

## Antibacterial Activities of Methanolic Extracts of *Datura innoxia*

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### Abstract

Indigenous plants are valuable and traditionally used against various ailments. These plants are used for the synthesis of numerous drugs. This study was conducted to investigate the antibacterial activities methanolic crude plant extracts of leaves, stem, root and seeds of *Datura innoxia*. Plant was screened. Antibacterial screening was performed against *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia Coli*, *Klebsiella pneumoniae*, *Streptococcus pneumonia*, *Proteus spp.*, and *Salmonella typhi* following the agar well diffusion method. Considerable biological activities were exhibited by each methanolic extracts of plant ranging diameter of inhibition zones from 6 mm to 24 mm. It is concluded that plant extracts should be preferred for treatment of various infectious diseases.

**Keywords:** Drugs, antibacterial, biological activities, agar well diffusion.

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## INTRODUCTION

In modern and traditional medicines, medicinal plants constitute an effective source. Plants act as a biosynthetic laboratory for its chemical compounds like alkaloids, phenolics, terpenoids and glycosides. Natural products have played an important role in treatment and prevention of human diseases (Newman *et al.*, 2000; Chin *et al.*, 2006; Kaushik *et al.*, 2008). There are reports of about 85,000 valuable medicinal plant species world-wide (Devi *et al.*, 2009; Liu and wang, 2008). The novel drugs were developed by the extraction of biologically active compounds from plants which were screened on the basis of medicinal uses or bioactivity (Hunter, 2001). Many researchers have inspected long-established uses of medicinal plants, but only a few studies have confirmed antimicrobial properties of these plants (Bhattarai *et al.*, 2008a; Shakya *et al.*, 2008). About 80% of population in developing countries uses medicinal plants as traditional health remedies as they lack access to pharmaceutical drugs (Magrani *et al.*, 2005).

Pakistan has unique biodiversity on earth comprising of different climatic zones with a variety of plant species.

There are estimates of existence of about 6000 plant species of medicinal plants in Pakistan. Natural products have been used as good sources of pharmacologically active compounds (Ahmed, 2015). Plants belonging to family *Solanaceae* are distributed worldwide, which includes 85 genera and about 2,800 species in the world. There are approximately 25 different species of *Datura* throughout the world, they are often called as Jimson weed or 'Thornapple'. The name *Datura* is derived from the early Sanskrit *Dustura* (Mann, 1996) or *dahatura*. *Datura* has numerous common names like deadly nightshade, Thorn apple, Stink weed, Jimson weed, Devil's apple and angel's trumpet (Heiser, 1969).

The whole plant is antiseptic, narcotic, sedative and is useful for asthma (Bhattacharjee and Supriya Kumar, 1998). Typical height of this plant is from 0.6 to 1.5 meters. The leaves and stems are protected by soft and short grayish hairs, thus whole plant appears grayish. The trumpet-shaped, white flowers are 12-19 cm long. The fruit of *Datura* plant is an egg-shaped spiny capsule which is about 5 cm in diameter. *Datura* seeds have shown 90 % germination rate even after 39 years of storage (Heiser,

1969). The germination time for seeds is usually 3 – 6 weeks at 15 °C.

The objective of the present study was to investigate the antibacterial activities of methanolic extracts of *Datura innoxia*.

## MATERIALS AND METHODS

### Collection of Plant Material

The fresh matured plant of *Datura innoxia* was collected during summer season from a natural population of University of Peshawar. The plant species of *Datura innoxia* were identified with reference to standard morphological characteristic features following the flora of Pakistan.

### Test Microorganisms

The methanol extracts of *Datura innoxia* were tested against the following seven bacterial strains: *Escherichia Coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Proteus spp.*, *Klebsiella pneumoniae*, *Salmonella typhi* and *Streptococcus pneumoniae*. These bacterial strains were retrieved from stock culture of Microbiological Research Laboratory, Centre of Biotechnology and Microbiology, University of Peshawar.

On nutrient agar plate bacterial species were maintained and thus recovered for testing by sub culturing in nutrient broth for 24 hrs. Stock cultures were stored at 4°C. For growth and maintenance of bacterial cultures Nutrient agar, Nutrient broth, Dextrose Agar), and MH (Mueller Hinton Agar) were used.

### Extract Preparation

Fresh parts of plants i.e: leaves, stem, root, and seeds were collected from *Datura innoxia* plant and washed under tap water, dried in shade and used for extraction. These leaves, stem, root and seeds were retained in dark room for drying at 37 °C for 15-20 days. These air dried parts of plant were placed in methanol for the extraction of active compounds. These were kept at room temperature for 15 days, observed and jiggle every day. Then the extracts were filtered. The soluble extracts were poured in isolated flasks. The solvents were evaporated for 1 hour at 50 °C by rotatory evaporator. Finally 5 gm crude extract of leaves and seeds were obtained separately. Similarly 8 gm extracts from stem and roots were isolated. For further use, the extracts were stored at 4 °C.

### Antibacterial Activity Testing

All the processes were carried out in sterilized environment. Nutrient agar slants were used for stock culture at 4 °C. Stock culture of bacteria was transferred to tubes containing 5 ml nutrient broth. These were poured on MH plates, rotated uniformly and kept for 30 minutes. So that microorganisms adheres on solid surface. Sterilized cork borer having 4 mm diameter was used for wells making. 2 mg of extracts were dissolved in 1 ml DMSO. Agar well diffusion method (Perez *et al.*, 1990) was employed. 10 µl solutions were pipette out and poured in wells to check the antibacterial activities of each parts of *Datura innoxia* separately. Then plates were placed in an

incubator at 37°C for 24 hrs to allow the bacterial growth and check out the active components of *Datura innoxia* against bacterial species. DMSO was used as negative control and 2 mg of erythromycin and streptomycin were dissolved in standard sterile distal water, considered as positive control.

## RESULTS AND DISCUSSION

The systematic screening of extracts from antimicrobial plants represents a continuous effort to find new compounds which are potentially active against multiresistant pathogenic bacteria and fungi. Methanol extracts from the leaves, stem, roots and seeds of *Datura innoxia* at 2 mg concentration were isolated and showed inhibition by well diffusion method ranging from 6 mm to 24 mm as shown in table 1. *Escherichia Coli*, *Salmonella typhi*, *Klebsiella pneumoniae*, *Proteus spp.*, *Streptococcus pneumoniae* and *Staphylococcus aureus* were more affected. The *Pseudomonas aeruginosa* showed resistance. Our results of antibacterial activity by methanolic extracts of *Datura innoxia* are in accordance to previous findings (Joshi and Kaur, 2013; Mathur *et al.*, 2013).

Natural products are continuously provided by plants which find extensive application in curing diseases and fulfilling various other everyday needs. There is great increase in multiple antimicrobial resistances in human pathogens by the use of commercial antimicrobial drugs. Nowadays it is a serious threat that some antibiotics show undesirable side effects and are responsible of emergence of infections (Marchese and Schito, 2000). This creates a great trouble for scientists and forced them to search for new antimicrobial substances from different sources like the medicinal plants. The analysis and screening of plant products and plant extracts for antimicrobial activities have demonstrated that higher plants serve as an important source of novel antibiotic prototypes (Meurer-Grimesa *et al.*, 1996). It has been inherited to use the medicinal plants as an important part of the health care system. About 20 % of the plants present on the earth have been submitted to test the pharmacological or biological activities (Suffredini *et al.*, 2004). Plant derivatives like honey have shown antibacterial activity against *B. alvei*, *B. polymyxa*, *B. subtilis* and *S. aureus* (Iqbal *et al.*, 2015).

## CONCLUSION

The methanol extracts of leaves, stem, roots and seeds of *Datura innoxia* showed activities against tested bacterial species. It was concluded that medicinal plants have huge contribution to the traditional and western medicine by providing ingredients for drug or being used in the drug discoveries.

**Table 1. Antibacterial activities of various compounds against tested bacteria**

Tested Bacteria	Zone of Inhibition for various compounds (mm)					
	Leaves Extracts	Seeds Extracts	Stem Extracts	Roots Extracts	Erythromycin	Dimethyl sulfoxide
<i>E.coli</i>	24	21	21	23	26	0
<i>Klebshiela</i>	21	11	11	6	24	0
<i>S.pneumonia</i>	14	14	13	17	26	0
<i>S.aureus</i>	24	18	24	13	26	0
<i>Proteus.spp</i>	13	11	8	10	24	0
<i>S.typhi</i>	15	11	14	14	34	0
<i>P.aeruginosa</i>	0	0	0	0	26	0

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## CONFLICT OF INTEREST

The authors declare that this article content has no conflict of interest.

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