

# INCIDENCE OF ENDRIN RESIDUES IN VEGETABLES AND ITS EFFECTS ON BIOLOGICAL SYSTEM

Pages with reference to book, From 362 To 365

Qaiser Iftikhar, Afzal Ilahi, M. Nawaz ( Department of Biochemistry and Department of Pharmacology, University of Agriculture, Faisalabad. )

Naeem-ur-Rahman ( University of Engineering and Technology, Lahore. )

## Abstract

The residue levels of Endrin were estimated for two vegetables, i.e., raddish (*Raphanus sativus*) and cabbage (*Brassica oleracia*). Samples were collected from fields and markets. The disappearance of endrin in raddish was also noted after spraying. Ten percent of raddish and 30 percent samples of cabbage were found to contain large amounts of the insecticide ranging from  $199.4 \pm 6.8$  to  $388.7 \pm 16.9$  ug per 100 g sample. The residues of the insecticide after spraying the raddish crop, persisted upto 10 days. The insecticide accumulated in the blood and livers of albino rats receiving three different doses of endrin orally. The growth rate was significantly affected (JPMA35 :362, 1985).

## INTRODUCTION

Insecticides protect agricultural commodities from plant and diseases by their immediate action. The increasing use and presence of insecticide residue in food material is likely to create multiple health problems in Pakistan.

The present study was undertaken to detect endrin in vegetables and its effect on biological systems.

## ATERIAL AND METHODS

Samples of two vegetable, raddish (*Raphanus sativus*) and cabbage (*Brassica oleracia*) were collected randomly from different fields and markets. Raddish crop was also sown in an experimental plot measuring 1350 square feet. At the time of maturity, it was sprayed with 0.05 percent solution of endrin at the rate of 100 gallons per acre. Raddish samples were collected from that plot on alternate days. Random and self sprayed samples were qualitatively screened for endrin residues using thin layer chromatography<sup>1</sup>. Insecticide was separated from the plant material<sup>2</sup> and endrin was estimated using the method of Terriere et al.<sup>3</sup>

Sixteen male albino rats were randomly divided into four groups A,B,C and D. The control group D was given normal stock diet throughout the experimental period of four weeks. The rats in three treated groups A,B and C were administered endrin orally in doses of 4.5, 2.25 and 1.125 mg per Kg body weight respectively. The initial and subsequent daily weights of rats were recorded. Initial and weekly blood samples were collected by cardiac puncture under anaesthesia from one randomly selected rat from each group for estimation of endrin.<sup>4</sup> At the end of four weeks, the rats were killed and weights of their principal organs like liver, kidney, spleen, heart, adrenals and lungs, were recorded for comparison. The livers were analysed for any accumulation of endrin<sup>5</sup>.

## RESULTS AND DISCUSSION

Ten samples of raddish and ten of cabbage collected randomly from various fields and markets, were analysed for the presence,, of endrin residues. Only one sample of raddish and three of cabbage

contained endrin. The amount of endrin in cabbage ranged from  $199.4 \pm 6.8$  to  $388.7 \pm 16.9$  ug per 100 g of the vegetable, whereas for raddish it was  $380.3 \pm 8.5$  ug per 100 g. These results indicate that the daily consumption of endrin by human population, ranges from 598.2 to 1166.1 ug per person, provided it is assumed that an adult healthy man of 70 kg body weight with normal dietary habits, consumes 300 g of the vegetable. The acceptable daily intake (ADI) calculated on this basis ranges between 8.5 and 16.6 ug per kg body weight. This amount is quite high and alarming as compared to the ADI established by FAO<sup>6</sup> to be 0.2 ug per kg body weight. The endrin residues persisted in the edible portion of raddish, upto 10 days and diminished thereafter (Figure 1).

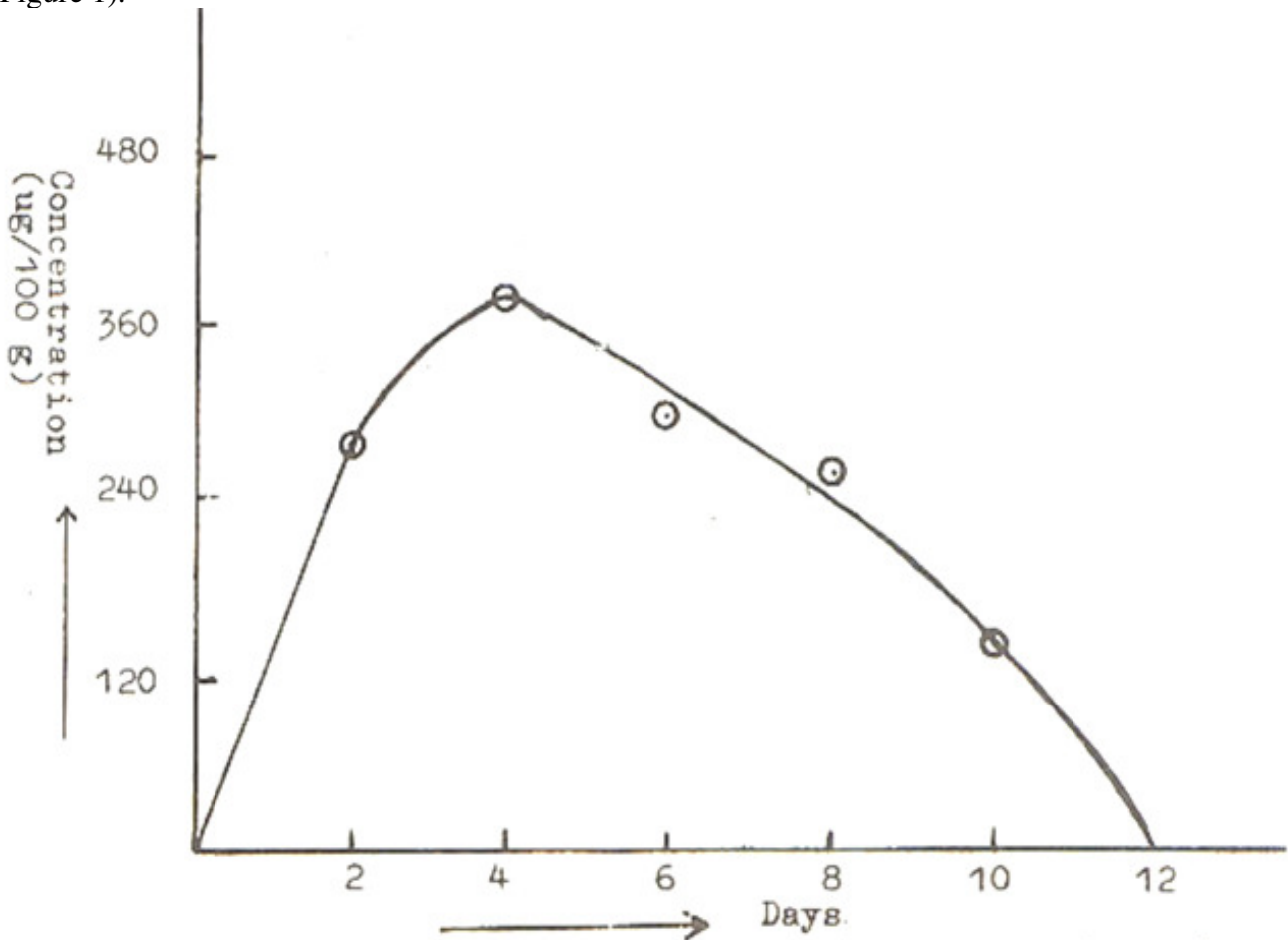


Fig.1. Concentration of endrin residues on various days in raddish crop sprayed with endrin.

Other studies show that endrin residues on cabbage disappeared within 2! days<sup>7</sup> and on raddish crop they persisted from<sup>7</sup> to 12 days.<sup>8</sup>

The various concentrations of endrin in blood of different groups of rats are shown in Figure 2.

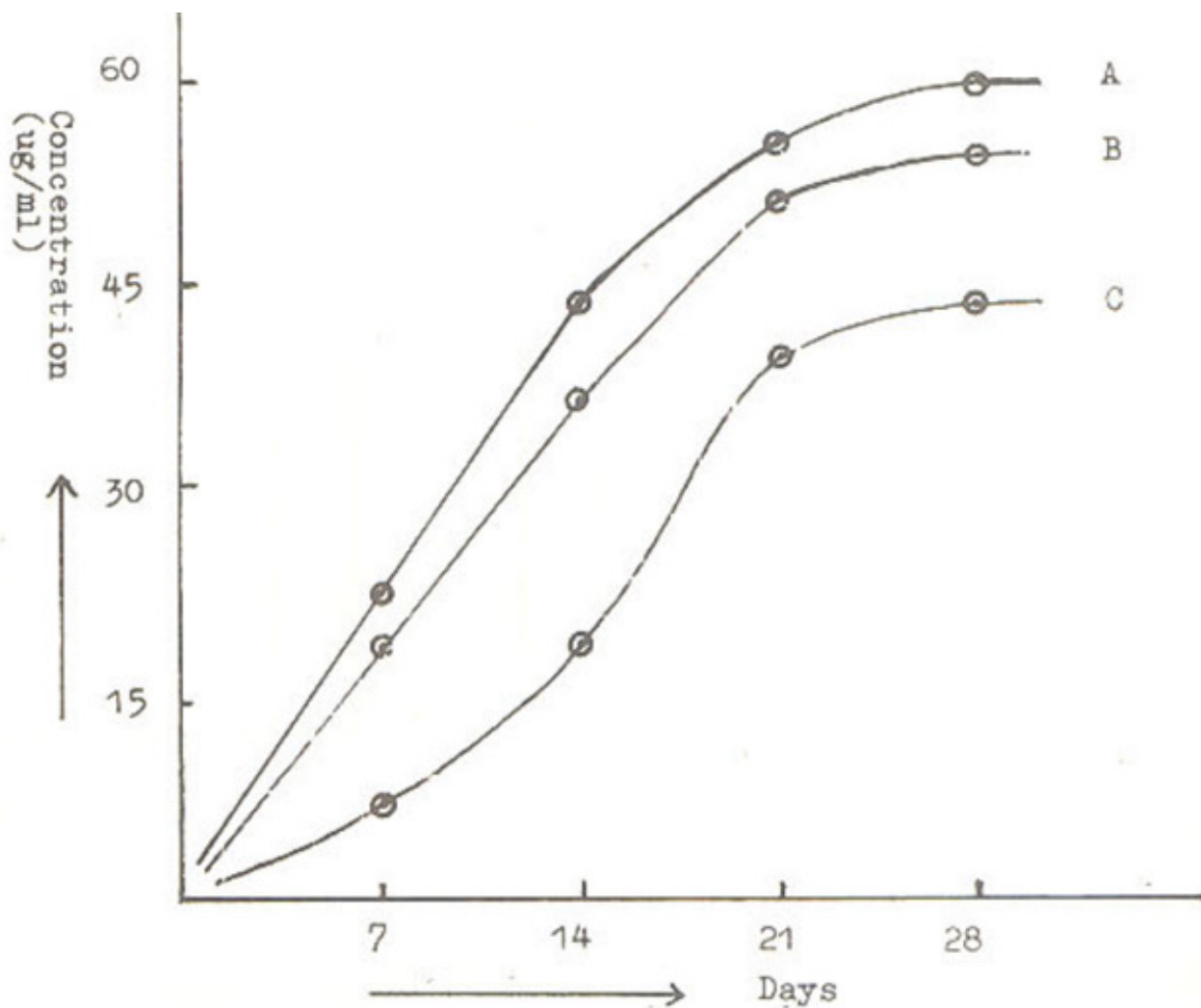


Fig. 2. Blood concentration of rats fed various levels of endrin.

The results indicated that the amount of endrin in blood increased progressively. A study of these values indicated that the blood endrin values of groups A and B did not increase with respect to the dose level. The blood endrin concentrations were therefore divided by the level of dose to eliminate the dose effect. The values obtained (Table I)

**Table I**  
**Blood Endrin Values Obtained after eliminating**  
**the Effect of Dose Level.**

Group	Dose (mg/kg) body wt. per day	Number of Days				
		0	7	14	21	28
A	4.50	0.0	4.88	9.77	12.54	13.33
B	2.25	0.0	7.77	16.52	23.29	24.45
C	1.125	0.0	5.79	16.45	35.31	37.56
D	0.0	0.0	0.0	0.0	0.0	0.0

indicated that the increase in plasma level of endrin, was not proportionate to the increase in dose as is evidenced by the observation that minimum dose exhibited maximum plasma level on the 21st and 28th day. It may therefore, be concluded that the rate of absorption from the gastro-intestinal tract was independent of the amount of insecticide fed to the rats. The amounts of endrin residues accumulated in the livers of different groups of rats, have been shown in Figure 3.

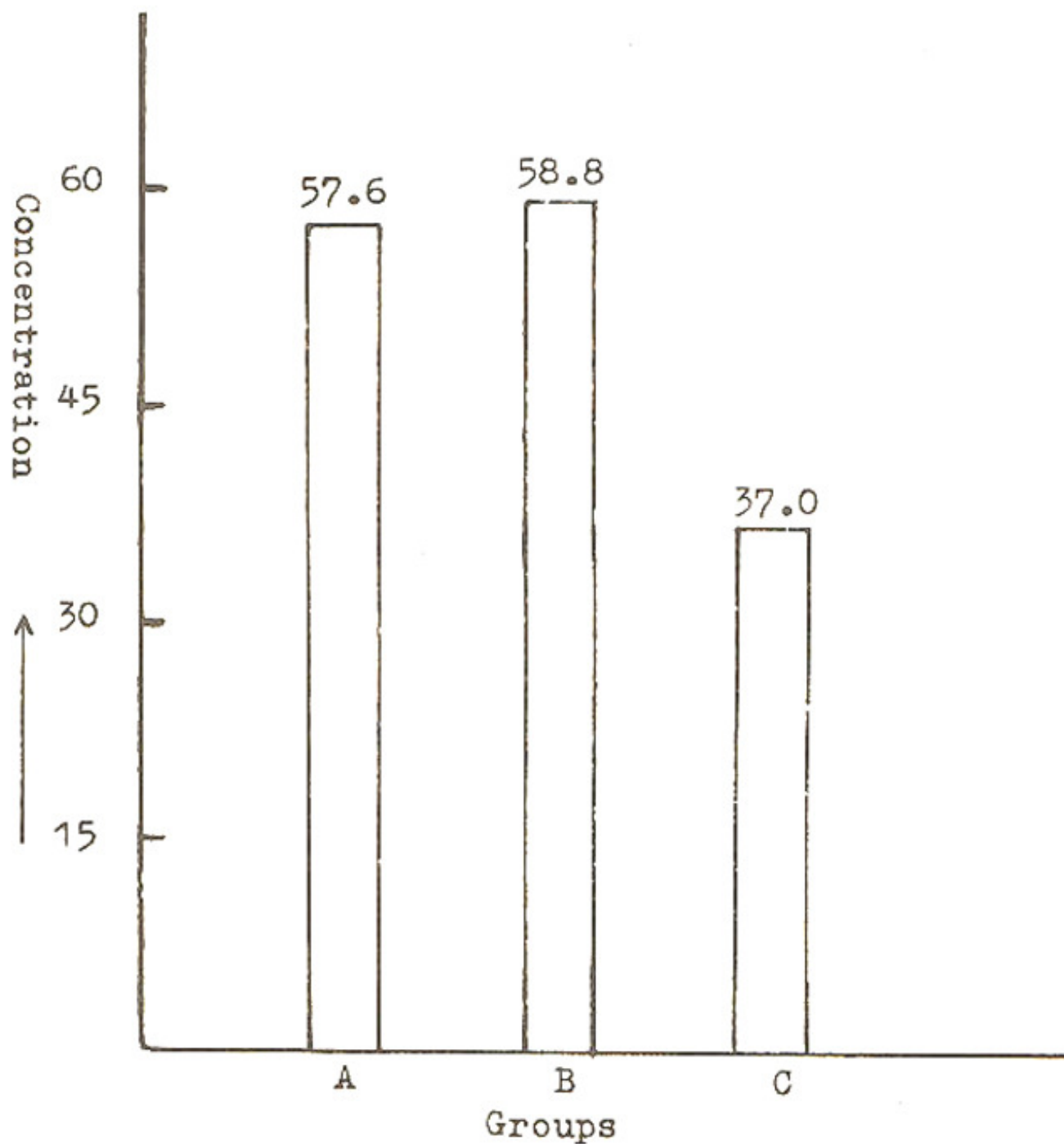


Fig. 3. Concentrations (ug/g) of endrin accumulated in the livers of rats.

The values indicated that the amount accumulated was independent of dose.  
The regression lines (Figure 4)

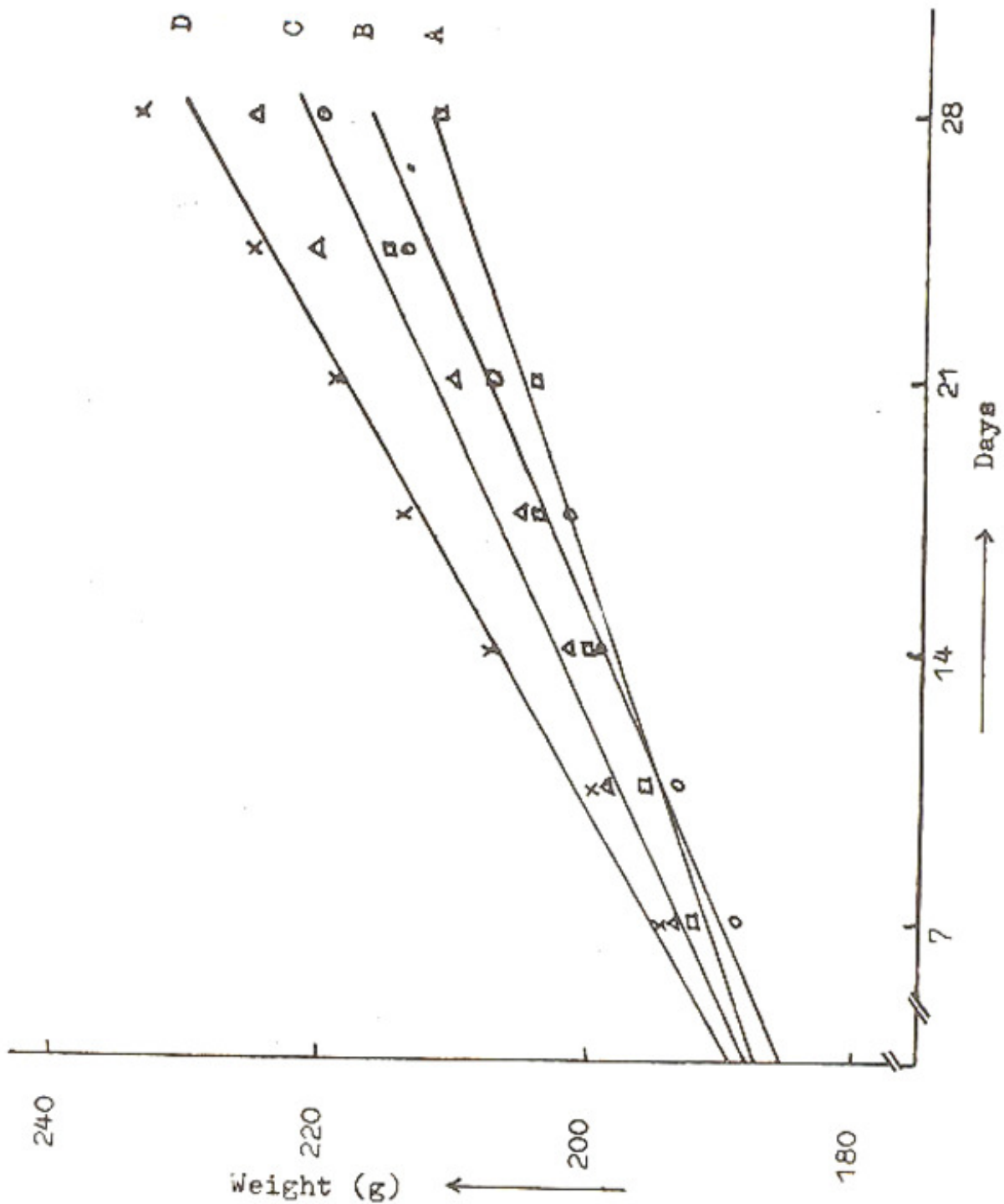


Fig. 4. Effect of different levels of endrin on the growth

drawn on the basis of average daily body weights of rats in each group, indicated that all doses of endrin adversely affected the growth rate of rats when compared with the control group. However, there was a non-significant difference on the decreased growth rate of rats by different dose levels of endrin.

The ratio of the weight of various organs to that of body weight is shown in Table II.

Table II

## Effect of Different Levels of Endrin on Various Body Organs of Rats

Group	Average body weight (g)	Dose level (mg/kg body weight)	Ratio (organ wt./body wt.)					
			Liver	Kidney	Spleen	Lungs	Heart	Adrenals
A	212.5	4.5	$4.24 \times 10^{-2}$	$5.79 \times 10^{-3}$	$1.55 \times 10^{-3}$	$5.41 \times 10^{-3}$	$2.35 \times 10^{-3}$	$1.13 \times 10^{-4}$
B	220.0	2.25	$3.44 \times 10^{-2}$	$5.55 \times 10^{-3}$	$1.73 \times 10^{-3}$	$5.50 \times 10^{-3}$	$3.12 \times 10^{-3}$	$1.18 \times 10^{-4}$
C	225.0	1.125	$3.71 \times 10^{-2}$	$5.29 \times 10^{-3}$	$1.44 \times 10^{-3}$	$4.58 \times 10^{-3}$	$3.00 \times 10^{-3}$	$1.24 \times 10^{-4}$
D	233.75	0.0	$3.59 \times 10^{-2}$	$5.35 \times 10^{-3}$	$1.67 \times 10^{-3}$	$5.26 \times 10^{-3}$	$3.31 \times 10^{-3}$	$1.07 \times 10^{-4}$

The livers of treated groups of rats, were significantly enlarged except in case of groups B. The hearts regressed in response to the treatment with endrin. No effect of endrin was observed on other organs.

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