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Research article phytochemical screening and antimicrobial activities of *Sphagneticola calendulacea* L. flower extracts

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Abstract

This study was designed based on phytochemical screening of aqueous, methanolic, chloroform and benzene extracts of antimicrobial activity of *Sphagneticola calendulacea* L. flower against clinical microbes. Preliminary phytochemical screening of the crude extracts revealed the presence of alkaloids, saponins, flavonoids, glycosides, steroids, tannins, terpenoids, phlobatannins and triterpenoids and quantitative analyses were also studied. These extracts were studied the antimicrobial activity by well diffusion method.

Keywords: *Sphagneticola calendulacea*, phytochemical screening, flower extracts, antimicrobial activity

Introduction

In recent years, an increasing awareness focused about the importance of medicinal plant. Drugs from these plants are easily available inexpensive, safe, efficient, and rarely accompanied by side effects [1]. Plants which have been selected for medicinally effective drugs such as antibacterial active pharmacological agents or as precursors for *Chemico pharmaceutical hemi synthesis*. There is also increase in the use of medicinal plants [2].

Sphagneticola calendulacea is a flowering plant species produces wedelolactone and Chinese perennial plant, is a tender spreading herbaceous and hairy herb, with the branches usually less than 50cm long, the leaves are used in curing grey hair and in promoting the growth of hair [3-5]. They are considered as tonic, alternative and useful in coughs, lephalalgia, skin disease and alopecia [6-8]. The juice of the leaves is much used as a shaft in lephalalgia [5]. A devotion of the fresh plant is also used for patching babies to prevent lichen tropices skin infections [9-10]. The fresh juice from the leaves of *S. calendulacea* is used by Ayurvedic, physicians in India to treat skin problems, infection inflammation fungus, abscesses [11].

Materials and Methods

Collection of plant materials

The fresh and healthy flowers of the plant *S. calendulacea* L. were collected from Herbal Garden, A.V.V.M. Sri pushpam college (Autonomous) poondi, Thanjavur, Tamil Nadu. During the month of December 2017 and authenticated by Principal Scientific Officer Dr.S. John Britto, St. Joseph's college, Trichirappalli, Tamil Nadu, India.

Preparation of plant extracts (Soxhelt method)

One gram of powder flowers blended with 50 mL of different solvents separately (aqueous, methanol, chloroform and benzene) for different periods with agitation at room temperature. After the extracts were allowed to filtration by using a 0.45 Millipore filter paper. The filtrate was concentrated using a rotary evaporator at 40 °C under reduced pressure. Finally the extracts were allowed to weigh and stored at -20 °C till their usage in the different tests. The qualitative and quantitative analysis of alkaloids, flavonoids, carbohydrate, saponin, tannain, terpenoids, steroids, triterpenoids, protein, phenol and glycosides followed by Harbone (1973) [12] method.

Antimicrobial activity (Agar well-diffusion method)

Agar well – diffusion method [13] was followed for determination of antimicrobial activity. Nutrient agar (NA) and Potato Dextrose Agar (PDA) plates were swabbed (sterile cotton swabs) with 24 hours culture and 48 hours old broth culture of respective bacteria and fungi were determined agar wells (5mm diameter) were made in each of these plates using sterile cork borer.

About different solvent flower extracts of *S. calendulacea* added using sterilized dropping pipettes into the wells and plates were left for 1 hour to allow a period of pre incubation diffusion in order to minimize the effects of variation in time between the applications of different solutions of the plates were incubated in an upright position at 37 ± 2 °C for 24 hrs for bacterial and 28 ± 2 °C for fungi. The organic solvents (aqueous and methanol) were acted as a negative control results were recorded, as the presence or absence of inhibition zone. The inhibitory zone around the well indicated absence of tested organism and it was reported as positive and absence of zone is negative. The diameters of the zones measured using diameter measurement scale. Triplicates were maintained and the average values were recorded for antimicrobial activity.

Results and Discussion

In the present investigation suggested that the qualitative and quantitative analysis of aqueous and methanolic extracts of *S. calendulacea* resulted the phytochemicals of alkaloids, saponins, flavonoids, glycosides, steroids, tannins, terpenoids, phlobatannins and triterpenoids. Were analysed (Table-1). The quantitative analyses of aqueous and methanolic extracts of *S. calendulacea* were resulted in table.2. The methanolic extract showed highest phytochemical content compared with aqueous extract.

The antibacterial activity of aqueous extract of *S. calendulacea* were resulted the highest zone inhibition of 23.3 ± 7.76 at 100 μ L for *P. aeruginosa*. The methanolic extract showed 27.06 ± 9.22 at 100 μ L for *P. aeruginosa* and antifungal activity of aqueous extract of *A. flavus* were result the highest zone inhibition of 16.03 ± 5.43 at 100 μ L and methanolic extract showed 18.0 ± 6.00 at 100 μ L for *F. spp.* The chloroform extract maximum activity showed 26.3 ± 8.76 at 100 μ L for *S. aureus* and benzene extract better activity showed the 26.0 ± 8.66 at 100 μ L for *S. aureus* respectively.

Table 1: Qualitative phytochemical analysis of *S. calendulacea* flower extract

S. No	Name of the compounds	Aqueous	Methanol
1	Alkaloid	+	+
2	Saponin	+	+
3	Flavonoids	+	++
4	Tannin	+	++
5	Terpenoids	+	+
6	Steroids	++	++
7	Triterpenoids	+	+
8	Anthroquinone	-	-
9	Phlobatannins	+	+
10	Glycosides	+	+

(++) strongly present, (+) present, (--) absent

Table 2: Quantitative phytochemical analysis of *S. calendulacea* flower extracts

Name of the compounds	Quantity (mg/g)	
	Aqueous	Methanol
Alkaloids	0.27 ± 0.05	0.29 ± 0.12
Flavonoids	0.22 ± 0.09	0.32 ± 0.16
Phenol	0.30 ± 0.11	0.35 ± 0.08
Protein	0.56 ± 0.12	0.63 ± 0.04
Steroids	0.46 ± 0.16	0.58 ± 0.04
Saponin	0.61 ± 0.08	0.72 ± 0.15
Tannin	0.77 ± 0.17	0.81 ± 0.11
Terpenoids	0.69 ± 0.09	0.76 ± 0.09
Triterpenoids	0.38 ± 0.12	0.46 ± 0.11

Standard deviation \pm error

Table 3: Antibacterial activity of *S. calendulata* in flower extract

Name of the bacteria	Zone of inhibition			
	Aqueous	Methanol	Chloroform	Benzene
<i>E. coli</i>	21.6 ± 7.22	24.6 ± 8.22	14.6 ± 4.86	17.3 ± 5.76
<i>Pseudomonas aeruginosa</i>	23.3 ± 7.76	27.6 ± 9.22	19.3 ± 6.43	21.3 ± 7.00
<i>Enterococcus aeromonas</i>	22.6 ± 7.53	21.3 ± 7.11	20.3 ± 6.76	19.6 ± 6.53
<i>Bacillus sp</i>	19.0 ± 6.33	21.0 ± 7.00	15.0 ± 5.00	18.3 ± 6.10
<i>S. aureus</i>	22.0 ± 7.33	24.6 ± 8.20	26.3 ± 8.76	26.0 ± 8.66

Standard deviation \pm error

Table 4: Antifungal activity of *S. calendulata* in flower extract

Name of the fungi	Zone of inhibition			
	Aqueous	Methanol	Chloroform	Benzene
<i>Aspergillus flavus</i>	16.3 ± 5.43	14.3 ± 4.76	7.00 ± 2.33	9.66 ± 3.22
<i>A. niger</i>	11.3 ± 3.76	13.3 ± 4.43	8.66 ± 2.86	10.3 ± 3.43
<i>A. terreus</i>	11.6 ± 3.86	12.0 ± 4.00	12.0 ± 4.00	8.33 ± 2.76
<i>Fusarium sp</i>	14.0 ± 4.66	18.0 ± 6.00	15.0 ± 5.00	15.6 ± 5.20
<i>Penicillium sp</i>	15.0 ± 5.00	12.0 ± 4.00	9.66 ± 3.20	9.33 ± 3.10

Standard deviation \pm error

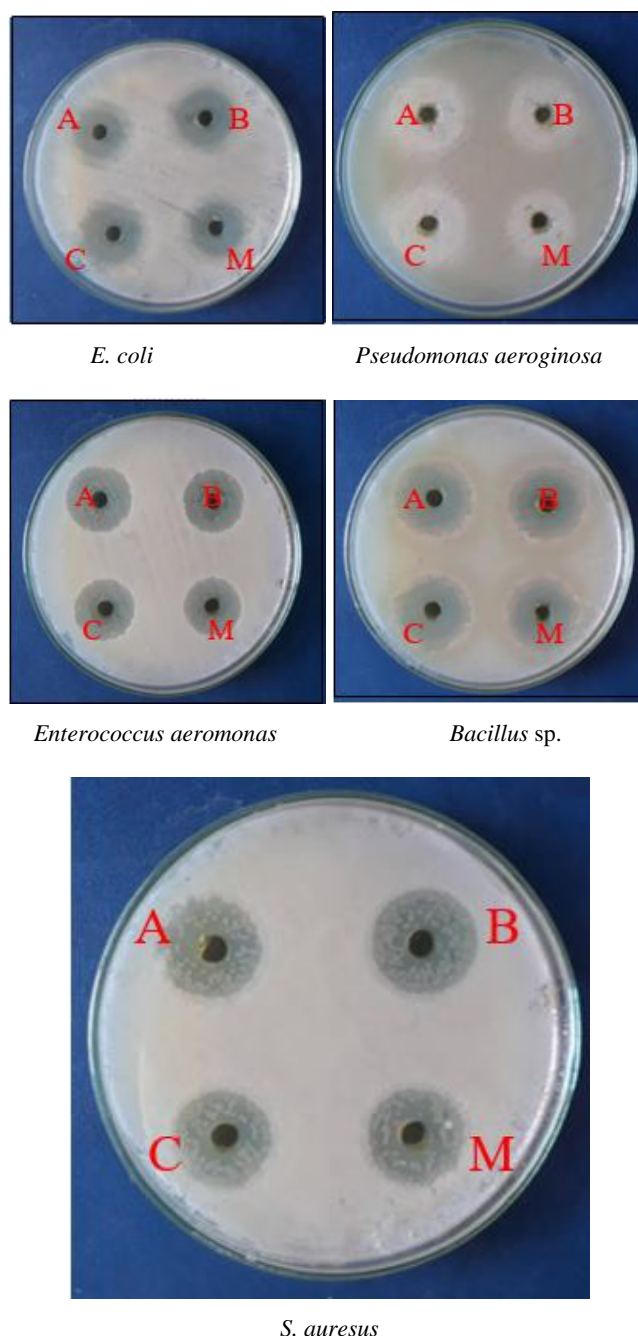


Fig 1: Antibacterial activity of *S. calendulacea* flower extracts

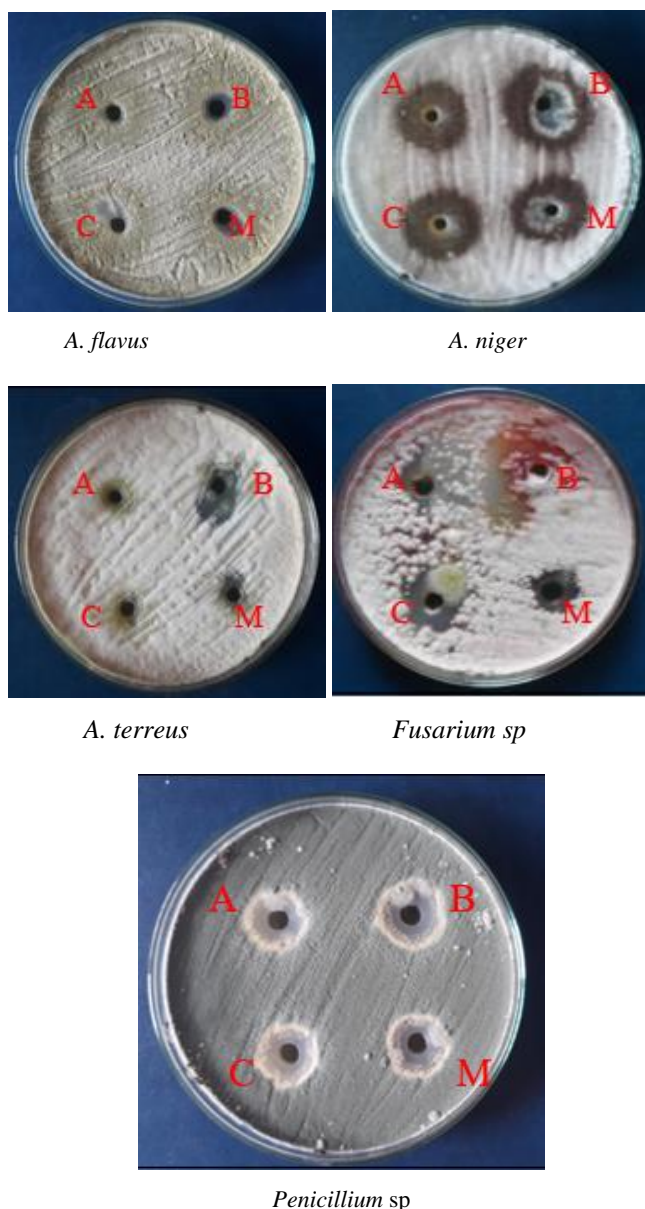


Fig 2: Antifungal activity of *S. calandulaceae* flower extracts

Conclusion

Phytochemical investigation of *S. calandulata* showed the presence of alkaloids, flavonoids, carbohydrate, saponins, tannin, terpenoids, steroids, triterpenoids, protein, phenol and glycosides. The quantitative analyses of methanolic extract showed highest phytochemical content. These phytochemicals were exhibited the various biological activities. The antimicrobial activity of aqueous, methanolic, chloroform and benzene extracts showed better antimicrobial activities. Thus the present investigation revealed the *S. calandulata* is phytochemically persuasive one.

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