

***In Vitro* Antibacterial Activity of *Allium sativum* L. (ကြက်သွန်ဖြူ) and Combined Effect with Antibiotics**

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Abstract

Nowadays, bacterial resistance to conventionally used antimicrobial agents is increasing. As for alternative approaches, scientists search for new antimicrobial substances from natural sources, as well as to use combination therapy of antimicrobial agents and plant extracts. *Allium sativum* L. (garlic) is well-known for its antibacterial activity. The present study has been carried out to determine the *in vitro* antibacterial activity of garlic against *Staphylococcus aureus*(ATCC 25923), *Pseudomonas aeruginosa*(ATCC 27853), *Escherichia coli* (Control Strain of DMR) and to study whether garlic extract shows any synergistic effect when used in combination with antibiotics (ciprofloxacin and ceftriaxone). Ethanolic and aqueous extracts were obtained from both fresh bulbs and bulb powder dried at room temperature and in the oven at 50 °C, respectively. Phytochemical analysis among six different extracts has indicated that all extracts contain carbohydrate, reducing sugar, tannins, phenolic compounds, alkaloids, glycosides, sulphur and amino acids. Allicin and E-ajoene were detected in all ethanolic and aqueous extracts using thin layer chromatography method. Antibacterial activity was determined by agar disc diffusion method at the concentration of 60 mg/disc. Antibacterial activity between fresh and dried extracts of each solvent type is almost the same. Ethanolic extracts showed greater antibacterial activity than aqueous extracts. Among different test organisms, all extracts showed highest activity against *S. aureus*. The minimum inhibitory concentrations (MICs) of ethanolic extract of fresh bulbs were 12.5 mg/mL for *P. aeruginosa*, *E. coli* and 6.25 mg/mL for *S. aureus*. The combined effects of ethanolic extract and antibiotics were determined using checkerboard assay. Combination of extract with each drug have synergistic action against *S. aureus* and additive against *P. aeruginosa*, whereas indifferent against *E. coli*. Therefore, garlic alone and in combination with antibiotics possess antibacterial activity and this study can give a clue for new choice to combat bacteria.

Keyword: *Allium sativum* L., Antibacterial activity, Synergism