EFFECT OF DIMECRON, ROGOR AND CUMAN L ON AChE AND PHOSPHATASES IN FRESH WATER MUSSEL, *LAMELLIDENS MARGINALIS* [LAMARCK.]

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USE of organic pesticides against the ravages of pests has increased enormously in recent past. Pesticides, besides serving their purpose, pose a threat to non-target organisms[1]. After entering into the aquatic environment by runoff waters they bring about lethal and sub-lethal effects on biota. Freshwater mussels form an integral part of aquatic ecosystem. They are bottom-dwelling and circulate large amounts of water to obtain oxygen and food by ciliary feeding mechanism. Hence they form good markers of aquatic pollution as they absorb soluble chemicals like pesticides. There is a paucity of literature on the influence of toxicants on fresh water mussel, hence an attempt has been made to study the impact of dimecron and rogor (organophosphates) and cuman L (carbamate) on AChE, acid and alkaline phosphatase activity levels of fresh water mussel, *Lamellidens marginalis.*

Medium sized mussels were used in the present experiment. The mussels were exposed to sub-lethal concentration (5 ppm). The sub-lethal concentration was selected after determining the LC_{50} values by the method of Finney[2] as described by Busvine[3]. The mussels were exposed to pesticide treated water for 48 hr. Commercial grade rogor (dimethoate) (30%) (O,O-dimethyl S-(N-methylcarbamoylmethyl) Phosphorodithioate) (P=S), dimecron (phosphamidon) (50%) (O,O-dimethyl-O-diethylamidochlorocrotomyl-2) phosphate) (P=O) and cuman L (Zinc-dimethyldithiocarbamate) (30%) were used in the present investigation. AChE (Acetylcholine-acetylhydrolase) (E.C.3.1.1.7) activity was estimated by the method of Metcalf[4] and Acetylcholine (ACh) content by the method of Hestrin as modified by Augustinson[5]. Acid phosphatase (orthophosphoric monoester phosphohydrolase) (E.C.3.1.3.2) and alkaline phosphatase (orthophosphoric monoester phosphohydralase) (E.C.3.1.3.1) were estimated by the method of Fiske and Subbaraw[6] at pH 4 and 9 respectively.

A reduction in AChE activity and accumulation of ACh content was observed (table 1). Dimecron caused higher depression of AChE activity than rogor. It has been shown that P atom of P=O group have greater electrophilic affinity at the esteretic site of AChE molecule than P=S of OP compounds[7]. The phosphorodithioates (P=S) like rogor, first undergo desulfuration to form the corresponding oxygen analogues (P=O) with the help of microsomal mixed function oxidases[8, 9] in the presence of NAD or NADH to become active anti ChE agents[10, 11]. Hence, dimecron

Table 1 *Changes in AChE, ACh content and phosphatases in some tissues with dimecron, rogor and cuman L exposed fresh water mussel, L. marginalis.* (*Values are expressed as mean ± S.D. of 6 individual observations*).

Parameters	Tissues	Control	Dimecron	Rogor	Cuman L
AChE[a]	Foot	1.864 ± 0.152	0.879 ± 0.076(−52.64)	0.922 ± 0.032(−47.85)	1.158 ± 0.078(−38.30)
	Mantle	1.1071 ± 0.148	0.637 ± 0.113(−40.52)	0.765 ± 0.155(−28.57)	0.881 ± 0.054(−17.74)
	Adductor muscle	1.368 ± 0.064	0.615 ± 0.129(−55.04)	0.804 ± 0.119(−41.23)	0.972 ± 0.031(−28.95)
ACh[b]	Foot	2.776 ± 2.88	4.091 ± 0.201(+47.12)	3.754 ± 0.244(+35.25)	3.485 ± 0.288(+25.54)
	Mantle	2.176 ± 1.06	3.191 ± 0.126(+46.79)	2.923 ± 0.154(+34 39)	2.699 ± 0.117(+24.31)
	Adductor muscle	2.323 ± 0.245	3.468 ± 0.221(+49.14)	3.146 ± 0.230(+35 34)	2.865 ± 0.235(+23.33)
Acid phosphatase[c]	Foot	2.78 ± 0.13	3.72 ± 0.14 (+33.81)	4.24 ± 0.11 (+52.52)	3.30 ± 0.19 (+18.71)
	Mantle	2.10 ± 0.09	2.72 ± 0.09 (+29 52)	3.06 ± 0.21 (+45.71)	2 52 ± 0.11 (+20.11)
	Adductor muscle	4.08 ± 0.27	5.12 ± 0.22 (+25 49)	6.02 ± 0.15 (+47.55)	4.70 ± 0.25 (+15.21)
Alkaline phosphatase[c]	Foot	5.10 ± 0.11	6.90 ± 0.15 (+35.29)	7.70 ± 0.13 (+50.98)	6 22 ± 0.09 (+21.57)
	Mantle	4.46 ± 0.09	5.98 ± 0.15 (+31.39)	6.50 ± 0.14 (+45.74)	5.54 ± 0.15 (+24.22)
	Adductor muscle	7.54 ± 0.15	9.92 ± 0.12 (+31.56)	10.94 ± 0.25 (+45.09)	9.30 ± 0.18 (+23.61)

a = *μmoles of ACh hydrolysed/100 mg wet wt./hr. b* = *μmoles/100 mg wet wt. c* = *μmoles of Pi liberated 100 mg wet wt hr.* The + or − values in parenthesis indicate percent change over normal. All values are statistically significant at $P < 0.001$.

showed more depression in AChE activity than rogor. Cuman L, a carbamate caused least effect on ACh—AChE system. Carbamates form carbomylated enzyme derivatives which are known to be reversible in reaction whereas dimecron and rogor, the organophosphates, form irreversible phosphorylated enzyme derivatives at the esteretic site of AChE molecule[12, 13].

Concomitant with AChE inhibition, there is an accumulation of ACh in the tissues of dimecron and rogor treated mussels (table 1). Inhibition of AChE in these tissues may cause structural and functional disturbances and produce adverse effects on the metabolism[14].

A significant increase in both acid and alkaline phosphatase activity by dimecron, rogor and cuman L was observed (table 1). Rogor caused greater elevation than cuman L. The increase in acid phosphatase activity may indicate release of these enzymes into the cellular environment due to disruption of lysosomal membrane since biocides are known to produce cytotoxic action and alterations in membrane fragility[15].

The increase in alkaline phosphatase activity was significant. This elevation may indicate increased uptake of certain metabolites and ions since these enzymes are reported to be involved in this process[16]. Higher activity of alkaline phosphatase in the present study may also suggest changes in the energy-supply metabolism as it is associated with carbohydrate metabolism[17].

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A CYTOLOGICAL NOTE ON THE POSSIBLE MODE OF ORIGIN OF *ATHERIGONA ORIENTALIS* SCHIN. FROM *MUSCA DOMESTICA* L.

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THE traditional materials like *Drosophila* and mosquitoes have been widely known for their salivary gland chromosomes. However, the family Muscidae has a poor representation in this respect. *Musca domestica* L.[1, 2] and *Atherigona orientalis* Schin.[3] are the only species of this family for which the salivary gland chromosome maps are available. These species, however, vary in their diploid number of chromosomes which is 12 in *Musca* (10 + XY) and 10 in *Atherigona* (8 + XY). As against these, 12 polytene chromosomal arms have been observed in *Musca*[2] and 11 in *Atherigona*[3]. The available salivary/polytene chromosomal maps of these two genera, belonging to the subfamilies Muscinae and Phaoniinae respectively, have been compared here to find out the banding differences, if any, at the generic/species level (figure 1). The relationship of their chromosome numbering systems has been summarized in table 1.

It is seen that the banding pattern of the Y chromosomes in the two genera reveals a good deal of resemblance. Similarly the major landmarks of the chromosomal arms III L, III R, IV L, IV R, V L and V R of *Atherigona* show resemblance with those of