

## Antibacterial Properties of *Rosa indica* (L.) Stem, Leaves and Flowers

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**Abstract:** *Rosa indica* leaves, stem and flowers were screened against various pathogenic bacterial strains to study the antimicrobial properties of the plant. Methanolic and ethyl acetate extracts of plant parts were screened by agar well diffusion method against *E. coli*, *P. aeruginosa* and *S. aureus*, respectively. Methanolic extracts of rose petals, leaves and stem were found to have good antibacterial properties against the entire test microorganisms selected in the study, while ethyl acetate extract showed activity against *P. aeruginosa* only. Rose flower was found best source for antibacterial activity against the microorganisms.

**Keywords:** *Rosa indica*, *E. coli*, *S. aureus*, antibacterial properties, antibiogram.

### Introduction:

A rose is a perennial plant of the genus *Rosa*, within the family Rosaceae. There are over 100 species [5]. They form a group of erect shrubs, and climbing or trailing plants, with stems that are often armed with sharp prickles. Flowers are large and showy, in a number of colours from white through yellow and red. Most species are native to Asia, with smaller numbers native to Europe, North America and Northwest Africa. Species, cultivars and hybrids are all widely grown for their beauty and fragrance. Rose plants range in size from compact, miniature roses, to climbers that can reach 7 meters in height. Species from different parts of the world easily hybridize, which has given rise to the many types of garden roses [12]. Roses have been one of the world's most popular ornamental plants for a long time. The flowers vary greatly in size, shape and colour. Tissue culture system in roses has been established [6, 9, 7-8, 11, 3, 2, 10]. Recently, *in vitro* flower induction in roses was demonstrated [15, 14]. The majority of ornamental roses are hybrids that were bred for their flowers.

### Materials and Methods:

Fresh leaves, stem and flowers of *Rosa indica* were collected from the local nursery of Gomti Nagar, Lucknow and identified as per our data record at MRD LifeSciences. The plant materials were dried and grinded in electronic blender to fine powder and were subjected to bioactive compounds extraction. Plant extracts were prepared from dried sample in this research work as has been reported earlier [4]. The extract was obtained by organic suspension extract method using solvent methanol and ethyl acetate. All the extracts were dried up to crystal form and were dissolved in distilled water at concentration of 200mg/ml. Bacterial cultures of *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli* were obtained from IMTECH, Chandigarh, and were sub-cultured onto Petri plate containing nutrient agar media. Single colony was transferred in sterile 50 ml of nutrient broth and incubated at 37 °C in shaker incubator at 140 rpm for 14

hrs. Bacterial cells were recovered by centrifugation and were suspended in sterile distilled water; concentration of pathogens was optimized by maintaining OD to 0.1 at 600 nm before use.

Agar well diffusion method was used here in order to get the antibiogram of various plant extracts against test microorganisms as has been performed earlier by [1]. The antimicrobial activity of *Rosa indica* plant parts were determined by agar well diffusion method against *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Escherichia coli*. 10.0 ml nutrient agar media was poured in a sterile Petri dish, 100 µl of test organisms were spread on the surface of media, wells were prepared with help of sterile borer and wells were aseptically filled by 30µl plant extracts with positive (Tetracycline; 50µg/ml) and negative control (autoclaved distilled water). Plates were incubated aerobically at 37 °C for 14 hrs. The diameters of zones of inhibition were measured.

Active plant extracts confirmed by agar well diffusion assay were further subjected to determine the Minimum Inhibitory Concentration (MIC) required for the bacteriostatic effects by standard micro-dilution agar double layer methodology. This is carried out by double agar gradient plate method. Nutrient agar (5.0 ml) was poured into sterilized Petri dishes, leaving the plate in slanted position. After setting the media, another 5.0 ml of nutrient agar (along with plant extract; 5.0 mg/ml) was added to the plates to make the level unity; thus the plate contained an increasing concentration of plant extract along the diameter of the plate. Now the 70µl of prepared inoculums of cultures were spread. Plates were incubated in upright position at 37 °C for 14 hrs. Concentration gradient along with the diameter was calculated for each mm. visible colonies were observed, distance was measured from top end and concentration of the compound was calculated as MIC.

### Results:

When the plant extracts were screened against bacterial pathogens, only methanolic extract showed positive results while extracts obtained by ethyl acetate failed to

show any result. Zone of inhibition of plant extracts (methanolic) against almost all of the bacterial pathogens is given below.



Fig.1- Photograph showing Antibiogram of Leaf, stem and flower extract (methanolic and ethyl acetate) of *Rosa indica* against *P. aeruginosa*.



Fig.2- Photograph showing Antibiogram of Leaf, stem and flower extract (methanolic and ethyl acetate) of *Rosa indica* against *S. aureus*.



Fig.3- Photograph showing Antibiogram of Leaf, stem and flower extract (methanolic and ethyl acetate) of *Rosa indica* against *E. coli*.

Figure 4: Antibiogram of methanolic, extracts (leaf, stem and flower) against bacterial pathogens. Extracts found to have inhibitory effects were tested for determination of minimum inhibitory concentration (MIC) by agar double layer method against susceptible bacterial species and the pattern obtained in the experiment is given below.

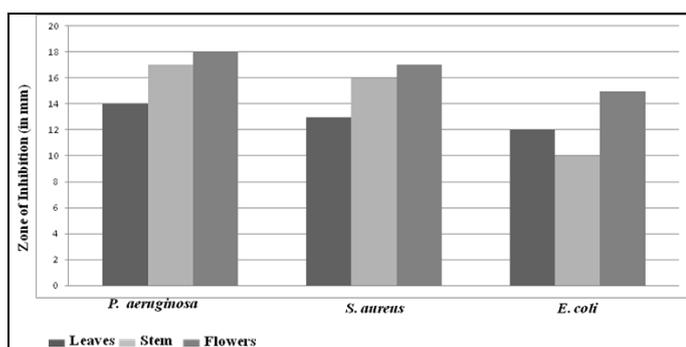
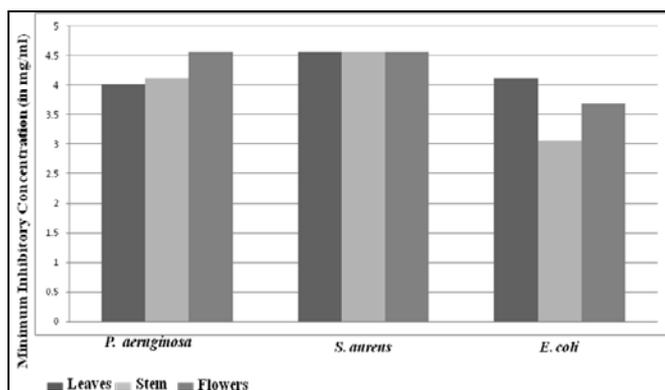


Figure 5: MIC of methanolic extracts of *R. indica* leaf, stem and flowers.



## Discussion:

Herbal medicines are a valuable and readily available resource for primary health care and complementary health care systems. Undoubtedly, the plant kingdom still holds many species of plants containing substances of medicinal value that have yet to be discovered, though large numbers of plants are constantly being screened for their antimicrobial effects. These plants may prove to be a rich source of compounds with possible antimicrobial activities but more pharmacological investigations are necessary.

The results obtained showed that the leaves, stem and flower of *Rosa indica* (red) have bacteriocidal effects on pathogenic microorganisms. **Figure 1-3** shows that methanolic extract proved better and improved antibacterial activity in comparison to ethyl acetate. The widest zone of inhibition (18mm) was determined by the methanolic extract of *Rosa indica* petals, followed by (14mm) leaves and (17mm) stem extract. A remarkable 13mm zone of inhibition was recorded by ethyl acetate extract of *Rosa indica* stem against *P. aeruginosa*, while *E. coli* and *S. aureus* found insensitive. Similar type of investigations was reported earlier with ethanolic extracts [13].

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