

**DATURA METEL LINN. - A PLANT WITH POTENTIAL AS ANTIBACTERIAL
AGENT**

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ABSTRACT : The leaves, stem, flowers and fruits of *Datura metel* Linn. which have some medicinal applications were investigated. Phytochemical analysis gave positive results for steroids, triterpenoids, reducing sugars, sugars, alkaloids, phenolic compounds, flavonoids and tannins. The crude methanol extracts showed growth inhibitory effects on *Xanthomonas campestris*. The methanol extract of the leaves and flowers showed significant inhibitory effect when compared with positive controls, neomycin and kanamycin respectively. The stem and fruits extracts did not show marked antibacterial activity.

Key words: Phytochemical analysis, crude extracts, Antibacterial screening.

INTRODUCTION

Datura metel Linn (Thorn-apple, Devil trumpet, Solanaceae) is a Nigerian medicinal plant widely used in phytotherapy to cure diseases such as asthma, cough, convulsion and insanity. The leaves and seeds are widely used in herbal medicine as anesthetic, antispasmodic, bronchodilator and as hallucinogenic (Duke and Ayensu, 1985 and Dabur *et al.*, 2004). A variety of phytochemicals have been found to occur in *D. metel*. These phytoconstituents comprises alkaloids, flavonoids, phenols, tannins, saponins and sterols. The solanaceous alkaloids hyoscyamine and scopolamines have been isolated from *D. metel* (Chopra *et al.*, 1986, Oliver-Bever, 1986).

Xanthomonas is a very important kind of phytopathogenic bacteria, which causes the plant diseases all around the world. The hosts of this genus include atleast 124 monocotyledonous and 268 dicotyledonous plants, among which the rice bacterial blight, cabbage black rot disease, and citrus blight disease are the most serious diseases, which cause a big economic impact on agricultural production every year. Chemical control has been proved efficient and economical in controlling blight disease. However, increasing public concern on environmental issues desires that alternative management systems be evolved either to reduce pesticide dependant or naturally occurring compounds be explored to constrain the pathogen attack (Singh *et al.*, 2003; Cuthbertson and Murchie, 2005). Natural plants derived compounds contribute a lot in fight against pathogens (Vyvyan, 2002). Various plant extracts have also been examined for their antibacterial activity with the objective of exploring environmentally safe alternatives of plant disease control. Thus with the objective to contribute to these studies, the antibacterial activity of methanol extract of different parts of *Datura metel* was investigated against *Xanthomonas campestris*.

MATERIALS AND METHODS

Collection of plant materials

Fresh plant/ plant parts were collected randomly from the region of Tirunelveli, India. Fresh plant material was washed; shade dried and then powdered using the blender and stored in air tight bottles.

Methanol extraction

10 g of plant powder was added to 100 ml of methanol in a conical flask and plugged with cotton wool. After 24 hours the supernatant was collected and the solvent was evaporated to make the crude extract and stored at 4°C (Harbone JB, 1973).

Phytochemical analysis

Phytochemical analysis of methanol extracts of different parts of *D. metel* was conducted following the procedure of Brindha et al., (1981).

Antibacterial assay

Xanthomonas campestris (MTCC No. 2286) was procured from the Institute of Microbial Technology (IMTECH), India. The antibacterial activity of methanol extracts of different parts of *D. metel* was tested in disc diffusion method following the procedure of Bauer et al., (1966). Muller Hinton agar medium was seeded with 100µl of inoculum (1×10^8 CFU/ml). The impregnated discs containing the test sample (100µg/ml) were placed on the agar medium seeded with tested microorganisms. Standard antibiotic discs (Kanamycin 30µg/disc, Neomycin 10µg/disc) and blank discs (impregnated with solvent) were used as positive and negative control. The plates were then incubated at 37°C for 24 h to allow maximum growth of the microorganisms (Bauer et al., 1966). The antibacterial activity of the test samples was determined by measuring the diameter of zone of inhibition expressed in millimeter. The assay was repeated twice and mean of the three experiments was recorded.

Statistical analysis

All data were expressed as mean \pm SD. Statistical analyses were evaluated by one-way ANOVA followed by Tukey HSD test. Values with $P < 0.05$ were considered statistically significant.

RESULTS AND DISCUSSION

Phytochemical analysis

The preliminary phytochemical analysis of the leaves, stem, flowers and fruits of *D. metel* showed the presence of steroids, triterpenoids, reducing sugars, sugars, alkaloids, phenolic compounds, flavonoids and tannins (Table 1).

Table 1: Phytochemical analysis of methanol extracts of selected plant parts

Compounds	Leaves	Stem	Flowers	Fruits
Steroids	+	+	+	-
Triterpinoids	+	-	-	-
Reducing sugars	-	+	+	+
Sugars	+	-	+	+
Alkaloids	+	+	+	+
Phenolic compounds	+	-	+	+
Flavanoids	+	+	+	-
Catechins	-	-	-	-
Saponins	-	-	-	-
Tannins	+	-	+	-
Anthroquinones	-	-	-	-
Amino acids	-	-	-	-

Antibacterial assay

From the results of the antimicrobial screening (Tables 2), the methanol extracts of leaves have significant antimicrobial activities compared to the other parts of the selected plant with respect to the tested bacteria *X. campestris*. The ANOVA analysis revealed that methanol extracts of leaves showed highly significant inhibitory effect ($p < 0.05$) when compared with neomycin and flowers also showed significant inhibitory effect ($p < 0.05$) when compared with kanamycin which are used as positive controls. The methanol extracts of stem and fruits of the selected plant did not show any inhibitory effects. Tukey HSD analysis of the data revealed that *X. campestris* was highly susceptible to leaves extract compared with flower extract.

Table 2: Antibacterial activity of different parts of selected plant against *Xanthomonas campestris* compared with two positive controls (zone of inhibition in mm)

Samples	Methanol solvent	Neomycin	Kanamycin
Leaves	25.30±0.47	17.00±0.82	8.00±1.60
Stem	-		
Flowers	11.60±1.25		
Fruits	-		

Data given are mean of three replicates ± standard error. $P < 0.05$

Datura metel L (syn. *Datura alba* Nees) is popular all over the world for its medicinal uses. It is also known for its antibacterial activity against burn pathogens (Gnanamani *et al.*, 2003) and antifungal activity against phytopathogens (Dabur *et al.*, 2004; Kagale *et al.*, 2004). Shirsat (2008) reported the anti-phytopathogenic activity of crude and methanol extract of leaves, stem bark, seed and dry fruit of *Terminalia thorelli*, against four phyto pathogens. Ghosh *et al.*, (2008) evaluated the antibacterial potentiality of hot aqueous and methanol solvent extract of mature leaves of *Polyalthia longifolia* against six reference bacteria.

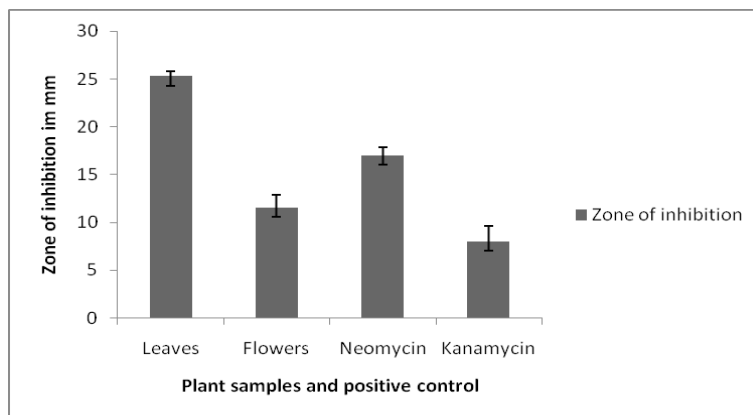


Figure 1: Antibacterial activity of methanol extracts of different parts of *Datura metel* plant against *Xanthomonas campestris*

CONCLUSIONS

Hence this study suggests that *Datura metel* plant (leaves and flowers) extract has significant antibacterial activity, which might be helpful in preventing or slowing the process of various plant diseases. The results of the present study also indicate that the plant parts possess many phytochemicals which could be responsible for the observed antibacterial activities of the plant.

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