



CHAPTER III
OBSERVATIONS

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The snail, *Viviparus bengalensis* were exposed to different concentrations from 100 ppm to 500 ppm of alcoholic leaf extract of *Clerodendron inerme*, *Vitex negundo* and neem oil (Neem Shastra) of *Azadirachta indica*. Per cent mortality of snails were recorded upto 120 hours at intervals of 24 hours and mortality data was subjected to probit analysis to find out the LC₅₀ values at different time of intervals for each experimental molluscicides.

The per cent mortality of *V.bengalensis* at different concentrations of alcoholic extract of *Clerodendron inerme*, *Vitex negundo* and *Azadirachta indica* are recorded in Table Nos. 1,2,3 and graphically represented in Figure Nos.1,2,3 respectively.

1. OBSERVATIONS ON MORTALITY

a) Observations on motality of *V. bengalensis* after its exposure to phytotoxin from *C. inerme*.

Fresh water snail, *V. bengalensis* was exposed to the different concentrations such as 100,200,300,400 and 500 ppm of alcoholic extract of *C. inerme* for different time intervals such as 24,48,72,96 and 120 hrs. respectively.

The per cent mortality of *V. bengalensis* to the phytotoxin from *C. inerme* was recorded in the Table No. 1.

There was no mortality observed in the control set. Motality was initiated in 100 ppm concentration after 48 hrs. of exposure period. Maximum mortality was observed after 120 hrs. of exposure in each concentrations. 15%,30%,60%,75% and 85% mortality was observed

respectively in the concentrations 100,200,300,400 and 500 ppm after 120 hrs. of exposure period.

Different values such as LnXY , ΣLnXY , LnX , ΣLnX , LnX^2 , ΣLnX^2 were calculated with the help of percentage, mortality, probit (Y) and concentrations in ppm and recorded in the Table No. 4 to 8. with the help of percentage mortality, probit (Y) and concentrations in ppm.

The values of 'b' and 'a' were calculated by using numerical data then the regression equations and LC_{50} values were calculated and have been recorded in Table No. 19.

b) Observation on mortality of *V. bengalensis* after its exposure to phytotoxin from *V. negundo*.

Fresh water snail, *V. bengalensis* was exposed to the different concentrations such as 100,200,300,400 and 500 ppm of alcoholic extract of *V. negundo* for different time intervals such as 24,48,72,96 and 120 hrs. respectively.

The per cent mortality of *V. bengalensis* to the phytotoxin from *V. negundo* was recorded in the Table No. 2.

There was no mortality observed in the control set. Mortality was initiated in 100 ppm concentration after 24 hrs. of exposure period.. Maximum mortality was recorded after 120 hrs. of exposure in each concentrations. 20%,40%,75% 95%and 100% mortality was observed respectively in the concentrations 100,200,300,400 and 500 ppm. 100% mortality was seen after 120 hrs. of exposure period in concentration 500 ppm.

Different values such as LnXY , ΣLnXY , LnX , ΣLnX , LnX^2 , ΣLnX^2 were calculated with the help of percentage, mortality, probit (Y) and

concentrations in ppm and recorded in the Table No. 9 to 13. with the help of percentage mortality, probit (Y) and concentrations in ppm.

By using numerical data, the values of 'b' and 'a' were calculated and with help of these values regression equations and LC_{50} were calculated and have been recorded in Table No. 20.

C) Observation on mortality of *V. bengalensis* after its exposure to phytotoxin from *A. indica*.

Fresh water snail, *V. bengalensis* was exposed to the different concentrations such as 100,200,300,400 and 500 ppm of alcoholic extract of *A. indica*(Neem oil) for different time intervals such as 24,48,72,96 and 120 hrs. respectively.

The per cent mortality of *V. bengalensis* to the phytotoxin from *A. indica* was recorded in the Table No. 3

No mortality was observed in the control set. Mortality was initiated in 100 ppm concentration after 48 hrs. of exposure period. The maximum mortality was observed after 120 hrs. of exposure period in each concentration. 15%,30%,55% 65% and 80% mortality was observed respectively in the concentrations 100,200,300,400 and 500 ppm respectively after 120 hrs. of exposure period.

Different values such as $\ln XY$, $\Sigma \ln XY$, $\ln X$, $\Sigma \ln X$, $\ln X^2$, $\Sigma \ln X^2$ were calculated with the help of percentage, mortality, probit (Y) and concentrations in ppm and recorded in the Table No. 14 to 18. with the help of percentage mortality, probit (Y) and concentrations in ppm.

By using numerical data, the values of 'b' and 'a' were calculated Then the regression equations and LC_{50} were calculated and have been recorded in Table No. 21.

Comparative data of LC₅₀ values of plant toxins *C. inerme* *V.negundo* *A.indica* with respect to snail, *V. bengalensis* and exposure periods are recorded in the Table No. 22.

From the above data the maximum mortality was observed in snails exposed to molluscicide *V. negundo* and it was 100% mortality after 120 hrs. of exposure period.

Table No. 1

Per cent mortality of *Viviparus bengalensis* after exposure to molluscicide *Clerodendron inerme* for different concentrations.

Conc. in ppm.	Per cent mortality				
	24 hrs	48 hrs	72 hrs	96 hrs	120 hrs
control	00.00	00.00	00.00	00.00	00.00
100	00.00	10.00	10.00	10.00	15.00
200	15.00	20.00	25.00	30.00	30.00
300	30.00	40.00	50.00	55.00	60.00
400	55.00	65.00	65.00	70.00	75.00
500	65.00	75.00	80.00	85.00	85.00

Table No. 2

Per cent mortality of *Viviparus bengalensis* after exposure to molluscicide *Vitex negundo* for different concentrations.

Conc. in ppm.	Per cent mortality				
	24 hrs	48 hrs	72 hrs	96 hrs	120 hrs
control	00.00	00.00	00.00	00.00	00.00
100	10.00	15.00	15.00	20.00	20.00
200	20.00	25.00	30.00	35.00	40.00
300	35.00	45.00	55.00	60.00	75.00
400	65.00	65.00	65.00	85.00	95.00
500	70.00	75.00	80.00	90.00	100.00

Table No. 3

Per cent mortality of *Viviparus bengalensis* after exposure to molluscicide *Azadirachta indica* for different concentrations

Conc. in ppm.	Per cent mortality				
	24 hrs	48 hrs	72 hrs	96 hrs	120 hrs
control	00.00	00.00	00.00	00.00	00.00
100	00.00	05.00	10.00	10.00	15.00
200	05.00	15.00	20.00	25.00	30.00
300	15.00	35.00	45.00	50.00	55.00
400	35.00	50.00	60.00	75.00	65.00
500	55.00	65.00	75.00	80.00	80.00

Table No. 4

Numerical data for calculation of 'b' and 'a' in relation to *Clerodendron inerme* extract and *Viviparus bengalensis* for 24 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnX	LnXY	LnX ²
00	1.0000	100	2	2.0000	4
15	3.9636	200	2.3	9.1162	5.29
30	4.4756	300	2.47	11.0547	6.10
55	5.1257	400	2.60	13.3268	6.76
65	5.3853	500	2.69	14.4864	7.23
	$\Sigma Y = 19.9502$ $Y = 3.9900$	n=5	$\Sigma \text{LnX} = 12.06$ $\text{LnX} = 2.41$	$\Sigma \text{LnXY} = 49.9841$	$\Sigma \text{LnX}^2 = 29.39$

Table No. 5

Numerical data for calculation of 'b' and 'a' in relation to *Clerodendron inerme* extract and *Viviparus bengalensis* for 48 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
10	3.7184	100	7.4368	2	4
20	4.1584	200	9.5643	2.3	5.29
40	4.7467	300	11.7243	2.47	6.10
65	5.3853	400	14.0017	2.6	6.76
75	5.67	500	15.2644	2.69	7.23
	$\Sigma Y = 26.6855$ $Y = 4.7366$	n=5	$\Sigma \text{LnX} =$ 57.9915	$\Sigma \text{LnX} = 12.06$ $\text{LnX} = 2.41$	ΣLnX^2 29.38

Table No. 6

Numerical data for calculation of 'b' and 'a' in relation to *Clerodendron inerme* extract and *Viviparus bengalensis* for 72 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
10	3.7184	100	7.4368	2	4
25	4.3255	200	9.9484	2.3	5.29
50	5.0000	300	12.3500	2.47	6.10
65	5.3853	400	14.0017	2.6	6.76
80	5.8416	500	15.7139	2.69	7.23
	$\Sigma Y = 24.2708$ $Y = 4.8541$	n= 5	$\Sigma \text{LnXY} =$ 59.4708	$\Sigma \text{LnX} = 12.06$ $\text{LnX} = 2.41$	ΣLnX^2 29.08

Table No. 7

Numerical data for calculation of 'b' and 'a' in relation to *Clerodendron inerme* extract and *Viviparus bengalensis* for 96 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
10	3.7184	100	7.4368	2	4
30	4.4756	200	10.2938	2.3	5.29
55	5.1257	300	12.6604	2.47	6.10
70	5.5244	400	14.3634	2.6	6.76
85	6.0364	500	16.2379	2.69	7.23
	$\Sigma Y = 24.8794$ Y = 4.9758	n = 5	$\Sigma \ln XY = 60.9923$	$\Sigma \ln X = 12.06$ LnX = 2.41	$\Sigma \ln X^2 = 29.38$

Table No. 8

Numerical data for calculation of 'b' and 'a' in relation to *Clerodendron inerme* extract and *Viviparus bengalensis* for 120 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
15	3.9636	100	7.9272	2	4
30	4.4756	200	10.2938	2.3	5.29
60	5.2533	300	12.9756	2.47	6.10
75	5.6745	400	14.7537	2.6	6.76
85	6.0364	500	16.2379	2.69	7.23
	$\Sigma Y = 25.4034$ Y = 5.0806	n = 5	$\Sigma \ln XY = 62.1882$	$\Sigma \ln X = 12.06$ LnX = 2.41	$\Sigma \ln X^2 = 29.38$

Table No. 9

Numerical data for calculation of 'b' and 'a' in relation to *Vitex negundo* extract and *Viviparus bengalensis* for 24 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
10	3.7184	100	7.4368	2	4
20	4.1584	200	9.5643	2.3	5.29
35	4.6147	300	11.3983	2.47	6.10
65	5.3883	400	14.0095	2.6	6.76
70	5.5244	500	14.8606	2.69	7.23
	$\Sigma Y = 23.4042$ Y = 4.6808	n = 5	$\Sigma \ln XY = 51.2695$	$\Sigma \ln X = 12.06$ LnX = 2.41	$\Sigma \ln X^2 = 29.38$

Table No. 10

Numerical data for calculation of 'b' and 'a' in relation to *Vitex negundo* extract and *Viviparus bengalensis* for 48 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
15	3.9636	100	7.9272	2	4
25	4.3255	200	9.9486	2.3	5.29
45	4.8743	300	12.0395	2.47	6.10
65	5.3853	400	14.0017	2.6	6.76
75	5.6545	500	15.2644	2.69	7.23
	$\Sigma Y = 24.2232$ Y = 4.8446	n = 5	$\Sigma \ln XY = 59.1814$	$\Sigma \ln X = 12.06$ LnX = 2.41	$\Sigma \ln X^2 = 29.38$

Table No. 11

Numerical data for calculation of 'b' and 'a' in relation to *Vitex negundo* extract and *Viviparus bengalensis* for 72 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
15	3.9636	100	7.9272	2	4
30	4.4756	200	10.2938	2.3	5.29
55	5.1257	300	12.6604	2.47	6.10
65	5.3853	400	14.0017	2.6	6.76
80	5.8416	500	15.7139	2.69	7.23
	$\Sigma Y = 24.7918$ Y= 4.9583	n = 5	$\Sigma \ln XY =$ 60.5970	$\Sigma \ln X = 12.06$ LnX=2.41	$\Sigma \ln X^2$ 29.38

Table No. 12

Numerical data for calculation of 'b' and 'a' in relation to *Vitex negundo* extract and *Viviparus bengalensis* for 96 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
20	4.1584	100	8.3168	2	4
35	4.6147	200	10.6138	2.3	5.29
60	5.2533	300	12.9765	2.47	6.10
85	6.0364	400	15.6949	2.6	6.76
90	6.2816	500	16.8975	2.69	7.23
	$\Sigma Y = 26.3444$ Y= 5.2688	n = 5	$\Sigma \ln XY =$ 64.4986	$\Sigma \ln X = 12.06$ LnX=2.41	$\Sigma \ln X^2$ 29.38

Table No. 13

Numerical data for calculation of 'b' and 'a' in relation to *Vitex negundo* extract and *Viviparus bengalensis* for 120 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
20	4.1584	100	8.3168	2	4
40	4.7467	200	10.9174	2.3	5.29
75	5.6745	300	14.0160	2.47	6.10
95	6.6449	400	17.2767	2.6	6.76
100 % 99.9	8.0902	500	21.7626	2.69	7.23
	$\Sigma Y = 29.3147$ Y = 5.8629	n = 5	$\Sigma \ln XY =$ 72.2895	$\Sigma \ln X = 12.06$ LnX = 2.41	$\Sigma \ln X^2$ 29.38

Table No. 14

Numerical data for calculation of 'b' and 'a' in relation to *Azadirachta indica* extract and *Viviparus bengalensis* for 24 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
00	1.0000	100	2.0000	2	4
05	3.3551	200	7.7167	2.3	5.29
15	3.9636	300	9.7900	2.47	6.10
35	4.6147	400	11.9982	2.6	6.76
55	5.1257	500	13.7881	2.69	7.23
	$\Sigma Y = 18.0591$ Y = 3.6118	n = 5	$\Sigma \ln XY =$ 45.2930	$\Sigma \ln X = 12.06$ LnX = 2.41	$\Sigma \ln X^2$ 29.38

Table No. 15

Numerical data for calculation of 'b' and 'a' in relation to *Azadirachta indica* extract and *Viviparus bengalensis* for 48 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
05	3.3551	100	6.7102	2	4
15	3.9636	200	9.1162	2.3	5.29
35	4.6147	300	11.3983	2.47	6.10
50	5.0000	400	13.0000	2.6	6.76
65	5.3853	500	14.4864	2.69	7.23
	$\Sigma Y = 22.3187$ $Y = 4.4637$	n = 5	$\Sigma \text{LnXY} = 54.7111$	$\Sigma \text{LnX} = 12.06$ $\text{LnX} = 2.41$	$\Sigma \text{LnX}^2 = 29.38$

Table No. 16

Numerical data for calculation of 'b' and 'a' in relation to *Azadirachta indica* extract and *Viviparus bengalensis* for 72 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
10	3.7184	100	7.4368	2	4
20	4.1584	200	9.5643	2.3	5.29
45	4.8743	300	12.0395	2.47	6.15
60	5.2533	400	13.6585	2.6	6.76
75	5.6745	500	15.2644	2.69	7.23
	$\Sigma Y = 23.6789$ $Y = 4.7357$	n = 5	$\Sigma \text{LnXY} = 57.9635$	$\Sigma \text{LnX} = 12.06$ $\text{LnX} = 2.41$	$\Sigma \text{LnX}^2 = 29.38$

Table No. 17

Numerical data for calculation of 'b' and 'a' in relation to *Azadirachta indica* extract and *Viviparus bengalensis* for 96 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
10	3.7184	100	7.4368	2	4
25	4.3255	200	9.9486	2.3	5.29
50	5.0000	300	12.3500	2.47	6.15
75	5.6745	400	14.7537	2.6	6.76
80	5.8416	500	15.7139	2.69	7.23
	$\Sigma Y = 24.5600$ Y = 4.9120	n = 5	$\Sigma \text{LnXY} =$ 60.2030	$\Sigma \text{LnX} = 12.06$ LnX = 2.41	ΣLnX^2 29.38

Table No. 18

Numerical data for calculation of 'b' and 'a' in relation to *Azadirachta indica* extract and *Viviparus bengalensis* for 120 hrs.

% mortality	Probit (Y)	Conc. in ppm	LnXY	LnX	LnX ²
15	3.9636	100	7.9272	2	4
30	4.4756	200	10.2938	2.3	5.29
55	5.1257	300	12.6604	2.47	6.15
65	5.3853	400	14.0017	2.6	6.76
80	5.8416	500	15.7139	2.69	7.23
	$\Sigma Y = 24.7918$ Y = 4.9583	n = 5	$\Sigma \text{LnXY} =$ 60.5970	$\Sigma \text{LnX} = 12.06$ LnX = 2.41	ΣLnX^2 29.38

Table No. 19

Regression equation with LC_{50} values of *Clerodendron inerme* leaf extract on snail, *Viviparus bengalensis* at different time intervals.

Time of interval (hrs)	Regression equation (Y=a+b X)	LC_{50} value in ppm calculated
24	$Y = - 11.07 + 6.2423 X$	375.7
48	$Y = - 2.2995 + 2.9144 X$	317.8
72	$Y = - 2.5296 + 3.0595 X$	312.5
96	$Y = - 2.9700 + 3.2919 X$	261.3
120	$Y = - 2.3201 + 3.0664 X$	241.8

Table No. 20

Regression equation with LC_{50} values of *Vitex negundo* leaf extract on snail, *Viviparus bengalensis* at different time intervals.

Time of interval (hrs)	Regression equation (Y=a+b X)	LC_{50} value in ppm calculated
24	$Y = - 1.957 + 2.7493 X$	332.4
48	$Y = - 1.2226 + 2.5119 X$	296.3
72	$Y = - 1.5131 + 2.6812 X$	266.5
96	$Y = - 2.4816 + 3.2113 X$	211.6
120	$Y = - 5.7548 + 4.7657 X$	176.4

Table No. 21

Regression equation with LC_{50} values of *Azadirachta indica* neem oil on snail, *Viviparus bengalensis* at different time intervals.

Time of interval (hrs)	Regression equation (Y=a+b X)	LC_{50} value in ppm calculated
24	$Y = - 10.402 + 5.8084 X$	446.8
48	$Y = - 2.6503 + 2.9479 X$	391.8
72	$Y = - 2.1628 + 2.8577 X$	318.5
96	$Y = - 1.8068 + 2.8668 X$	275.7
120	$Y = - 1.5131 + 2.6812 X$	263.0

Table No. 22

LC₅₀ values of *C.inerme*, *V.negundo* and *A.indica* on snail, *viviparus bengalensis* at different time intervals,

Time of Exposure in hrs	Concentration in ppm LC ₅₀ values		
	<i>C.inerme</i>	<i>V.negundo</i>	<i>A. indica</i>
24	375.7	332.4	446.8
48	317.8	296.3	391.8
72	312.5	266.5	318.5
96	261.3	211.6	275.7
120	241.8	176.4	263.0

Fig.No.1 : Effect of different concentrations of alcoholic leaf extract of *Clerodendron inerme* on mortality snail *Viviparus bengalensis*

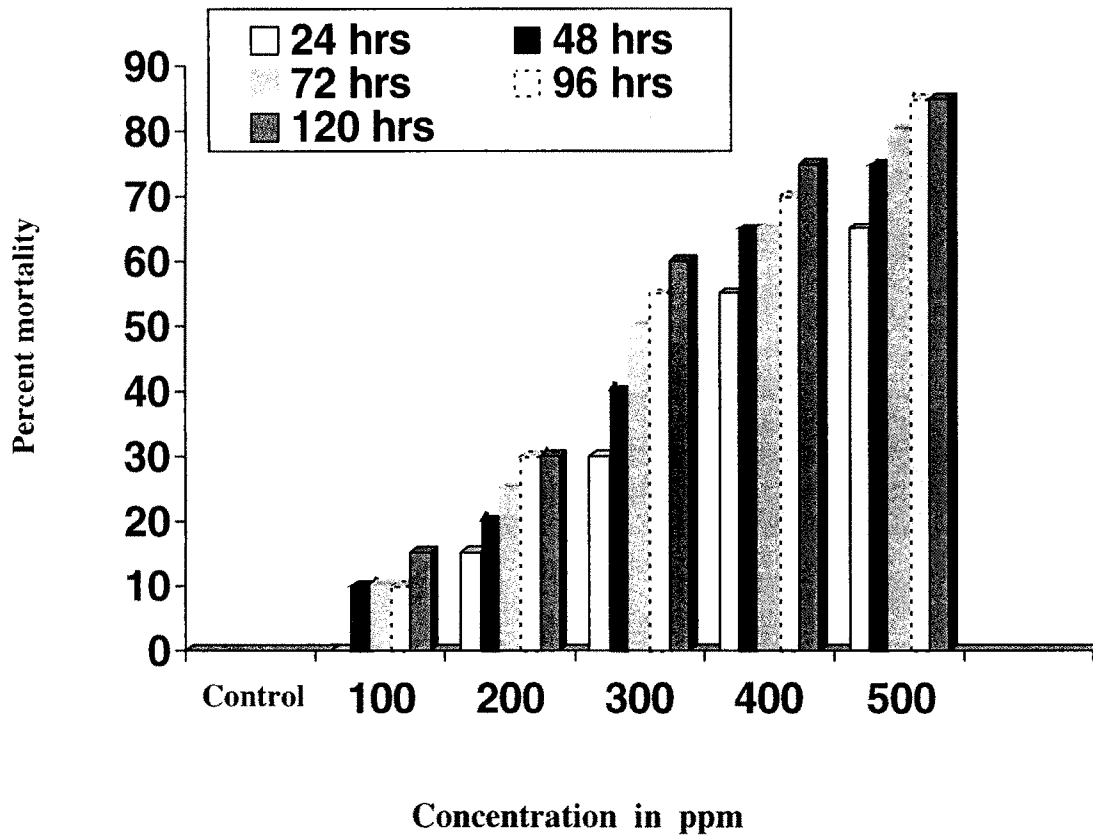


Fig.No.2 : Effect of different concentrations of alcoholic leaf extract of *Vitex negundo* on mortality snail *Viviparus bengalensis*

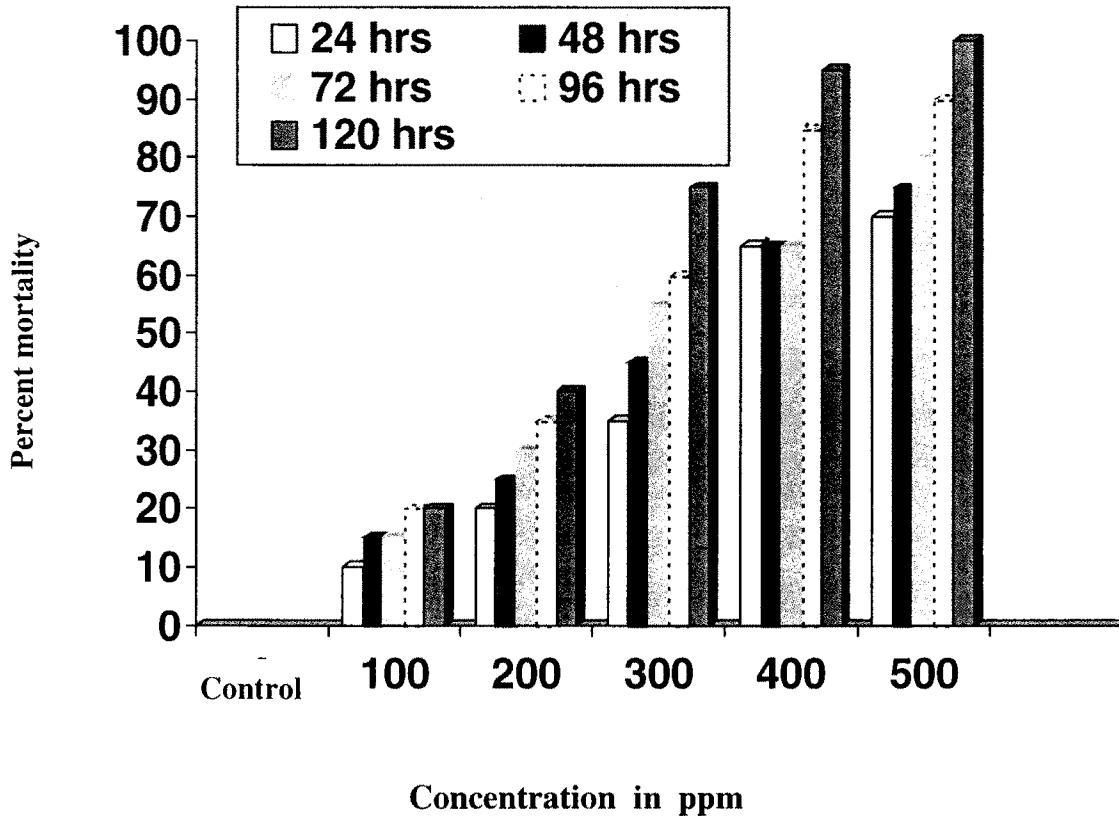
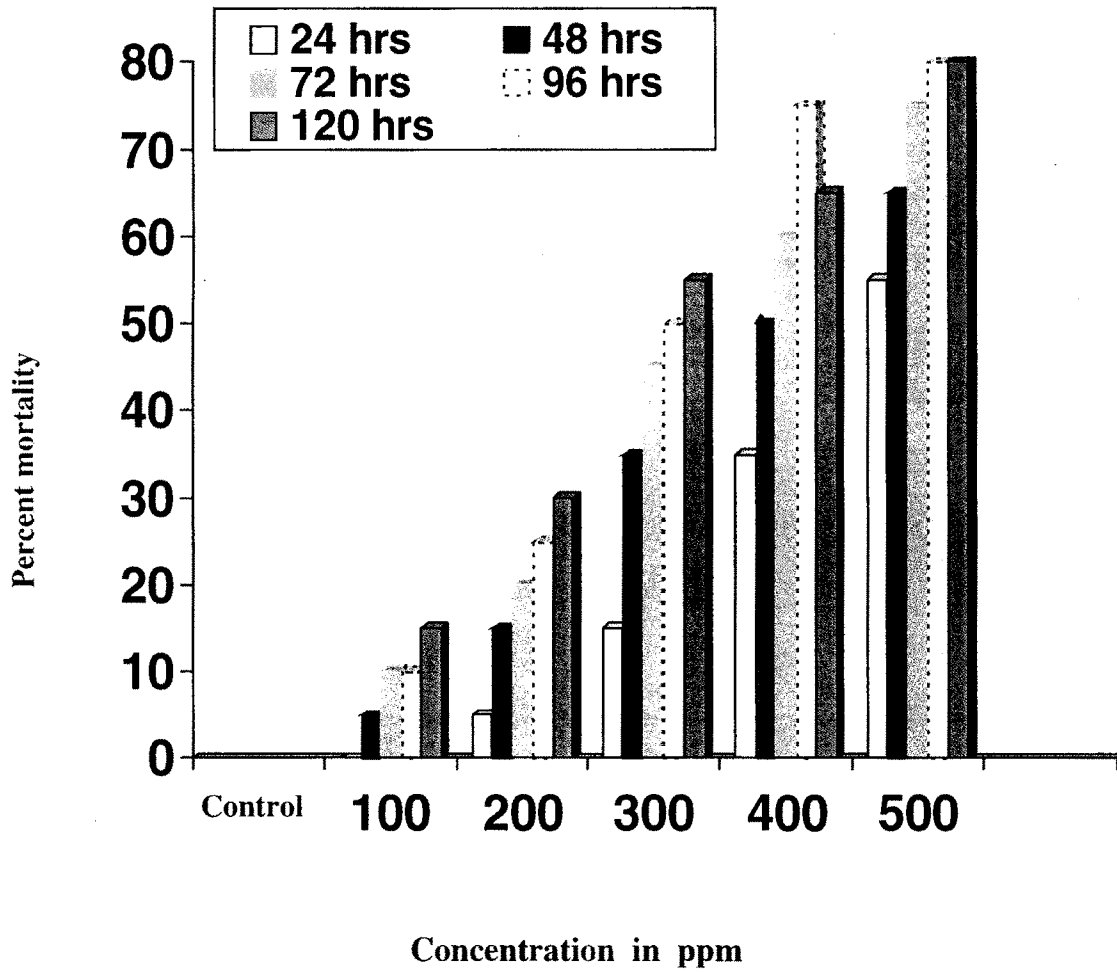


Fig No.3 : Effect of different concentrations of neem oil (Neem Shastra) of *Azadirachta indica* on mortality snail, *Viviparus bengalensis*



2. OBSERVATIONS ON OXYGEN CONSUMPTION –

The observation on the effect on the oxygen consumption in fresh water snail, *Viviparus bengalensis* after treatment of natural molluscicides or phytotoxins from *Clerodendron inerme*, *Vitex negundo* and *Azadirachta indica* are recorded in Table Nos. 23,24, 25 and represent graphically in Figure Nos.4,5,6 respectively.

a) Observations on rate of oxygen consumption of snail *V. bengalensis* after exposure to phytotoxin *C. inerme* at different periods

When snails were exposed to *C.inerme* the rate of oxygen consumption was increased after 2 hours of exposure but afterwards the rate of oxygen consumption was slowly decreased up to 120 hrs.of exposure period.

In the control group the rate of oxygen consumption is not remarkably changed in all the snails. The oxygen consumption of snails in control group was 0.2639 0.2996, 0.2365 0.2890, and 0.2960 ml/gm body wt/hr/l, respectively from 24,48,72,96 and 120 hrs.

The decrease in oxygen consumption was found 0.2200, 0.2408, 0.1810 ,0.2086, and 0:2110 ml/gm body wt/hr/l at 24,48,72,96,and 120 hrs.. respectively due to effect of plant toxins from *Clerodendron inerme* in all the exposed snails. It was noticed that the oxygen consumption was affected due to toxic effect of plant toxins from *Clerodendron inerme*. The percentage decrease in oxygen consumption was observed 16.63%, 19.62%, 23.46%,27.82% and 28.71% at 24,48,72,96,and 120 hrs respectively.

It was seen that the rate of oxygen consumption was reduced in *V. bengalensis* after 24 to 120 hrs of exposure to plant toxins from *Clerodendron inerme* which was inversally proportional to exposure period. The observations on the effect of plant toxins from *Clerodendron inerme* on

oxygen consumption snail, *V. bengalensis* were recorded in Table No.23 and graphically represented in Figure No.4.

b) Observations on rate of oxygen consumption snail *V. bengalensis* after exposure to phytotoxin *V.negundo* at different periods.

After exposure of snails to *V. negundo* the rate of oxygen consumption was increased after 2 hours of exposure but afterwards the rate of oxygen consumption was slowly decreased up to 120 hrs.of exposure period.

In the control group the rates of oxygen consumption was remained nearly constant in all the snails. The oxygen consumption in control group was 0.3048, 0.2885, 0.2922 , 0.2860 and 0.2881 ml/gm. body wt./l./hour after exposure at 24, 48, 72,96 and 120 hrs. respectively.

The remarkable decreased values were observed after exposure to toxins of *Vitex negundo*. The decreased oxygen consumption rate was 0.2911, 0.2515, 0.2189 , 0.1956 and 0.1995 ml/gm body wt./l./hour at 24, 48, 72, 96 and 120 hrs respetively. The percentage of oxygen consumption decrease was observed 4.49%,12.82%,25.08% ,31.60% and 30.75% after exposure period 24, 48,72,96 and 120 hrs respectively.

The rate of oxygen consumption was remarkably reduced in *V. bengalensis* after 24 to 120 hrs of exposure to plant toxins from *V. negundo* which was inversally proportional to exposure period. The observation on the effect of plant toxins from *V. negundo* on oxygen consumption of snail, *V. bengalensis* were recorded in Table No.24 and graphically represented in Figure No5.

C) Observations on oxygen consumption after exposure to phytotoxin *A. indica*.

When snails were exposed to *A. indica* the rate of oxygen consumption was increased after 2 hours of exposure but afterwards the rate of oxygen consumption was slowly decreased up to 120 hrs. of exposure period.

In the control group the rate of oxygen consumption was nearly constant which was 0.3124, 0.2986, 0.3002, 0.2924 and 0.2985 ml/gm/body wt./l./hour after exposure period 24, 48, 72, 96 and 120 hrs. respectively. But after exposure of snails to *A. indica* the rate of oxygen consumption was reduced to 0.2810, 0.2196, 0.2321, 0.2130 and 0.2160 ml/gm/body wt./l./hour at 24, 48, 72, 96 and 120 hrs. respectively.

The percentage decrease in oxygen consumption was observed 10.05%, 19.63%, 22.68%, 27.15% and 27.96% at 24, 48, 72, 96 and 120 hrs. respectively.

It was seen that the rate of oxygen consumption was reduced in *V. bengalensis* after 24 to 120 hrs of exposure to plant toxins from *Azadirchata indica*. which was inversally proportional to exposure period. The observation on the effect of plant toxins from *Azadirchata indica* on oxygen consumption of snail, *V. bengalensis* were recorded in Table No.25 and graphically represented in Figure No. 6.

From above data the maximum percentage decrease in oxygen consumption was observed in snails exposed to the molluscicide *V. negundo* and it was 30.75% after 120 hrs. of exposure period.

The secretion of thick mucus was observed on gills of all intoxicated snails, exposed to all above molluscicide.

Table No. 23

Oxygen consumption of freshwater snail, *Viviparus bengalensis* after exposure to *Clerodendron inerme*.

Sr. No.	Exposure period (hrs)	Experimental condition	Oxygen consumption (ml/gm body wt./hr./l.)	% increase or decrease
1	2	Control	0.2048 \pm 0.005	+ 28.36
		Intoxicated	0.2629 \pm 0.007	
2	24	Control	0.2639 \pm 0.006	- 16.63
		Intoxicated	0.2200 \pm 0.005	
3	48	Control	0.2996 \pm 0.006	- 19.62
		Intoxicated	0.2408 \pm 0.006	
4	72	Control	0.2365 \pm 0.008	- 23.46
		Intoxicated	0.1810 \pm 0.005	
5	96	Control	0.2890 \pm 0.006	- 27.87
		Intoxicated	0.2086 \pm 0.009	
6	120	Control	0.2960 \pm 0.008	-28.71
		Intoxicated	0.2110 \pm 0.005	

\pm SD, P < 0.005

Table No. 24

Oxygen consumption of freshwater snail, *Viviparus bengalensis* after exposure to *Vitex negundo*.

Sr. No.	Exposure period (hrs)	Experimental condition	Oxygen consumption (ml/gm body wt./hr./l.)	% increase or decrease
1	2	Control	0.2120 \pm 0.007	+ 29.24
		Intoxicated	0.2740 \pm 0.005	
2	24	Control	0.3048 \pm 0.009	- 4.49
		Intoxicated	0.2911 \pm 0.006	
3	48	Control	0.2885 \pm 0.008	- 12.82
		Intoxicated	0.2515 \pm 0.005	
4	72	Control	0.2922 \pm 0.005	- 25.08
		Intoxicated	0.2189 \pm 0.009	
5	96	Control	0.2860 \pm 0.007	- 31.60
		Intoxicated	0.1956 \pm 0.007	
6	120	Control	0.2881 \pm 0.008	- 30.75
		Intoxicated	0.1995 \pm 0.006	

\pm SD, P < 0.005

Table No. 25

Oxygen consumption of freshwater snail, *Viviparus bengalensis* after exposure to *Azadirachta indica* (neem oil).

Sr. No.	Exposure period (hrs)	Experimental condition	Oxygen consumption (ml/gm body wt./hr./l.)	% increase or decrease
1	2	Control	0.2365 ± 0.009	+ 18.81
		Intoxicated	0.2810 ± 0.008	
2	24	Control	0.3124 ± 0.005	- 10.05
		Intoxicated	0.2810 ± 0.007	
3	48	Control	0.2986 ± 0.007	- 19.63
		Intoxicated	0.2496 ± 0.007	
4	72	Control	0.3002 ± 0.009	- 22.68
		Intoxicated	0.2321 ± 0.006	
5	96	Control	0.2924 ± 0.009	- 27.15
		Intoxicated	0.2130 ± 0.008	
6	120	Control	0.2985 ± 0.005	- 27.96
		Intoxicated	0.2160 ± 0.005	

±SD, P < 0.005

Figure No. 4

Oxygen consumption of, *V. bengalensis* after exposure to *C. inermis*.

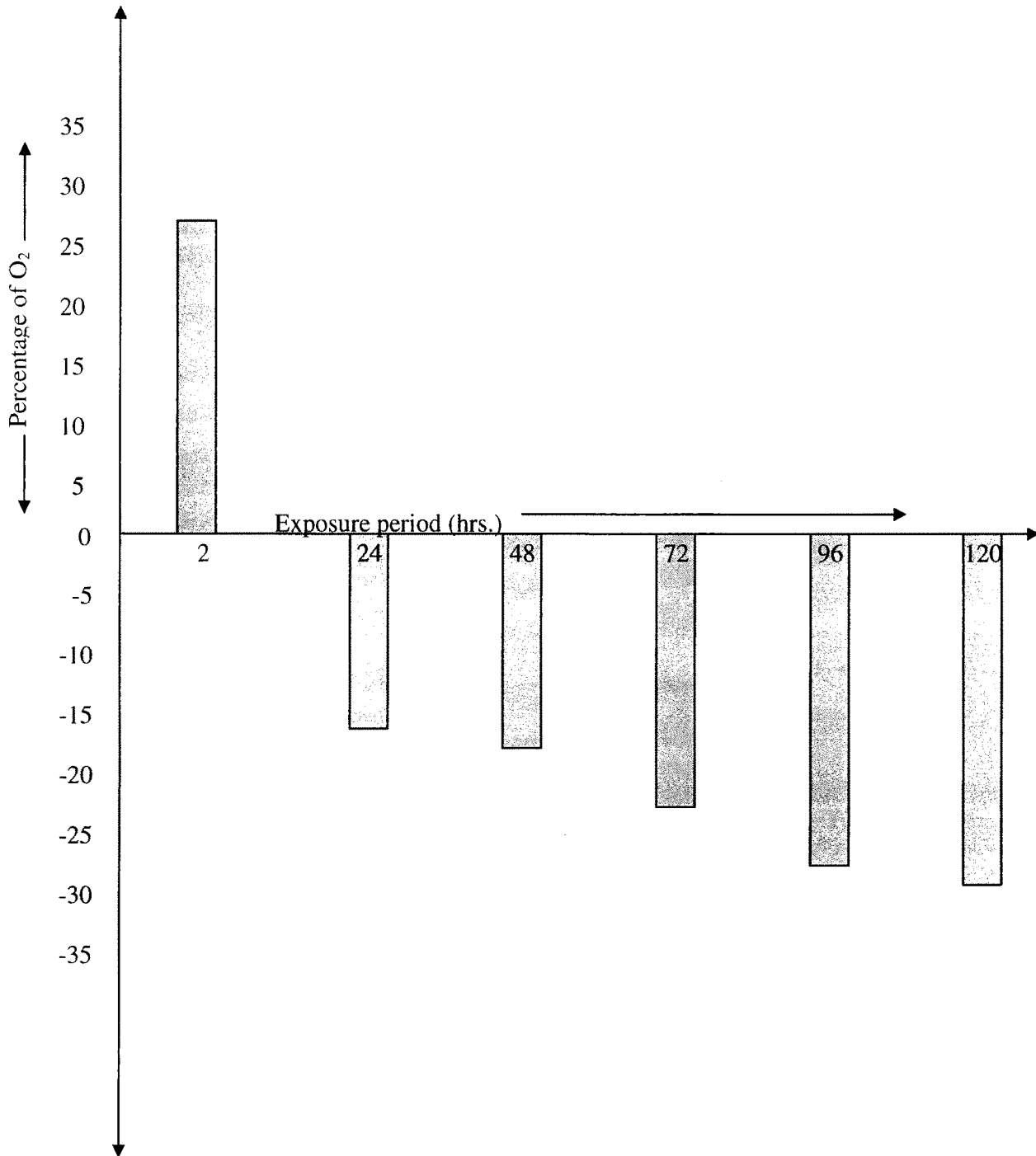


Figure No. 5

Oxygen consumption of, *V. bengalensis* after exposure to *Vitex negundo*.

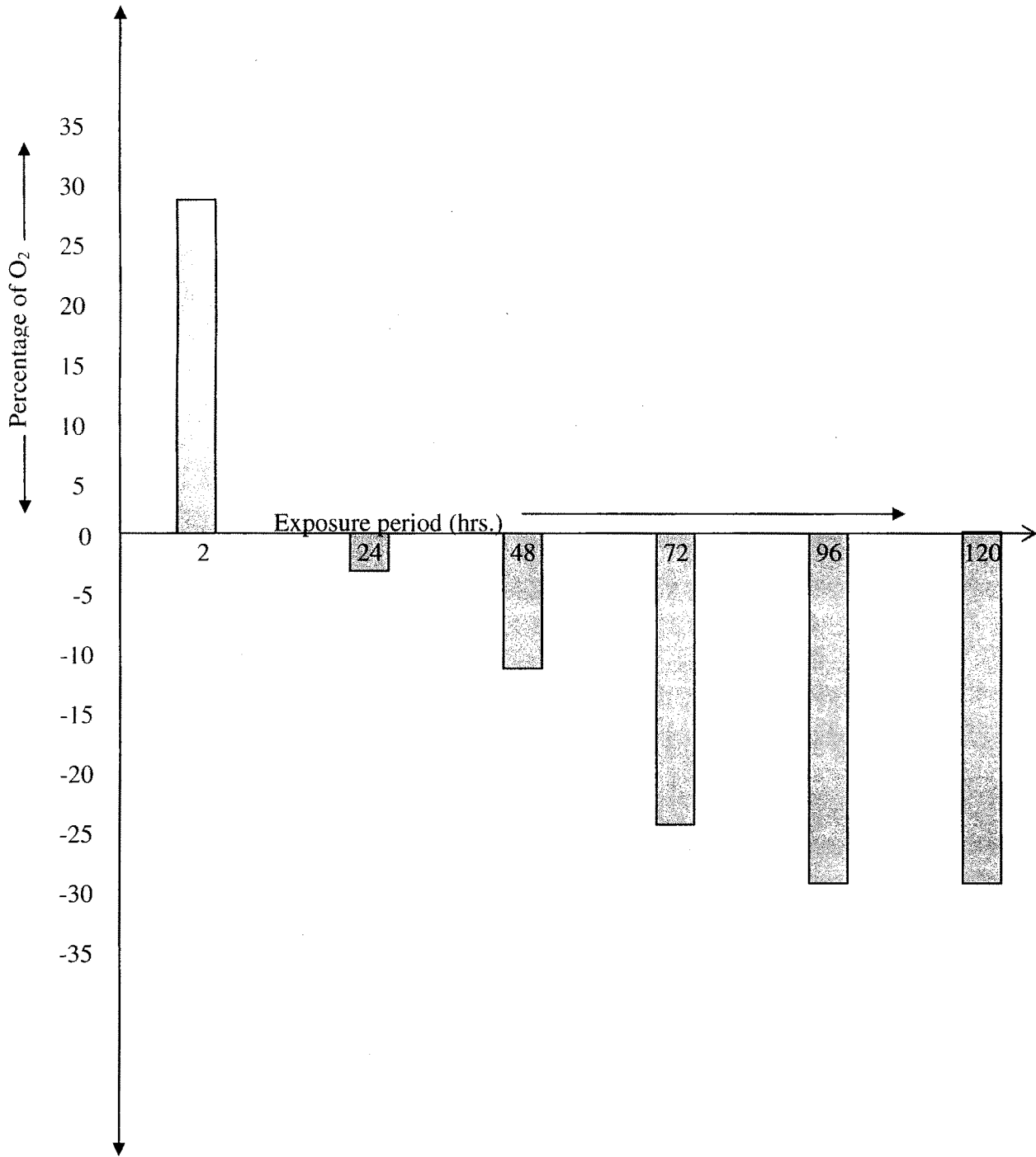
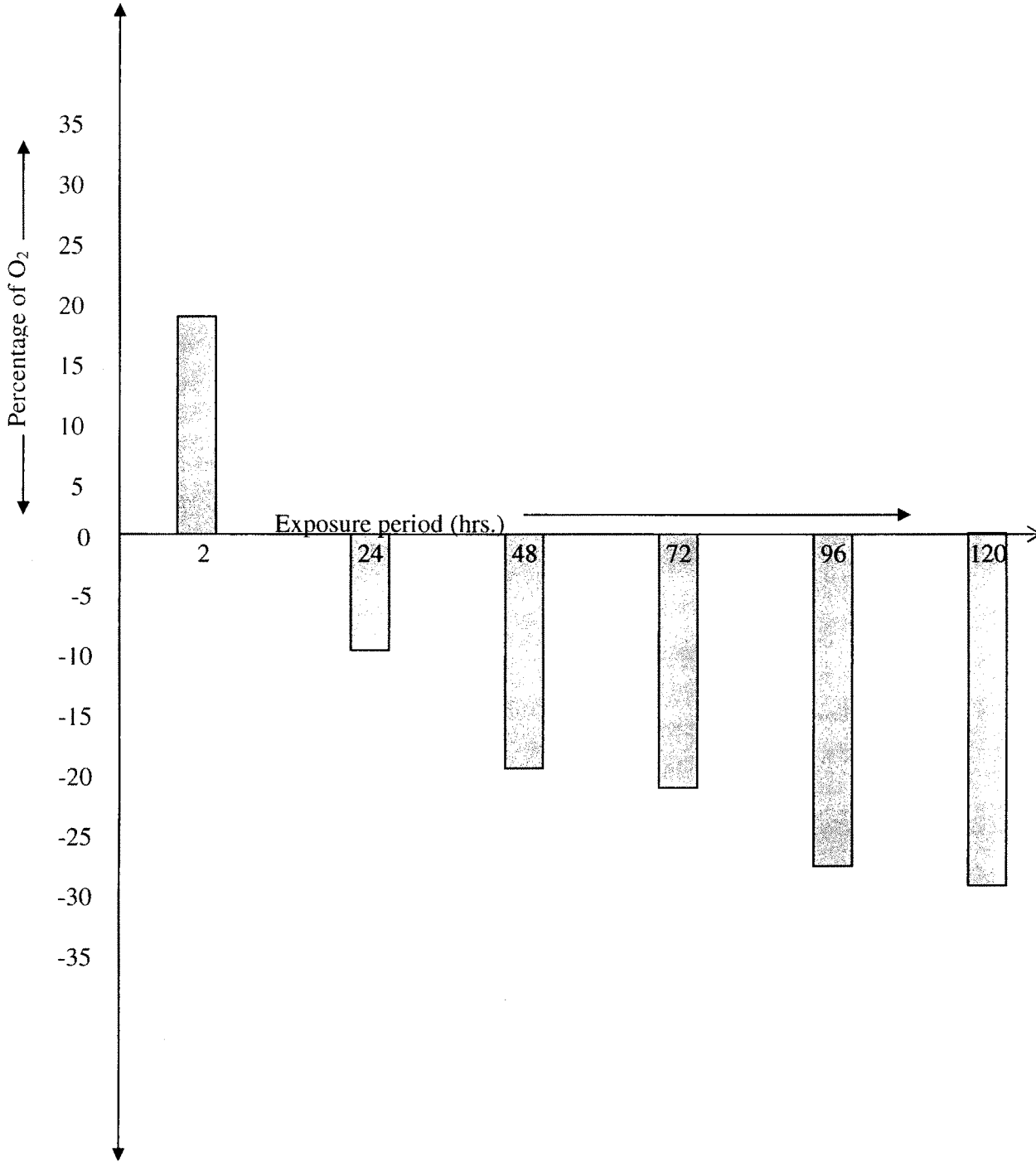


Figure No. 6

Oxygen consumption of, *V. bengalensis* after exposure to *A. indica*.



3.) OBSERVATIONS ON BIOCHEMICAL PARAMETERS -

The data of per cent glycogen, proteins and lipids in gills of *Viviparus bengalensis* under normal and experimental condition due to toxic effect of *Clerodendron inerme*, *Vitex negundo* and *Azadirachta indica* are recorded in Table Nos. 26,27,28 and represented graphically in Figure Nos. 7,8,9 respectively.

Observations on biochemical parameters of gill tissue of *V. bengalensis* after exposure to molluscicides

The molluscicides from the plants *C.inerme*, *V. negundo* and *A. indica* affected the biochemical constituents of gill of snail, *V. bengalensis*. These results were compared with the results in the control set. The data of per cent glycogen, proteins and lipids in gills of *Viviparus bengalensis* under normal and experimental condition due to toxic effect of *Clerodendron inerme*, *Vitex negundo* and *Azadirachta indica* are recorded in Table Nos. 26,27,28 and represented graphically in Figure Nos. 7,8,9 respectively.

a) Observations on biochemical parameters of gill tissue of *V. bengalensis* after exposure to molluscicides from *Clerodendron inerme*

The biochemical parameters glycogen, proteins and lipids were depleted in the gills of the experimental snail *Viviparus bengalensis* after their exposure to the molluscicides from *C. inerme* from 24 to 120 hrs. these observations were recorded in Table No. 26. and represented graphically in Figure No. 7.

i) Effect of on the glycogen -

When snails, *V. bengalensis* were exposed to molluscicide from *C. inerme* the glycogen content was found declined in gills. In the control set the glycogen content was 9.16 mg/100mg of gill, where as these contents were 8.80,6.11, 5.41,3.54 and 2.60 mg/100mg of snail exposed for 24,48,72,96 and 120 hrs respectively.

The percentage decrease in glycogen in gills of *V.bengalensis* was 3.93%, 33.3%, 40.93%, 61.35% and 71.62% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

ii) Effect on the proteins -

The total proteins were slightly decreased in exposed snails. Proteins were 4.39mg/ 100mg of gills in control set while proteins were observed as 4.03 3.79, 3.72, 3.60 and 3.52 mg/gm of gills respectively after exposure period of 24, 48. 72 ,96 and 120 hrs.

The percentage decrease in proteins in gills of *V.bengalensis* was 8.20%, 13.66%, 15.26%, 17.99% and 19.81% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

iii) Effect on the total lipids -

When snails, *V. bengalensis* were exposed to molluscicide from *C.. inerme* the total lipids were found depleted. In the control set 9.00mg/100mg lipids were observed in gills. Where as the lipid contents were depleted to 9,06,6,03, 2.6 and 2 mg/100mg respectively after exposure period of 24, 48. 72 ,96 and 120 hrs.

The percentage decrease in lipids in gills of *V.bengalensis* was 0.0%, 33.3%, 66.66%, 71.11% and 77.77% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

b) Observations on biochemical parameters of gill tissue of *V. bengalensis* after exposure to molluscicides from *V. negundo*

The biochemical parameters glycogen, proteins and lipids were depleted in the gills of the experimental snail *Viviparus bengalensis* after their exposure to the molluscicides from *V. negundo* from 24 to 120 hrs. these observations have been recorded in table No. 27 and represented graphically in Figure No. 8.

i) Effect on glycogen -

When snails, *V. bengalensis* were exposed to molluscicide from *V. negundo* the glycogen concentration was found declined very fastly in gills. In the control set the glycogen content was 9mg /100mg of gills. Where as these contents were 8.85, 5.50, 4.15, 2.65, 2.58 mg/100mg of gill of snail exposed for 24, 48, 72, 96 and 120 hrs respectively.

The percentage decrease in glycogen in gills of *V. bengalensis* was 3.38%, 39.95%, 54.69%, 71.07% and 71.83% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

ii) Effect on proteins -

The total proteins were slightly decreased in exposed snails. Proteins were 4.49mg/ 100mg of gills in control set while proteins were observed as 4.22, 3.84, 3.63, 3.56, 3.48 mg/100mg after exposure period of 24, 48, 72, 96 and 120 hrs. 24 to 120 hrs respectively.

The percentage decrease in proteins in gills of *V. bengalensis* was 6.01%, 14.48%, 19.15%, 20.71% and 22.49% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

iii) Effect on lipids

The total lipids was decreased fastly as compare to the control set. In control set 8.5mg/100mg lipids were observed in gills. Where as the lipid contents were depleted to 8, 6.5, 06, 03, 02 mg/100mg respectively after exposure period of 24, 48, 72, 96 and 120 hrs.

The percentage decrease in lipids in gills of *V.bengalensis* was 5.88%, 23.52%, 29.41%, 64.70% and 76.47% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

C) Observations on biochemical parameters of gill tissue of

V. bengalensis after exposure to molluscicides, *A. indica*.

The biochemical parameters glycogen, proteins and lipids were depleted in the gills of the experimental snail *Viviparus bengalensis* after their exposure to the molluscicides from *A. indica* from 24 to 120 hrs. these observations have been recorded in Table No. 28 and represented graphically in Figure No. 9.

i) Effect on glycogen :

When snails, *V. bengalensis* were exposed to molluscicide from *A. indica* the glycogen concentration was found declined very fastly in gills. In the control set the glycogen content was 9.16mg /100mg of gills. Where as these contents were 8.46, 6.28, 6.11, 5.23 and 3.92 mg/100mg of gill of snail exposed for 24, 48, 72, 96 and 120 hrs respectively.

The percentage decrease in glycogen in gills of *V.bengalensis* was 6.55%, 31.44%, 33.29%, 42.90% and 57.20% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

ii) Effect on proteins -

The total proteins were slightly decreased in gill of *V. bengalensis* after exposure for 24 to 120 hrs. In gills of snail, *V. bengalensis* the total protein present was about 4.49 mg/gm in control set while in intoxicated set protein level was decreased from 24 to 120 hrs, 4.22, 4.07, 3.93, 3.79 and 3.71 mg/gm respectively, proteins decreased in less quantity.

The percentage decrease in proteins in gills of *V. bengalensis* was 6.01%, 9.35%, 12.47%, 15.59% and 17.37% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

iii) Effects on the total lipids -

The total lipids was decreased fastly as compare to the control set. In control set 9mg/100mg lipids were observed in gills. Where as the lipid contents were depleted after exposure period of 48 hrs. Lipid contents decreased to 7.00, 6.00, 3.00, 2.00 mg/100mg at 48, 72, 96 and 120 hrs. respectively.

The percentage decrease in lipids in gills of *V. bengalensis* was 0.00%, 22.22%, 33.33%, 66.66% and 77.77% respectively after 24, 48, 72, 96 and 120 hrs. of exposure period.

From above data the maximum percentage decrease in glycogen, protein and lipids was observed in gills of snails exposed to the moluscicide *V. negundo* and it was 57.20%, 17.37% and 77.77% respectively after 120 hours of exposure period.

Table No. 26

Effect of leaf extract of *Clerodendron inerme* on the biochemical contents in the gills of freshwater snail, *Viviparus bengalensis*.

Sr. No.	Time of exposure(hrs.)	Concentration of biochemical parameters (mg/ 100mg of gills)		
		Glycogen	Proteins	Lipids
1.	control	9.16	4.39	9.00
2.	24	8.80(3.93%)	4.03(8.20%)	9.00(0.0%)
3.	48	6.11(33.30%)	3.79(13.66%)	6.00(33.33%)
4.	72	5.41(40.93%)	3.72(15.26%)	3.00(66.66%)
5.	96	3.54(61.35%)	3.60(17.99%)	2.60(71.11%)
6.	120	2.60(71.62%)	3.52(19.81%)	2.00(77.77%)

Table No. 27

Effect of leaf extract of *Vitex negundo* on biochemical contents in the the gills of *Viviparus bengalensis*.

Sr. No.	Time of exposure(hrs.)	Concentration of biochemical parameters (mg/ 100mg of gills)		
		Glycogen	Proteins	Lipids
1.	control	9.16	4.39	8.5
2.	24	8.85(3.38%)	4.22(6.01%)	8.00(5.88%)
3.	48	5.50(39.95%)	3.84(14.48%)	6.50(23.52%)
4.	72	4.15(54.69%)	3.63(19.15%)	6.00(29,41%)
5.	96	2.65(71.07%)	3.56(20.71%)	3.00(64.70%)
6.	120	2.58(71.83%)	3.48(22.49%)	2.00(76.47%)

Table No. 28

Effect of neem oil of *Azadirchta indica* on biochemical contents in the gills of *Viviparus bengalensis*.

Sr. No.	Time of exposure(hrs.)	Concentration of biochemical parameters (mg/100mg of gills)		
		Glycogen	Proteins	Lipids
1.	control	9.16	4.39	9.00
2.	24	8.46(6.55%)	4.22(6.01%)	9.00(0.0%)
3.	48	6.28(31.44%)	4.07(9.35%)	7.00(22.22%)
4.	72	6.11(33.29%)	3.93(12.47%)	6.00(33.33%)
5.	96	5.23(42.93%)	3.79(15.59%)	3.00(66.66%)
6.	120	3.92(57.23%)	3.71(17.37%)	2.00(77.77%)

Figure No. 7 : Effect of extract of *Clerodendron inerme* on biochemical parameters of gills of *Viviparus bengalensis*

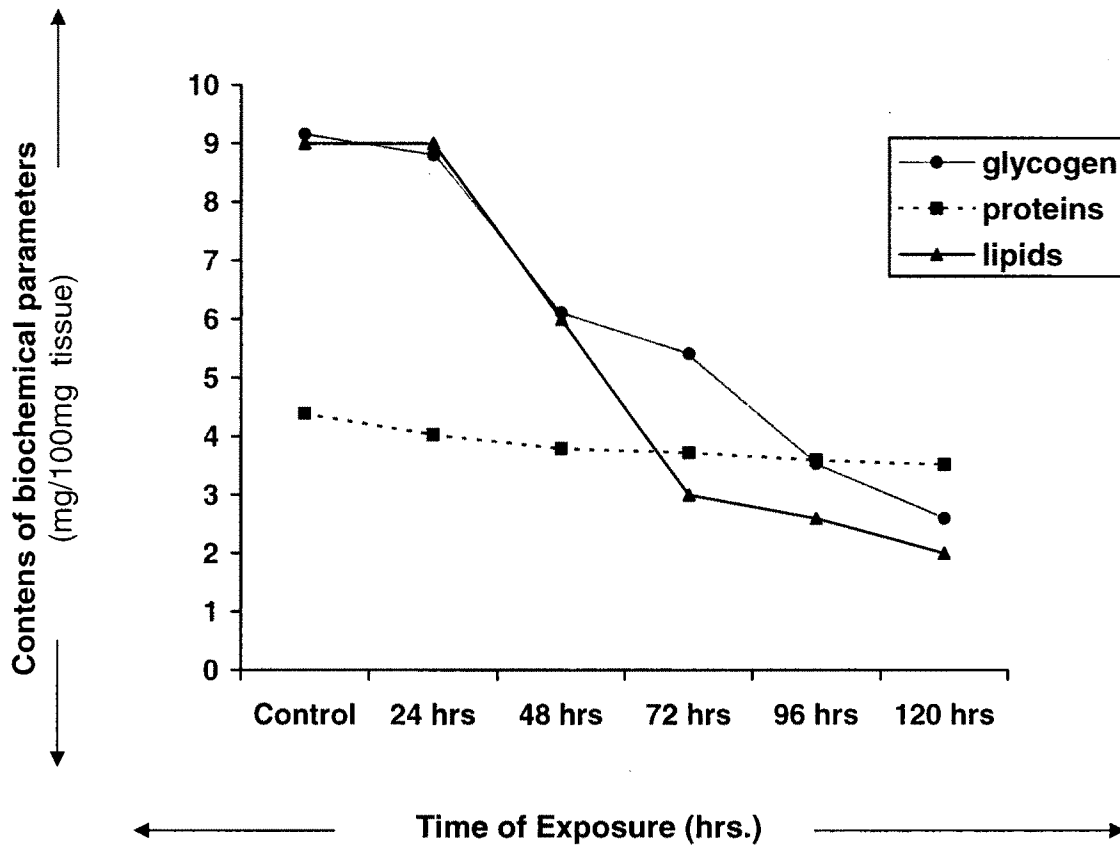


Figure No. 8 : Effect of extract of *Vitex negundo* on biochemical parameters of gills of, *Viviparus bengalensis*

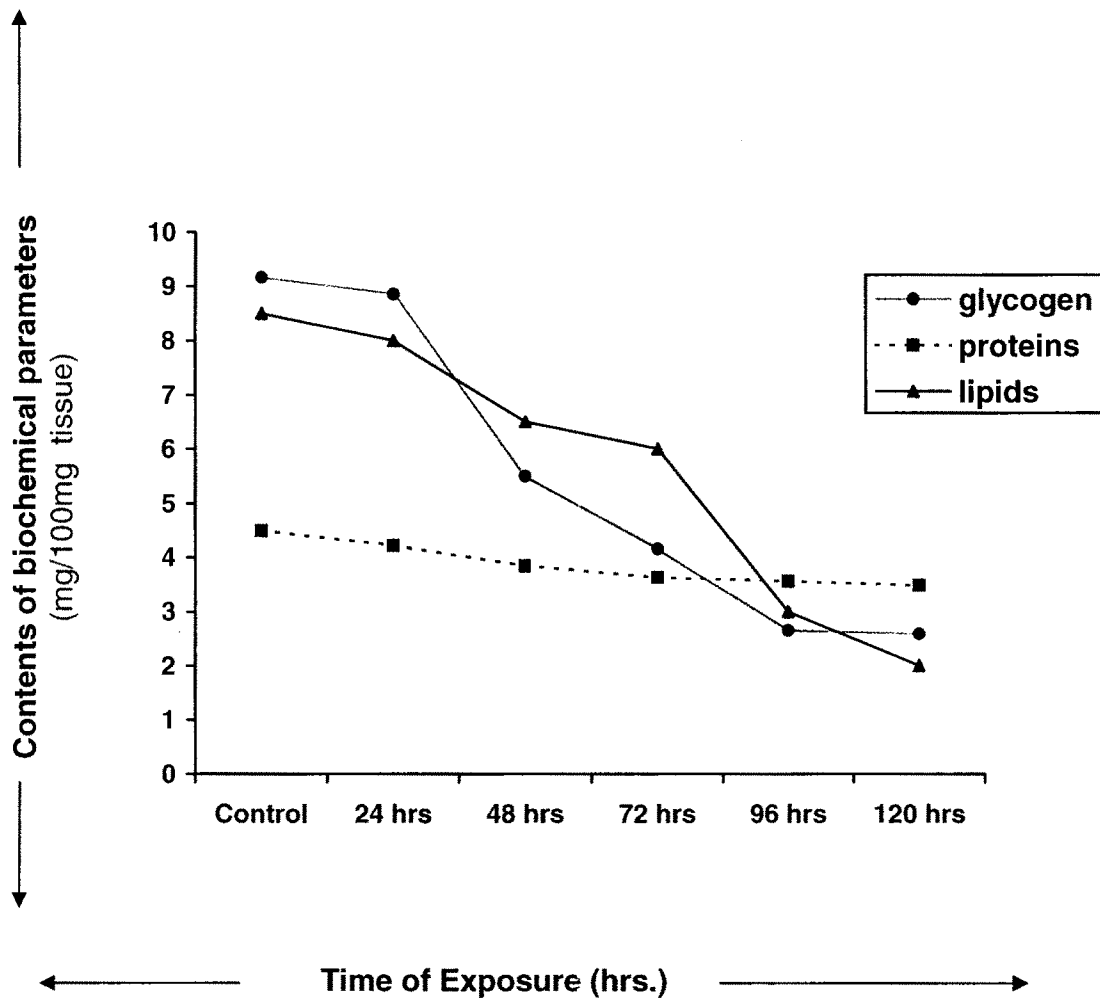


Figure No.9 :Effect of neem oil of *Azadirchta indica* on Biochemical parameters of gills of, *Viviparus bengalensis*

