

## THE EFFECTIVENESS OF GARLIC (*Allium sativum*) IN ENHANCING THE IMMUNITY OF COMMON CARP (*Cyprinus carpio* L.) AGAINST MOTILE AEROMONAS SEPTICEMIA

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### ABSTRACT

The aim of the research was to investigate and discover the effectiveness of fresh *Lumbu hijau* (type of garlic) given by ten-minute immersion and *Kating* (type of garlic) extract mixed with feed in enhancing common carp's immunity against *Motile Aeromonas Septicemia*. The research results showed that *Kating* was the most highly effective in inhibiting the growth of *A. hydrophila* in comparison with the other type of garlic. The inhibition diameter of the garlic against *A. hydrophila* was  $17.00 \pm 20.00$  mm.

A test of the active components of *Kating* using the spectrometrical chromatography method (GC-MS) detected as many as 13 components, one of which was diallyl disulfide with antimicrobial activity found with area of 16.95%, whereas a test using thin-layered chromatography detected saponin with antimicrobial activity.

A minimum inhibitory concentration (MIC) test of a squeeze of *Lumbu hijau* on *A. hydrophila* showed a minimum concentration of 6.13-3.63% (61,300 ppm-36,300 ppm). The  $LC_{50}$  the garlic on common carp immersed for ten minutes was 4,913.99 ppm whereas 24-hour immersion gave a  $LC_{50}$  of 846.75 ppm.

Research for preventing and curing MAS by ten-minute immersion was conducted four times in four days interval. A completely random design in triplicate (10 fishes/replication) was used in this experiment. The doses administered were: P0, P1 (1.000 ppm), P2 (2.000 ppm) and P3 (3.000 ppm). At the end of the research, the fish were intraperitoneally infected with *A. hydrophila* with a density of  $10^8$  cell/ml in a dose of 0.1 ml/fish.

The research result demonstrated that the survival rate of fish immersed in a squeeze of *Lumbu hijau* was higher than that of the control group ( $P < 0,05$ ). The best dose to increase the survival rate by ten-minute immersion was 1826 ppm.

Treatment by ten-minute immersion was not effective as the survival rate of treated fish was lower than that of the control ( $P > 0,05$ ) because the MIC value was greater than the  $LC_{50}$  value. Pathological changes occurred on the epidermis: the skin underwent erosion, hemorrhage, and degeneration; the club cells underwent degeneration; on the gills the primary lamella underwent hemorrhage, proliferation on the secondary lamella and there was congestion; the kidney underwent necrosis and congestion; the intestines underwent congestion, necrosis, and oedema; and there was a sign of congestion of the heart.

In order to simplify the application, the garlic was mixed with feed.  $LD_{50}$  of garlic extract on fish fed with feed containing *Kating* extract was 10.75%/kg of feed. The doses administered were as follows:  $Kp$  (the positive group was infected and without treatment with garlic extract);  $Kn$  (uninfected fish as the negative control group); P1 (2.5%); P2 (5%); and P3 (10%)/kg of feed given for 30 days, and then the fish were intramuscularly

infected with *A. hydrophila* with a density of  $10^6$  cell/ml in a dose of 0.1 ml/fish. The experimental design used was Completely Random Design in ten replications (ten fish).

The research results showed enhanced non-specific defence in terms of the quantities of leukocytes, lymphocytes, neutrophils, monocytes and the percentage of phagocytotic activity, which were greater than those of the positive control (*Kp*)( $P < 0,05$ ). Histopathological observations of the injuries to the skin, gills, intestines, kidney, liver and heart in the fish treated with feed containing *Kating* extract indicated that they were less severe than those of the positive control (*Kp*). The cut left by the injection closed 14 days after the injection. Observations of weight growth showed that it was not affected but the extended length of fish was significant compared with the control ( $P < 0,05$ ).

Treatments with garlic either by immersion or supplementation in feed were effective in preventing *Motile Aeromonas Septicemia*. Treatment with garlic in the appropriate doses was able to enhance non-specific defence and may be used as an immunomodulator for common carp.

**Keywords** : *Aeromonas hydrophila*, garlic extract, *Cyprinus carpio* L, non-specific defence