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Biological Activities of *Geranium wallichianum*

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Abstract: The crude extract of *Geranium wallichianum* was tested for antifungal, antibacterial, insecticidal, phytotoxic and cytotoxic activities. The extract displayed an overall moderate activity against human, animal and plant pathogens in antifungal bioassay and against *Staphylococcus aureus* in antibacterial activity. The extract did not display any remarkable activity in the rest of bioassays.

Key words: *Geranium wallichianum*, antifungal, antibacterial, insecticidal, phytotoxic, cytotoxic

Introduction

The relationship between man and plants has been very close from the day of life till death. Therefore, the medicine obtained from medicinal plants are more beneficial than synthetic or semisynthetic drugs. Still natural drugs have a common link between the traditional and modern medical science, as they are the main source of drugs and medicine. Recently various modern procedures and techniques have been developed for the determination of biological activity of plants extract and bioassay techniques (Bashir *et al.*, 2002; Zafar *et al.*, 2002; Ismail *et al.*, 2003).

Geranium wallichianum belongs to family Geraniaceae. It is a tall much branched procumbent or erect perennial herb found in the Himalayas, from Kashmir to Nepal at the altitude of 7000-11000 feet (Vakil, 1956.). Also found in Chitral, Dir Swat Hazarra, Murree Hills, Pounch and Kashmir (Nasir, 1972).

The herb evidently possesses the astringent properties of the genus to a marked degree (Watt, 1972). The rootstock is used as a substitute for that of *Cotis teeta* Wall in eye troubles. The herb is also used in the treatment of toothache. *G. thunbergii* have been used in intestinal disorders in Japan (Ito *et al.*, 1999).

Here an attempt has been made to study the antifungal, antibacterial, Phytotoxic, Cytotoxic and Insecticidal activities of *Geranium wallichianum*

Materials and Methods

The plant was collected from northern areas of NWFP, Pakistan in the month of July. The identification was confirmed from Taxonomy Department, Islamia College, Peshawar, University of Peshawar, Pakistan.

Test materials: The plant was shade dried, chopped into small pieces and finally pulverized into fine powder. The powdered plant material was soaked in ethanol (70%) for 15 days. The extract was filtered and dried at low

temperature under reduced pressure in rotary evaporator to obtain the crude extract (yield 2.0% w/w).

Previously isolated constituents: Tannins, Geranin, Geranic acid B and C, Phyllanthusine F, Dehydroallagittalin, Dehydrogermin, Furosinin and Furosine (Okuda *et al.*, 1982)

Studied activity: Antifungal activity by agar tube dilution method, Antibacterial activity by agar well diffusion method (Attar ur Rehman *et al.*, 1991), Phytotoxic activity (McLaughlin *et al.*, 1991) Cytotoxic activity (Meyer, 1982) and Insecticidal activity (Naqui *et al.*, 1991).

Used microorganisms: The antifungal activity was tested against human pathogens (*Trichophyton schoenleinii*, *Pseudallescheria boydii*, *Candida albican*, *Aspergillus niger*), animal pathogen (*Microsporum canis*, *Trichophyton simii*) and plant pathogens (*Fusarium solani* var. *lycopersici*, *Macrophomina phaseolina*).

Antibacterial activity was carried out using *Bacillus cereus*, *Corynebacterium diphtheriae*, *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Bacillus subtilis*, *Staphylococcus aureus* and *Streptococcus pyogenes*.

Cytotoxicity was carried out on *Artemia salina* (brine-shrimp eggs) while *Tribolium castaneum*, *Sitophilus oxyzae*, *Rhyzopartha dominica* and *Trogoderma granarum* were used to determine the insecticidal activity. The phytotoxicity of the plant was tested against *Lemna aquinoctialis* Welw.

Results and Discussion

Analysis of the data for antifungal activity (Table 1) revealed that the crude extract of *Geranium wallichianum* exhibited an overall moderate activity against human,

Table 1: Antifungal activity (% inhibition) of the crude extract of *Geranium wallichianum*

Name of Fungi	Linear growth (mm)		Inhibition (%)	Standard Drugs
	Sample	Control		
Human pathogens				
<i>Trichophyton Schoenleinii</i>	35	40	12.5	Miconazole Ketoconazole
<i>Pseudallescheria Boydii</i>	45	65	30.7	Miconazole Ketoconazole
<i>Candida albicans</i>	50	60	16.6	Miconazole Ketoconazole
<i>Aspergillus niger</i>	45	60	25	Miconazole Ketoconazole
Animal pathogens				
<i>Trichophyton simii</i>	40	65	38.5	Miconazole Ketoconazole
<i>Microsporium Cans</i>	30	40	25	Miconazole Ketoconazole
Plant pathogens				
<i>Fusarium solani</i> Var. <i>Lycopersici</i> (Tomato)	24	50	52	Benlate Nabam
<i>Macrophomina phaseolina</i>	45	60	25	Benlate Nabam

Incubation period: 7days Incubation Temperature: 28±1°C

Table 2: Antibacterial activity of the crude extract of *Geranium wallichianum*

Name of Bacteria	Zone of Inhibition (mm)	Zone of Inhibition of Tetracyclin (Std. Drug) (mm)	Inhibition by the Crude Extract (%)
<i>Bacillus cereus</i> ,	—	25	0.00
<i>Corynebacterium diphtheriae</i>	—	30	0.00
<i>Escherichia coli</i>	—	24	0.00
<i>Klebsiella pneumoniae</i>	—	30	0.00
<i>Proteus mirabilis</i>	—	14	0.00
<i>Pseudomonas aeruginosa</i>	—	22	0.00
<i>Salmonella typhi</i>	—	30	0.00
<i>Bacillus subtilis</i>	—	30	0.00
<i>Staphylococcus aureus</i>	15	30	50.00
<i>Streptococcus pyogene</i>	—	30	0.00

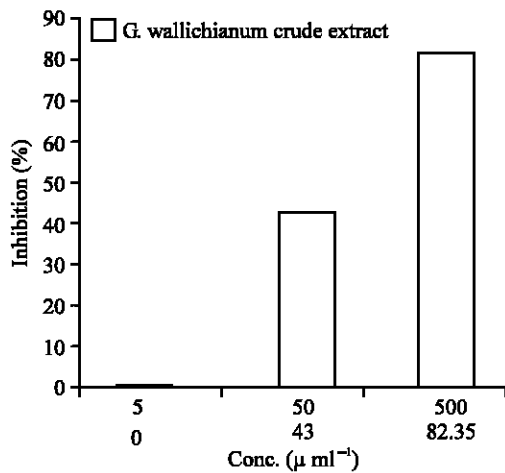


Fig. 1: Phytotoxic activity of Crude extract of *G. wallichianum*

animal and plant pathogen. The most significant activity (52%) was observed against the plant pathogen *Fusarium solani* Var. *Lycopersici* (Tomato) followed by animal pathogen *Trichophyton simii* (38.5%) and human pathogen *Pseudallescheria Boydii* (30.7%). The extract did not display remarkable antifungal activity against the rest of pathogens.

The results for antibacterial activity (Table 2) showed that the extract of *G. wallichianum* was devoid of any

antibacterial activity against all the pathogen except *Staphylococcus aureus* against which it displayed 50% inhibition.

The results for phytotoxic activity (Fig. 1) showed that the crude extract of *G. wallichianum* demonstrated a good activity at the highest tested concentration (500 µg ml⁻¹) against *Lemna acuinotialis* Walv. and inhibited the growth of the plant by 82.35% as compared with reference inhibitor (Paraquate). The extract showed a moderate activity at 50 µg ml⁻¹ but displayed no activity at a concentration 5µg ml⁻¹.

The crude extract of *G. wallichianum* was also tested for insecticidal and cytotoxic activities but did not display exhibited any remarkable activities in these bioassays.

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