# ANTIBACTERIAL ACTIVITY OF THE LEAVES AND STEM BARK OF *AILANTHUS EXCELSA* ROXB.

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**Summary**

Aqueous and alcoholic extracts of *Ailanthus excelsa* Roxb leaves and stem bark were investigated for their in-vitro antibacterial properties by agar cup-plate method. The crude extracts inhibited the growth of both Gram positive and Gram negative bacteria. The gram positive bacteria tested appeared to be more susceptible to the extracts than the gram negative bacteria. Both the extracts of leaf and stem bark showed inhibitory activity against all the tested bacteria. The order of antibacterial activity of different extracts was alcoholic leaf extract > alcoholic stem bark extract > aqueous leaf extract > aqueous stem bark extract. Based on the current findings it can be concluded that the plant possess potent antibacterial activity.

**Keywords:** *Ailanthus excelsa* Roxb, antibacterial activity, agar cup-plate method.

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## Introduction

*Ailanthus excelsa* Roxb is a large deciduous tree, 18-25m tall, truck straight, 60-80cm in diameter, bark light grey and smooth, becoming grey brown and rough on large trees, aromatic, slightly bitter. Leaves are alternate, pinnately compound, edges coarsely toothed and often lobed, greenish yellow in colour. Commonly found in Bihar, Uttar Pradesh and central parts of India. In the indigenous system of medicine the bark of the tree is used as a bitter, refrigerant, astringent, appetizer, anthelmintic and febrfuge. It is claimed to be effective in diarrhea and dysentery [1, 2]. The drug is reported to care skin disease, troubles of rectum and fever. Further the drug is used in dyspeptic complaints, asthma, chronic bronchitis and diseases some of which are caused by micro-organisms [3-5]. The vast ethnomedical uses prompted us to investigate antibacterial properties of the leaves and stem bark of the plant.

## Materials and Methods

**Plant material collection and preparation of extracts:**
Fresh leaves and stem barks of the plant *Ailanthus excelsa* Roxb were obtained from the national highway-24, near Bareilly, UP, India in the month of April, 2008 and identified by authentitic sources. A voucher specimen has been deposited in the Pharmacognosy Department of College of Pharmacy, IFTM, Moradabad, India for further references. The collected leaves and stem barks were dried in shade and crushed to coarse powder. The powder was passed through sieve no.40 and used for extraction. The leaf and stem bark powders were extracted separately with methanol using soxhlet apparatus. Finally the aqueous extract was prepared by decoction. All the extracts were concentrated by rotary vacuum evaporator and stored in desiccator until further use.

**Bacterial strains:**
Gram positive bacterias: *Bacillus subtilis* (NCIM NO. 2196), *Staphylococcus aureus* (NCIM NO. 2672), *Sarcina lutea* (ATCC 9341) and *Bacillus megatherium* (NCIM NO. 2032), and Gram negative bacterias: *Escherichia coli* (NCIM NO. 2837), *Pseudomonas aeurogenosa* (NCIM NO. 2914), *Proteus vulgaris* (NCIM NO. 2857) and *Shigella sonnie* (MTCC 2958) were procured from NCL, Pune, India. Test cultures were prepared by transferring a loop full of bacteria from stock culture nutrient broth and incubated at 37°C for 24 hours.

**Screening of antibacterial activity:** [6-8]
The extracts of *Ailanthus excelsa* Roxb were tested for antibacterial activity by agar cup-plate method. The extracts were dissolved in dimethysulphoxide (DMSO) to get a concentration of 1 mg/ml and ampicillin trihydrate was used as standard drug. Fifteen milliliters of nutrient agar media was poured into sterile petri dishes. Cell suspensions of different microorganisms were prepared and evenly spread onto the surface of the media using sterile swab sticks. Once the plates had been aseptically dried, 10 mm wells were bored using a sterile cork borer. 200 µl of the extracts were placed into the wells, left for one hour at room temperature for diffusion and the plates were incubated at $37^0$C for 24 h after which diameter of zones of inhibition were measured.

## Results

The results of antibacterial activity (Table 1) indicated that all the extracts exhibited significant activity against both Gram positive and Gram negative bacterial strains tested. Gram positive bacterias were more susceptible towards the alcoholic extracts of both leaf and stem bark. Highest zone of inhibition (16-20 mm) was shown by alcoholic extract of leaf against *B. subtilis, S. aureus, B. megatherium, E. coli* and *P. aeurogenosa* whereas the same zone of inhibition exhibited by alcoholic extract of stem bark was only against *B. megatherium*. The order of antibacterial activity of different extracts was alcoholic leaf extract > alcoholic stem bark extract > aqueous leaf extract > aqueous stem bark extract. It is quiet apparent from the studies that the alcoholic extract possesses significant antibacterial activity and it would be interesting to isolate the constituents responsible for the same.

**Table 1.** Determination of antibacterial activity of different extracts of *Ailanthus excelsa* leaf and stem bark

| Microorganisms | *Zone of inhibition | | | | Ampicillin |
|---|---|---|---|---|---|
| | Leaf extracts | | Stem bark extracts | | |
| | Alcoholic | Aqueous | Alcoholic | Aqueous | |
| *B. subtilis* | +++ | ++ | ++ | ++ | ++++ |
| *S. aureus* | +++ | ++ | ++ | + | ++++ |
| *S. lutea* | ++ | ++ | + | + | ++++ |
| *B. megatherium* | +++ | ++ | +++ | + | ++++ |
| *E. coli* | +++ | ++ | ++ | + | ++++ |
| *P. aeurogenosa* | +++ | + | ++ | + | ++++ |
| *P. vulgaris* | ++ | + | ++ | + | ++++ |
| *S. sonnie* | ++ | + | + | + | ++++ |

*average of three readings; + = 6-10 mm; ++ = 11-15 mm; +++ = 16-20 mm; ++++ = >20 mm.

## Discussion

*Ailanthus excelsa* contains a number of phytoconstituents viz. quassinoids [9-12], steroids [13], triterpenes [14-16], triacontane and hexatriacontane [17], alkaloids [18], proteins [19], flavonoids [20, 21], ailantic acid [22] etc which are responsible for various pharmacological activities. Hence, the antimicrobial activity exhibited by the leaf and stem bark may be due to the above phytoconstituen(s). However, it will be interesting to isolate the chemical entities from the active extracts of the plant and to study their antibacterial activity.

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