

Enhancement of Antioxidant and Immune Level in Juvenile Penaeid Shrimp *P. vannamei* using Chitosanencapsulated Vitamin C

Arvind Kumar Ray, P.K. Patil, SatheeshaAvunje and C. Gopal

ICAR-Central institute of Brackishwater Aquaculture (CIBA), Chennai 600 028, India

Abstract—Indian aquaculture industry is primarily driven by shrimp farming in terms of revenue generation, employment and livelihood. However, diseases are the major constraint causing significant economic loss to the sector. Shrimps being primitive in immunological evolution do not present strong immune response such as specific cellular and acellular immunity, Hence efficient prophylactic/therapeutic methods such as vaccination often do not help. Farmers tend to application of antibiotics that lead to several issues like development of antibiotic resistant strains and import rejections due to antibiotic residues. Thus development of efficient immunostimulants and delivery mechanism has become necessities. Vitamin C is well known antioxidant used in aquaculture as stress remover. However unstable nature of vitamin C makes it difficult to deliver it into shrimp. Chitosan biopolymer with good biocompatibility, biodegradability and low toxicity, have emerged as good encapsulating agent for drug delivery. In this study application of chitosan encapsulated vitamin C as immunostimulating and antioxidating agent in juvenile of *Penaeus vannamei*, pacific white shrimp, was observed. Vitamin C was encapsulated with chitosan-sodium triphosphate (CS-STP) by ionic gelation interaction. Encapsulated particles were then characterized by high resolution scanning electron microscopy, Fourier Transform Infrared Spectra (FTIR), zeta potential and particle size measurements by particle size analyzer. Shrimp fed with chitosan encapsulated vitamin C were sampled to collect hemolymph and its influence on immune status of shrimp. The results obtained from SEM shows that OMP CS-STP encapsulated particle were spherical in shape and FTIR analysis confirmed interaction of amino group in chitosan of CS-STP nanoparticles. Particle found an average of 46.2 mV Zeta potential and 299 nm particle size with single major peak. Shrimp fed with chitosan encapsulated vitamin C showed significantly increase in prophenoloxidase, glutathione-peroxidase and respiratory burst activity, however there was no significant increase in lipid peroxidase activity after encapsulation. With this study, we demonstrate application of chitosan encapsulated vitamin C as potential immunomodulating agent and improve health and survival of shrimp in culture farm.

Keywords: Chitosan, encapsulation, vitamin C and aquaculture.