

## Antimicrobial Activity of Artemisinin - An Antimalarial Drug

Ankit Agrawal<sup>1\*</sup>, Anjana Sharma<sup>2</sup> and Narmada Prasad Shukla<sup>1,3</sup>

<sup>1</sup>MP Council of Science and Technology, Vigyan Bhawan, Nehru Nagar, Bhopal (M.P.), India

<sup>2</sup>Bacteriology laboratory, Department of Post Graduate Studies and Research in Biological Sciences,  
Rani Durgawati University, Jabalpur (M.P.), India

<sup>3</sup>MP Pollution Control Board, E-5, Arera Colony, Bhopal (M.P.), India

\*Corresponding Author E-mail: [ankitagr01@gmail.com](mailto:ankitagr01@gmail.com)

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### ABSTRACT

Resistance of bacterial pathogens to commonly used drugs led to screening the medicinal plants having potential of antimicrobial, which have no or less side effects. Artemisinin is a bioactive compound of *Artemisia annua* known for its antimalarial activity. Into the search of its antimicrobial activity, it was screened against five microorganism i.e. *Escherichia coli* (Wild), *E. coli* (DH5a), *Micrococcus luteus*, *Staphylococcus aureus* and *Bacillus subtilis* by using disc diffusion method. The present study concluded that artemisinin had no antimicrobial activity for the all tested microorganism even at maximum concentration of 400 µg/disc.

**Key words:** *Artemisia annua*, Artemisinin, Disc Diffusion, Antimicrobial activity, Antimalarial.

### INTRODUCTION

Antibiotics are widely used for the treatment of infectious diseases, but many pathogens are becoming resistant to them. There are frequent reports on the isolation of bacteria that are known to be sensitive for routinely used drugs and now became multi drug resistant<sup>1</sup> due to their genetic ability to acquire and transmit resistance against currently available antibacterials. Into the search of new drug, plant derived drug can be a better option, as they had less or no side effects as compared to the antibiotics, which has many side effects. Many plant extract and secondary metabolites are known to possess the antimicrobial activity

against various microorganism. There are several reports available, which state that the medicinal plants had antimicrobial activity, which can lead into an additional source of drug<sup>2,3,4</sup>.

*Artemisia annua* is one of the important traditional medicinal plants used for curing the various diseases. There are various reports which state that the extracts of *A. annua* and its essential oil are effective against several infectious microorganisms<sup>5,6,7</sup>. *A. annua* had a bioactive compound, Artemisinin which is most commonly used as antimalarial drug<sup>8</sup>.

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Looking upon the importance of artemisinin and antimicrobial activity of extracts as well as essential oil of *A. annua*, the screening of antimicrobial activity of artemisinin will be beneficial for medical science. Therefore, the present study was undertaken to explore the antimicrobial activity of artemisinin against five microorganisms i.e. *Escherichia coli* (Wild), *E. coli* (DH5 $\alpha$ ), *Micrococcus luteus*, *Staphylococcus aureus* and *Bacillus subtilis*.

#### MATERIAL AND METHOD

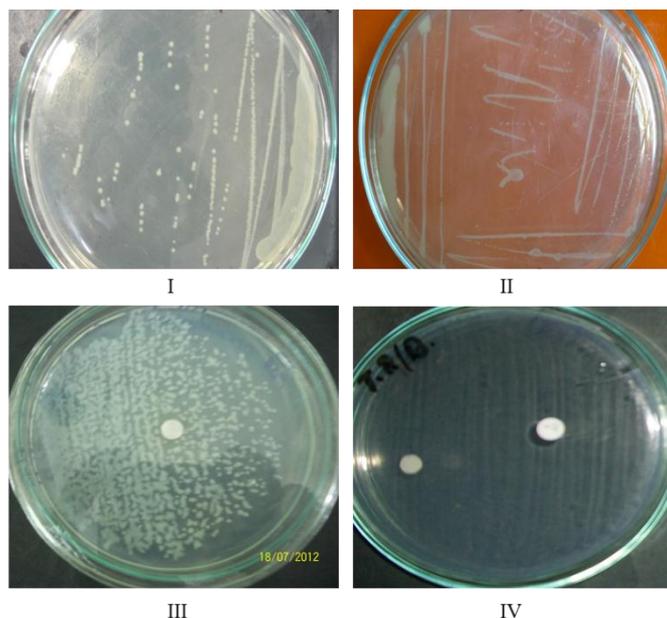
Disc diffusion method was used for the assay of antimicrobial activity of artemisinin<sup>3,4-9</sup>. The petriplates containing Mueller Hinton agar medium were seeded with 24 hours old culture of *Escherichia coli* (ATCC 25922), *E. coli* (DH5 $\alpha$ ), *Micrococcus luteus* (ATCC 9341), *Staphylococcus aureus* (ATCC 9144), *Bacillus subtilis* (ATCC 6051). Sterile 5 mm diameter filter paper discs (prepared by Whatman filter paper grade 1) impregnated with 200  $\mu$ g and 400  $\mu$ g of artemisinin/disc (Artemisinin 99.99% Sigma Aldrich, USA) were placed aseptically on the surface of seeded plates. The plates were incubated at 37 °C for 24 hours and zone of inhibition was observed.

#### RESULT AND DISCUSSION

After 24 hours incubation at 37 °C of culture bed of five test organisms i.e. *E. coli* (Wild), *E. coli* (DH5 $\alpha$ ), *M. luteus*, *S. aureus* and *B. subtilis* having discs impregnated with 200 and

400  $\mu$ g per disc of artemisinin, it was observed that the artemisinin did not show any inhibition zone against the all five test organisms (fig. 1).

The observations of present experiment revealed that artemisinin had no antimicrobial activity against the tested microorganisms (two strains of *E. coli* and one strain each of *M. luteus*, *S. aureus* and *B. subtilis*) even at maximum concentration of 400  $\mu$ g/disc. Shoeb *et al.*<sup>10</sup> observed that 100  $\mu$ g/disc concentration of artemisinin had no antibacterial activity against *E. coli* and *S. aureus*, while Thofner *et al.*<sup>11</sup> tested artemisinin at a concentration ranging between 100 to 300  $\mu$ g and found that it had no activity against the test microorganisms i.e. eight strains of *E. coli*, five strains each of *Streptococcus* species and *Proteus* species and one strain of *Staphylococcus* species. However, Dhingra *et al.*<sup>12</sup> found that artemisinin had antibacterial activity on strain (s) of *E. coli*, *B. subtilis*, *Agrobacterium rhizogenes*, *B. pumilus*, *Pseudomonas aeruginosa*, *P. putida*, *Salmonella abony*, *Streptococcus faecalis*, *Klebsiella oxytoca*, *Acrmonium strictum*, *Proteus vulgaris*, *Shigella* Species, *Serratia* species and *Saccharomyces cerevisiae* at the concentration of 1 mg/ml through cup plate method. However this study has no significance as effect is reported at a very high concentration, impractical to be used as antimicrobial agent.



**Figure 1: Antimicrobial assay of Artemisinin compound**

I. Culture of *Escherichia coli* on LB agar medium; II. Culture of *Staphylococcus aureus* on NA agar medium; III. Antimicrobial susceptibility test on *E. coli* Culture bad; IV. Antimicrobial susceptibility test on *S. aureus* Culture bad.

### CONCLUSION

The present study culminated that artemisinin has no antimicrobial activity against the tested microorganisms i.e. *E. coli* (Wild), *E. coli* (DH5 $\alpha$ ), *M. luteus*, *S. aureus* and *B. subtilis*.

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