Pakistan Journal of Biological Sciences 17 (1): 62-67, 2014
ISSN 1028-8880 / DOI: 10.3923/pjbs.2014.62.67

Heavy Metals Concentration Relationship with *Perna viridis* Physical Properties in Mengkabong Lagoon, Sabah, Malaysia

Noraini Abdullah, Rohana Tair and Mohd Harun Abdullah
School of Science and Technology, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia

Abstract: *Perna viridis* (*P. viridis*) has been identified as a good biological indicator in identifying environmental pollution, especially when there are various types of Heavy Metals Accumulations (HMA) inside its tissue. Based on the potential of *P. viridis* to accumulate heavy metals and the data on its physical properties, this study proffers to determine the relationships between both properties. The similarities of the physical properties are used to mathematical model their relationships, which included the size (length, width, height) and weight (wet and dry) of *P. viridis*, whilst the heavy metals are focused on concentrations of Pb, Cu, Cr, Cd and Zn. The concentrations of metal elements are detected by using Flame Atomic Adsorption Spectrometry. Results show that the mean concentration of Pb, Cu, Cr, Cd, Zn, length, width, height, wet weight and dry weight are: 1.12±1.00, 2.36±1.65, 2.12±2.74, 0.44±0.41 and 16.52±10.64 mg kg^{-1} (dry weight), 105.08±14.35, 41.64±4.64, 28.75±3.92 mm, 14.56±3.30 and 2.37±0.86 g, respectively. It is also found out that the relationships between the Heavy Metals Concentrations (HMA) and the physical properties can be represented using Multiple Linear Regressions (MLR) models, relating that the HMA of Zinc has affected significantly the physical growth properties of *P. viridis*.

Key words: *Perna viridis*, biological indicator, heavy-metals-accumulations (HMA), mathematical model, multiple linear regressions (MLR)

INTRODUCTION

Pollutants as heavy metals can be distributed to aquatic environment through many pathways. These pathways may involve processes, what are also known as bioaccumulation. The accumulation of heavy metals in living tissues, especially mollusc, may cause the increasing of the toxicity levels in living tissues (Dobrowolski and Skowronska, 2001). However, some molluscs, such as *P. viridis*, have a natural technique to reduce the heavy metals concentration from their tissues which in turn, is related to its dual-shell activity; open and closed feeding method. In addition, *P. viridis* had also been known as a biological indicator for heavy metals concentration by many researchers (Sivalingam, 1977; Yap *et al*., 2002; Widmeyer and Bendell-Young, 2007).

According to Widmeyer and Bendell-Young (2007), active feeding behavior of mollusc may increase the concentrations availability of pollutant in its tissue. Mollusc is also exposed to different food suspensions consisting mixtures of sediment, particulate matter and seston. The different concentrations of pollutant in aquatic environment may affect the growth of mollusc in aquatic environment. So, the purpose of this study is to determine the relationships between the heavy metals accumulations in total soft tissue with the physical properties of *P. viridis*.

MATERIALS AND METHODS

Study site: Mengkabong Lagoon is located in the Tuaran District, which is 53 km away from the city of Kota Kinabalu in Sabah. It is dominated by a mangrove ecosystem which is suitable for aquaculture activities (Fig. 1). There are four stations of aquaculture activities being identified, namely B1, B2, B3 and B4, as shown in Fig. 1.

Data samplings of *P. viridis*: Fresh samples (n = 120) of *P. viridis* in Fig. 2 are collected randomly in different length sizes, ranging from 60 mm to 113 mm. Each individual is separated from its shell and the constant weights of tissue samples are taken at 60°C (Silva *et al*., 2006; Blackmore, 2001; Nair *et al*., 1993).

The digestion method of tissue samples is carried out by first adding 10 mL of concentrated nitric acid to it and then heated on a hotplate at 70°C (Silva *et al*., 2006;

Corresponding Author: Noraini Abdullah, School of Science and Technology, Universiti Malaysia Sabah, 89400 Kota Kinabalu, Sabah, Malaysia