Detection of *Vibrio cholerae*, and *Vibrio parahaemoliticus* in Sri Lanka's export shrimp

By

H.S.Hathurusinghe

2005

This thesis is submitted to the University of Kelaniya, in partial fulfillment of the requirement for the Master of Science degree in Applied Microbiology

Department of Microbiology
Faculty of Science
University of Kelaniya
Sri Lanka.

Abstract

Shrimp industry contributes a higher fraction in compared with other foreign exchange earnings. But maintaining the required microbiological standard according to the importing countries is very important and not an easy tusk. Although Japan is the major buyer of Sri Lanka aquaculture shrimps, they are very strict on detection of *Vibrio cholerae*. European Union (E.U) also very strict on any pathogenic bacteria detection in their imports and place lot of trade barriers.

Therefore this study was carried out to develop a baseline data on microbiological standards especially *Vibrio cholerae* on export shrimps from Sri Lanka. For this study twelve areas were selected from the North Western Province in Sri Lanka where shrimps farms are highly concentrated and samples (finished products) were also collected from six processing factories.

55 samples of pond water, pond sediment, raw shrimps from the same pond and the finished products (frozen shrimp) in relation to the sampled raw shrimps were analyzed for the total viable count, coliforms, *E.coli, Vibrio cholerae,* and *Vibrio parahaemoliticus*. In addition 12 samples of ice used for transport of raw shrimp from farm to the factory, water and ice used for (chilling purposes) processing in the factory were examined for the total viable count, coliforms and *E.coli*. At the time of sampling, physical parameters such as temperature, pH and salinity of the pond water were recorded.

Microbiological parameters were analyzed according to the methods specified in the Sri Lanka standards. Log mean total plate count of raw shrimp, 5.8 Colony Forming Units/g (cfu) is higher than the log mean total plate count of finished frozen product, 4.87cfu/g. Frozen finished products analyzed for the total plate count range between 2.88×10^3cfu/g to 3.33×10^6cfu/g which satisfy the International Committee for Microbiological Standards in Food (ICMSF) (1986) limits.

1

E.coli was not detected in any of the ice used for the transport, ice used in the factories and the water used for processing. The mean log total plate count of the transport ice was 4.52 cfu/ml, which is higher than factory ice (1.83cfu/ml). Mean log total plate count of factory water was 0.16 cfu/ml, which satisfy the Sri Lankan Standards. High numbers of coliforms were been observed in the pond water and sediment samples. Mean *E.coli* count of raw shrimp (2.69MPN/g) was higher than that of pond water (2.36MPN/100ml). In frozen shrimp samples *E.coli* count was 0.27 MPN/g. This range is below the ICMSF (1986) standards. In this study, *E.coli* count of raw shrimp is higher than the frozen shrimp.

Out of 220 samples analyzed, none of the samples were positive for *Vibrio cholerae*. This satisfies the ICMSF (1986) microbiological limits which *Vibrio cholerae* should be absent in the final product. Four samples (one pond water sample, one raw shrimp sample and two sediment samples) positive for *V. parahaemolyticus* but only one sample was positive for *E coli*, which was in sediment sample No. 23. The mean of temperature, salinity and pH of all the pond water analyzed were 31^0C, 20 % and 8.30 respectively.

According to the outcome of the study there is no risk of contamination of shrimps with *Vibrio cholerae* pathogenic species if there is not an outcome of disease in the area but *Vibrio parahaemoliticus* may present, as the environmental conditions are more favorable for the particular bacteria. Therefore fish processing establishment should apply their Hazard Analysis Critical Control Point System (HACCP) very effectively. Shrimp farmers also to be aware about the risk of contamination of their products with these bacteriological species and on the precautionary actions to minimize such an incident. Further study is recommended in these areas to cover minimum of four growth cycles (two years period) with higher number of samples to represent all the areas and relevant factors.