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## Biological and Pharmacological Properties of two Indigenous Medicinal Plants, *Rheum emodi* and *Paeonia emodi*

Muhammad Ismail, Zafar Iqbal, Bashir Ahmad, Shahida Zakir and <sup>1</sup>Uzma Niaz

Department of Pharmacy, University of Peshawar, Pakistan

<sup>1</sup>Faculty of Pharmacy, University of Punjab, Lahore, Pakistan

**Abstract:** The ethanol (70%) crude extracts of *Rheum emodi* and *Paeonia emodi* were screened for various biological and pharmacological activities including antifungal, antibacterial, insecticidal, phytotoxic and brine-shrimp cytotoxic activities. It was explored that the extracts of both these plant possess moderate antifungal activities. The *Rheum emodi* exhibited remarkable phytotoxic activity against *Lemna aequinoctialis* Wulfe while the said activity of the *Paeonia emodi* was also reasonable. However, these extracts did not show any significant antibacterial, insecticidal activities and Brine shrimp cytotoxicity during this study.

**Key words:** Pharmacology, medicinal plants, biological activities

### Introduction

*Rheum emodi* (Polygonaceae), commonly known as revand-chini, is the Himalayan species of Indian rhubarb found wild at an altitude of 4000–12000 feet in Kashmir, Nepal, Sikkim and Bhutan (Nadkarni, 1954). Roots of the Indian rhubarb is darker, inferior in aroma, is a well known stomachic, bitter and cathartic and used all over the world (Thakur *et al.*, 1989). The *R. emodi* rhizomes contain antifungal and antibacterial constituents (Agarwal *et al.*, 2000; Babu *et al.*, 2003).

*Paeonia emodi* (Paeoniaceae) is an erect, leafy perennial herb, 50 cm long, glabrous, leaves biternate or ternate, lamina pale, flowers solitary, axillary. It is distributed in Pakistan, India and East Afghanistan (Nasir and Ali, 1978). It has various physiological activities including prevention of epileptic attacks, for cholera and whooping cough (Watt, 1982). The tubers of the plant are highly effective medicine for uterine diseases, colic, bilious obstructions, dropsy, epilepsy, convulsions and hysteria. The infusion of the dried flowers is highly valued remedy for diarrhea while seeds are emetic and cathartic. The tubers and seeds contain toxic alkaloids, which produce contractions of renal capillaries and increases the coagulability of blood (Indian Medicinal Plants, Budhidra Nath Bhuwaneswari Asrama, Bahadurgunj, India, 1918 and Desheprabhu, 1966). Monoterpene glycosides, paeoniflorin, lactiflorin and oxypaeoflorine are some of the compounds that have been reported from this plant (Muhammad *et al.*, 1999).

The use of plants, plant extracts and pure compounds isolated from the natural sources provided the foundation to modern therapeutic sciences and thus enabled the man to establish the empirical system of medicines. Keeping in

view the medicinal importance of plants, the current study was undertaken to provide scientific bases to the use of the selected plants in traditional system of medicine and also to explore some new effects of these plants. For this purpose, these plants were screened for antibacterial, antifungal, insecticidal, cytotoxic and phytotoxic activities.

### Materials and Methods

**Plant material:** The plants were collected from Kaghan, Naran and Bara Gali, NWFP, Pakistan in the month of July. The identification was confirmed by Prof. Dr. Jahandar Shah, plant taxonomist, Islamia College, Peshawar, University of Peshawar, Pakistan.

**Extraction:** The plants were 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 extracts.

**Antifungal activity:** Antifungal activity of the crude extracts was evaluated by agar tube dilution method (Atta-ur-Rehman *et al.*, 1991). The extracts (24 mg) were dissolved in sterile DMSO (1.0 ml) which served as stock solution. Sabouraud dextrose agar (SDA) (4ml) was dispensed into screw cap tubes which were autoclaved at 121°C for 15 min. and then cooled to 50°C. The non-solidified SDA media was poisoned with stock solution (66.6 µl), giving the final concentration of 400 µg of the extract/ml of SDA. Each tube was inoculated with a piece (4 mm diameter) of inoculum removed from a seven days

old culture of fungi. For non-mycelial growth, an agar surface streak was employed. Inhibition of fungal growth was observed after 7 days of incubation at  $28 \pm 1^\circ\text{C}$ . A control experiment with test substance (medium supplemented with appropriate amount of DMSO) was carried out for verification of the fungal growth.

**Phytotoxic activity:** Phytotoxic activity of the extracts was carried out against the *Lemna aequinoctialis* Welv. (McLaughlin *et al.*, 1991). The medium was prepared by mixing various constituents in distilled water (100 ml) and the pH was adjusted (5.5 - 6.5) by adding KOH pellets. The medium was then autoclaved at  $121^\circ\text{C}$  for 15 min. The extracts (15.0 mg) dissolved in ethanol (1.5 ml) served as stock solution. Nine sterilized flasks, three for each concentration, were inoculated with 1000, 100 and 10  $\mu\text{l}$  of the stock solution to give the final concentration of 500, 50 and 5 ppm, respectively. The solvent was allowed to evaporate overnight under sterile conditions. To each flask, medium (20 ml) and plants (10), each containing a rosette of three fronds, of *Lemna aequinoctialis* Welv., were added. One other flask supplemented with solvent and reference growth inhibitor (Paraquate), served as negative control. All flasks were plugged with cotton and kept in the growth cabinet for seven days. The number of fronds per flask were counted and recorded on day seven.

**Antibacterial activity:** The extracts were screened against various human pathogens including *Corynebacterium diphtheriae*, *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus morganni*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Shigella boydii*, *Staphylococcus aureus* and *Streptococcus pyogenes* by agar well diffusion method (Atta-ur-Rehman *et al.*, 1991).

**Brine-shrimp cytotoxicity:** *Artemia salina* (brine-shrimp eggs) were used to determine the cytotoxic activity of the crude extracts (Meyer *et al.*, 1982).

**Insecticidal activity:** *Tribolium castaneum*, *Sitophilus oxyzae*, *Rhyzopartha dominica* and *Trogoderma granarum* were used to determine the insecticidal activity of the crude extracts (Naqvi and Parveen, 1991).

## Results and Discussion

Antifungal activity of the crude extracts of *Rheum emodi* and *Paeonia emodi* were tested against human pathogens (*Trichophyton schoenleinii*, *Pseudallescheria boydii*, *Candida albicans*, *Aspergillus niger*), animal pathogen (*Microsporium canis*, *Trichophyton simii*) and plant pathogens (*Fusarium solani* var. *lycopersici*, *Macrophomina phaseolina*). Growth in the medium containing the extracts was determined by measuring the linear growth (mm) and growth inhibition (%) was calculated with reference to the negative control. The results (Table 1) indicated that both the *Rheum emodi* and *Paeonia emodi* possess a moderate antifungal activities. The *Rheum emodi* showed good activity against animal pathogens while moderate activity against plant pathogens especially *Fusarium solani* var. *lycopersici* (54.5%). However, it did not display a good inhibitory activity against the human pathogens. The *Paeonia emodi* exhibited an overall moderate inhibition for the selected human, animal and plant pathogens (Table 1). The most significant antifungal activity of the crude extract of the *P. emodi* was observed for *Pseudallescheria boydii* (human pathogen, 55.5%), *Microsporium canis* (Animal pathogen, 55.1%) and *Fusarium solani* var. *lycopersici* (plant pathogen, 50%).

Table 1: Antifungal activity of *P. emodi* and *R. emodi*

Name of fungi	<i>R. emodi</i>			<i>P. emodi</i>			Standard drugs
	Linear growth (mm)			Linear growth (mm)			
	Control	Sample	Inhibition (%)	Control	Sample	Inhibition (%)	
Human Pathogens							
<i>Trichophyton Schoenleinii</i>	40	30	25	55	30	45.5	Miconazole Ketoconazole
<i>Pseudallescheria boydii</i>	60	40	33.3	45	20	55.5	Miconazole Ketoconazole
<i>Candida albicans</i>	60	6	0	25	20	20	Miconazole Ketoconazole
<i>Aspergillus niger</i>	60	42	30	60	40	33	Amphotericine-B
Plant Pathogens							
<i>Microsporium canis</i>	40	20	50	49	22	55.1	Miconazole Ketoconazole
<i>Trichophyton simii</i>	65	30	53	50	30	40	Miconazole Ketoconazole
Animal Pathogens							
<i>Fusarium solani</i> Var.							
<i>Lycopersici</i> (Tomato)	55	25	54.5	42	21	50	Benlate
<i>Macrophomina phaseolina</i>	60	40	35.5	50	40	20	Nabam

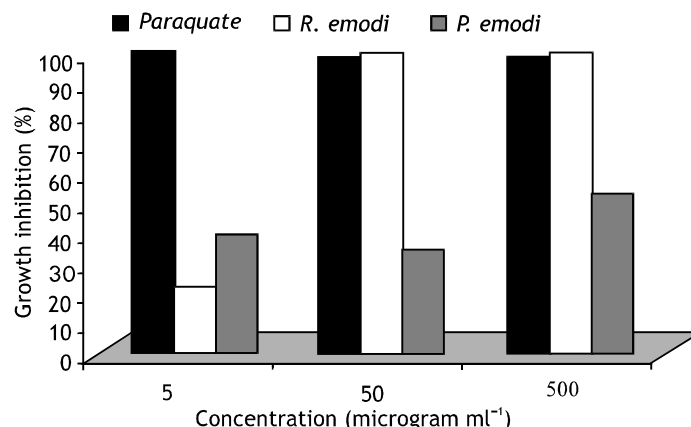


Fig. 1: phytotoxicity activity of the crude extracts of *R. emodi* and *P. emodi*

Results of the phytotoxic activity of the crude extracts from *Rheum emodi* and *Paeonia emodi* was interpreted by analyzing the growth regulation in percentage calculated with reference to the negative control. Paraquate was used as standard inhibitor. The results (Fig. 1) showed that the crude extract of *Rheum emodi* remarkable phytotoxic activity against *Lemna aequinoctialis* Walv. It caused 100% inhibition of the plant growth at a concentration of 500 and 50  $\mu\text{g ml}^{-1}$ . However, it was quite inactive at lower concentration (5  $\mu\text{g ml}^{-1}$ ) and inhibited the growth of *Lemna aequinoctialis* by only 22%. *Paeonia emodi* showed a moderate growth inhibitory activity to *Lemna aequinoctialis*. At the highest concentration (500  $\mu\text{g ml}^{-1}$ ) it was found to cause 52% inhibition of the *Lemna aequinoctialis* while at lower concentration it was explored to have no significant phytotoxic activity.

The extracts of *Rheum emodi* and *Paeonia emodi* were also screened for antibacterial, insecticidal and cytotoxic activities but did not display any significant activity in these bioassays.

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