

Immunological status of Koi carp (*Cyprinus carpio* L.) with artificial infections of three bacterial pathogens

A.D.W.R. Rajapakshe^{1*}, P. Prasad² and K. Kumar²

¹Inland Aquatic Resources and Aquaculture Division, National Aquatic Resources Research and Development Agency (NARA), Crow Island, Colombo 15, Sri Lanka.

²Central Institute of Fisheries Education, Fisheries University Road, Andheri (West), Mumbai-40006, India.

Bacterial infections are very common among ornamental fish species. Koi carp is a fish variety that is in high demand in the ornamental fish industry. Fishes are capable enough to recover from the infections by developing immunity in their bodies. Therefore, this experiment was conducted to understand the immunological status of Koi carp with artificial infection of *Aeromonas hydrophila*, *Pseudomonas aeruginosa* and *Edwardsiella tarda*. Fish were injected intraperitoneally with three bacteria separately. The doses used of each bacterium were 100 – 150 µl of 2.26×10^7 , 4.45×10^8 , 5.75×10^7 cfu/ml respectively. Fish blood serums were collected at three day intervals upto fifteen days and agglutination tests were carried out in U bottom micro titer plates. The highest dilutions at which agglutination was observed were recorded for each test. Separate experiments were conducted for further observation by giving booster doses with respective bacterium separately and performing the agglutination test for observing the immunological memory of the Koi carp for three bacterial pathogens. There were significant increases ($p < 0.05$) of agglutination units, where as *A. hydrophila* infected fish, 1.33 ± 0.27 , 4.27 ± 1.07 , 10.67 ± 2.13 , 21.33 ± 4.27 , *P. aeruginosa* infected fish, 1.07 ± 0.27 , 4.27 ± 1.07 , 8.53 ± 2.13 , 17.07 ± 4.27 and *E. tarda* infected fish, 1.87 ± 0.71 , 4.27 ± 1.07 , 8.53 ± 2.13 , 17.07 ± 4.27 after 6th, 9th, 12th and 15th days post infections. In addition, there were significant increases ($p < 0.05$) of agglutination units in infected groups administered with booster doses. The highest values were recorded on the 15th day (4.61 ± 0.51 , 4.10 ± 0.63 and 7.17 ± 1.25 respectively) after second booster dose administration. The values (4.10 ± 0.63 , 1.02 ± 0.16 and 0.51 ± 0.08) decreased from 15th day post booster dose

administration. Therefore, it was obvious that the experimental fish had developed the immunological memory with the antigen of three bacterial pathogens and Koi carp can maintain a long term immunological memory against *Aeromonas hydrophila* in comparison with other two bacterial pathogens. Therefore, subsequent infection with *Aeromonas hydrophila* can be prevented for a longer time compared to the others.

Keywords: immunology, *Aeromonas hydrophila*, *Pseudomonas aeruginosa*, *Edwardsiella tarda*, booster doses

*Corresponding author e-mail: wrajapakshe@gmail.com