



## Exploring the nutritional composition of cultured horseshoe crab (*Tachypleus gigas*): A study of proximate composition, minerals, amino acids, and fatty acids

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### ABSTRACT

This study was done to determine the proximate composition, mineral content, amino acid and fatty acid composition of *Tachypleus gigas*. *T. gigas* were collected at the Horseshoe Crab Hatchery and Breeding Centre, Malaysia. The samples were analyzed for its proximate composition of different body parts, roe and muscle. The mineral analysis was determined using Inductively Coupled Plasma mass spectrometer. The amino acids were analysed using High-Performance Liquid Chromatography and the fatty acids were analysed using Gas Chromatography-Flame Ionization Detector. The results showed that the roe of *T. gigas* contained higher crude proteins, crude fats and carbohydrates compared with muscle. Minerals content (K, Ca, and Na) were the most abundant in roe samples. The roe samples had higher concentrations of amino acids compared to the muscle samples, with the highest being  $7.20 \pm 0.66$  g/100 g of leucine. The fatty acid composition showed that roe samples had higher concentrations of palmitic acid, stearic acid and oleic acid, contributing  $21.0 \pm 1.05\%$ ,  $19.5 \pm 1.60\%$  and  $32.4 \pm 1.8\%$ , respectively. These nutrients are important for human health and could help address nutrient malnutrition.

### 1. Introduction

Horseshoe crab belongs to arthropods of the family Limulidae, suborder Xiphosurida and order Xiphosura (Xu et al., 2020). In Asia, there are three species of horseshoe crabs which are *Tachypleus gigas* (*T. gigas*), *Tachypleus tridentatus* (*T. tridentatus*) and *Carcinoscorpius rotundicauda* (*C. rotundicauda*) (Sarmiento et al., 2022; Wang et al., 2020). Horseshoe crabs live primarily in and around shallow ocean waters on soft sandy or muddy areas (Meilana & Fang, 2020; Tan et al., 2012; Wang et al., 2020). Generally, eggs of horseshoe crab are used as bait and food for bird and finfish (Burger et al., 2017). In the past two decades a number of researchers have sought to determine the development and reproductive biology of horseshoe crabs. Literatures have been published on the contribution of the horseshoe crabs in medical applications and pharmacology (Vijay & Ghasemian, 2022; Xu et al., 2020). One of its applications is in biomedical industry where the copper-based blue blood provides the source of limulus amebocyte

lysate (LAL) used in medical applications. LAL is used as a standard assay for protecting vaccines, injectable drugs and other pharmaceutical devices from the contamination of bacterial endotoxins (Tinker-Kulberg et al., 2020; Wang et al., 2020).

In Malaysia, horseshoe crabs of the species *T. gigas* can be found in areas such as Johor, Pahang, Terengganu, Sabah, and Sarawak (Manca et al., 2017; Mat Zauki et al., 2019; Noor Jawahir et al., 2017). These creatures are utilized as a food source, with both the eggs and meat being consumed either raw, grilled, or boiled. There has been a recent surge in the popularity of horseshoe crab as a food product in restaurants, leading to increased demand in the country. Some of these horseshoe crabs are even exported to Thailand to fulfill their own demand, where the eggs are used in dishes such as omelettes and stir-fries.

However, despite the growing interest in using horseshoe crabs as a food source, there are concerns and interest about their safety and nutritional value. Many studies to date have focused on their biology, evolution, conservation, management, and biomedical and ecological

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