Effect of oral supplementation of different *Bacillus* spp. on growth performance, digestive enzyme activity and immune response in *Penaeus vannamei*

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Bacillus *megaterium, B. cereus, B. subtilis*, and *B. infantis* effects in growth and physiological response were assessed on *Penaeus vannamei* through feed supplementation (108 CFU/g). For this purpose, five treatments were established: control (basal diet without probiotics) and four treatment diets T1 (basal diet + *B. megaterium*), T2 (basal diet + B. cereus), T3 (basal diet + *B. subtilis*), T4 (basal diet + *B. infantis*). During 6 weeks, animals were fed with their respective diets at 10% of body weight, four times a day, and reared in triplicate tanks. Among the treatments, *B. subtilis* supplemented diet-fed group exhibited significantly higher final weight (0.97 ± 0.06 g), weight gain (0.94 ± 0.06 g), specific growth rate (7.88 ± 0.18 %/day), and survival rate (64.66 ± 4.16%). Similarly, in digestive enzyme activities, the *B. subtilis* received group showed significantly higher amylase (7.53 ± 1.27 U/mg protein), protease (3.57 ± 0.42 U/mg protein), and lipase (747.83 ± 139.03 U/mg protein) activities compared to other treatments. In contrast, the group that received *B. megaterium* was higher in cellulase (246.83 ± 29.77 U/mg protein) activity. Interestingly, *B. subtilis* incorporated diet-fed group exhibits significantly lower activities of phenoloxidase, superoxide dismutase, and catalase. Overall, the study found that the inclusion of *B. subtilis* improves the growth performance and physiological response of *P. vannamei*. Before recommending its application in aquaculture practices, further exploration is required on its potentiality in commercial culture tanks.

Keywords: Bacillus, digestive enzymes, feed supplementation, growth, probiotic.

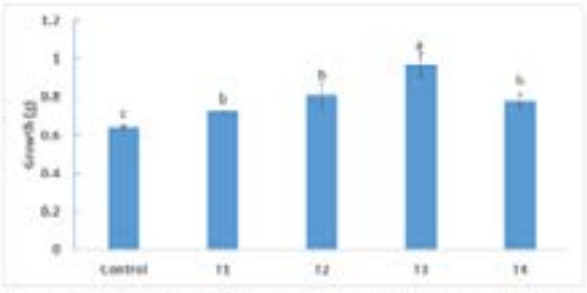

Fig. 1. Growth of shrimp fed with different *Bacillus* spp. incorporated diets. Bars with different superscripts differ significantly at $P < 0.05$.

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