

31 were also dependant on temperature. During 1981, race 77 dominated the flora and is at present the most virulent race able to attack 9 genes out of 13, in our set and gives variable reaction on *Lr* 17. Race 12A that occurs in ver low frequency has virulence for 4 genes, while race 63 not traced for the last many years has virulence for just 1 gene. This is clearly reflected by the values assigned in the new nomenclature system. The more virulent (able to infect greater number of resistant genes) gets a higher number. In other words, higher the number, complex is the race and hence, the nomenclature itself quantifies the reaction potentials.

The procedure to decode and arrive at the susceptible genes is easy and involves simple arithmetic. Supposing we have 132 R 7 virulence. Refer table 5 and follow the following steps.

A. Which is the nearest smaller decanary value?

B. Detect that value from the value of the virulence.

Example: Nearest to 132 is 12B (Line 8 - *Lr* 19)
 $132 - 12B = 4$.

C. Check the nearest value to the balance number.

D. Minus that from total.

E. Keep going till the end.

Example: The balance is 4 which fits with line 3 (*Lr* 31).

In set B, value 7 means that line 3 which has a value of 4 is susceptible ($7 - 4 = 3$), line 2 is also susceptible which has a value 1 is left, it is clear line 1 is also susceptible ($2^0 = 1$). The virulence analysis shows that 132 R 7 is virulent against *Lr* 19, *Lr* 13, *Lr* 2c, *Lr* 2a and *Lr* 3.

Identification of genes in the host by matching technique would be initiated once pure cultures are established. This system would be implemented from the 1981 crop year onwards, at Flowerdale, Simla, India which has the national mandate for monitoring and analysis of the cereal rust pathogen.

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METHYL PARATHION IMPACT ON THE REGULATION OF PHOSPHORYLASE ACTIVITY IN SELECTED TISSUES OF THE SNAIL, *PILA GLOBOSA* (SWAINSON)

K. SIVA PRASADA RAO, K. SATHYA PRASAD AND K. V. RAMANA RAO
 Department of Zoology, S. V. University Postgraduate Centre, Kavali 524 202, India.

ABSTRACT

Sublethal studies of methyl parathion showed depletion of total carbohydrates and glycogen contents in the selected tissues of the snail, *Pila globosa*. The activity levels of phosphorylase 'a' showed a significant decrease while phosphorylase 'b' showed a variable trend. The results are discussed in relation to the regulation of glycogen breakdown.

INTRODUCTION

OF the several factors that contribute to the disturbance and imbalance of an ecosystem, the pesticides are noteworthy¹, since they form potential toxins used to eradicate pests and insects². The imbalance of an ecosystem has profound influence on several non-target species³. Recent reports indicate that many of these pesticides cause cytogenic, mutagenic⁴

and pathological changes². This paper presents a study on the sublethal effects of methyl parathion (0-0 dimethyl 0-4 nitrophenyl phosphorothioate, a widely used organophosphate pesticide) on the glycolytic pathway, taking the key enzyme phosphorylase in the selected tissues of the fresh water snail, *Pila globosa*. This species was selected because it forms an integral part of the fresh water and rice field ecosystems.

MATERIALS AND METHODS

The snails were collected from unpolluted fresh-water canals and streams around Kavali. They were fed *ad lib* with hydrilla plants and acclimatised to laboratory conditions for one week. During acclimatisation, the water was changed daily. The technical grade methyl parathion of 80% purity, obtained from Bharat Pulverising Mills, Bombay was used for the present study. The standard stock solution was prepared as described earlier⁵. LC values were determined by probit analysis⁶ and the LC₅₀ of methyl parathion to *Pila globosa* was found to be 1.2 ppm for 48 hr. Hence, the snails were exposed at 0.4 ppm concentration of methyl parathion for 48 hr, since this represents sublethal concentration which is normally one third to two thirds the LC₅₀ value⁷. Equal number of snails are kept in tap water for the same period served as controls.

After the exposure, three tissues *viz.*, foot, mantle and hepatopancreas were isolated and the homogenates were prepared in 10% trichloroacetic acid for the estimation of total carbohydrates and glycogen⁸. For phosphorylase assay, the tissue homogenates were prepared in a medium containing sodium flouride (0.1 M) at pH 6.5 as suggested by Guillory and Mommaerts⁹ to prevent enzymatic interconversions of the two phosphorylases. The supernatants were used for

the assay. The glycogen phosphorylase activity was estimated by the method of Cori *et al.*¹⁰ in the direction of glycogen synthesis by determining the amount of inorganic phosphate formed from glucose-1-phosphate. The inorganic phosphate liberated was estimated by the method of Fiske and Subba Row¹¹. The protein content was determined by the method of Lowry *et al.*¹² The statistical correlations were conducted using student 't' test as described by Bailey¹³.

RESULTS AND DISCUSSION

The total carbohydrates and glycogen contents in the tissues of the methyl parathion exposed (MPE) snails showed a significant decrease, while the activity levels of phosphorylase 'a' and 'b' also showed a decreasing trend. However, phosphorylase 'b' values were not significant in mantle and foot tissues of MPE snails (table 1).

The decrease in total carbohydrates and glycogen in the respective tissues of MPE snails suggest immediate utilisation of these organic products under methyl parathion toxic stress. Nevertheless, the glycogen depletion ranged from 35 to 42% in the MPE tissues, while total carbohydrates declined by 32 to 35%, suggesting that the metabolisable carbohydrates alone are utilised under MPE stress condition to meet the

TABLE I

Levels of total carbohydrates, glycogen (mg/g wet wt) and phosphorylase 'a' and 'b' (μ moles of ip/mg protein/inhr) in the tissues of normal (NR) and methyl parathion exposed (MPE) snails. Values are mean \pm SD of 6 individual observations.

Component	Hepatopancreas		Mantle		Foot	
	NR	MPE	NR	MPE	NR	MPE
Total Carbohydrates	30.23 \pm 5.50	19.9 \pm 4.1	69.43 \pm 6.12	46.2 \pm 5.3	59.18 \pm 6.23	39.91 \pm 5.10
	PC = -34.17*		PC = -33.45*		PC = -32.23*	
Glycogen	13.73 \pm 2.90	8.3 \pm 1.8	12.23 \pm 2.10	7.3 \pm 1.9	17.4 \pm 3.1	10.19 \pm 2.20
	PC = -39.5*		PC = -35.36*		PC = -41.36*	
Phosphorylase 'a'	0.39 \pm 0.09	0.25 \pm 0.08	0.06 \pm 0.006	0.04 \pm 0.01	0.22 P 0.09	0.11 \pm 0.01
	PC = -39.54*		PC = -33.33*		PC = -50.00*	
Phosphorylase 'b'	0.86 \pm 0.12	0.65 \pm 0.02	0.094 \pm 0.029	0.113 \pm ^{0.01}	0.108 \pm 0.078	0.09 \pm 0.01
	PC = -24.4*		PC = 20.0**		PC = -16.66**	

P values: * = 0.001; ** = not significant PC = Percent change over normal.

energy demands. These results also suggest that there is economy in the utilisation of glycogen under methyl parathion exposure. To verify this possibility, the regulatory enzyme phosphorylase 'a' and 'b' were estimated. The phosphorylase 'a' (active form) showed a significant decrease ranging from 33 to 50% in the tissues, while phosphorylase 'b' (inactive form) showed significant decrease in hepatopancreas (24%) and insignificant trends in mantle and foot (table 1). These observations suggest that there is economy in the utilisation of glycogen.

Earlier studies on the same species showed loss of ions, more so of Ca^{++} and increase in organic acid content in the tissues¹⁴. Since Ca^{++} is known to indirectly to inhibit the activation of phosphorylase 'b' to phosphorylase 'a'¹⁵ and since organic acids are known to inhibit the phosphorylase activity¹⁶, it is quite probable that the loss of Ca^{++} and accumulation of organic acids during methyl parathion stress should inhibit glycogenolysis. This shows the regulation of phosphorylase in the utilisation and retention of glycogen in these tissues. Since glycogen cannot be totally exhausted, the decrease in the total carbohydrates suggests compensation of glycogen breakdown to meet the energy demands of the methyl parathion stress condition.

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ANNOUNCEMENT

SECOND INTERNATIONAL WORKSHOP ON THE PHYSICS OF SEMICONDUCTOR DEVICES SSPL, DELHI, INDIA

The Solid State Physics Laboratory is organising the Second International Workshop on the "Physics of Semiconductor Devices" at Vigyan Bhawan from December 5-10 this year. The Workshop is being sponsored by many institutions, including the Committee of Science and Technology in Developing Countries (COSTED) UNESCO. Recent trends and developments in the semiconductor field with emphasis on Si, GaAs and alloys of III-V compounds, other

materials, needed in semiconductor devices and VLSI will be discussed. Advances made in MOS, Solar Cell, IR detectors, other optoelectronic devices, microwave devices, LSI and VLSI including short channel effect will also be included.

For further information, please contact:

Dr. Vinod K. Jain
Solid State Physics Laboratory
Lucknow Road, Delhi-110 007 INDIA.