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Original Article

Evaluation of Antimicrobial Activity of Spider Silk *Pholcus Phalangioides* Against Two Bacterial Pathogens in Food Borne

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ABSTRACT

Objective: Due to the alarming increase the incidence and prevalence of infectious diseases and increasing bacterial resistance to antibiotics need to discover new strong antimicrobial compounds is feeling. **Methods:** In this study, the antimicrobial properties of spider silk *Pholcus phalangioides* produced in sterile conditions against two bacteria, *Listeria monocytogenes* and *Esherichia coli* with using well diffisuiou method and Macro Broth Dillution method was evaluated. **Results:** The results showed that the antimicrobial compounds present in the solution spider silk greater inhibitory effect on gram-positive bacteria *L. monocytogenes* than Gram-negative bacteria *E. coli*.

INTRODUCTION

The natural world is a good source of therapeutic products that are able to inhibit the growth of bacteria. However, due to the increased incidence of new infections and the increasing incidence of bacterial resistance to antibiotics, severe and ongoing needs be felt to discovery of diverse chemical structures and new mechanisms of antimicrobial compounds (Zuridah and Shinabarger et al. 2008). Spiders for their biological activity needs have to produce cobweb. In the past few years, people were used of spider silk for wound healing because it is contains high amounts of vitamin K and is also able to low stimulate the immune system (Heimer et al, 1988). Spiders silk is contains Amino acids including glycine and alanine and large amounts of pyrrolidine helping to keeps the water in the spider silk and will protect it from drying out. In addition, phospholipids

hydrate and potassium nitrate available at spider silk can prevent from the growth of fungi and bacteria on the silk (Chakraborty et al. 2009; Gomes et al. 2010). In the number of studies have shown that some of bisphosphonate (Phosphonates) peptides have antibacterial activity and could be found in the spider silk (Gellynck et al. 2006). The purpose of this study was to evaluate antibacterial activity of spider silk *Pholcus phalangioides* against two strains standard drug-resistant bacteria human pathogens and compare the antibacterial properties compounds of spider silk against them.

2. MATERIALS AND METHODS

Spiders used in this study were taken from the surface of the wall and then transferred into plastic boxes sterile for produce cobweb. Also used for feed the beasts of

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Drosophila and for moisture supply needed every few days, once the particles of water was sprayed into the box. For determine the effect of antibacterial cobweb used of Kirby-Bauer test and for evaluate the effectiveness of antimicrobial compounds intra it, were 500mg of spider's web in the sterile distilled water containing 1% Tween80 and 5% acetone to 5ml and were 60 days at room temperature until dissolved spider silk in the solvent. In the next step for ensure that is not contamination in the solution and generate errors in test, solution were passed through from filters with pores size 0.4 micrometer. To determine the effect of antibacterial cobweb solution used of well diffusion method at 24h, 48h and 72 h after incubation and for determine the minimum inhibition concentration of solution were used of Macro Broth Dilution method (Nelmerk et al. 2005; Mirghani et al. 2012).

3. Results

The results showed that the zone of growth inhibition for bacteria, *L. monocytogenes* and *E. coli* by Kirby-Bauer test method were 12.33mm and 11.67mm respectively. The antimicrobial compounds in the spider silk solution showed inhibitory effects against both bacteria *L. monocytogenes* and *E. coli* (Diagram1, 2). The minimum inhibitory concentration of spider silk solution for the two bacteria *L. monocytogenes* and *E. coli* were 0.78mg/ml and 3.12mg/ml respectively. According to our findings, spider silk solution prevents of bacterial growth and the inhibitory effect it were against Gram-positive bacteria more than Gram-negative bacteria.

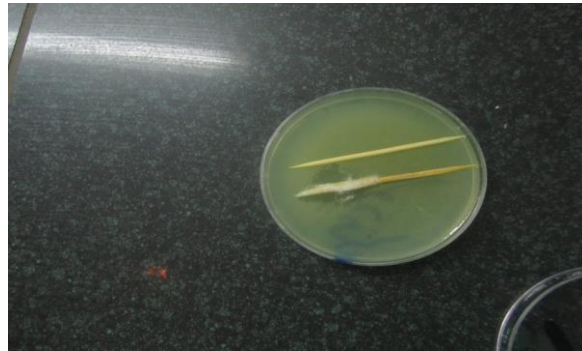


Figure 1:

Observed inhibited the growth in culture medium of *L. monocytogenes* by spider silk via Kirby-Bauer test method

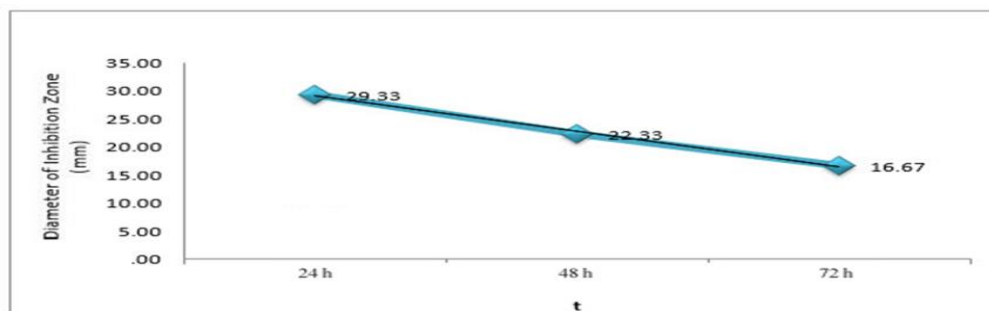


Diagram 1:

Evaluation of antibacterial properties of spider silk solution (100mg / ml) against *L. monocytogenes* by well diffusion method at different times of incubation.

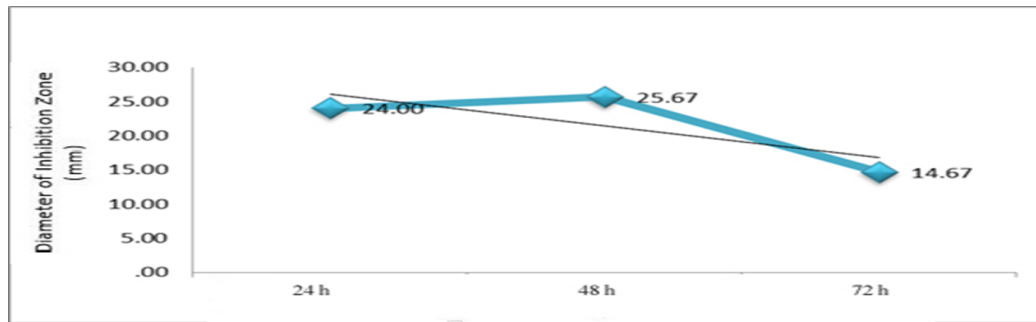


Diagram 2:

Evaluation antibacterial properties of spider silk solution (100mg / ml) against *E. coli* by well diffusion method at different times of incubation.

4. Discussion

In this study, the spider silk and the solution form it showed inhibitory effect significantly against bacteria. Results indicated that maximum inhibitory effect for both bacteria in concentration 100 mg / ml and at time 24 hours after incubation for *L. monocytogenes* and after 48 hours of incubation were for *E. coli*. Without a doubt one

of the most important uses of cobweb by spider is conserving prey trapped in the cobweb for a very long time, which is basically the hunt generated of organic materials and especially protein components. Antimicrobial compounds of spider silk and also relatively low levels of MIC for *L. monocytogenes* and *E. coli* that are important factors in the borne food diseases could be herald and promising in the future.

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