

Sutee Wongmaneeprateep 2010: The Effects of Temperature on the Virulence of White Spot Syndrome Virus in Pacific White Shrimp (*Litopenaeus vannamei*). Doctor of Philosophy (Fisheries Science), Major Field: Fisheries Science, Department of Fishery Biology. Thesis Advisor: Associate Professor Chalor Limsuwan, Ph.D. 202 pages.

This study evaluated the effects of water temperature on the virulence of white spot syndrome virus (WSSV) infection in Pacific white shrimp (*Litopenaeus vannamei*) juveniles (5-6 g) and postlarvae (PL₁₅) under standardized conditions. Infection by WSSV was achieved using three methods, *per os* (oral) administration, intramuscular injection and immersion challenge. Moribund and surviving shrimp were examined for WSSV infection by nested-PCR, immunochromatographic test strip, histopathology, immunohistochemistry and bioassay methods. In the first experiment, the effects of water temperature (24-25, 28-29 and 32-33 °C) on WSSV infections in PL₁₅ and juvenile shrimp were investigated. Shrimp were kept continuously at 24-25, 28-29 and 32-33 °C after WSSV challenge. Both PL₁₅ and juvenile shrimp kept continuously at 24-25 and 28-29 °C had 100 % cumulative mortalities within 7 days after challenge. In contrast, shrimp kept continuously at 32-33 °C showed no clinical sign and mortality. In the second experiment, the effects of high water temperature (32-33 °C) on the severity and virulence of WSSV infections in PL₁₅ and juvenile shrimp were investigated. Juvenile shrimp were kept continuously at 28-29 °C for 0, 12, 24 and 48 h after WSSV challenge and switched to 32-33 °C while control group shrimp were constantly maintained at 28-29 °C after WSSV challenge until the end of the experiment. Shrimp kept continuously at 28-29 °C for 0 and 12 h after WSSV challenge and then increased temperature to 32-33 °C showed no gross sign and mortality. PL₁₅ and juvenile shrimp were maintained at 32-33 °C for 0, 1, 3, 5 and 7 days after WSSV challenge with *per os* and immersion methods, and at 32-33 °C for 0, 1, 3, 5, 7, 9, 11 and 14 days after WSSV-injection challenge method before switched to 28-29 °C while control group shrimp were constantly maintained at 32-33 °C after WSSV challenge throughout the experiment. Shrimp were kept continuously at 32-33 °C for 7 days after WSSV challenge with *per os* and immersion methods before switched to 28-29 °C, and 14 days after WSSV-injection challenge method before switched to 28-29 °C showed no clinical sign and mortality. For the third experiment, the effects of high water temperature (32-33 °C) on clearance of WSSV in juvenile shrimp were carried out. Shrimp were divided into two groups. Group 1, WSSV-infected shrimp constantly maintained at 28-29 °C and Group 2, at 32-33 °C. Shrimp in each group were sampled for WSSV infection at 1, 2, 3, 4, 5, 6, 7, 9, 11 and 14 days after challenge by nested-PCR assay, immunohistochemistry and histopathology methods. The results showed that shrimp constantly maintained at 32-33 °C after WSSV challenge with *per os*, injection and immersion methods gave WSSV-negative at day 7, 14 and 7 after challenge, respectively. In the fourth experiment, the effects of different percentage water exchange rates on the virulence of WSSV infection in juvenile shrimp were conducted at 24-25, 28-29 and 32-33 °C. After exchanging water at 10, 20 and 30 % contained 1×10^4 , 2×10^4 and 3×10^4 WSSV copies/ml respectively, shrimp were observed for morbidity and mortality. At 10 % water exchange rate at 24-25 and 28-29 °C cumulative mortalities reached 80.0-83.3 %, while at 20 and 30 % water exchange rates cumulative mortalities reached 100 % within 7 days. In contrast, shrimp at 32-33 °C showed no morbidity and mortality. In the fifth experiment, the viability of WSSV in water temperature of 28-29 and 32-33 °C were studied. Juvenile shrimp were placed into aquaria after resting water containing WSSV (1×10^5 copies/ml) at 0, 1, 2, 3, 4, 5, 6 and 7 days. The results revealed that WSSV could survive and cause disease for 5 days at 28-29 °C, while only 3 days at 32-33 °C. In conclusion, this study clearly indicated that water temperature of 32-33 °C is an effective prevention and reduce mortality in early stages of WSSV infection. Elevation of water temperature to 32-33 °C during larval rearing for at least 7 days before stocking PL in the grow-out pond could prevent white spot disease.

Student's signature

Thesis Advisor's signature