



Dietary lacto-sacc stimulates the immune response of gravid mud crab (*Scylla olivacea*)

Md. Abdul Hannan^{a,e,*}, Mohammad Bodrul Munir^{b,**}, Roslianah Asdari^a, Md. Shoebul Islam^c, Rabina Akther Lima^c, H.M. Rakibul Islam^c, Md. Harunor Rashid^c, Henry Wong Yip Hing^d

^a Faculty of Resource Science and Technology, Universiti Malaysia Sarawak 94300, Kota Samarahan, Sarawak, Malaysia

^b Faculty of Agriculture, Universiti Islam Sultan Sharif Ali, Sinaut Campus TB1741, Jalan Tutong, Tutong, Brunei Darussalam

^c Bangladesh Fisheries Research Institute, Shrimp Research Station, Bagerhat 9300, Bangladesh

^d Alltech biotechnology Private Limited, Malaysia

^e Faculty of Fisheries, Aquaculture and Marine Science, Sher-e-Bangla Agricultural University, Sher-Bangla Nagar, Dhaka 1207, Bangladesh

ARTICLE INFO

Keywords:

Scylla sp.
Innate immunity
Prophenoloxidase
Superoxide dismutase
Orange mud crab

ABSTRACT

Mud crabs have a functioning innate immune system. Probiotics have a considerable effect in improving immune responses in gravid mud crab. The current study investigated the influence of three lacto-sacc concentrations (T1=0 %, T2=1 %, and T3=1.5 %) in a 45 % protein and 12 % lipid meal on the immune response of gravid mud crabs. Three groups of wild gravid mud crabs (average weight: 122.33±1.53 g) were raised individually in bamboo spawning boxes at mangrove pens for 12 weeks. Wild gravid mud crabs (T4) were also caught from the river during the breeding season and tested to offer a more exact assessment of the effect of lacto-sacc. After a 12-week feeding study, T3 therapy resulted in the highest total hemocyte count levels ($P < 0.05$), followed by T2 and T1. The T3 treatment results in somewhat faster hemolymph clotting, although there is no significant difference among the treatments ($P < 0.05$). T3 treatments significantly improved immunological parameters (PO, proPO, and SOD enzyme) and survival (61.67±2.89 %) when challenged with *Vibrio parahaemolyticus*. In the challenge test, the immunological markers THC, PO, and proPO correlated positively, but hemolymph clotting time and mortality linked negatively. Furthermore, T1 was compared to an untreated wild gravid female mud crab (T4), and the results were almost identical. Thus, 1.5 % lacto-sacc is recommended for gravid mud crabs.

Introduction

Mud crab commonly known as mangrove crabs belong to the family Portunidae under genus *Scylla* with four major species i.e., *Scylla olivacea*, *S. serrata*, *paramamosain*, and *S. tranquebarica* [1]. Among four the mud crab *S. olivacea* also known as orange mud crab is commercially important species and most abundant species in Sundarbans Mangrove region [2]. Disease infestation caused by infectious pathogens (virus, bacteria, fungus, etc.) is a serious restriction in crustacean aquaculture, accounting for significant economic loss in the aquaculture industry worldwide [3]. High rates of larval mortality in mud crab hatcheries are typically associated with bacterial infections, despite the fact that antibiotics are extensively used to enhance survival rates [4]. Probiotics have practical significance for crab farming sustainability since they improve immunostimulation, growth promotion, sickness control, and

reduce the usage of antibiotics. Probiotic bacteria are used in aquaculture as a microbiological supplement in place of antibiotics [5]. Probiotics are live bacteria that, when consumed in enough amounts, improve the host's health [6]. Probiotics such as microalgae, yeasts, and gram-positive and gram-negative bacteria have been utilized to improve the growth, survival, health, and disease prevention of aquatic animals. Probiotics can produce inhibitory compounds including antibiotic substances, bacteriocins, and siderophores, which compete with pathogens for chemicals and energy while enhancing immunity and restoring microbial balance [7]. Probiotics are used as feed supplements in aquaculture to boost humoral immunity by increasing lysozyme activity, phagocytosis, and respiratory burst [8]. Probiotics as feed additives also enhance the gut health benefits and immune response of the crustaceans and boost up disease resistance capacity [9]. The innate immune response is a conserved feature in crustaceans that aids in pathogen

* Corresponding author.

** Corresponding author.

E-mail addresses: hannan.aahm@sau.edu.bd (Md.A. Hannan), hsjewel730@yahoo.com (M.B. Munir).

<https://doi.org/10.1016/j.cirep.2024.200156>

Received 9 April 2024; Received in revised form 15 June 2024; Accepted 18 June 2024

Available online 26 June 2024

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