Research Article

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Antibacterial activity of some selected plants of Swat valley

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The aerial parts of *Hedera nepalensis* and *Rubia manjith* while root of *Paeonia emodi* were extracted in methanol-water (80:20) at room temperature. The crude extracts were screened against six bacterial strains i.e. *Staphylococcus aureus*, *Staphylococcus methacilline, Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Shigella flexenari* and *Pseudomonas sesame* using agar well diffusion assay. *P. emodi* exhibited comparable results with standard drug. The maximum inhibition was shown against *Salmonella typhi*, *Shigella flexenari* (17 mm each). The extracts of *H. nepalensis* and *R. manjith* remained inactive against tested bacterial strains.

Key words: Antimicrobial activity, *Hedera nepalensis*, *Rubia manjithl*, *Paeonia emodi*, Agar well diffusion assay.

Nature has been a source of medicinal agents for thousands of years and an impressive number of modern drugs have been isolated from natural sources; many of these isolations were based on the uses of the agents in traditional medicine. This plant-based, traditional medicine system continues to play an essential role in health care, with about 80% of the world's inhabitants relying mainly on traditional medicines for their primary health care (Owolabi et al., 2007). Natural products of plants may provide a new source of antimicrobial agents with possibly novel mechanism of action (Motsei et al., 2003; Barbour et al., 2004). The search of biologically active compounds from plants has always been of great interest to scientists looking for new sources of useful drugs against infectious diseases. In the recent years, infections have increased to a great extent and antibiotic resistance becomes an ever increasing therapeutic problem (Shahwar and Raza 2009).

The use of plant extracts and phytochemicals, both with known antimicrobial properties, can be of great significance in therapeutic treatments. In the last few years, a number of studies have been conducted in different countries to prove such efficiency (Artizzu et al., 1995; Izzo et al., 1995)**.** Many plants have been used because of their antimicrobial traits, which are due to compounds synthesized in the secondary metabolism of the plant. According to World Health Organization, medicinal plants would be the best source to obtain a variety of drugs. Therefore, such plants should be investigated to better understand their properties, safety and efficacy (Nascimento et al., 2000).

Paeonia emodi Wall. (Paeoniaceae) is perennial herb, widely distributed in Nourth Pakistan, India, Nepal and China (Khan et al., 2005). *P. emodi* finds several applications in indigenous medical system. The roots and rhizomes are used to cure backache, dropsy and epilepsy and are also used as a tonic, emetic, cathartic, blood purifier and colic while the seeds are purgative (Shinwari et al., 2003). The various constituents isolated from this plant include oleanolic acid, betulinic acid, ethyl gallate, methyl grevillate and 1, 5-dihydroxy-3-methylanthraquinone (Nawaz et al., 2000). Other constituents are monoterpene glycosides, wurdin and

benzoylwurdin along with paeoniflorin, lactiflorin and oxypaeoniflorin (Muhammad et al., 1999). *Hedera nepalensis* (Araliaceae) is known as "Albumbar", distributed in West Asia, Japan, Afghanistan and the Himalayas. Climbs extensively on walls, rocks, tree trunks by its aerial roots (Nasir, 1975). Leaves of *H. nepalensis* are used traditionally for treatment of diabetes (Gilani *et al*., 2007). According to another study by Hamayun *et al*., (2006), leaves are used to treat cancer. Phytochemically, there is frequent occurrence of triterpenoid saponins and polyynes (Frohne and Pfander, 2004). *Rubia manjith* (Rubiaceae) is a herb, distributed throughout the lower hills of Himalayas in the North and Western Ghats in the South India, Japan, Indonesia, Ceylon, Peninsula, Java and in tropical Africa moist temperate and tropical forests (Khare, 2004). *R. manjith* is astringent and used as a blood purifier and against skin and urinary diseases (Rajbhandari *et al*. 1995). The root of this plant is used as a digestive and in leprosy, urinary complaints and snakebite (Mischenko *et al*., 1999). Stems are used for snake bite and scorpion stings. Rubiadin is a potent antioxidant, inhibits lipid peroxidation and is anti-inflammatory and immunomodulatory (Tripathi & Sharma 1998). The present study was designed to check the antimicrobial potential of some selected plants of Swat valley.

MATERIALS AND METHODS

Collection and identification of plant materials

Paeonia emodi, *Hedera nepalensis* and *Rubia manjith* were collected from District Swat (Khyber Pukhtonkhwan, Pakistan) and identified at Hazara University, Mansehra, Pakistan.

Extraction of plant materials

The plant material was air dried in shade, pulverized and extracted (500 g) in methanol: water (80-20) at room temperature for seven days (3 times). The crude extracts were filtered and concentrated at reduced pressure using rotary evaporator.

Microorganisms used

Staphylococcus aureus, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Shigella flexenari*, *Pseudomonas sesame* and *Staphylococcus methacilline* were obtained from Department of Botany, Arid University, Rawalpindi, Pakistan.

Antimicrobial assay

Antibacterial activity was carried out using agar well diffusion method (Shahid et al., 2009). Agar plates were prepared by pouring 25ml of sterilized nutrient agar medium (Merck, pH 7) seeded with respective bacterial strain in 14 cm petri plates. Wells were made by using 8 mm borer and filled with 50 µl of respective concentration of each extract (5mg/ml). Imepenum (2mg/ml) was used as standard drugs while DMSO was used as negative control. Plates were incubated at 37 ^{o}C and zone of inhibition was measured after 24 hours. Experiment was repeated in triplicate and data was presented as ±S.D using MS Excel 2007 software.

RESULTS & DISCUSSION

Paeonia emodi, *Hedera nepalensis* and *Rubia manjith* were collected from Northern areas of the Pakistan and extracted in aqueous methanol. The crude extracts were screened against five selected bacterial strains using agar well diffusion assay. The results were summarized in Table 1, which revealed that extracts of *H. nepalensis* and *R. manjith* were remained inactive against all bacteria while only extract of *P. emodi* showed comparable result with standard drug.

Maximum inhibition activity was exhibited by the crude extract of *P. emodi* against *S. typhi* and *S. flexenari* (17 mm). Khan et al., 2005 reported that aerial parts of *P. emodi* showed significant herbicidal activity but no antifungal and antibacterial activity. Although the root extracts of this plant are being used by traditional practioners but its antibacterial activity was still not reported. This is the first report on the antibacterial activity of root extract of *P. emodi.* Northern areas of Pakistan are well known for production of many useful medicinal plants. Ahmed *et al*., (2004) have described the ethnopharmacological survey of some medicinally important plants of Galliyat areas of NWFP. Important ethnomedicinal herbs of Ayubia National Park, Abbottabad are described by Gilani *et al*., (2007).

Ethnobotanical profile of Utror and Gabral valleys, district Swat is described by Hamayun *et al*., (2005). In another study by Hamayun *et al*., (2006), folk medicinal knowledge and conservation status of some economically

valued medicinal plants of district Swat, is described.

Table 1: Antibacterial activity of plant extracts against different bacterial strains.

Sr. No	Bacterial strains	Zone of inhibition (mm)			
		P. emodi	***H. nepalensis***	***R. manjith***	**Imepenem**
1	*S. aureus*	15±1	-	-	28±3
2	*E. coli*	15±2	-	-	25±2
3	*P. aeruginosa*	14±1	-	-	21±1
4	*S. typhi*	17±2	-	-	27±3
5	*S. flexenari*	17±3	-	-	26±2
6	*P. sesame*	15±1	-	-	31±1
7	*S. methacilline*	15±1	-	-	32±3

Plants are important source of potentially useful structures for the development of new chemotherapeutic agents. The first step towards this goal is the in vitro antibacterial activity assay (Tona et al., 1998). Many reports are available on the antiviral, antibacterial, antifungal, anthelmintic, antimolluscal and anti-inflammatory properties of plants (Palombo EA, Semple SJ, 2001; Kumaraswamy et al., 2002; Stepanovic et al., 2003; Bylka et al., 2004). Some of these observations have helped in identifying the active principle responsible for such activities and in the developing drugs for the therapeutic use in human beings. The results of present investigation clearly indicate that the antibacterial and antifungal activity vary with the species of the plants and plant material used. Thus, the study ascertains the value of plants used in ayurveda, which could be of considerable interest to the development of new drugs.

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