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RESEARCH ARTICLE

CATION CONCENTRATION IN MUSCLE, GONAD AND HEPATOPANCREAS OF THE FRESHWATER CRAB *Paratelphusa hydrodromous*

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ABSTRACT

This study aimed to estimate the cations (calcium, potassium & sodium) in the fresh water field crab *Paratelphusa hydrodromous*. The sodium concentration in hepatopancreas gradually decreased are size of the crab increase and there was an inverse relationship between gonad and hepatopancreas in sodium ion concentration. In muscle and hepatopancreas the calcium ion concentration gradually decreased as size group advanced (increase). However in gonad it varied in different size groups and the variation in the calcium ion concentration is may be correlated with moulting cycle of the crab. The potassium ion concentration of *P. hydroromous* in selected tissues showed slight variation in different size group. However in gonad, hepatopancreas an inverse relationship was noticed.

INTRODUCTION

The fish and fishery products such as prawns, shrimps and crabs are chief sources of protein. Dietary protein deficiency can easily alleviated by consuming fish and fishery product. The superiority of fish and fishery product compared to other protein rich food such as chicken, mutton are suitable for human nutrition. Fish and fishery product is not only easily digestable but also containing all essential amino acids, like lycin, metheonin, histidine, etc., Vitamin such as A, B, C, D and B_{12}, minerals like Ca, K, Fe, Na, Mg and Sulphur are present in sufficient quantity. The fishery product especially crabs are having high protein value along with minerals and vitamins. The cations such as Calcium, Potassium, Sodium are also distributed in considerable quantities. Ionic concentrations play an important role in the osmo-ionic regulation of the organisms and some extent in the enzymatic activities of the organisms. The cations are also influence in the normal physiological activities and nervous co-ordination and also in gametes production (Gross 1958; Lockwood 1969).

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The ions like Na^{+}, K^{+}, Ca^{++}, and Mg^{++} are important in the composition of the tissues. The concentration are these ions vary in various tissues during reproductive cycle, nutritive cycles and moulting cycle like pre-moult, post-moult and inter-moult stages of the crab. They also play a vital role in the metabolism of the organism information on the distribution and concentration of cations in the aquatic organisms like fishes, prawns, shrimp and crab is require to assess accumulation of ions in the tissue and possibly transfer for human through food chain (Sather 1967). Hence, the present study aimed to estimate the cation such as calcium, potassium, sodium in the fresh water field crab *Paratelphusa hydrodromous*.

MATERIALS AND METHODS

The random collection of freshwater field crab *Paratelphusa hydrodromous* were made from the field and brought to the laboratory for acclimation. They weighed accurately and the carapace length and breath were recorded. The individuals were grouped into four size groups 10, 13, 15 & 19 gm according to their weight. The male and female were separated and they were sacrified to remove tissues of muscle, gonad and hepatopancreas quickly after dissect ion. The tissues were placed in the Petridisc separately and fixed in 5 percent TCA solution, to stop the enzymatic reaction. These tissues were taken for analysis of cation by using the standard procedure.

RESULTS AND DISCUSSION

The concentration of sodium, calcium and potassium ion in muscle, gonad and hepatopancreas of four different size groups of *Paratelphusa hydrodromous*, are summerised in Fig. 1-3. The concentration of sodium ion in the muscle, ranged from 98.6 ppm to 81.4 ppm wet weight and it was found to be maximum lower weight group and minimum. In third size group and it slightly increase in the fourth size group. In gonad the sodium ion concentration ranged from 91.6 ppm to 102.3 ppm wet weight basis. The high value of (102.3) ppm was a recorded in the third size group and lower value (91.6 ppm) were

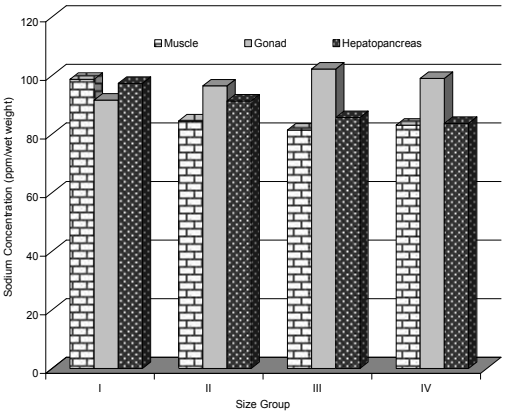

Fig.1. Sodium concentration of *P. hydrodromous* in relation to different size groups

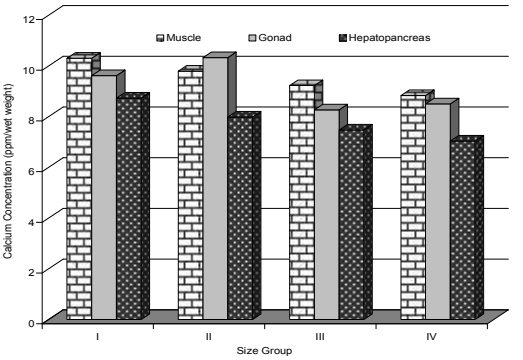

Fig. 2. Calcium concentration of *P. hydrodromous* in relation to different size groups

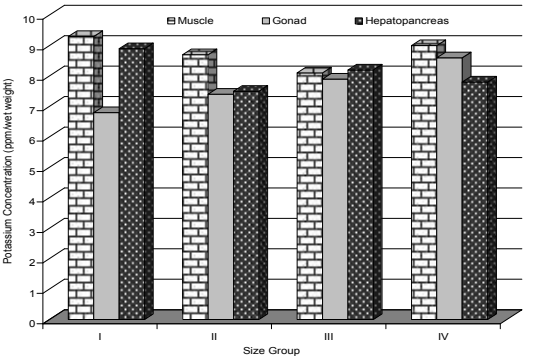

Fig. 3. Potassium concentration of *P. hydrodromous* in relation to different size groups

recorded in low size group. In gonad the sodium ion concentration slightly increased as size group

increased. In hepatopancreas it ranged from 83.7 ppm to 97.5 ppm wet weight. It was found to be high (97.5 ppm) in lower size group and low (83.7 ppm) in higher size group. The sodium concentration in hepatopancreas gradually decreased are size group increase, there was an inverse relationship notice between gonad and hepatopancreas in sodium ion concentration. It success that the transfer of sodium from hepatopancreas to gonad during gonad maturity (Fig. 1).

The cations also undergo changes during the reproductive and moulting cycles. Sodium is the most abundant cation in sea water which is known to participate in several developmental processes (Lockwood, 1969; Shaw and Suttliffe, 1961). Sodium is the principal cation of extracellular fluids of most animals. In freshwater field crab *Paratelphusa Hydrodromus* the sodium level in gonad slightly increased as the size group advanced as in hepatopancrease in the muscle. Similar observation was noticed in sodium concentration of haemolymph in the crab *Neptunus pelagicus* and *Scylla serrata*. In these animals the sodium levels are possibly affected by increasing temperature of the medium (Senthilkumar and Desai, 1978). Seasonal variations in haemolymph composition with reference to age, sex and moult cycle of *Oreconectus limosus* (Andrews, 1967). *Carcinus maenas* (Greenway, 1976; Shaw and Suttifle (1961) reported that *Gammarus duebeni* and *G. pulex pulex* active uptake of sodium is involved in the distribution of this ion between blood and medium. Sodium ion was partially reabsorbed from the urine, in the crab *Carcinus maenas*. The cation distribution between blood and medium is mainly passive, hyper ion regulation in dilute sea water is affected largely by changes in the rates of uptake (Zander, 1980).

The calcium ion concentration in the muscle, ranged from 8.8 ppm to 10.3 ppm on wet weight basis. It was found to be maximum (10.3) ppm in the lower size group and minimum group (8.8 ppm) in higher size group. In gonad the calcium ion concentration varied from 8.3 ppm to 10.3 ppm, third size group and higher value in second size group. In hepatopancreas the sodium ion concentration ranged from 7.0 to 8.7 ppm wet weight, the value was found to be low (7.0 ppm) in high size group and (8.7 ppm) in the first size group. In muscle and hepatopancrease the calcium ion concentration gradually decreased as size group advanced (increase). However, in gonad it varied in variable to size group the variation in the calcium ion concentration is may be correlated with moulting cycle of the crab (Fig. 2). In depacod crustaceans wide variation of calcium concentration have been reported by many workers. Hormonal control and calcium level in the crab *Scylla serrata* have been observed (Menon and Sivadass, 1963). Dall (1965) reported that the calcium ion concentration differs, with body size, calcium ion concentration varied in the exoskeleton and tissues during moulting and producting cycles of the shrimp. In the present study calcium concentration of *Paratelphus hydroromous* gradually decrease in the muscles and hepatopancreas as size group advanced were as in gonad, it vary invariable to size group. The present study agrees with earlier observations in *Neptunes pelagicus* and *Scylla serrats* (Senthil kumar and Desai, 1978) *Carcinus maenas* (Roer, 1980) and *Ozioterphusa senex senex* (Srinivasulu Reddy, 1985).

The potassium in the muscle ranged from 8.1 ppm to 9.3 ppm wet on weight basis. It was found to be maximum (9.3 ppm) in the small size group and minimum (8.1 ppm) in third size group. In gonad the potassium ion concentration ranged from 6.8 to 8.6 ppm wet weight. The lowest values was recorded (6.8 ppm) was recorded in first size group and highest value (8.6 ppm) was recorded in fourth size group. In hepatopancreas it varied from 7.5 to 8.9 ppm wet weight. The potassium ion concentration was found to be minimum (7.5 ppm) in second size group and (8.9 ppm) in first size group (Fig. 3). The potassium ion concentration in various tissues showed slight variation in different size group when compared to the calcium and potassium. Potassium is another important cation, which also influences the osmo-ionic regulation of marine animals (Dehnel and Carfoot, 1965; Skinner 1965; Sather 1967; Poat 1967 and Towle, 1976). The potassium ion concentration in *Paratelphus hydroromous* in various tissues showed slight variation in different size groups. However in gonad, hepatopancreas inverse

relationship notice in the size group. The present study agrees with earlier observation (Towle 1991, Neufield (1980) studied the salinity adaptation of gill K+ ATP-ase in the blue crab *Callinectus sapidus*. According to Moran and Pierce (1984), K+ regulates the salinity tolerance.

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