

Thasanee Nonwachai 2012: Effects of Dissolved Oxygen, Ammonia and pH Levels on Feed Intake, Growth, Survival, Non-Specific Immune Characteristic of Pacific White Shrimp (*Litopenaeus vannamei*) and Challenged with *Vibrio harveyi*. Doctor of Philosophy (Fisheries Science), Major Field: Fisheries Science, Department of Fishery Biology. Thesis Advisor: Associate Professor Chalor Limsuwan, Ph.D. 129 pages.

A study on the effects of dissolved oxygen (DO), ammonia (NH₃) and pH levels on feed intake, growth, survival and immune response of Pacific white shrimp (*Litopenaeus vannamei*) was conducted under laboratory conditions. For feed intake study, 10 shrimp (6-8 g) were reared in 100-liter aquaria (salinity 25 parts per thousand, 29±1 °C), 30 shrimp (6-8 g) were reared in 500-liter tanks for growth, survival and immune parameter study. Shrimp were fed a commercial feed four times daily for the period of 60 days. Two experiments were studied, first experiment was conducted at three DO levels of above 4 mg/l (treatment 1), 2-4 mg/l (treatment 2), and less than 2 mg/l (treatment 3) with three replicates/treatment. Results showed that shrimp in the treatment 3 had the highest leftover feed after 30 minutes of feeding at 73.31±3.65% which was statistically significantly different (p<0.05) from treatment 1 (2.60±3.31%) and 2 (13.22±5.67%). After 60 days, the shrimp in treatment 1 had an average body weight (28.16 ± 2.77 g) which was significantly higher (p<0.05) than those of treatment 2 (25.01±1.81 g) and treatment 3 (25.90 ± 2.51 g). Survival rate of shrimp reared in treatment 1 and 2 range from 92.22-81.11% which was significantly higher (p<0.05) than treatment 3 (56.67%). The immune parameters including total hemocyte count, percentage phagocytosis, bactericidal activity, phenoloxidase activity, superoxide dismutase activity from treatment 1 and 2 were significantly higher (p<0.05) than treatment 3. Shrimp in treatment 1 and 2 had bactericidal activity at the serum dilution of 1:8 while shrimp in treatment 3 had it at the dilution of 1:4. Shrimp in treatment 1 had the highest survival rate at 53.33±0.58 % after experimental challenge with *Vibrio harveyi* but not significantly different (p>0.05) from the shrimp in treatment 2. The second experiment was carried out at three DO levels (above 4, 2-4 and less than 2 mg/l) and total ammonia maintained at 3 mg/l at pH levels of 7.5 and 8.5 respectively with three replicates/treatment. Shrimp with DO less than 2 mg/l at pH 8.5 had highest leftover feed after 30 minutes of feeding (73.38±1.90%) with no statistically significant difference of DO less than 2 mg/l at pH 7.5 (73.09±1.44%) but significantly different from the treatment reared in DO 2-4 mg/l and higher than 4 mg/l at both pH levels 7.5 and 8.5. Shrimp in treatment that contained DO above 4 mg/l at pH 7.5 had highest average body weight (25.34±0.80 g) with no statistically significant difference from the treatment with DO above 4 mg/l at pH 8.5 (25.07±0.82 g) but significantly different from other treatments. Shrimp reared in treatment with DO above 4 mg/l at pH 7.5 had highest survival rate at 93.33±3.33% with no statistically significant difference of DO above 4 mg/l at pH 8.5 but significantly higher (p<0.05) than treatment that was in DO 2-4 and less than 2 mg/l at both pH levels 7.5 and 8.5 respectively and showed the survival rate from 78.89 to 50.00%. The immune parameters including total hemocyte count, percentage phagocytosis, bactericidal activity, phenoloxidase activity, superoxide dismutase activity were significantly higher (P<0.05) in treatment with DO above 4 and 2-4 mg/l at both pH levels 7.5 and 8.5 than treatment with DO less than 2 mg/l at both pH levels 7.5 and 8.5. Shrimp of treatment that DO less than 2 mg/l at both pH levels had bactericidal activity at the serum dilution of 1:4 while shrimp in other treatments had the dilution of 1:8. Shrimp in treatment that DO more than 4 mg/l at both pH levels 7.5 and 8.5 had the highest survival rate (43.33±0.58%) after experimental challenge with *V. harveyi* with no significantly different (p>0.05) from the shrimp of treatment that DO 2-4 mg/l at both pH levels 7.5 and 8.5 (40.00±1.00 and 36.67±0.58%) but significantly higher (p<0.05) than treatment with DO less than 2 mg/l at both pH levels 7.5 and 8.5. This study indicated that dissolved oxygen had more effects on feed intake, growth, survival and immune response of *Litopenaeus vannamei* than ammonia and pH levels of 7.5-8.5.

Student's signature

Thesis Advisor's signature