INTRODUCTION

The pathogenic bacteria and fungal infection is a cosmopolitan problem and the situation is more critical especially in the third world countries where in most cases lack of adequate sanitation and primary health care programs make it difficult and expensive to combat diseases. A number of higher plants have been used for centuries as remedies for human diseases. Currently studies pertaining to the use of botanicals in management of pathogens and related diseases are highly focused (Koche, 2013; Toppo, 2013; Mathad, 2013; Mathad, 2013; Mahapatra, 2013; Bish, 2013). This has encouraged scientists to screen higher plants for antimicrobial properties are of great significance in therapeutic treatments viz. Parthenium hysterophorus (Asteraceae) possess luteolin (Zhou et al., 2011c), parthenolide and parthenin (Zhou et al., 2011d) and Chrysanthemum indicum (Asteraceae) contains terpenoid, flavonoids, oxygenated terpenes, sesquiterpenes and the antimicrobial activity of such compounds have been established by Sassi. et al. (2008). The review of literature revealed that considerable contributions have been made on medicinal plants by many workers (Dadsena et al., 2013; Dandapat et al., 2013; Kullu et al., 2013; Kumar et al., 2013; Kumar et al., 2013a; Mahato et al., 2013; Tabassum et al., 2013; Toppo et al., 2013; Sahu et al., 2013).

Sphagnetica trilobata (L.) Pruski. (Previously accepted name, Wedelia trilobata L.) is a member of Asteraceae, (Meena, et
al., 2011), its common name is “Wedelia” or trailing daisy. It is a creeping, perennial herb, stem rooting at the nodes, leaves shortly petiolate, opposite-decussate, ovate, lobed, irregularly toothed, capitulo heterogamous, receptacle convex, ray florates are golden yellow in colour (Hossain and Hossan, 2005). Sphagnetocila trifolata is native to the tropics of Central America and has naturalized in many wet tropical areas of the world, West Indies, Hawaii, South Florida, India, and Bangladesh (Hossain and Hossan, 2005). It has been historically used as traditional folk medicinal plant for the treatment of various ailments, (Li et al., 2012). Coe et al (1996) have reported that fruits, leaves and stem are used in childbirth and in the treatment of bites and stings, fever and infection. Leaves are used in the treatment of kidney dysfunction, cold, wounds and amenorrhoea and dysmenorrhoea (Tsai et al., 2009; Govindappa et al., 2011; Meena et al., 2011). It was reported that numerous potential bioactive molecules such as sesquiterpenes, diterpenes, (Kaurenoic acid), triterpenes lactones, luteolin and volatile oil, with antioxidant, anti-inflammatory, antimicrobial, hepto-protective activity, insecticidal, larvicidal and tripanocidal activity, anticancer, anti-tumoural activity have been isolated from various parts of the plant (Taddei and Rosas-Romerio,1999; Zhang, et al., 2004; Huang, 2006; Zhang, 2008; Maldini et al., 2009; Wu and ). The antimicrobial activity of Sphagnetocila trifolata was reported by many earlier workers, Taddei and Rosas Romero (1999), Utrakoon. et al. (2009), Govindappa et al. (2011) and Chethan et al. (2012). The test organism Pseudomonas aeruginosa is a Gram-negative, aerobic, bacillus, non-spore forming bacterium, widespread in nature, inhabiting soil, water, plants and animals (including humans) (Palleroni, 2008). It is a frequent cause of nosocomial infections such as pneumonia, urinary tract infections (UTIs) (Bitsori, 2012) and bacteremia. It was the third and fifth most common cause of hospital-acquired urinary tract infections in the USA and Europe, respectively (Anonymous, 1996; Bouza et al., 2002). Mycobacterium tuberculosis, a small, highly aerobic, nonmotile bacillus, a causative agent of tuberculosis (Kassim and Ray, 2004), typically attacks lungs. One third of the world’s population is thought to have been infected with M. tuberculosis with new infections occurring at a rate of about one per second (WHO, 2010). Salmonella typhi is a Gram-negative, rod-shaped, non-spore-forming, predominantly motile with peritrichous flagella. It is the only one that is pathogenic exclusively for humans, in whom it causes typhoid or enteric fever. It is estimated that more than 33 million cases of typhoid fever occur annually causing more than 500,000 deaths (Khan et al., 2008). It remains a serious problem in India (Kumar et al., 2001; Saha et al., 2002). Staphylococcus aureus is a Gram-positive, coccal, non-motile, non-spore forming facultative anaerobes bacterium. It is often found as a commensal associated with skin, skin glands, and mucous membranes, particularly in the nose of healthy individuals (Crossley and Archer, 1997). S. aureus is one of the main causes of hospital and community-acquired infections (nosocomial) which can result in serious consequences (Diekema et al., 2001). Microsporum canis is a zoophilic dermatophyte which is basically animal pathogens, Cats and Dogs are the main sources of infection. It is a common agent of ringworm in animals but is also frequently associated with human infection (English, 1972). This species invades hair, skin and rarely nails. Both macro and micro conidia are produced. Trichophyton rubrum is an anthropophilic fungus, which infection is restricted to man only, mainly associated with community life. It is a dermatophyte becoming more prevalent among urban populations, due mainly to the “modern” way of life such as the wearing of occlusive shoes, which maintain heat and humidity (Philpot, 1977). It frequently causes chronic infections of skin, hair and nails, especially in toe webs, soles and palms. This genus produces smooth walled macroconidia and microconidia. E. floccosum is another anthropophilic dermatophyte. Its infection usually occur on the skin and nails. It is not known to invade hair. E. floccosum is transmitted between individuals by contact, particularly in community swimming pool areas, common showers and gym facilities. This genus is a common cause of tinea pedis and tinea cruris (eczema marginatum of Hebrae) affecting inguinal areas, particularly in males, although some infections do occur in females (Howard et al., 1983). It does not produce microconidia. Aspergillus candidus is a pathogenic fungus. It is characterized by white, typically globose conidial head; A. candidus represents a potential respiratory hazard for grain workers (Traczyk and Dutchkiewicz, 2000). It has been claimed to be involved in a wide range of human infections including invasive aspergillosis (Ribeiro et al., 2005), aspergilloma, otomyositis (Yasin et al., 1978), brain granuloma and onychomycosis (Cernene and Eastman, 1975; Piraccini, 2002). The pathogenic feature of considered bacteria viz. Pseudomonas aeruginosa, Salmonella typhi, Staphylococcus aureus and Mycobacterium tuberculosis and fungus viz. Microsporum canis, Trichophyton rubrum, E. floccosum and Aspergillus candidus is of very high intensity not only for human but also for cattle. A large number of human populations are suffering from pathogenicity of these microbes. The scientific community is struggling with these microbes since very long period but even today above bacteria and fungi are a serious challenge for us. Many antibiotics have been discovered against such pathogens but unfortunately after sometimes all develop resistancy against antibiotics. Another aspect is toxicity of antibiotics with lot of side effect. So this is the need of the hour to search suitable molecule from natural resource to combat with above mentioned pathogen and that too without toxicity and minimum side effect. Thus present work has been undertaken with the objective to ascertain the antibacterial and antifungal activity of extracts obtained from different parts of Sphagnetocila trifolata and constantly screened for their possible pharmacological value.

**MATERIALS AND METHODS**

**Collection and identification of plants**

The plant Sphagnetocila trifolata was collected from Durg District (20°23′23″N and 22°02′23″N) and (80°48′43″E and 81°57′23″E) occupies geographical area of 8537 km². The area which was selected for the collection of the plant materials for the present study was 50 km². Around the district headquarter. The identification and authentication of the plants was carried out
The bacteria seeded plates containing extract Agar (Himedia, India) for fungus rubrum Dextrose Agar (Himedia, India) for Staphylococcus aureus (MTCC-7443). Microorganism used India) for about 48h. The solutions were used further in the determination of their clinical importance.

Preparation of plant extract

The root, stem, leaves and flowers of Sphagnticola trilobata was washed thoroughly three times with running tap water and once with distilled water and then shade dried for seven days, coarsely powdered and used for extraction. The powdered plant material was extracted with solvents methanol and distilled water. The ratio of the plant material and solvent were 1:10 and it was subjected to Soxhlet extraction unit (MSW, India). The impregnated disks were then placed on to the surface of a suitable solid agar medium like Nutrient Agar (Himedia, India) for Salmonella typhi, Bacillus subtilis, Mycobacterium smegmatis, S. aureus, P. aeruginosa, S. epidermidis, E.coli, Proteus vulgaris, P. aeruginosa, Salmonella paratyphi and Shigella sonnei. The aqueous extract was inactive against the tested bacteria (Taddi et al., 1999).

Preparation of plant extract

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Microorganism used

The human pathogenic bacteria used for this study were Staphylococcus aureus (MTCC-7443), Salmonella typhi (MTCC-733), Pseudomonas aeruginosa (MTCC-7296), Mycobacterium tuberculosis (MTCC-300) and four human pathogenic fungi considered for the study were Microsporum canis (MTCC-2820), Epidermophyton floccossum (MTCC-613), Trichophyton rubrum (MTCC-296) and Aspergillus candidus (MTCC-1989), obtained from Microbial Type culture collection and Gene Bank of IMTECH Chandigarh, India. All these pathogenic organisms were selected for the study on the basis of their clinical importance.

Antimicrobial activity

The antimicrobial activity was evaluated by agar disk diffusion method accepted by NCCLS which is a modification described by Bauer et al., 1966. The disk of 6.00mm of Whatman filter paper no. 1 was saturated with plant extracts and allowed to dry. The impregnated disks were then placed on to the surface of a suitable solid agar medium like Nutrient Agar (Himedia, India) for Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella typhi and Lowenstein Jensen Medium (Himedia, India) for Mycobacterium tuberculosis, Potato Dextrose Agar (Himedia, India) for Microsporum canis, Sabouraud Dextrose Agar (Himedia, India) for Trichophyton rubrum and Epidermophyton floccossum, Czapak Yeast extract Agar (Himedia, India) for fungus Aspergillus candidus. The bacteria seeded plates containing Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella typhi were incubated for 24h at 37°C and plates containing Mycobacterium tuberculosis was incubated for three weeks at 37°C. Fungal seeded plates were incubated for 72h at 25°C, except Trichophyton rubrum which is incubated at 30°C for 72h in the incubator (Coslab, India). The microbial growth was determined by measuring the diameter of zone of inhibition in millimetre (Das et al., 2010).

**Table 1: Showing zone of inhibition (in mm) by Sphagnticola trilobata against four Bacteria at 400µL conc. in two solvents**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Name of organism</th>
<th>Sphagnetica trilobata</th>
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<tr>
<td></td>
<td></td>
<td>Stem</td>
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<tr>
<td>1</td>
<td>Staphylococcus aureus</td>
<td>8.66 ± 0.43</td>
<td>-</td>
<td>9.19 ± 0.34</td>
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<td>8.99 ± 0.46</td>
<td>-</td>
<td>23.79 ± 0.27</td>
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<tr>
<td>2</td>
<td>Salmonella typhi</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>16.92 ± 0.58</td>
<td>-</td>
<td>19.66 ± 0.94</td>
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<tr>
<td>3</td>
<td>Pseudomonas aeruginosa</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>12.93 ± 0.28</td>
<td>-</td>
<td>23.60 ± 0.92</td>
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<td>4</td>
<td>Mycobacterium tuberculosis</td>
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**Table 2: Showing zone of inhibition (in mm) by Sphagnticola trilobata against four fungal organisms at 400µL conc. in two solvents**

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Name of organism</th>
<th>Sphagnetica trilobata</th>
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<td>Stem</td>
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<tr>
<td>1</td>
<td>Microsporum canis</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13.73 ± 0.49</td>
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<tr>
<td>2</td>
<td>Epidermophyton floccossum</td>
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<td>-</td>
<td>17.73 ± 0.46</td>
<td>15.66 ± 0.63</td>
<td>16.19 ± 0.33</td>
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<tr>
<td>3</td>
<td>Trichophyton rubrum</td>
<td>-</td>
<td>-</td>
<td>17.33 ± 0.34</td>
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<tr>
<td>4</td>
<td>Aspergillus flavus</td>
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**RESULTS AND DISCUSSION**

The antibacterial activity of Sphagnticola trilobata was found significant against three bacteria, Pseudomonas aeruginosa, Staphylococcus aureus and Salmonella typhi. The methanolic extract of leaf showed 8.99±0.46mm, 16.92±0.58mm, 12.93±0.28mm and flower extract of methanol showed 23.79±0.27mm, 19.66±0.94mm and 23.60±0.92mm zone of inhibition against Staphylococcus aureus, Salmonella typhi and Pseudomonas aeruginosa respectively. The methanol extract of stem and root showed zone of inhibition 8.66±0.43mm and 19.19±0.34mm against Staphylococcus aureus only. All extracts were not effective against Mycobacterium tuberculosis. Aqueous extract of all parts of the plant were not effective against all tested bacteria (Table 1, Fig. 1).

In our study, the antifungal activity of Sphagnticola trilobata was found significant against three fungal organisms Microsporum canis, Trichophyton rubrum and Epidermophyton floccossum in leaf and the root extract. The methanolic extract of leaf and root and aqueous extract of leaf showed 17.73±0.46mm, 16.19±0.33mm and 15.66±0.63mm zone of inhibition against Epidermophyton floccossum. The methanolic extract of leaf showed 17.33±0.34mm zone of inhibition against Trichophyton rubrum and aqueous extract of leaf, showed 13.73±0.49 mm zone of inhibition against Microsporum canis, all extracts were not effective against Aspergillus candidus. (Table 2, Fig. 2).

Some previous literature related to antibacterial activity of n-hexane extract of Sphagnticola trilobata are available against Bacillus subtilis, Mycobacterium smegmatis, S. aureus, S.epidermidis, E.coli, Proteus vulgaris, P. aeruginosa, Salmonella paratyphi and Shigella sonnei. The aqueous extract was inactive against the tested bacteria (Taddi et al., 1999).
The antibacterial activity of ethanol extract of leaf and stem of Sphagneticola trilobata against E. coli, S. typhi, P. aeruginosa, S. aureus and K. pneumoniae, Xanthomonas oryzae and X. ananopodis was reported by Govindappa et al. (2011), but we found antibacterial property of methanolic extract of leaf of Sphagneticola trilobata against Staphylococcus aureus, Salmonella typhi and Pseudomonas aeruginosa and methanolic extracts of stem and root of Sphagneticola trilobata against Staphylococcus aureus only. Methanolic extract of flower of Sphagneticola trilobata was reported against Staphylococcus aureus only by Chethan et al. (2012), but we found effect against Salmonella typhi and Pseudomonas aeruginosa also. In the case of fungi, Govindappa, et al. (2011) reported the methanolic extract of leaf, stem and flower of Sphagneticola trilobata exhibited less activity on the species of Fusarium and Aspergillus, but in this study, first time we are reporting significant antifungal property of Sphagneticola trilobata against Epidermophyton floccossum in methanolic and aqueous extract of leaf and in methanolic extract of root. Both the leaf and root part were found effective against Epidermophyton floccossum. The plant was also found effective against Trichophyton rubrum in methanolic extract of leaf and Microsporum canis in aqueous extract of leaf. All are the dermatophytes. Findings of Taddei and Rosas Romero (1999) have not showed any biological activity of Sphagneticola trilobata against Trichophyton rubrum in n-hexane extract but in our study we reported the significant antifungal activity against Trichophyton rubrum in methanolic extract of leaf. Utrakoon et al. (2009) reported the efficacy of essential oil extracted of Sphangenticala trilobata leaves on the growth of Aspergillus flavus but we found antifungal activity in aqueous and methanolic extract of leaf against Epidermophyton floccossum, in aqueous extract of leaf against Microsporum canis, in methanolic extract of leaf against Trichophyton rubrum. On the basis of our significant findings we conclude that there is an urgent need of study of action of...
specific ingredients of Sphagnetica trilobata against particular microorganism for pharmaceutical application.

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