Screening of Bacillus Strains Isolated from the Gastrointestinal Tracts of Shrimp to Develop Novel Probiotics for Improving Shrimp Quality and Yield

Quang, Nguyen

Anh, Tran

Shrimp aquaculture is increasing worldwide, and probiotics are extensively used as feed supplements to improve the gut health and yield of shrimp. However, most of the commercial probiotics are not of intestinal origin; therefore, they do not colonize and grow well in the shrimp intestine and are less efficient. We aimed to isolate and screen heat-stable spore-forming Bacillus strains from the gut of 12 shrimp species collected from the Ben Tre province of Vietnam, to develop novel probiotics, particularly for whiteleg shrimp (Litopenaeus vannamei), which is the most exported species from Vietnam. For improving the shrimp quality, we screened Bacillus aquimaris SH6, an orange pigment-producing strain, which produced carotenoids having 90% scavenging activity for 2,2-diphenyl-1-picrylhydrazyl radicals, and had the best survival in the shrimp gut (70% population). Our results showed that whiteleg shrimp (n = 30) fed with SH6 spores were redder (21 vs 20 score) and had 3-fold higher astaxanthin levels (0.73 vs 0.22 μg/g shrimp) than the shrimp in the control group. To improve shrimp yield, we selected a non-pigmented B. subtilis SH23 because of its “3 in 1” probiotic activities, including inhibition of pathogenic species Vibrio parahaemolyticus and V. vulnificus, quick biofilm formation, and high production of digestive enzymes. Field trials in 15 shrimp ponds showed that compared to the control group (0.76 kg/m²), the group fed with SH23 spores (1.36 kg/m²) showed an 81.7% increase in yield. Thus, SH6 and SH23 are promising probiotic strains of gastrointestinal origin for improving the quality and yield of shrimp.

Awards Won:

Fourth Award of $500