INVITRO ANTIBIOTIC ACTIVITY OF GARLIC (*Allium sativum*) EXTRACT AGAINST COMMON POULTRY PATHOGENS

P. Shamsudeen and A. Jagadeeswaran

Ethnoveterinary Herbal Research Centre for Poultry,

Veterinary Hospital Campus, Namakkal– 637 002, Tamil Nadu, India. .

Correspondence: E-mail: shams_phd@rediffmail.com

Received 17-6-2013 Accepted 21-8-2013

ABSTRACT

An investigation was made to assess preliminary phytochemical constituents and *in vitro* antibiotic activity of garlic extract against common poultry pathogens by agar well diffusion method. Qualitative phytochemical analysis revealed the presence of saponins, terpenoid, flavanoids and volatile oils in garlic. The sensitivity revealed that the *Salmonella sp* .exhibited more sensitivity at 50 and 100% concentration, equal sensitivity at 25% and lesser sensitivity at 12.5% concentration of garlic than gentamicin and ciprofloxacin. *E. coli* showed more sensitivity to garlic even at the concentration of 12.5% than the reference antibiotics. *Staphylococcus sp.* showed lesser sensitivity at 25, 50 and 100% concentrations of garlic than reference antibiotics, whereas it was resistant to garlic at 12.5% concentration.

KEY WORDS : Garlic, Phytochemical analysis, Sensitivity, Poultry pathogens

INTRODUCTION

Infectious bacterial diseases are the common and recurring problem in commercial poultry farms and the use of antibiotics creates microbial resistance to these antibiotics and also antibiotic residue may contaminate poultry products. Sub-therapeutic use of antibiotics as growth promoter in Europe has been banned and thus there is need of finding alternate to antibiotic growth promoter in poultry. The herbs/herbal spices like garlic provide potential and viable alternate to antibiotic growth promoter in poultry production. Hence a study was undertaken to analyze the preliminary phytochemical analysis and the antibiotic sensitivity against common poultry pathogens. i.e *Escherichia coli, Salmonella* and *Staphylococcus*.

MATERIALS AND METHODS

Preliminary phytochemical analysis of garlic (obtained from local market of Namakkal town, Tamil Nadu) was carried out according to the methods described by Trease and Evans (1989). For assessing *invitro* antibiotic activity, fresh juice from garlic was obtained by crushing with mortar and pestle without adding water and was filtered with sterile Whatman No. 1 filter paper. The neat garlic juice was diluted with sterile distilled water to make different concentration of 12.5, 25, 50 and 100 per cent (100% indicates undiluted neat extract). A garlic piece sliced aseptically to the size of standard antibiotic disc was also assessed for the activity.

Pathogenic poultry isolates viz. *Salmonella sp., Escherichia coli* and *Staphylococcus sp* obtained from Poultry Disease Diagnosis and Surveillance Lab., Namakkal were used for the study. The organisms were subcultured on appropriate solid media followed by overnight incubation at 37^0 C. The antibacterial activity of garlic extract was tested by agar well diffusion method (Perez *et al.,* 1990). The bacteria were streaked onto nutrient agar plate and incubated overnight at 37^0C. Single colony from the plate was then inoculate into nutrient broth and incubated for 3 hrs at 37^0 C. The bacteria grown in the broth was diluted to 0.5 Mc Farland standards and streaked onto nutrient agar plates. Once the plate dried, it was punched with 6 mm diameter wells and filled with 50 µl

of fresh juice. The antibiotics, ciprofloxacin, gentamicin and penicillin were kept as positive control on the same plate. The plates were incubated at 37^0 C overnight and the zone of inhibition was measured and recorded. All the test were carried out in triplicate.

RESULTS AND DISCUSSION

The result of the phytochemical analysis revealed the presence of saponins, terpenoid, flavanoids and volatile oils in garlic. The result of antibacterial activity of garlic revealed that the *Salmonella sp.* was sensitive to gentamicin (21mm) and ciprofloxacin (21mm). Garlic extract also showed similar sensitivity at 25 per cent concentration but showed higher sensitivity to garlic extract at 50 per cent (23 mm) and 100 per cent (27 mm) concentration than the control antibiotics. The garlic piece as such showed lesser sensitivity (14 mm) than gentamicin and ciprofloxacin against *salmonella* organism. Safithri *et al.* (2011) also reported that filtrate of fresh garlic could be used to inhibit growth of *S. typhimurium*.

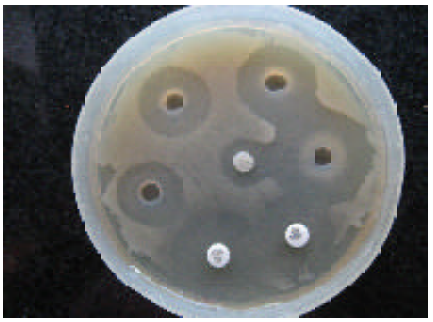

Photo 1. **Garlic extract against *Salmonella sp.***

E. coli showed intermediate sensitivity to gentamicin (16 mm) and ciprofloxacin (18 mm); Garlic extract even at the concentration of 12.5 per cent showed more sensitivity (19.5 mm) than control antibiotics. Garlic piece as such showed sensitivity similar to gentamicin. An interesting observation is that the organism showed intermediate sensitivity to control antibiotics, but showed higher sensitivity to garlic extract. *E. coli* infection is a common problem in poultry and indiscriminate use of these antibiotics would have resulted in reduced sensitivity of the organism to these antibiotics. Indu *et al.* (2006) also reported similar sensitivity of *E. coli* organism to garlic extract.

Photo 2. **Garlic extract against *E. coli***

Staphylococcus sp. showed sensitivity to penicillin G (21 mm) and ciprofloxacin (21 mm); Garlic extract at 25, 50 and 100 per cent concentrations showed lesser sensitivity than control antibiotics, whereas garlic extract at 12.5 per cent concentration and garlic piece as such showed resistance to the bacteria.

The result of the present study showed that higher the concentration of garlic extract, higher was the sensitivity as shown by more zone of inhibition. The observed secondary metabolites such as saponins, terpenoid, flavanoids and volatile oils might be responsible for the antibacterial activity of garlic. This is supported by the finding of Harris *et al*. (2001) who stated that a bioactive compound in garlic that has antibacterial activity is a volatile compound containing sulfur known as allicin. Other bioactive compounds namely, dialildisulphide, and dialiltrisulphide of garlic have antibacterial activity (Avato *et al*., 2000; Tsao and Yin 2001).

Photo 3. **Garlic extract against *Staphylococus sp.***

The study shows that garlic possesses antibacterial activity especially against *E. coli* and *salmonella* organisms affecting poultry and it could provide viable alternate to common antibiotics in poultry health.

REFERENCES

Avato, P., Tursil, E., Vitali, C., Miccolis, Y. and Candido, V. (2000). Allylsulfide constituents of garlic volatile oil as antimicrobial agents. Phytomedicine, **7:** 239-243.

Harris, J.C., Cottrell, S.L., Plummer, S. and Lloyd, D. (2001). Antimicrobial properties of Allium sativum (garlic). Applied Microbiol Biotech. **57:** 282-286.

Indu, M.N., Hatha, A.A.M., Abirosh, C., Harsha, U. and Vivekanadan, G. (2006). Antimicrobial activity of some of the south-Indian spices against serotypes of *Escherichia coli*, *Salmonella*, *Listeria monocytogenes* and *Aeromonas hydrophila*. Brazilian J Microbiol. **37:** 153-158

Perez, C., Pauli, M. and Bazerque, P. (1990). An antibiotic by the agar well method. Acta Biologiae et Medicine Experimentalis, **15:** 113-115.

Safithri, M., Bintang, M. and Poeloengan, M. (2011). Antibacterial activity of garlic extract against some pathogenic animal bacteria. Media Peternakan, **34 (3):** 155-158.

Trease, G.E. and Evans, W.C. (1989). Pharmacognosy. Brailliar Tiridel can, 13th edition. Macmillian Publishers.

Tsao, S.M. and Yin, M.C. (2001). In vitro antimicrobial activity of four diallyl sulphides occurring naturally in garlic and Chinese leek oils. J Medicine and Microbiol. **50:** 645-649.

❑