation of urinary stones are not fully understood but it is generally agreed that urinary lithiasis is a multifaceted process involving events leading to crystal nucleation, aggregation and growth of insoluble particles. Crystal growth and agglomeration may be due to super saturation with respect to stone forming constituents or the presence of various inhibitory or stimulatory biomolecules or even pH (Fan et al., 1999). Urine is always supersaturated with common stone forming minerals, however, the crystallization inhibiting capacity of urine does not allow urolithiasis to happen in most of the individuals, whereas this natural inhibition is impaired in stone formers (Tiselius et al., 2001).

In recent years, numerous studies describing the therapeutic properties of extracts from different parts of various medicinal plants have been developed. Indeed, the use of such extracts as complementary and alternative medicine has lately increased, and also serves as an interesting source of drug candidates for the pharmaceutical industrial research (Newman and Cragg, 2007). In our present study preliminary phytochemical screening and antiurolithiatic activity of *Aerva lanata* leaves were evaluated using standard procedure.

MATERIALS AND METHODS

Collection of plant materials

The healthy leaves of *Aerva lanata* were collected from Ravusapatti, Thanjavur district, Tamil Nadu, India.

Preparation for extract

1 gram of the powder of *Aerva lanata* leaves were transferred in to different conical flask (250ml). The conical flask containing 50ml of different solution (ethanol and water). The conical flask containing *Aerva lanata* leaves were shaken well for 30 minutes by free hand. After 24 hrs, the extracts were filtered using Whatman filter paper No.1 and filtrate is used for further analysis.

Phytochemical screening

Chemical tests were carried out on the extract using standard procedures to identify the constituents as described by Sofowara (1993), Trease and Evans (1989) and Harborne (1973 and 1984). Total phenols estimated by the method of Edeoga *et al*., (2005). Flavonoid determine by the method of Bohm and Kocipai-Abyazan (1994).

Determination of antiurolithiatic activity

The antiurolithiatic activity was performed by nucleation and aggregation method (Patel et al., 2012).

RESULTS AND DISCUSSION

Phytochemicals are playing vital role for the treatment of different types of diseases and still are use in, both traditional and modern system of medication. In the present study was carried out on the *Aerva lanata* leaves extract and revealed the presence of medicinally active constituents. The phytochemical characters investigated and summarized in Table 1. The tannin, saponins, flavonoids, steroids, terpenoids, triterpenoids, polyphenol, glycoside, anthraquinone and coumarins were present in both aqueous and ethanol extracts Table 2 shows the significant amount of flavonoids (40.00±0.28 mg/gm) and total phenol (264.30±1.54 mg/gm) were present in *Aerva lanata* leaves.

Table 1: Qualitative analysis of Phytochemicals in *Aerva lanata* extract

S. No	Phytochemicals	Aqueous	Ethanol
1	Tannin	+	++
2	Saponin	++	++
3	Flavonoids	++	++
4	Steroids	+	++
5	Terpenoids	++	++
6	Triterpenoids	+	++
7	Alkaloids	-	-
8	Anthraquinone	+	++
9	Polyphenol	++	++
10	Glycoside	+	++
11	Coumarins	++	++

(+) Presence, (++) High concentrations and (–) Absences

Table 2: Quantitative phytochemical analysis of *Tinospora cordifolia* leaves

S. No	Secondary Metabolites	Result (mg/gm)
1	Flavonoids	40.00±0.28
2	Total phenol	264.30±1.54

Values are expressed as mean ± SD for triplicates

According to Aziman *et al*. (2012), several phenolic compounds like tannins present in cells of plant are potent inhibitors of many hydrolytic enzymes such as proteolytic macerating enzymes used by plant pathogens. In addition, herbs that has tannins as their main components are astringent in nature (Ikhane *et al.*, 2015; Vedhanarayanan *et al.*, 2013). According to Baljeet *et al*., (2015) the phytochemical screening of different spices

extracts demonstrated the presence of flavonoids and saponins which supported these findings. The presence of these metabolites probably explains the various uses of this plant in traditional medicine.

***In vitro* Antiurolithiatic Activity**

Nephrolithiasis or urolithiasis, commonly known as kidney or renal stone, is a highly prevalent clinical problem that affects about 20% of the human population. A majority of urinary stones are composed of phosphates, oxalates, cystine, and uric acid. Almost 80% of these calculi are composed of calcium oxalate (CaOx). Kidney stone formation is a complex process which is the outcome of several physio-chemical events such as supersaturation, nucleation, crystal growth, aggregation, and retention. Several pharmacological and clinical studies on traditional medicinal plants used in the treatment of kidney stones have publicized their therapeutic potential in variousin vitro as well as in vivo models. In the present study in vitro antiurolithiatic activity of *Aerva lanata* leaves extract.

Nucleation is a prerequisite in the pathogenesis of CaOx urolithiasis. Nucleation basically marks a thermodynamically driven event of phase change wherein dissolved substances in a supersaturated solution spontaneously crystallize. Similar phase change and formation of CaOx crystals was witnessed while carrying out nucleation assay. Aerva lanata leaves extract showed significant inhibitory effect on CaOx crystal aggregation. *Aerva lanata* leaves extract showed 87.93 % of inhibition at 500µg/ml of extract and nearest to Cystone drug noticed in table 3 and figure 1.

Table 3: *In vitro* Antiurolithiatic Activity of *Aerva lanata* leaves extract using Nucleation assay

Concentrations (µg/ml)	% of inhibitions	
	Aerva lanata	**Std. (Cystone)**
100	17.58±1.87	20.13±1.09
200	29.03±1.85	35.42±0.37
300	43.14±1.54	53.75±0.78
400	71.73±1.73	75.33±0.67
500	87.93±1.81	90.64±1.05

Values expressed as Mean ± SD for triplicates

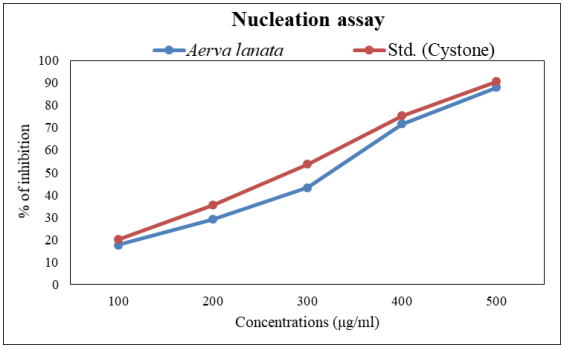

Figure 1: *In vitro* Antiurolithiatic Activity of *Aerva lanata* leaves extract using Nucleation assay

Aggregation of crystals marks the process wherein numerous crystals in the solution come together and adhere forming large crystal agglomerates. Aggregation is a key determinant of crystal retention as large crystal agglomerates are the ones that produce renal tubular obstruction thereby promoting stone formation. *Aerva lanata* leaves extract showed significant inhibitory effect on CaOx crystal aggregation. *Aerva lanata* leaves extract showed 81.14 % of inhibition at 500µg/ml of extract and nearest to Cystone drug noticed in table 4 and figure 2.

Table 4: *In vitro* Antiurolithiatic Activity of *Aerva lanata* leaves extract using Aggregation assay

Concentrations (µg/ml)	% of inhibitions	
	Aerva lanata	**Std. (Cystone)**
100	23.80±2.37	26.61±0.96
200	41.01±2.01	46.22±0.57
300	59.13±1.86	62.18±0.84
400	67.74±3.22	75.34±1.06
500	82.79±4.92	86.57±1.22

Values expressed as Mean ± SD for triplicates

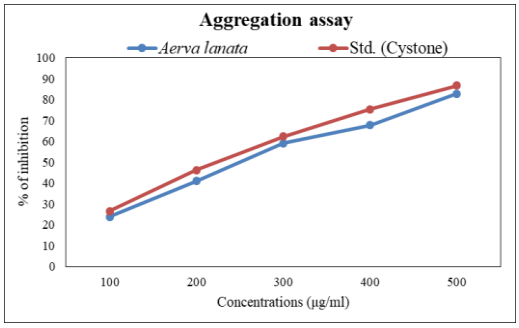

Figure 2: *In vitro* Antiurolithiatic Activity of *Aerva lanata* leaves extract using Aggregation assay

Urinary stones affect a large proportion of the population. Approximately 85% of urinary stones are calcium stones, which consist of oxalate and phosphate, either alone or in combination (Basavaraj et al., 2007). The mechanisms involved in the formation of urinary stones are not fully understood but it is generally agreed that urinary lithiasis is a multifaceted process involving events leading to crystal nucleation, aggregation and growth of insoluble particles (Baumann, 1998).

CONCLUSION

Overall, it can be concluded that the *Aerva lanata* leaves contains a rich source of phytochemicals and Antiurolithiatic activity. This study is the first scientific report that provides convincing phytochemicals and antiurolithiatic evidence for the relevance of *Aerva lanata* leaves thus providing scientific validity to its traditional consumption by the local populace of south India.

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