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# Population Structure of Digestive Trypsin Phenotypes in Hatcheries for Pacific White Shrimp and Their Frequencies during Growth in Commercial Culture

Jazmin Asusena Aguiñaga-Cruz , Juan Carlos Sainz-Hernández , Juan Manuel González-Prieto, Francisco Vargas-Albores , Eduardo Sandoval-Castro, Damaris Rúbio-Gastelum, ...show all

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## Abstract

Trypsin from Pacific white shrimp *Litopenaeus vannamei* is a polymorphic protein composed of three alleles (A, B, and C). The C allele is monomorphic for the first region, while A and B are allelic variations for the second region that are segregated according to Mendelian rules. These three alleles give rise to three individual trypsin phenotypes displayed in sodium dodecyl sulfate polyacrylamide gel electrophoresis: CBA, CB, and CA. The expected frequencies from mating CBA males and females resulted in offspring that consisted of 25% CB, 25% CA, and 50% CBA trypsin phenotypes. To define a management protocol for studying shrimp performance associated with the trypsin phenotype, the goal of this study was to determine if the expected proportions of the three trypsin phenotypes are represented in the population structure at breeding age in 11 hatcheries. Here, we hypothesized that the population structure of the trypsin phenotypes is represented by frequencies that are subject to selection, and it is possible to establish a management protocol to study shrimp performance. A total of 2,828 breeding shrimp from 11 hatcheries were analyzed to describe their population structure. The results showed a high frequency of CBA breeders and a near absence of the CA phenotype in the population structure. To discard the possibility that man-made selection is the cause of the trypsin phenotype frequency, the offspring of CBA breeders were cultured in nine commercial ponds, and the phenotype frequencies were monitored during 75 d. Interestingly, the CA phenotype was only present during the early stages of culture, which suggests that the population structure is not due to human selection of CBA shrimp in the hatcheries. In this condition, poslarvae production could be directed to make trials that contribute to describe the difference between the culture performance between phenotypes, but not to support the commercial production of larvae with the highest culture performance trypsin phenotype.

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