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Antifungal Activity of *M. pudica* L. Against Selected Human Pathogens

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Abstract
The aim of this study is to determine the antifungal activity of leaf and root extracts of *Mimosa pudica* against selected fungal pathogens *Aspergillus terreus*, *Aspergillus flavus*, *Aspergillus niger* and *Fusarium solani* by disc diffusion method. The solvents acetone, aqueous, benzene, diethyl ether and ethanol were used for the preparation of extracts from leaf and root of *M. pudica*. In this study, various concentrations of extracts 2.5 mg/50 µl, 3.75 mg/75 µl and 5 mg/100 µl were used and prepared discs individually for the determination of antifungal activity against selected fungal pathogens. The prepared discs were placed on each petriplate with respective fungal species along with control dimethyl sulfoxide (DMSO) and standard Iitraconazole (30µg) discs and then the plates were incubated at 27 ºC for 72 hrs. After incubation period, the diameter of zones formed around the discs was measured. The maximum levels of zone of inhibition were observed in ethanol root extract against *Aspergillus flavus* 20±0.8 mm, *Aspergillus terreus* 20±0.7 mm and acetone root extract against *Aspergillus terreus* 18±0.8 mm. The minimum level of zone of inhibition was observed in aqueous leaf extract against *Aspergillus terreus* 07±0.4 mm and acetone leaf extract against *Aspergillus niger* 07±0.8 mm. Minimum inhibitory concentration (MIC) of extracts of leaf and root of *M. pudica* against selected fungal species were also determined. In conclusion, there is in need of study to isolate and purify the active phytocompounds from leaf and root of *M. pudica*, which possess antifungal activity against above mentioned fungal species and it may be useful in the treatment of fungal diseases.
Keywords: *Mimosa pudica*, antifungal activity, leaf, root, microorganisms, disc diffusion method.

1. Introduction

Infectious diseases represent a critical problem to health and they are one of the main causes of morbidity and mortality worldwide (WHO, 1998). Infectious diseases are caused by fungi, bacteria, viruses and parasites. These are the major threat to public health despite tremendous growth in human chemotherapeutic medicine. Their impact is particularly great in developing countries because of the unavailability of medicines and the emergence of widespread drug resistance (Okeke et al., 2005). Plant diversity serves the humankind as renewable natural resources for a variety of biologically active chemicals. These chemicals bear a variety of properties viz, antibacterial, antifungal, antiviral, anthelmintic, anticancer, sedative, laxative, cardiotonic, diuretic and others (Parajuli et al., 1998). Fungal infections are the leading cause of death in both advanced and developing countries. This is due to the use of immunosuppressive treatments, long term use of antibiotics, and longer survival of immunocompromised individuals (Molero et al., 1998**)**. Fungi are extremely fit for survival as evidenced by their ubiquity in nature. However, of the estimated several hundred thousand species of fungi, fewer than 150–200 were considered to be pathogens of humans. However, in recent years, fungi are flourishing in man. The number of fungi causing systemic disease is growing and the number of systemic diseases caused by fungi is increasing. Up to 7% patients dying in hospitals have invasive aspergillosis (Groll et al., 1996; Vogesar et al., 1997).

Fungal diseases represent a critical problem to the health, and they are one of the main causes of morbidity and mortality worldwide. Human infections particularly those involving the skin and mucosal surfaces constitute a serious problem especially in tropical and subtropical developing countries (Portillo et al., 2001). The toxic effects of fungi are carcinogenic, genotoxic, nephrotoxic, hepatotoxic, immunosuppressive and cause reproductive disorders (Lacey, 1988; Desjardins et al., 2000; Satish et al., 2007).

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Medicinal plants have been a source of bioactive compounds to treat many diseases. Traditionally used medicinal plants produce a variety of compounds with known therapeutic properties (Chopra et al., 1992). Some bioactive compounds within these plants are responsible for their medicinal value. The most prominent of these bioactive compounds are alkaloids, tannins, flavonoids and phenolic compounds (Shihabudeen et al., 2010). Herbs are widely exploited in the traditional medicine and their curative potentials are well documented (Dubey et al., 2004). Interestingly, plants are widely employed in folk medicine, mainly in communities with inadequate conditions of public health and sanitation. The antimicrobial compounds produced by plants are active against plant and human pathogenic microorganisms (Ramezani et al., 2002).

Due to the emergence of antibiotic resistant human pathogenic fungi, it is of great importance to develop new antifungal agents. The field of ethnobotanical research has expanded greatly in recent years as the value of this type of research in identifying
novel therapeutics has come to be more widely recognized (McCutcheon et al., 1992). Several screening studies have been carried out in different parts of the world. There are several reports on the antimicrobial activity of different herbal extracts of different regions of the world (De Boer et al., 2005).

Mimosa pudica Linn. (Family: *Mimosaceae*) is a famous ornamental plant commonly known as sleeping grass, sensitive plant, humble plant, shy plant, touch-menot, chuimui and lajwanti among other names. Its ornamental use can be attributed to its thigmonastic and seismonastic movements in which closure of leaves and hanging down of petioles takes place in response to certain stimuli like light, vibration, wounds, wind, touch, heat, and cold (Volkov et al., 2010a, b; Soetedjo et al., 2015). This creeping perennial herb has been mentioned as a tribal medicine all over India. Traditionally *M. pudica* is used in the treatment of headache, migraine, insomnia, diarrhea, dysentery, fever, piles and fistula. Roots in the form of decoction are used to treat urinary complaints and in diseases arising from corrupt blood and bile. The paste of the leaves is applied to glandular swelling and dressing for sinus. (Kirtikar and Basu, 1975;Nandkarni et al., 1996; Chopra et al., 1985; Nayagamm and Pushparaj, 1999).

The phenolic extract of root of *M. pudica* is used in the treatment of asthma (Williams and Lemko, 1995). The aqueous extract of stem of *M. pudica* and methanolic extract of leaves and seeds of *M. pudica* showed antimicrobial activity (Ojalla et al., 1999; Ahmad and Beg, 2001; Parrotta, 2001). The methanolic extract of root of *M. pudica* showed very good wound healing activity. The decoction of *Mimosa pudica* leaves showed anticonvulsant activity (Kannan et al., 2009). There are many pharmacological studies on *M. pudica*, but a few studies are available on antifungal activity of *M. pudica.* There is also lack of study on antifungal activity of leaf and root of *M. pudica.* So, the present study, is focused on antifungal activity of acetone, aqueous, benzene, diethyl ether and ethanol extracts of leaf and root of *M. pudica* was examined against selected fungal species *Aspergillus terreus, Aspergillus flavus, Aspergillus niger* and *Fusarium solani.*

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2. Materials and Methods

2.1 Collection and preparation of plant material

The fresh plants of *M. pudica* L. were collected from natural habitats of Thirupanipet Village, Thanjavur District, Tamilnadu, India. The collected plant was identified by Rev. Dr. S. John Britto, Director, Rabinet Herbarium and Centre for Molecular Systematics, St. Joseph's College, Tiruchirappalli, Tamilnadu, India and deposited in the herbarium (Voucher specimen number: KV 001). The collected plants were brought into the laboratory and washed thoroughly in running tap water to remove the soil particles and adhered debris and then finally washed with sterile distilled water. The leaf and root of *M. pudica* were separated and dried under shade for 10 days at room temperature and then the plant materials were pulverized into powder. The powdered materials were stored in air tight containers until the time of use.

2.2 Preparation of plant extract

Fifty gram of leaf and root powder of *M. pudica* were soaked in 500ml of acetone, aqueous, benzene, diethyl ether and ethanol individually and then kept in orbital shaker for 48h at room temperature. After 48h, the mixture was filtered through a clean muslin cloth. Then the filtrate again filtered by using a Whatman No. 1 filter paper and the extracts were concentrated and dried in a rotary evaporator at 37 ºC (Ogu et al., 2012) till a sticky mass was obtained. After evaporation of solvents, the dried extracts were stored at 4 ºC until further use.

2.3 Disc preparation

The 6 mm (diameter) discs were prepared from Whatmann No. 1 filter paper. The discs were sterilized by autoclave at 121 °C. After the sterilization the moisture discs were dried on hot air oven at 50 °C. The different solvent extracts of leaf and root of *M. pudica* were prepared in dimethyl sulfoxide (DMSO, 5% w/v). Then various solvent extract discs at different concentrations (2.5 mg, 3.75 mg and 5 mg) and control discs were prepared.

2.4 Microorganisms

The microorganisms were selected for this study obtained from Microbial Type Culture Collection and Gene Bank (MTCC), Chandigarh, India. The fungal species *Aspergillus terreus* (MTCC 2207), *Aspergillus flavus* (MTCC 2501), *Aspergillus niger* (MTCC 4325) and *Fusarium solani* (MTCC 2028) were used in this study. The fungal cultures were maintained in Potato Dextrose Agar (PDA) slants at 4 ºC.

2.5 Preparation of microbial suspension culture

The fungus was grown at 27 °C on potato dextrose agar (PDA). Spores of the fungus were collected from cultures on agar plates after 7 days as described by Broekaert et al. (1990). The sporangial suspension concentration was estimated using a cell counting chamber and adjusted to 2×10^6 spores mL^{-1} (Abril *et al.*, 2008). The fungal spore suspensions were stored in 20% glycerol at -40 °C.

2.6 Assay of antifungal activity

Antifungal activity test was carried out by disc diffusion method originally described by Bauer et al. (1966) with slight modifications. Potato Dextrose Agar (PDA) was prepared and autoclaved at 15 lbs pressure for 20 minutes and cooled to 45 ºC. The cooled media was poured on to sterile petriplates and allowed for solidification. The plates with media were seeded with the respective microbial suspension using sterile swab. The various solvents extract discs prepared individually were placed on each petriplate along with control dimethyl sulfoxide (DMSO) and standard Iitraconazole (30µg) discs. The plates were incubated at 27 ºC for 72 hrs. After incubation period, the diameter of zone formed around the paper discs were measured and expressed in millimetre (mm). Each experiment was replicated three times.

2.6 Determination of Minimum Inhibitory Concentration (MIC)

MIC was determined based on the method of Murray et al. (1995) with slight modifications against selected fungi. The different volumes 20 µl (1mg), 40 µl (1mg) and 60 µl (1mg) of extract (5% w/v) were introduced separately into 10ml of Potato Dextrose Broth (PDB) medium (v/v). Spore suspension (10 µl) of each target fungi was inoculated in the test tube containing PDB and incubated for 3-5 days at 28±2 ^{o}C. The control tubes containing PDB were inoculated only with fungal suspension. Concentration at which no visible growth was observed considered as MIC.

Statistical analysis

The results of this study were subjected to statistical analysis and expressed as mean ± standard deviation of three replicates.

3. Results

Effect of acetone, aqueous, benzene, diethyl ether and ethanol extracts of leaf and root of *M. pudica* was tested against *Aspergillus terreus*, *Aspergillus flavus*, *Aspergillus niger* and *Fusarium solani* at different concentrations 2.5 mg, 3.75 mg and 5 mg by disc diffusion method. The observed results were measured as diameter of zone of inhibition (mm). There was no zone of inhibition in the negative control DMSO. Iitraconazole (30µg) was used as positive control which produced zone of inhibition at different levels against the selected fungal species. The positive control Iitraconazole showed zone of inhibition ranges between 18±1.4 mm and 22±0.9 mm against all selected fungal species of this study.

3.1 Antifungal activity of leaf extracts

The antifungal activity of acetone, aqueous, benzene, diethyl ether and ethanol extracts of leaf of *M. pudica* was carried out and the results were presented in Table 1. The diethyl ether extract showed highest zone of inhibition against *Aspergillus terreus* 18±0.2 mm at the concentration of 5mg (100µl), and the minimum zone of inhibition against against *Aspergillus niger* 12±0.4 mm when compared to other fungal species. The acetone extract showed maximum zone of inhibition against *Aspergillus terreus* 08±0.4 mm and minimum zone of inhibition against *Aspergillus niger* 07±0.8 mm. The aqueous extract exhibited antifungal activity by the formation of zone of inhibition against all the selected fungal species only at 5mg (100µl) of concentration. The benzene extract showed maximum zone of inhibition

against *Aspergillus niger* 17±0.5 mm and minimum zone of inhibition against *Aspergillus terreus* 14±0.6 mm. The ethanol extract showed maximum zone of inhibition against *Fusarium solani* 17±0.4 mm and minimum zone of inhibition against *Aspergillus flavus* 14±0.4 mm. The benzene and ethanol extracts of leaf were also showed antifungal activity against all selected fungal species at both 3.75 mg (75 µl) and 5 mg (100µl) of concentrations.

3.2 Antifungal activity of root extracts

The antifungal activity of acetone, aqueous, benzene, diethyl ether and ethanol extracts of root of *M. pudica* was also carried out and the results were presented in Table 2. The ethanol extract of root of *M. pudica* showed maximum zone of inhibition against *Aspergillus flavus* 20±0.8 mm in the concentration of 5 mg while the minimum zone of inhibition against *Fusarium solani* 07±1.2 mm. The acetone extract exhibited maximum zone of inhibition against *Aspergillus terreus* 18±0.8 mm and minimum zone of inhibition against *Aspergillus flavus* 15±0.3 mm. The aqueous extract showed zone of inhibition against *Aspergillus niger* and *Fusarium solani* 08±0.7 mm. The benzene extract showed maximum zone of inhibition against *Aspergillus terreus* 20±0.3 mm but no antifungal activity against *Aspergillus niger* and *Fusarium solani*. The diethyl ether extract showed maximum zone of inhibition against *Aspergillus terreus* 14±0.5 mm and minimum zone of inhibition against *Fusarium solani* 07±0.4 mm.

3.3 Minimum Inhibitory Concentration (MIC) of leaf extracts

The Minimum Inhibitory Concentration (MIC) of the extract (5% w/v) of leaf of *M. pudica* was determined against selected microorganisms (no visible growth) using 20 µl (1 mg), 40 µl (2 mg) and 60 µl (3 mg) of extract in 10 ml of nutrient broth (v/v) and the results were presented in Table 3. The acetone extract exhibited MIC of 3 mg or less but more than 2mg against *Fusarium solani*, but have no MIC against *Aspergillus terreus*, *Aspergillus flavus* and *Aspergillus niger* in all tested concentrations 1mg, 2mg and 3 mg. The aqueous extract of leaf of *M. pudica* has no MIC against selected microorganisms in all tested concentrations. The benzene extract showed MIC of 3mg or less but more than 2mg against *Aspergillus terreus*, *Aspergillus niger* and *Fusarium solani* whereas the benzene extract have no MIC against *Aspergillus flavus*. The diethyl ether extract showed MIC of 2 mg or less but more than 1mg against *Aspergillus terreus* and *Aspergillus flavus* but have no MIC against *Aspergillus niger* and *Fusarium solani*. The ethanol extract exhibited MIC of 3 mg or less against *Aspergillus terreus* and *Aspergillus flavus* and followed by MIC of 2 mg or less but more than 1mg against *Aspergillus niger* and *Fusarium solani*.

3.4 Minimum Inhibitory Concentration (MIC) of root extracts

The MIC of root extract of *M. pudica* against selected microorganisms (no visible growth) was determined using different concentration such as 20 µl (1 mg), 40 µl (2 mg) and 60 µl (3 mg) of extract in 10 ml of nutrient broth (v/v) and the results were presented in Table 4. The acetone extract showed MIC of 2 mg or less but more than 1 mg against *Aspergillus flavus*, but have no MIC against *Aspergillus terreus*, *Aspergillus niger* and *Fusarium solani*. The aqueous extract showed MIC of 3 mg or less against *Aspergillus flavus* but have no MIC against *Aspergillus terreus*, *Aspergillus niger* and *Fusarium solani*. The benzene extract exhibited MIC of 2 mg or less but more than 1mg against *Aspergillus flavus* and *Aspergillus flavus*, whereas have no MIC against *Aspergillus niger* and *Fusarium solani*. The diethyl ether extract and ethanol extract showed MIC of 2 mg or less but more than 1mg against *Aspergillus terreus*, *Aspergillus flavus* and *Aspergillus niger* but have no MIC against *Fusarium solani*.

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Table 1. Antifungal activity of acetone, aqueous, diethyl ether, ethanol and benzene extracts of leaf of *M. pudica*

Name of solvent extract	Concentration of plant extract	Diameter of zone of inhibition (mm)			
		Name of microorganism			
		Aspergillus terreus	*Aspergillus flavus*	*Aspergillus niger*	*Fusarium solani*
DMSO	NC	-	-	-	-
Acetone	50µl (2.5mg)	-	-	-	07±0.1
	75µl (3.75mg)	-	-	-	07±0.3
	100µl (5mg)	08±0.4	-	07±0.8	08±0.2
Aqueous	50µl (2.5mg)	-	-	-	-
	75µl (3.75mg)	-	-	-	-
	100µl (5mg)	07±0.4	-	08±0.8	08±1.2
Benzene	50µl (2.5mg)	-	-	08±0.6	07±0.8
	75µl (3.75mg)	14±0.4	07±0.9	14±0.6	14±1.5
	100µl (5mg)	14±0.6	15±0.2	17±0.5	16±0.8
Diethyl ether	50µl (2.5mg)	14±0.8	15±0.8	-	-
	75µl (3.75mg)	14±0.5	16±0.4	-	-
	100µl (5mg)	18±0.2	16±0.8	12±0.4	-
Ethanol	50µl (2.5mg)	-	-	12±0.6	14±0.5
	75µl (3.75mg)	14±0.6	12±0.7	14±0.8	14±0.7
	100µl (5mg)	16±0.4	14±0.4	16±0.7	17±0.4
Itraconazole	PC (30 µg)	22±0.9	20±1.2	19±0.7	18±1.4

NC- Negative control (DMSO), PC- Positive control (Itraconazole)
Values are expressed as mean ± standard deviation of triplicates

Table 2. Antifungal activity of acetone, aqueous, diethyl ether, ethanol and benzene extracts of root of *M. pudica*

Name of solvent extract	Concentration of plant extract	Diameter of zone of inhibition (mm)			
		Name of microorganism			
		Aspergillus terreus	*Aspergillus flavus*	*Aspergillus niger*	*Fusarium solani*
DMSO	NC	-	-	-	-
Acetone	50µl (2.5mg)	-	14±0.5	-	-
	75µl (3.75mg)	-	14±1.0	-	-
	100µl (5mg)	18±0.8	15±0.3	16±0.6	16±0.6
Aqueous	50µl (2.5mg)	-	07±0.2	-	-
	75µl (3.75mg)	-	07±0.4	-	-
	100µl (5mg)	-	08±0.5	08±0.7	08±0.7
Benzene	50µl (2.5mg)	16±0.2	14±0.6	-	-
	75µl (3.75mg)	18±0.4	16±0.8	-	-
	100µl (5mg)	20±0.3	18±0.7	-	-
Diethyl ether	50µl (2.5mg)	10±0.9	10±0.4	10±0.4	-
	75µl (3.75mg)	12±0.6	10±0.8	10±1.0	-
	100µl (5mg)	14±0.5	12±0.9	12±0.6	07±0.4
Ethanol	50µl (2.5mg)	18±0.4	16±0.4	14±0.7	-
	75µl (3.75mg)	18±0.8	16±0.7	14±1.1	-
	100µl (5mg)	20±0.7	20±0.8	16±0.5	07±1.2
Itraconazole	PC(30 µg)	22±0.9	20±1.2	19±0.7	18±1.4

NC- Negative control (DMSO, PC- Positive control (Itraconazole)
Values are expressed as mean ± standard deviation of triplicates

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Table 3: Minimum Inhibitory Concentration (MIC) of leaf extract of *M. pudica* against selected microorganisms

Name of solvent extract	Concentration of plant extract in 10ml of broth (mg)	Appearance of growth of microorganisms			
		Aspergillus terreus	*Aspergillus flavus*	*Aspergillus niger*	*Fusarium solani*
Control	-	+	+	+	+
Acetone	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	+	+	+	+
	60 µl (3 mg)	+	+	+	-
Aqueous	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	+	+	+	+
	60 µl (3 mg)	+	+	+	+
Benzene	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	+	+	+	+
	60 µl (3 mg)	-	+	-	-
Diethyl ether	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	-	-	+	+
	60 µl (3 mg)	-	-	+	+
Ethanol	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	+	+	-	-
	60 µl (3 mg)	-	-	-	-

\+ Appearance of visible growth of fungus (turbid tube)
\- No appearance of visible growth of fungus (clear tube)

Table 4: Minimum Inhibitory Concentration (MIC) of root extract of *M. pudica* against selected microorganisms

Name of solvent extract	Concentration of plant extract in 10ml of broth (mg)	Appearance of growth of microorganisms			
		Aspergillus terreus	*Aspergillus flavus*	*Aspergillus niger*	*Fusarium solani*
Control	-	+	+	+	+
Acetone	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	+	-	+	+
	60 µl (3 mg)	+	-	+	+
Aqueous	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	+	+	+	+
	60 µl (3 mg)	+	-	+	+
Benzene	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	-	-	+	+
	60 µl (3 mg)	-	-	+	+
Diethyl ether	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	-	-	-	+
	60 µl (3 mg)	-	-	-	+
Ethanol	20 µl (1 mg)	+	+	+	+
	40 µl (2 mg)	-	-	-	+

\+ Appearance of visible growth of fungus (turbid tube)
\- No appearance of visible growth of fungus (clear tube)

4. Discussion

Infections by pathogenic fungi are increasingly recognized as an emerging threat to public health (Wu, 1994; Walsh et al., 1996). These problems are associated with resistance to antibiotics and toxicity during prolonged treatment with several antifungal drugs (Giordani et al., 2001). Due to this emergence of antibiotic resistant pathogenic fungi, it is of great importance to develop new antifungal agents. The field of ethnobotanical research has expanded greatly in recent years as the value of this type of research in identifying novel therapeutics has come to be more widely recognized (McCutcheon et al., 1992). Medicinal plants are of great importance to health of individuals and communities. This importance lies in their chemical substances that produce a definite physiological action on the human body. The most important of these bioactive compounds include alkaloids, tannins, flavonoids, and phenolic compounds (Edeoga et al., 2005). In the present study, various solvent extracts of leaf and root of *M. pudica* showed antifungal activity against *Aspergillus terreus, Aspergillus flavus, Aspergillus niger* and *Fusarium solani*. The benzene and ethanol extract of leaf of *M. pudica* showed zone of inhibition against all selected fungal species. The acetone and aqueous extracts of leaf showed no antifungal activity against *Aspergillus flavus* and showed zone of inhibition against *Aspergillus terreus* and *Aspergillus niger* at 5 mg of concentration. The diethyl ether extract of leaf showed no antifungal activity against *Fusarium solani*.

In the present study, the antifungal activity of different solvent extracts of root of *M. pudica* was exhibited as different level of zone of inhibition against selected fungal species. The acetone and benzene extract of root of *M. pudica* showed no activity against *Aspergillus niger* and *Fusarium solani*. The diethyl ether and ethanol extract of root showed activity against *Fusarium solani* at 5 mg of concentration. The aqueous extract of root showed no activity against *Aspergillus terreus*.

Fungicidal effect of medicinal plants may be due to the lysis of fungal cell wall and cytoplasmic membrane due to the liberation of antimicrobial products and it was also reported that plant lytic enzymes act on the fungal cell used in traditional medicine. The cell wall of fungi undergoes breakage caused by the hydrolysis of 1,3 glycan, 1,6, glycan and chitin polymer (Paula et al., 2006).

The present study is also in agreement with the earlier study, in that the antifungal activity of methanol extract of leaf of *Euphorbia hirta* against *Candida albicans* was reported (Basma et al., 2011). The antifungal activity of different solvent extracts of leaf and flower of *Withania somnifera* was reported (Singariya et al., 2012). Similarly, the antifungal activity of aqueous, alcoholic and ethyl acetate extracts of leaves of five *Terminalia* species against plant pathogenic fungi *A. flavus, A. niger, Alternaria brassicicola, A. alternate* and *Helminthosporium tetramera* was reported (Saheb et al., 2011). Antifungal activity of organic extracts of leaf, flower and fruit of *Lawsonia inermis* against *Aspergillus niger, Penicillium notatum, Fusarium oxysporum, Colletotrichum gloeosporioides* and *Rhizopus stolonifer* was reported (Jeyaseelan et al., 2012). *M. pudica* was attributed to the presence of bioactive constituents like terpenoids, flavonoids, glycosides, alkaloids, quinines, phenols, tannins, saponins and coumarins and they may be responsible for the antimicrobial activity (Gandhiraja et al., 2009).

Conclusion

In this study, the antifungal activitiy of acetone, aqueous, benzene, diethyl ether and ethanol extracts of leaf and root of *M. pudica* was confirmed against selected fungal species *Aspergillus terreus, Aspergillus flavus, Aspergillus niger* and *Fusarium solani*. Antimicrobial properties of medicinal plant *M. pudica* may be due to the presence of bioactive compounds. The further study is needed to find out the bioactive compounds, which are responsible for antifungal activity. So, the identification of phytocompound with antifungal activity in leaf and root of *M. pudica*, may be useful in the preparation of drugs for the treatment of fungal diseases.

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