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Toxic effect of Agrochemicals on Ionic regulation in Fresh water snail *Pilaglobosa*

Mohita Sardana[1], Amit Priyadarshi[2], ShashiBhushan Lal[3], Raj Kumar Singh[3], BipinBihari Singh[4].

1. *P.G. Department of Zoology, A.N College, Patna, Bihar, India*
2. *P.G. Department of Biochemistry, Patna University, Patna, Bihar India*
3. *P.G. Department of Zoology, Patna University, Patna, Bihar, India*
4. *Department of Biotechnology, A.N College, Patna, Bihar, India*

Abstract
Background- *The objective of present investigation werechanges in the levels of ions in tissues of snail due to roger exposure. The digestive gland, gills, posterior adductor muscles were digested in acid and the levels of ions such as sodium and potassium were detected in the control as well as experimental animals as per the standard methods used for flame photometry*
Materials and Methods – *The levels of sodium, potassium were determined with a flame photometer (ElicoPvt. Ltd. Model CL 22A). Standard graphs were prepared by using sodium chloride and potassium chloride solutions.*
Results and Discussion- *Sodium and potassium levels were declined in almost all the tissues studied in* ***Pilaglobosa****exposed to the 3 sub-lethal conentrations of rogor for 15 days*
Conclusion- *Ionic regulation study shows adverse effects of rogor on the ionic content of tissues in the snails. Decrease in the sodium and potassium ions is significant in all the tissues studied affecting the activities of enzymes and osmoregulation in these snails.*
Key Words: Agrochemicals, Pilaglobosa, Ionic regulation

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I. Introduciton

In Molluscan cells, ions contribute to about 40-50% of the total osmotic concentration (Potts, 1958; Robertson, 1965). Various organic compounds such as taurinne, glycerine, betaine and amino acids account for the rest of the osmotic pressure. These substances together with inorganic ions play an important role in the is osmotic process which enables euryhaline molluscs to cope with the osmotic stress. Potts (1958) reported that the concentration of amino acids and also of the sodium, potassium and chloride ions decreased considerably in ***Mytilusedulis*** muscle during the adaptation from seawater to 50% seawater. On the other hand, an increase in the ionic and amino acid concentration had been recorded in the muscle of freshwater mussel adapted to 18% seawater. During these adaptations, the slight changes in the water con tent cannot account for the modification of the concentration changes may be the result of an active process. In ***Macomainconspicua***there is a significant decrease in the level of the free ninhydrin-posative substances during adaptation to 50% seawater (Emerson, 1969).

A mechanism controlling the synthesis- degradation pathways of the organic osmotic effectrors, appears to play a role in the regulation of their concentration (Schoffeniels and Gilles, 1972). They also suggested a possibility of the role of inorganic omposition of the intracellular medium in the activity of enzymes implicated in these pathways. More information on the intracellular localisation of the enzymes involved, the ionic composition prevailing locally, and the effects of ions on the enzymatic activity are needed before a more complete picture can be produced.

Molluscs, certainly constitute the most representative phylum of the littoral area, in as much that have often been chosen as landmarks in the definition of the shore levels. Unfortunately, today these molluscs have to face environmental medium ontaminated with sewage, oils, industrial chemicals, pesticides, metal etc. in addition to the frequent and rapid changes occurring naturally in the osmolarity of their external medium. Studies done by many researchers have demonstrated that DDT and related pesticides impair osmoregulatory ability in many aquatic animals (Cutcomp et al 1971 ; Janicki and Kinter, 1971; Nimmo and Blackman, 1972, Kinter, 1972; Letherland and Sanstegard, 1981) Mishra and Shrivastava (1983) reported malathion induced hemotological and biochemical changes in the Indian catfish ***Heteropneustesfossilis***. Biswas (1986) noted

hyperionic levels of Na^+ and K^+ and hypoionic levels of Ca^{++} Mg^{++} and Cl in blood serum of crab. ***Scylla serrate***exposed chronically to sub-lethal levels of ThiodanGopi 1992) studied the alterations in the ionic regulation in fish treated with an organophosphorus insecticide-fenthion in laboratory.

Comparatively very few reports are available on the alterations produced by various contaminants in free amino acid composition or in levels of ions in bivalve molluscs (Kabeer Ahmed et al. 1978; Moorthy et al, 1984: Hemelraad et al., 1990; Day et al. 1990; Ingale, 1991; Sivaramakrishna et al. 1991). In the present study, therefore experiments were conducted to know the effect of rogor on levels of sodium and potassium ions in various tissues of ***Pilaglobosa***.

II. Materials And Methods

The live Snails brought to the laboratory were acclimated to the laboratory conditions. They were than exposed to three sub-lethal concentrations of rogor (0.02, 0.12, 0.22 mg/L) for C a period of 15 days tap water of temperature $28^0 \pm 2$. A control group was also maintained simultaneously.

At the end of the test period of 15 days, the animals were sacrificed and tissues such as gills, mantle, digestive glands, food and muscles were obtained by dissecting the animal. The tissues were then digested in 1:1 (v/v) concentrated perchloric acid and nitric acid and evaporated to 100^0C (Dall, 1967). The residues were dissolved in double distilled water and the levels of sodium, potassium were determined with a flame photometer (ElicoPvt. Ltd. Model CL 22A). Standard graphs were prepared by using sodium chloride and potassium chloride solutions.

III. Result And Discussion

Sodium and potassium levels declined in almost all the tissues studied in ***Pilaglobosa*** exposed to the 3 sub-lethal conentrations of rogor for 15 days (table 1.1 & 1.2). The decrease in these ions was greater in Snails exposed to 0.12 mg/L and 0.22 mg/L than in snail exposed to 0.02 mg/L. On exposure to rogor a strong decrease (50%) of Na^+ and K^+ was observed in mantle of snails exposed to 0.12mg/L and 0.22mg/L. in all other organs/tissues of P. globosa exposed to 0.22 mg/L the decrease in Na^+ and K^+ was about 20 to 30% (Table 1.1 & 1.2).

The major functions of sodium in the animal body appear to be in connection with osmotic-pressure regulation and acid-base balance, although other funcitons such as a catalytic effect on enzyme activity cannot be excluded (Hawk et al, 1965) From the data that is available it is obvious that sodium ion is the chief cation of blood plasma and other extracellular fluids of the body. Within the cells potassium, magnesium and calcium are principal cations.

Table 1.1 changes in Sodium ion (Na^+) content (mg/gm) in different tissues of *PilaGlobosa*exposed to sub-lethal concentration of rogor for 15 days.

Exposure concentration	Sodium ion (Na*) content different tissues of ***Pilaglobosa***(mg/gm)				
	Gill	mantle	Digestive glad	Foot	muscie
Control (0.00)	4.34±031	3.97±0.29	2.95±0.3	3.31±0.35	4.60=0.27
0.02	4.30±0.28 (-1.67%)	3.43±0.27 (-13.52%)	2.44*±0.25 (-17.24%)	2.94±0.27 (-11.16%)	4.19=34 (-9.00%)
0.12	4.03±020 (-7.85%)	1.96**±0.18 (-50.64)	2.09**±0.18 (-29.07%)	2.20**±0.25 (-33.46%)	3.44**=0.27 (-25.25%)
0.22	3.28**±0.18 (-25.05%)	1.97**±0.15 (-50.32%)	2.00**±0.12 (-32.42%)	2.15*±0.19 (-35.07%)	3.63**=0.14 (-21.23%)

Value are mean =SD of 5 determinations
Values in parenthesis indicate % change over control
P<0>05. **P<0.01
Temperature 28^0C ± 2

Exposure concentration	Potassium ion (K*) content different tissues of ***Pilaglobosa***(mg/gm)				
	Gill	mantle	Digestive glad	Foot	muscie
Control (0.00)	3.00 ±0.25	3.08 ±0.31	4.51 ±0.29	4.06 ±0.28	3.135±0.35
0.02	2.72±0.23 (-9.34%)	2.36 ±0.25 (-23.42%)	3.73*±0.28 (-17.24%)	3.85 ± 0.25 (-5.18%)	2.63±0.29 (-16.0%)
0.12	2.52*±0.27 (-15.98%)	1.52*±1.14 (-50.55%)	3.27**±0.21 (-27.51%)	2.87**±0.16 (-29.37%)	2.17±0.16 (-30.66%)
0.22	2.35**±0.16 (-21.75%)	1.54**±0.18 (-49.97%)	3.25**±0.12 (-27.98)	2.5**±0.25 (-37.48%)	1.99±0.27 (-36.45%)

Table 1.2: Changes in Potassium ion (K*) content (mg/gm) in different tissues of *PilaGlobosa Exposed to sub-lathal concentration of rogor for 15 days.*

Values are mean = SD of 5 determinations
Values in parenthesis indicate % change over control
P<0.05 ** ±P <0.01
Sea water characteristcs – Salinity 29% ± pH 7.6 ± 0.2, Temperature 28^0C ±2

IV. Conclusion

Ionic regulation study shows adverse effects of rogor on the ionic content of tissues in the Snails. Decrease in the sodium and potassium ions is significant in all the tissues studied affecting the activities of enzymes and osmoregulation is these snails.

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CONFLICT OF INTEREST

Authors declare no conflict of interest regarding publication or any other activity related to this article.

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