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ANTILITHIATIC ACTIVITY AND PHARMACOGNOSTIC STUDIES OF SCOPARIA DULCIS

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ABSTRACT

Scoparia dulcis Linn has been widely reported to have pharmacological uses arising from its wide spread uses. The different extracts were prepared by successive extraction with petroleum ether, chloroform, ethanol and water using soxhlet distillation method. Phytochemical analysis of plant extract revealed the presence of alkaloids, carbohydrates, glycoside, tannins, starch etc. Thin layer chromatography and Gas chromatography-mass spectrometric analysis revealed the presence of different components in the plant extract. Among the 50 components obtained, 10 important organic compounds were analyzed. All these compounds are found to be having some medicinal application. UV visible spectroscopic analysis of extract of Scoparia dulcis reported four chromatogram figures which showed prominent peaks having maximum absorption of 666 nm corresponded to wavelength of methylene blue and brilliant blue. FTIR spectroscopic analysis reveals the presence of important functional groups like-OH,-NO2,-SO3,-SH, -COOH, NH2, R-X etc. Antibacterial activity of petroleum ether, chloroform, and ethanol and water extracts of stems and leaves of Scoparia dulcis reveals that chloroform and ethanol extracts shows maximum resistance against Staphylococcus while ethanol and aqueous extracts showed maximum resistance against Klebsiela pneumonia. The exciting fact came out of the study is that water extract of Scoparia dulcis showed great potential to dissolve the Calcium oxalate crystals ie, the plant extract shows invitro antilithiatic activity for kidney stones. Thus Scoparia dulcis act as a source of different valuable organic compounds that are having medicinal applications and have a beneficial effect on kidney stone problem.

Key words: *Scoparia dulcis, Antibacterial activity, Antilithiatic activity, Calcium oxalate dissolution method, Gas chromatography-mass spectrometry.*

INTRODUCTION

The world health medicines for their primary health care needs and about 85% of the traditional medicines involves the use of organization estimates that 80% of the people in developing countries of the world rely on traditional plant extract. This means that 3.5-4 billion people in the world rely on plants as source of drugs[(1)]. Research could lead to new drug discovery or advance use of indigenous herbal medicine for treatment. This revival of interest in plant derived drugs is mainly due to current wide spread belief that the green medicine is safe and more dependable than the costly synthetic drugs many of which have adverse effect[(2)]. These medicinal plants are considered as rich resource of ingredients which can be used in drug development of human culture around the world. Moreover some plants are considered as an important source of nutrition and as a result these plants are recommended for therapeutic values[(3)]. Many of the herbs and spices used by humans to season fruit also yield useful medicinal compounds[(4)]. In all cultures vegetables are spiced less than meat presumably because they are resistant to spoilage[(5)]. Angiosperms (flowering plants) were the original source of most of the plant medicine[(6)].India has a rich culture of medicinal herbs and spices, which includes about more than 2000 species and has a vast geographical area with high potential abilities for Ayurvedic, Unani, Siddah traditional medicines but only very few have been studied chemically and pharmacologically for their potential medicinal values[(8)]. Many of the common weed that populate human settlements such as nettles, dandelion and chickweed have medicinal properties[(9)(10)]. A large amount of archaeological evidence exists which indicates that human were using medicinal plants during the Paleolithic, approximately 60,000 years ago. Furthermore, other non human primates are also known to ingmedicinal plants to treat illness[(11)]. The Sushrutasamhita attributed to Sushruta in the 6th century BC describes 700 medicinal plants, 64 Preparations from mineral sources and 57 preparations based on animal sources[(12)]. The use of herbs to tract diseases in almost universal among non industrialized societies[(13)]. Many herbs have shown positive results in-vitro, animal model or small scale clinical test, while studies on some herbal treatments have found negative results[(14,15)].

All over the globe especially in South American countries the use of medicinal plants has significantly supported primary health care[(16)]. Infection diseases represent an important cause of morbidity and mortality among the general populations particularly in developing countries. Therefore pharmaceutical companies have been motivated to develop new antimicrobial drugs in recent years especially due to the constant emergence of microorganism's resistance to conventional antimicrobials[(17)]. Apparently bacterial species present the genetic ability to acquire and transmit resistance against currently available antibacterial. Since there are frequent reports on the isolation of bacteria there are known to be sensation to routinely used drugs and became multi-resistant to other medication available on the market[(18,19)]. Reactive Oxygen Species (ROS) such as superoxide anions,

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hydrogen peroxide and hydroxyl, nitric oxide and peroxynitrite radicals, play an important role in oxidative stress related to the pathogenesis of various important diseases[20,21]. In healthy individuals, the production of free radicals is balanced by the anti-oxidative defense system; however oxidative stress is generated. When equilibrium favors free radical generations as result of a depletion of antioxidant levels[22]. Moreover knowledge and application of such potential antioxidant activities in reducing oxidative stresses in vitro has promoted many investigations to search for potent and cost-effective antioxidants from various plant sources[23]. The world best known and most universally used medication, has its natural origins from the glycoside salicin which is found in many species of the plant genera Salix and Populus[24]. The scientific literature is rich in epidemiological studies that support significant differences in the occurrence of cancers between oriental and accidental population[25]. Generally populations that consume a high level of natural herbal products have a reduced incidence of cancer. An example is the low incidence of colon cancer in Asian countries with high consumption of soya bean products[26]. Soya bean are the major dietary source of saponins which have been suggested as possible anticancer agents[27]. Urolithiasis is characterized by the formation of stone in the kidneys or urinary tracts. A large number of people nearly 4-15 percentage of the human population is suffering from urinary stone problem all over the globe[28]. The crystals of calcium oxalates are primary constituents of more that 60% age of the majority of human kidney stone; they exists in the form of Calcium oxalate mono hydrate (COM) and Calcium oxalate dihydrate (COD)[29]. In spite of substantial progress in the pathophysiology and treatment of urolithiasis, there is no satisfactory drug being used in clinical therapy. Thus a drug for the prevention of this disease or its recurrence would be of great interest. Without specific knowledge of their cellular actions or mechanisms, phytochemicals have been considered as drugs for millennia. Some phytochemicals with physiological properties may be elements rather than complex organic molecules. For example, Selenium which is abundant in many fruits and vegetables is involved with major metabolic pathways, including thyroid hormone metabolism and immune function[30]. Plants are known to contain a large number of biologically active compounds. In the search for biologically active molecules of plant origin, member of Scrophulariaceae family have proved to be a rich source as they contain different glycoside substances. The plant Scoparia dulcis is one of the most important sources of herbal medicine from the family of Scrophulariaceae. Because of the medicinal use this plant, Scoparia dulcis is further explored is not an unprecedented[7].

MATERIALS AND METHODS

Drugs and chemicals

All chemicals are of analytical grade. Petroleum ether, chloroform, ethanol were purchased from Sigma-Aldrich (USA) while sodium Meta silicate from Merk (Germany).

Collection and identification of plants

The investigated plant Scoparia dulcis L.was collected from Avaneeswaram, Kollam district, Kerala, India in December. The collected plant parts (aerial) were cleaned, dried and ground into a coarse powder with the help of suitable grinder. The powder was stored in a air tight container and kept in a cool, dry place until analysis commenced.

Preparation of extracts

Nearly 100g of well powered plant sample was tied in cotton and taken in Soxhlet apparatus and 750 ml petroleum ether was taken in the round bottom flask at first. The solvent was evaporated using heating mantle. The concentrated ether extract obtained by distillation was collected in a container after 24 hours. The process of distillation is continued by using chloroform, ethanol, and water successively. This process of four solvents extraction was carried out successively in the increasing order polarity. The four extracts were used for several tests.

Phytochemical screening: Phytochemical screening of the prepared extracts was conducted with various qualitative tests to identify the presence of chemical constituents.

Thin layer chromatographic analysis

Thin layer chromatographic analysis and their Rf values are calculated.

UV and visible spectroscopic analysis

When the beams of UV light were passed through sample cell and solvent cell, the photoelectric cells received an intense beam from the reference cell and less intense beam from the sample cell. The signals were amplified by means of dynodes and finally an absorption curve relating wavelength (abscissa) and absorption (ordinate) were plotted on a recorder.

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FTIR spectroscopic analysis

Fourier transform infrared spectroscopy is a technique for obtaining high quality infrared spectra by mathematical conversation of an interference pattern into a spectrum.

Gas chromatography-Mass spectrometric analysis

GC-MS analysis is a common confirmation test because it separates all the components in the sample and provides a representative spectral output. The sample was injected into the injection port of the gas chromatography device. The GC instrument vaporized the sample and then separated and analyzed the various components of this separation. Each component ideally produced a specific special peak. They help to differentiate between same compounds. The peak was measured from the baseline to the tip of the peak.

Antibiotic sensitivity test (Kirby- Bauer disc diffusion)

Antibiotic sensitivity test is conducted against the pathogens *Staphylococcus* and *Klebsiela pneumonia*.

In vitro anti- lithiatic activity test by calcium oxalate dissolution method

To know the role of plant extract in dissolving the already formed stone nucleus in renal system, some artificial Calcium Oxalate Crystals were prepared by standard method.

5 mg of artificially prepared calcium oxalate crystals were weighed and packed in a semi permeable membrane and was allowed to suspend in separate conical flasks containing petroleum ether extract, chloroform extract, ethanol extract and water extract. The entire flask with 5 mg of calcium oxalate crystals were placed in incubator at (37+1) oC for 7 hours. After 7 hours the crystals are taken out, dried and weighed. Loss of weight of each sample is calculated. Weight loss; indicate a portion of calcium oxalate crystals has dissolved in the extract. From each weight the percentage of dissolution of crystals in different extract can be calculated.

RESULTS

Quantitative pharmacognostic analysis of Scoparia dulcis

The quantitative pharmacognostic analysis showed that the percentage of moisture content , total ash, acid insoluble ash, water soluble ash were shown in the table-1

Phytochemical screening

Steroid, reducing sugar, carbohydrate, phenol, compounds, saponins and flavanoids were reported in these four extracts. The results are given in the table-2

Thin layer chromatographic analysis

The Rf values were found out by using suitable solvent system. When ethanol acetate and n-butanol were taken in 90:10 ratios, the values obtained are given in table -3

UV visible spectroscopic analysis

Petroleum ether extract of stems and leaves of Scoparia dulcis showed a peak having a maximum absorption of 666 nm. The chloroform extract and ethanol extract of stems and leaves of Scoparia dulcis showed a peak having a maximum absorption of 650 nm .The graphs obtained are given in figure 1.

FTIR spectroscopic analysis

FTIR scan results of petroleum ether extract of stems and leaves of *Scoparia dulcis* gives peaks at 684 cm^{-1}, 1029 cm^{-1}, 1103 cm^{-1},1168 cm^{-1}, 1237 cm^{-1}, 1377 cm^{-1}, 1458 cm^{-1}, 1627 cm^{-1}, 1732 cm^{-1}, 2333 cm^{-1}, 2681 cm^{-1}, 2854 cm^{-1}, 2922 cm^{-1}, 3396 cm^{-1} ,3406 cm^{-1}

FTIR analysis of chloroform extracts of stems and leaves of *Scoparia dulcis* gives peaks at 1274 cm^{-1}, 2333 cm^{-1}, 2362 cm^{-1}, 2926 cm^{-1}, 3012 cm^{-1}, 3400 cm^{-1}, 3425 cm^{-1}, 3441 cm^{-1}, 3745 cm^{-1}

FTIR analysis of ethanol extract of stems and leaves of *Scoparia dulcis* gives peaks at 648cm^{-1},1076 cm^{-1},1253 cm^{-1},1415 cm^{-1}, 1458 cm^{-1},1512 cm^{-1}, 1643 cm^{-1}, 2333 cm^{-1}, 2362 cm^{-1},2856 cm^{-1}, 2926 cm^{-1},3394 cm^{-1}, 3738 cm^{-1},3811 cm^{-1}, 3894 cm^{-1}

FTIR analysis of water extract of stems and leaves of *Scoparia dulcis* gives *peaks* at 443 cm-1, 487 cm-1, 511 cm-1, 623 cm-1, 665 cm-1, 711 cm-1, 879 cm-1, 1076 cm-1, 1242 cm-1, 1311 cm-1, 1396 cm-1, 1612 cm-1, 2110 cm-1, 2945 cm-1, 3344 cm-1, 3379 cm-1, 3412 cm-1 (figure 2)

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Gas chromatography mass spectrometric analysis

The compounds present in the chloroform extract of stems and leaves of Scoparia dulcis were identified by GC-MS analysis. Around 50 compounds were analyzed from the extract. Among these the retention time (RT), molecular formula, molecular weight (MW) and percentage composition of 10 components were studied and are given in table-5.

Analysis of antibacterial activity of extracts

Petroleum ether, chloroform, ethanol and aqueous extract of stems and leaves of *Scoparia dulcis* shows antibacterial activity against pathogens. The chloroform and ethanol had pathogen resisting zone of 10 mm and 9 mm respectively against *Staphylococcus*. The ethanol and aqueous extract had pathogen resisting zone of 8 mm each against *Klebsiela pneumonia* (*table*-4)

In vitro anti- lithiatic activity test by calcium oxalate dissolution method

The percentage of dissolution of crystals in different extracts is calculated and is given in table 6.

Table 1: Quantitative pharmacognostic analysis of *Scoparia dulcis*

- Moisture content- 80.2
- Total Ash -7.2
- Acid insoluble Ash -10.8
- Water insoluble Ash -51.53
- Extractive Value
- Petroleum ether - 4.2
- Chloroform - 10.4
- Ethanol - 20.0
- Water-27.96

Table 2: Phytochemical screening of the extracts of leaves and stems of *Scoparia dulcis*

Phytochemicals	Petroleum ether	Chloroform	Ethanol	Water
Reducing sugar	+	+	+	+
Carbohydrate	-	-	+	+
Alkaloid	+	+	-	+
Phenolic compound	-	-	+	+
Saponins	+	-	-	+
Starch	+	-	+	+
Tannins	-	+	+	+
Flavanoids	-	+	+	+
Terpenoids	-	-	+	+

Table 3: Thin layer chromatographic analysis

Sl No	Name of extract	UV	Visible	R_f value
1	Petroleum Ether	Light Green	Brown	0.24,0.39,0.13
2	Chloroform	Green	Light Brown	0.31,0.26,0.15
3	Ethanol	Green	Dark Green	0.38,0.24,0.21
4	Water	Green	Dark Green	0.23,0.15

Solvent System – Petroleum ether: Ethyl Acetate (90:10)

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Table 4: Antibacterial activity of *Scoparia dulcis* against *Staphylococcus aureus* and *Klebsiella pneumonia*

Type of plant Extract	Organism	Inhibition of zone in mm	Positive control (Gentamycin 10 mcg/disc	Negative Control
Petroleum ether Chloroform Ethanol Aqueous	*Staphylococcus aureus Staphylococcus aureus* *Staphylococcus aureus* *Staphylococcus aureus*	NZ 10 mm 9 mm NZ	25 mm 25 mm 25 mm 25 mm	NZ NZ NZ NZ
Petroleum ether Chloroform Ethanol Aqueous	*Klebsiella pneumonia* *Klebsiella pneumonia* *Klebsiella pneumonia* *Klebsiella pneumonia*	NZ NZ 8 mm 8 mm	25 mm 25 mm 25 mm 25 mm	NZ NZ NZ NZ

NZ-No zone

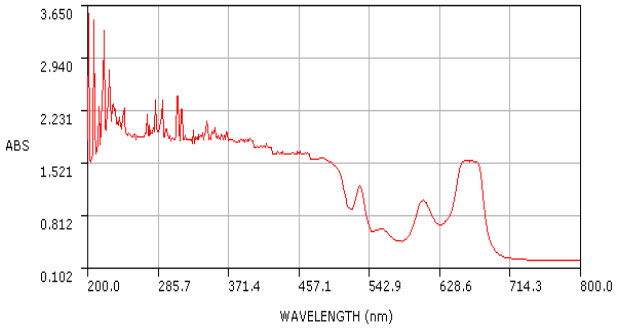
Table 5:Anti-lithiaticactivity of different extracts of stems and leaves of *Scoparia dulcis*

Treatment	Calcium Oxalate dissolution in %
Petroleum ether extract	25%
Chloroform Extract	32%
Ethanol extract	34%
Water extract	52%

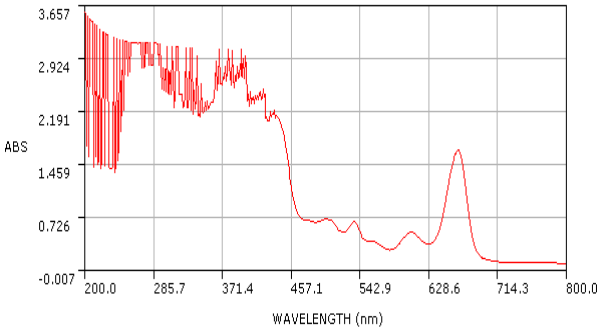
Table 6 :Gas chromatography Mass spectrometric analysis of chloroform extract of *Scoparia dulcis*

Comp No	RT	Name of the compound	Mol. Formula	Mol Wt	CAS Registry No.
1	2.8	Boronic acid, ethyl-bis (2-mer- capto ethyl ester)	C6H15BO2S2	194	Not available
2	5.5	5-Benzyloxypyrimidine-2- carboxylic acid	C12H10N2O3	230	Not available
3	7.6	Benzo furan, 2,3-dihydro	C8H8O	120	496-16-12
4	9.4	Ethanone, 1-(2-hydroxy-5-methyl phenyl)-	C9H10O2	150	1450-72-2
5	11.5	Benzene ethanol, 4-hydroxy	C8H10O2	138	501-94-0
6	13.5	Phenol, 2,4-bis (1,1-dimethyl ethyl)-	C14H22O	206	96-76-4
7	16.1	4-n-Hexylthiane, S,S-dioxide	C11H22O2S	218	70928-52-8
8	21.8	6-Methoxy-2-benzoxazoline	C8H7NO3	165	532-91-2
9	23.4	3,7,11,15-Tetramethyl-2-hexadecen-1-ol	C20H40O	296	102608-53-7
10	26.3	22-Tricosenoic acid	C23H46O2	354	65119-95-1

UV visible spectrochemical analysis



Petroleum ether, Prominent peak: 666nm



Chloroform extract, Prominent peak: 650nm

Figure 1: FTIR spectroscopic analysis

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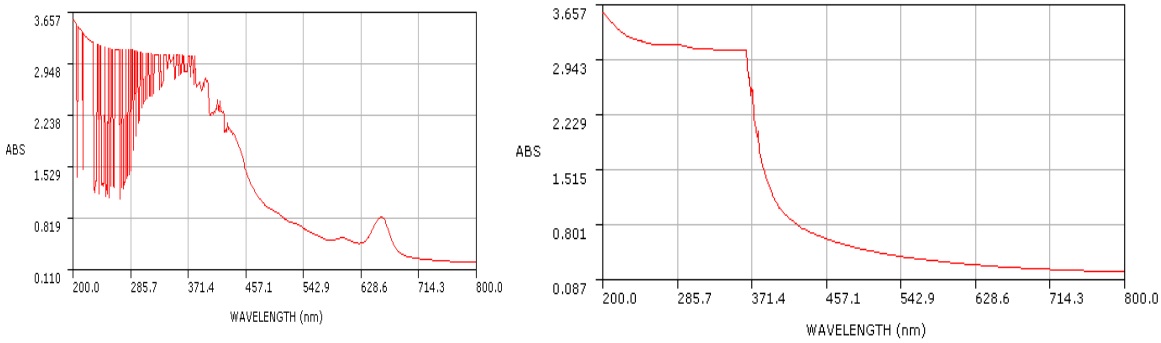


Ethanol extracts

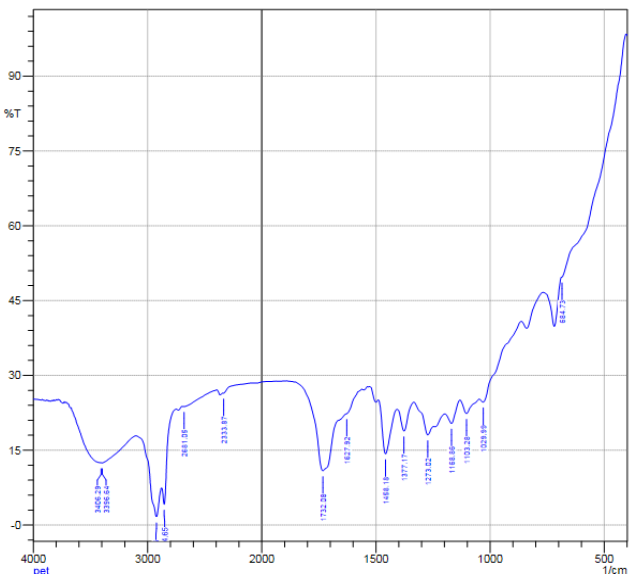
Prominent peak: 650nm

Aqueous extract

Prominent peak: 360nm

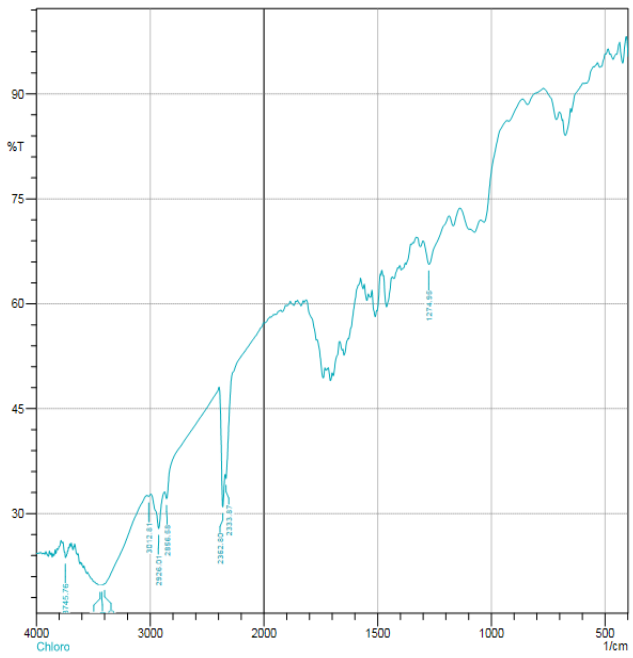
Figure 2: FTIR spectroscopic analysis

FTIR Spectroscopic analysis of petroleum ether extract of Scoparia dulcis



No.	Peak	Intensity	Corr. Int	Base (H)	Base (L)	Area	Corr. Are
1	684.73	49.707	0.334	686.66	405.05	48.403	5.064
2	1029.99	24.664	2.076	1047.35	864.11	89.296	0.806
3	1103.28	22.372	2.748	1130.29	1049.28	50.424	1.863
4	1168.86	20.388	3.129	1197.79	1132.21	42.885	1.862
5	1273.02	18.072	3.132	1332.81	1247.94	57.668	1.881
6	1377.17	18.862	4.966	1408.04	1334.74	48.559	3.064
7	1458.18	14.286	10.056	1489.05	1409.96	57.125	8.246
8	1627.92	22.272	0.143	1629.85	1562.34	40.587	0.054
9	1732.08	10.885	12.9	1849.73	1664.57	133.459	20.428
10	2333.87	26.438	0.068	2339.65	2096.62	134.675	0.01
11	2681.05	23.777	0.14	2692.63	2395.59	176.815	0.378
12	2854.65	4.173	5.949	2875.86	2750.49	107.329	6.792
13	2922.16	1.602	7.975	3097.68	2877.79	237.558	35.766
14	3396.64	12.485	0.084	3400.5	3107.32	242.372	1.022
15	3406.29	12.493	0.165	3668.61	3402.43	212.533	8.417

FTIR Spectroscopic analysis of chloroform extract of Scoparia dulcis



No.	Peak	Intensity	Corr. Int	Base (H)	Base (L)	Area	Corr. Are
1	1274.95	65.653	4.119	1300.02	1188.15	18.108	1.307
2	2333.87	34.994	0.917	2339.65	2002.11	97.062	0.07
3	2362.8	30.965	9.714	2393.66	2341.58	22.526	2.469
4	2856.58	32.12	1.52	2873.94	2395.59	182.616	0.355
5	2926.01	27.855	5.111	2993.52	2875.86	60.19	3.457
6	3012.81	32.475	0.216	3028.24	2995.45	15.972	0.055
7	3400.5	19.967	0.068	3402.43	3030.17	218.18	0.207
8	3425.58	19.731	0.058	3429.43	3402.43	18.978	0.028
9	3441.01	19.689	0.121	3464.15	3431.36	23.096	0.068
10	3745.76	23.72	0.806	3751.55	3726.47	15.502	0.225

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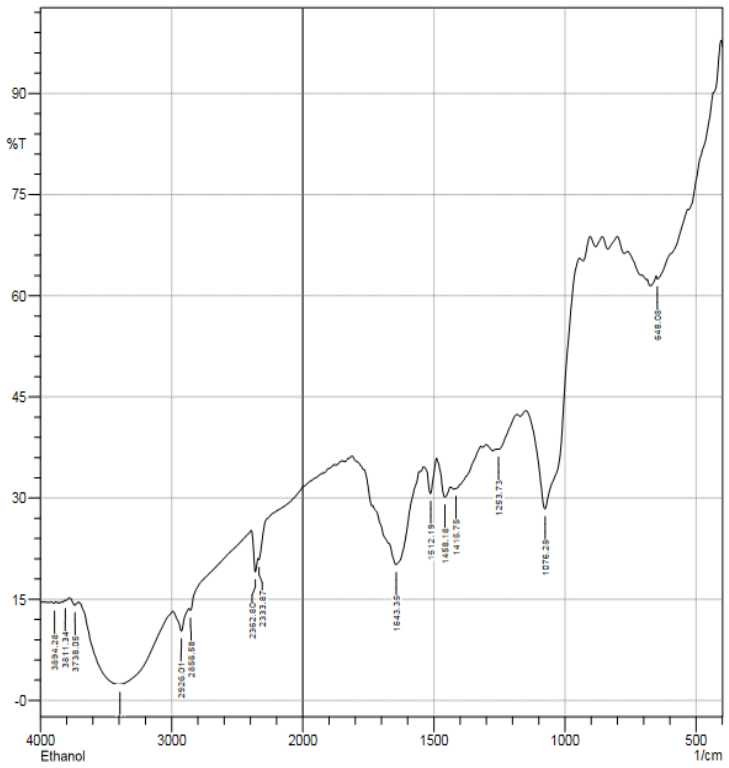
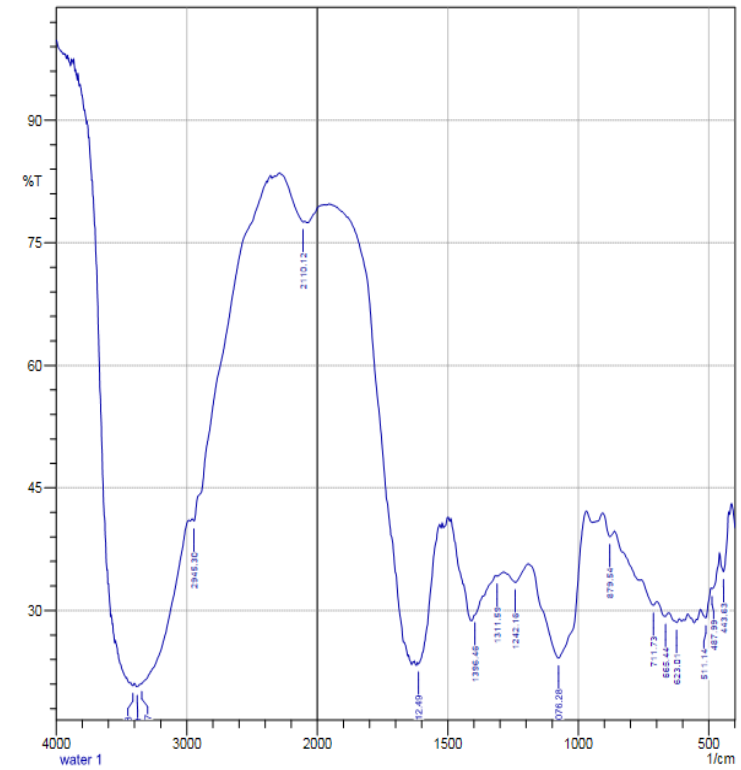
FTIR Visible spectroscopic analysis of ethanol extract of Scoparia dulcis



No.	Peak	Intensity	Corr. Int	Base (H)	Base (L)	Area	Corr. Are
1	648.08	62.493	0.786	651.94	532.35	20.952	0.756
2	1076.28	28.415	22.527	1147.65	945.12	79.281	23.802
3	1253.73	37.235	0.405	1259.52	1184.29	30.279	0.228
4	1415.75	31.384	0.128	1417.68	1323.17	44.286	0.523
5	1458.18	30.151	3.302	1489.05	1435.04	26.718	1.147
6	1512.19	30.699	4.651	1539.2	1490.97	23.121	1.31
7	1643.35	20.143	5.711	1670.35	1558.48	67.856	6.321
8	2333.87	20.865	0.36	2339.65	1926.89	223.299	0.048
9	2362.8	19.059	3.696	2393.66	2341.58	34.895	1.648
10	2856.58	13.353	0.561	2868.15	2395.59	330.05	0.218
11	2926.01	10.275	3.161	2991.59	2870.08	111.605	5.619
12	3394.72	2.364	11.509	3693.68	2993.52	882.939	280.137
13	3738.05	14.15	0.604	3766.98	3718.76	40.563	0.549
14	3811.34	14.784	0.097	3817.13	3784.34	27.068	0.079
15	3894.28	14.394	0.254	3915.5	3886.56	24.263	0.128

FTIR Spectroscopic analysis of water extract of Scoparia dulcis



No.	Peak	Intensity	Corr. Int	Base (H)	Base (L)	Area	Corr. Are
1	443.63	34.74	4.2538	457.13	424.34	14.2509	1.0331
2	487.99	32.6513	0.3603	489.92	459.06	14.417	0.3375
3	511.14	29.099	2.3547	530.42	491.85	20.0347	0.6772
4	623.01	28.5411	0.6353	650.01	613.36	19.768	0.2403
5	665.44	29.2744	0.6609	700.16	657.73	22.206	0.2364
6	711.73	30.6432	0.8953	756.1	702.09	26.9234	0.4353
7	879.54	39.0318	1.5538	906.54	862.18	17.6577	0.3728
8	1076.28	24.1915	14.8663	1190.08	970.19	115.6728	25.3559
9	1242.16	33.4759	1.6957	1286.52	1192.01	43.8188	0.9733
10	1311.59	34.2201	0.1431	1319.31	1288.45	14.3038	0.0347
11	1396.46	29.4513	0.1171	1398.39	1319.31	39.1535	0.0282
12	1612.49	23.4336	1.0262	1616.35	1533.41	42.9885	1.2511
13	2110.12	77.5647	0.2365	2274.07	2104.34	16.1956	0.2143
14	2945.3	40.9433	1.2522	2958.8	2389.8	114.0489	0.2559
15	3344.57	21.06	0.1308	3346.5	2983.88	199.5554	7.4721
16	3379.29	20.5666	0.4584	3400.5	3363.86	25.007	0.1932
17	3412.08	20.8119	0.3143	3427.51	3402.43	17.0372	0.109

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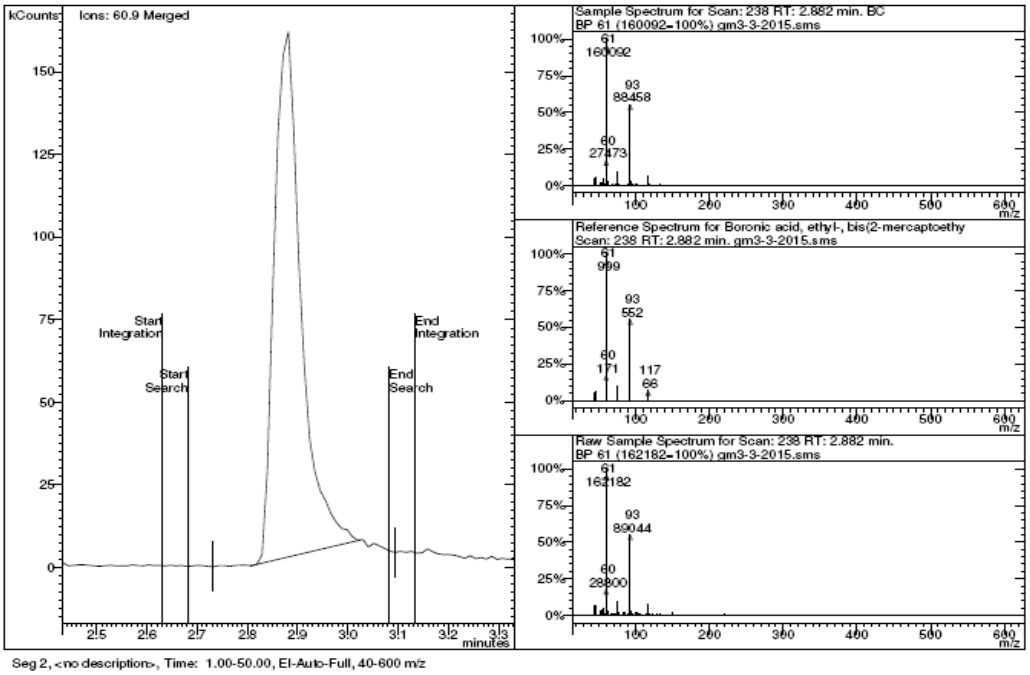
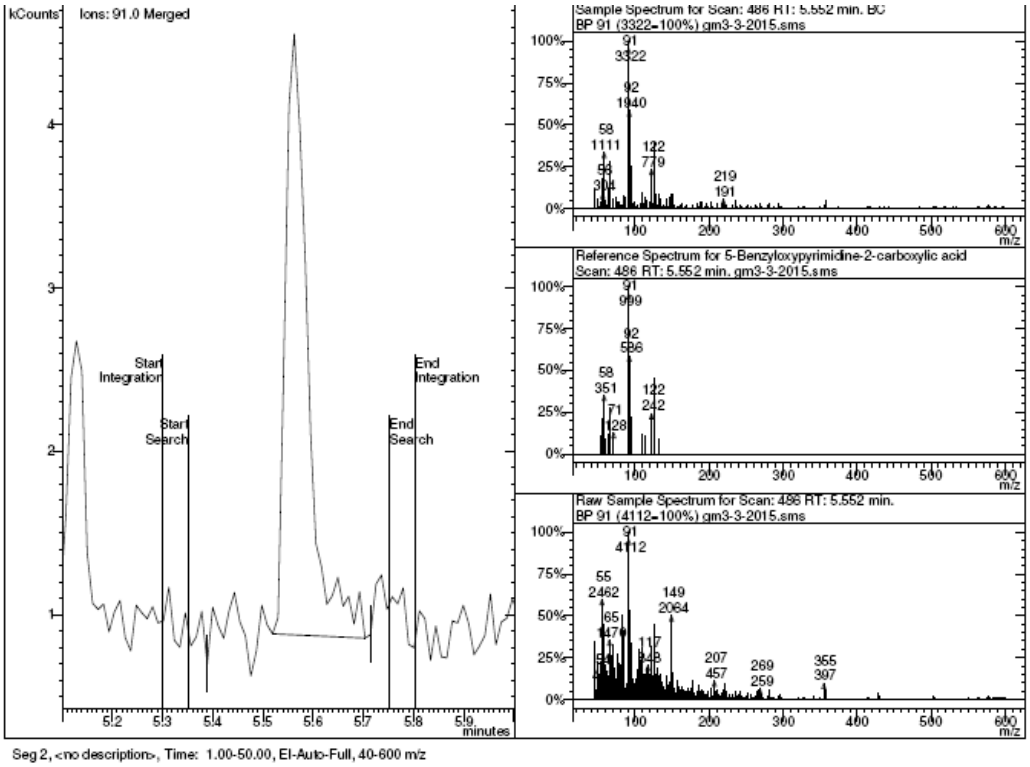
GC-MS analysis of chloroform extract of stems and leaves of Scoparia dulcis
Component no.1 (boronic acid, ethyl-bis (2-mer- capto ethyl ester)



Seg 2, <no description>, Time: 1.00-50.00, EI-Auto-Full, 40-600 m/z

Component No.2 (5-Benzyloxypyrimidine-2- carboxylic acid)



Seg 2, <no description>, Time: 1.00-50.00, EI-Auto-Full, 40-600 m/z

DISCUSSION

Scoparia dulcis is a medicinal plant, rich in secondary metabolites and has numerous uses in traditional medicine to treat several ailments. The quantitative pharmacognostic analysis showed that the percentage of moisture content , total ash, acid insoluble ash, water soluble ash were 80.2%, 7.2%, 10.8%, and 51.53% respectively. The extractive values of petroleum ether, chloroform, ethanol and water cold extracts of Scoparia dulcis are 4.2%, 10.4%, 20.4% and 27.96% respectively. These results showed that Scoparia dulcis was more soluble in water than other extract. The extract of stems and leaves of Scoparia dulcis in petroleum ether, chloroform, ethanol of and

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water were prepared successively by soxhlet distillation method. The four extract were involved in preliminary phytochemical analysis. Steroid, reducing sugar, carbohydrate, phenolic compounds, saponins and flavanoids were reported in these four extracts. Petroleum ether extracts reported steroid, carbohydrate and saponins. Chloroform extracts reported reducing sugar, alkaloids and tannins. Ethanol extract reported reducing sugar, carbohydrate, phenolic compounds etc. Water extract reported carbohydrates, reducing sugar, terpenoids, saponins etc. These organic compounds presented in these extracts were the cause of antibacterial activity of Scoparia dulcis. Isolation and separation of Scoparia dulcis extracts were determined by thin layer chromatography. The Rf values were found out by using suitable solvent system, the values indicate many components are present in this plant extract.

Petroleum ether, chloroform, ethanol and water extract were scanned in UV-visible spectroscopy. Petroleum ether extract of stems and leaves of Scoparia dulcis showed a peak having a maximum absorption of 666 nm corresponded to the wavelength of methylene blue. The chloroform extract and ethanol extract of stems and leaves of Scoparia dulcis showed a peak having a maximum absorption of 650 nm corresponded to the wave length of Brilliant blue. Brilliant blue absorbs yellow light in the range 560 to 650 nm and so blue is seen by the human eye. The aqueous extract of steams and leaves of Scoparia dulcis showed a peak having a maximum absorption of 347nm corresponding to CH3N=NCH3 with $n-\pi*$ transition. FTIR scan results of extract of stems and leaves of Scoparia dulcis reported wavelength of some functional groups such as acids, alcohols, amines, nitro groups, alkyl halides, cyano group. The compounds present in the chloroform extract of stems and leaves of Scoparia dulcis were identified by GC-MS analysis. Around 50 compounds were analyzed from the extract. Among these the retention time (RT), molecular formula, molecular weight (MW) and percentage composition of 10 components were studied. The main components analyzed are Boronic acid, ethyl-bis (2-mer- capto ethyl ester), 5-Benzyloxypyrimidine-2- carboxylic acid, Benzofuran, 2,3-dihydro, Ethanone, 1-(2-hydroxy-5-methyl phenyl)-, Benzene ethanol, 4-hydroxy, Phenol, 2,4-bis (1,1-dimethyl ethyl)-, 4-n-Hexylthiane, S,S-dioxide, 6-Methoxy-2-benzoxazoline, 3,7,11,15-Tetramethyl-2-hexadecen-1-ol,22-Tricosenoic acid. All these compounds are found to be having some medicinal applications. Petroleum ether, chloroform, ethanol and aqueous extract of stems and leaves of Scoparia dulcis shows antibacterial activity against pathogens.. The Chloroform and, ethanol had pathogen resisting zone of 10 mm and 9 mm respectively against Staphylococcus .The ethanol and aqueous extract had pathogen resisting zone of 8 mm each against Klebsiela pneumonia. Among all the extracts chloroform and ethanol shows maximum resistance against Staphylococcus while ethanol and aqueous showed resistance against Klebsiela pneumonia. The extract of the plant showed great potential to dissolve the calcium oxalate crystals .The percentage of dissolution of crystals in different extracts are calculated. It was found that water extract of the plant showed great potential to dissolve the existing stone crystals.

CONCLUSION

From the present investigation we can conclude that studies with new active principles obtained from the whole plant of *Scoparia dulcis* can result in novel and effective pattern of treatment. The phytochemical analysis showed that the extracts of stems and leaves of *Scoparia dulcis* in different solvents contained same organic components such as steroids, reducing sugar, carbohydrates, phenol compounds and saponins which are responsible for the antibacterial activity. Antibacterial analysis of petroleum ether, chloroform, ethanol and aqueous extracts of stems and leaves of *Scoparia dulcis* had variations in pathogen resisting activity against *Staphylococcus* and *Klebsiela pneumonia*. UV visible spectroscopic analysis of extracts of *Scoparia dulcis* reported four chromatogram figures which showed prominent peaks, corresponded to organic compounds containing methylene blue and brilliant blue. FTIR Spectroscopic analysis reported wavelengths of some functional groups such as acid, alcohol, amines, nitro groups, ketones etc. Almost 50 components were obtained through GCMS analysis, among these 10 main compounds are analyzed and studied. All these compounds obtained here are having much medicinal application. The exciting fact came out of the study is that the water extract of plant showed great potential to dissolve the calcium oxalate crystals. Thus *Scoparia dulcis* shows "invitro antilithiatic activity".

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