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Bioaccumulation of lead, chromium and cadmium in the cultured shrimp, Penaeus monodon

Bioaccumulation potential of three toxic heavy metals; lead, cadmium and chromium in the cultured shrimp, *Penaeus monodon* was assessed in relation to different fractions of the cultured environment. Concentrations of the three metals in the muscle tissue of shrimp harvested from selected shrimp farms in the North Western Province of Sri Lanka in 2001, source water, sediments of the water sources & the farms and formulated shrimp feed used by the farms were determined by Atomic Absorption Spectrophotometry using standard analytical

procedures. Bio-transfer factors of the three metals in the muscle tissue of the shrimp (n=360) were enumerated in relation to source water, source sediments, farm sediments and to formulated shrimp feed.

Levels of lead, chromium and cadmium in the muscle tissue of the shrimp (Mean ± SEM) were (in µg g-1 dry weight) 0.360±0.044, 0.610±0.044 and 0.199±0.012 (n=360) respectively. Overall concentrations of lead, chromium and cadmium in the source water used for culturing the shrimp were (in mg L-1) 0.149±0.027, 0.134± 0.007 and 0.059 ± 0.003 (n=24) respectively. Levels of the three metals in the sediments of the water sources were (in µg g-1 dry weight) 6.426±1.835, 21.671± 0.423 and 0.010± 0.001 (n=36) whereas the levels in farm sediments were 8.38±0.14, 27.95±0.40 and 0.028±0.001 (n=72) for lead, chromium and cadmium respectively. The metal contents in the different brands of feed used by the farms were (in µg g-1 dry weight) 0.385±0.033 for lead, 1.578 ±0.162 for chromium and 2.248 ± 0.224 (n=18) for cadmium. Bio-transfer factors of the three metals in shrimp in relation to water ranged from 3 to 5 indicating bioaccumulation of the metals occurs through the water phase. Of the three metals studied, bio-transfer factors of cadmium from the sediments ranged from 9 to 21 indicating high potential of bioaccumulation via the sediments. However, bio-transfer factors of chromium and lead in shrimp tissue from the sediments were lower than 1. Metal wise comparisons indicated bio-transfer factors of cadmium in shrimp in relation to sediments were significantly higher than that of the other two metals. Bio-transfer factors of the three metals in shrimp from the formulated feed ranged from 0.4 to 0.9. Present study revealed that bioaccumulation of lead and chromium in shrimp muscle tissue occurs mainly through the water and bioaccumulation of cadmium in the shrimp takes place via the sediments in addition to water phase. However, the bioaccumulation potential of the three metals in shrimp through the formulated feed was low in comparison to that from the water and the sediments.