

INFLUENCE OF ETHION 50% EC ON NUCLEIC ACIDS (DNA & RNA) CONTENT IN DIFFERENT ORGANS OF FRESHWATER FISH***LABEO ROHITA******Dr. Prsanna Chimata**

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Article Published on 01 March 2026,<https://doi.org/10.5281/zenodo.18802599>***Corresponding Author****Dr. Prsanna Chimata**Faculty in Department of
Environmental Science, Acharya
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522510. A.P, India.**How to cite this Article:** *Dr. Prsanna Chimata. (2026). Influence Of Ethion 50% Ec On Nucleic Acids (Dna & Rna) Content In Different Organs Of Freshwater Fish *Labeo Rohita*. World Journal Of Pharmaceutical Research, 15(5), 869-880. This work is licensed under Creative Commons Attribution 4.0 International license.**ABSTRACT**

Nucleic acids, such as DNA and RNA, are essential biological macromolecules that store and transmit genetic information, acting as blueprints for protein synthesis and carrying hereditary traits across generation. Pesticides effects on nucleic acids function. Ethion 50% EC is a carbamate insecticide. In the present study decreased levels of DNA & RNA was observed in all the tissues of freshwater fish *Labeo rohita* exposed to 24 hrs lethal and sub lethal & 5days, 10 days sublethal concentrations of Ethion 50%EC. Inhibition of DNA synthesis, thus might affect both protein as well as amino acid levels by decreasing the level of RNA in protein synthesis machinery. Pesticides are potential inhibitor of DNA synthesis, which might result in reduction of RNA level.

KEYWORDS: Nucleic acids, Ethion 50%EC, *Labeo rohita*.**I. INTRODUCTION**

The physiological and biochemical alterations observed in an animal under any physiological stress can be correlated with the structural and functional changes of cellular proteins. Proteins occupy a unique position in the metabolism of cell because of the proteinaceous nature of all the enzymes which mediate at various metabolic pathways (Lehninger, 2008; Harper, 2012). The stress induced biochemical changes are described as secondary responses of the fish. The biochemical analysis of DNA, RNA and protein are considered as markers in

the toxicity study (Tilak *et al.*, 2009).

Inhibition of DNA synthesis, thus might affect both protein as well as amino acid levels by decreasing the level of RNA in Protein machinery. Pesticides are potential inhibitors to DNA synthesis, which might result in reduction of DNA level. Because of electrophonic nature, the carbamate compounds attack on many enzymes which are responsible for normal metabolic pathway. Thus, it is possible that the enzyme is necessary for DNA synthesis might have been inhibited by toxicant. On compilation of the result, it appears that the disruption of DNA synthesis might have affected RNA synthesis and consequently protein synthesis (Tripathi and Singh, 2003; Ravikiran *et al.*, 2012).

II. Estimation of Nucleic acids

The nucleic acids, Deoxyribose (DNA) and Ribose (RNA) were estimated by the method of Searchy and Maclinnis 1970(a&b). 5% homogenates of gill, brain, muscle, liver and kidney were prepared in 5 ml of 0.5 N perchloric acid and heated at 90°C for 20 minutes. After cooling, the tissue homogenates were centrifuged at 3000 rpm for 10 minutes. The supernatant was separated into two volumes and used for DNA and RNA analysis.

DNA

The first half or one half of the homogenate was mixed with diphenylamine reagent and kept aside for 20 hrs. After 20 hrs the colour developed was read at 595 nm. The standard graph was plotted with standard DNA (calf thymus) supplied by the Sigma Chemical Company with the aforesaid method.

RNA

The other part of the homogenate was mixed with dischi-orcinol and heated at 90°C for 15 minutes. After cooling at room temperature, the colour developed was read at 655 nm. The standard graph was plotted with standard RNA (Baker's yeast) supplied by Sigma chemical company.

III. RESULTS

Nucleic acids

The calculated values of nucleic acids along with standard deviation and the percent change over the control were given in Table.1 – 2 and Fig.1 -2 the DNA content in control fish *L. rohita* in different tissues was in the order of:

Kidney> Brain > Liver>Gill > Muscle

Under exposure to sublethal and lethal concentrations of Ethion 50% EC for 24hr, the DNA content in gill, liver, and kidney increased but was found to decrease in brain and muscle. The decreasing order of DNA content in different tissues is in the order of:

Ethion 50% EC sublethal 24hr: Brain > Liver>Gill > Kidney>Muscle
Ethion 50% EC lethal 24 hr: Brain > Liver>Gill > Kidney>Muscle

Under exposure to sublethal concentrations of Ethion 50% EC for 5 and 10 days it was found that the gill, liver, kidney and muscle DNA content was decreased but the brain DNA content was found to increase. The decreasing order of DNA content in different tissues in the order of:

Ethion 50% EC 5 and days controls: Liver>Brain >Gill >Kidney>Muscle
Ethion 50% EC Sublethal 5days: Gill > Brain > Liver>Kidney>Muscle
Ethion 50% EC 10days controls: Liver>Brain >Gill> Kidney >Muscle
Ethion 50% EC Sublethal 10 days: Brain>Kidney>Gill>Liver>Muscle

Under control group the total DNA content was present in different tissues of fish *Labeo rohita* exposed to Ethion 50% EC for 24hr, the maximum amount present in kidney (6.40) and followed by brain (6.20), liver (5.62), gill (4.15) and minimum amount of DNA content was present in muscle (1.82).

Under Ethion 50% EC for 24hr sublethal, the percentage of depletion was found in all the tissues of test fish *Labeo rohita*, maximum percentage of depletion was in brain (3.41) and followed by liver (2.70), gill (2.65), kidney (2.40) and minimum depletion was present in muscle (1.31). Under Ethion 50% EC for 24hr lethal, the percentage of depletion was found in all the tissues of test fish *Labeo rohita*, maximum percentage of depletion was in brain (4.19) and followed by liver (3.87), gill (3.49), kidney (2.65) and minimum depletion was present in muscle (2.08).

Under control group the total DNA content was present in different tissues of fish *Labeo rohita* exposed to Ethion 50% EC for 5days, the maximum amount present in liver(5.10) and followed by brain (3.74), gill (3.15), kidney (2.90) and minimum amount of total DNA content was present in muscle (1.20). Under Ethion 50% EC for 5days sublethal, the percentage of depletion was found in all the tissues of test fish *Labeo rohita*, maximum percentage of

depletion was in gill (3.39) and followed by brain (3.31), liver (1.92), kidney (1.68) and minimum depletion was in muscle (1.16).

Under control group the total DNA content was present in different tissues of fish *Labeo rohita* exposed to Ethion 50% EC for 10days, the maximum amount present in liver (4.90) and followed by brain (3.40), gill (2.85), kidney (2.54) and minimum amount of total DNA content was present in muscle (1.05). Under Ethion 50% EC for 10days sublethal, the percentage of depletion was found in all the tissues of test fish *Labeo rohita*, maximum percentage of depletion was in brain (3.90), and followed by gill (3.19), kidney (3.11), liver (2.44) and minimum depletion was in muscle (1.90).

Table 1: Changes in the DNA (mg/g wet weight of the tissue) and % change over the control, in different tissue of the freshwater fish, *Labeo rohita* exposed to sublethal and lethal concentrations of Ethion 50% EC for 24hr.

DNA Tissues	Control	Sublethal (mg/g)	% change	lethal(mg/g)	% change
Gill	4.15±0.05	5.25±0.03	2.65	5.60±0.12	3.49
Liver	5.62±0.12	7.14±0.05	2.70	7.80±0.01	3.87
Kidney	6.40±0.014	7.94±0.07	2.40	8.10±0.15	2.65
Brain	6.20±0.001	8.32±0.12	3.41	8.80±0.24	4.19
Muscle	1.82±0.012	2.06±0.01	1.31	2.20±0.03	2.08

Values are the mean of five observations ;(±) indicates the standard deviation: Values are significantly at $P < 0.05$.

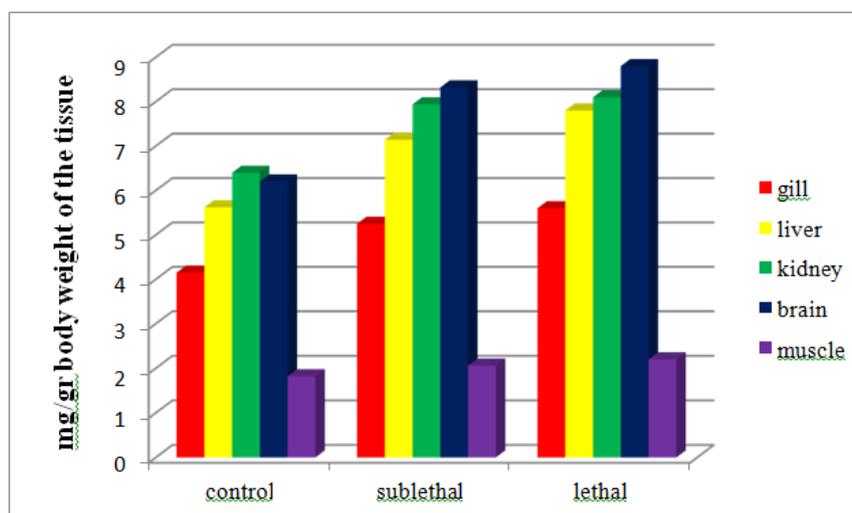


Fig. 1: Changes in the DNA (mg/g wet weight of the tissue) and % change over the control, in different tissue of the freshwater fish, *Labeo rohita* exposed to sublethal and lethal concentrations of Ethion 50% EC for 24hr.

Table 2: Changes in the DNA (mg/g wet weight of the tissue) and % change over the control, in different tissue of the freshwater fish, *Labeo rohita* exposed to sublethal concentrations of Ethion 50% EC for 5 and 10 days.

DNA Tissues	5 days			10days		
	Control	Sublethal (mg/g)	% change	Control	Sublethal (mg/g)	% change
Gill	3.15±0.01	2.08±0.04	3.39	2.85±0.08	1.94±0.01	3.19
Liver	5.10±0.04	4.24±0.015	1.92	4.90±0.05	3.70±0.08	2.44
Kidney	2.90±0.12	2.78±0.03	1.68	2.54±0.08	1.75±0.05	3.11
Brain	3.74±0.05	2.50±0.32	3.31	3.40±0.05	2.07±0.12	3.90
Muscle	1.20±0.07	1.06±0.07	1.16	1.05±0.02	0.85±0.03	1.90

Values are the mean of five observations ;(±) indicates the standard deviation: Values are significantly at $P < 0.05$.

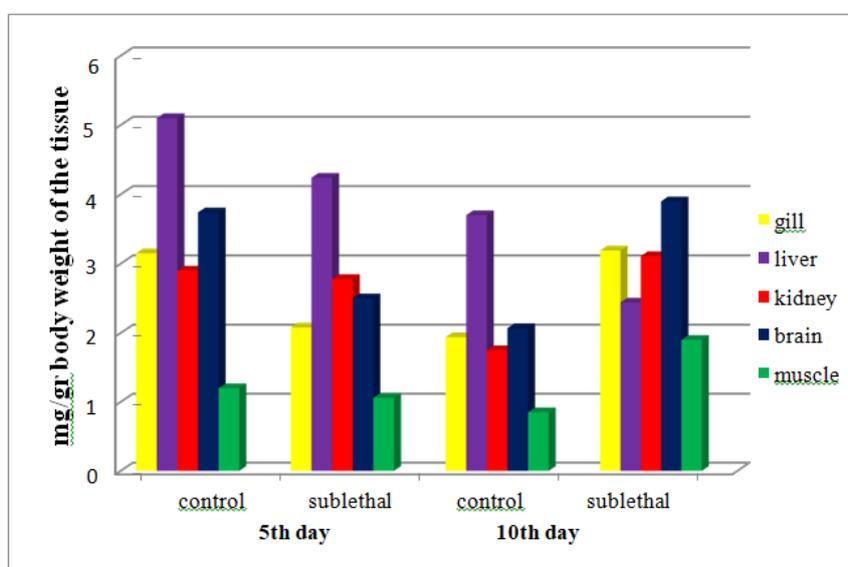


Fig. 2: Changes in the DNA (mg/g wet weight of the tissue) and % change over the control, in different tissue of the freshwater fish, *Labeo rohita* exposed to sublethal concentrations of Ethion 50% EC for 5 and 10 days.

RNA

The calculated values of nucleic acid content RNA, along with standard deviation and the percent change over the control fish were presented in Table. 3 -4 and Fig. 3-4. The RNA content in 24hrs control fish *L. rohita* in different tissues was in the order of:

Kidney > Liver > Gill > Brain > Muscle

Under exposure to sublethal and lethal concentrations of Ethion 50% EC for 24 hr it was found that the gill, liver, kidney, brain and muscle. RNA content was decreased but the brain

RNA content was found to increase. The decreasing of RNA content in different tissues is in the order of:

Ethion 50% EC lethal 24 hr: Kidney> Muscle>Liver>Gill>Brain

Ethion 50% EC sublethal lethal 24 hr: Liver> Kidney> Gill>Muscle<Brain

Under exposure to sublethal concentrations of Ethion 50% EC for 5 and 10 days it was found that the gill, liver, kidney, and muscle. RNA content was decreased but the brain RNA content was found to increase. The increasing order of RNA content in different tissues is in the order of:

Ethion 50% EC 5 and 10 days: Kidney> Liver> Gill> Brain >Muscle
Ethion 50% EC sublethal 5 days: Kidney> Liver> Gill> Muscle <Brain
Ethion 50% EC sublethal 10 days: Liver Kidney>> Gill<Muscle<Brain

The results in Table 3 and Fig.3. Indicate heterogeneous levels of RNA in the tissue of liver, brain, muscle, gill and kidney. Under control group the total RNA content was present in different tissues of fish *Labeo rohita* exposed to Ethion 50% EC for 24hr, the maximum amount present in kidney (5.09) and followed by liver (4.30), gill (3.70) brain (2.68) and minimum amount of RNA content was present in muscle (1.85).

Under Ethion 50% EC for 24hr sublethal, the percentage of depletion was found in all the tissues of test fish *Labeo rohita*, maximum percentage of depletion was in kidney (- 3.24) and followed by muscle (3.24), liver (-2.09) and minimum depletion was present in gill (-0.54). Under Ethion 50% EC for 24hr lethal, the percentage of depletion was found in all the tissues of test fish *Labeo rohita*, maximum percentage of depletion was in liver (- 5.11) and followed by kidney (-4.51), gill (-3.78) and minimum depletion was present in muscle (-2.16).

Under control group the total RNA content was present in different tissues of fish *Labeo rohita* exposed to Ethion 50% EC for 5days, the maximum amount present in kidney (5.00) and followed by liver (4.25), gill (3.64), brain (2.62) and minimum amount of total RNA content was present in muscle (1.78). Under Ethion 50% EC for 5days sublethal, the percentage of depletion was found in all the tissues of test fish *Labeo rohita*, maximum percentage of depletion was in liver (-2.11) and followed by kidney (-2.4), gill (-1.64) and minimum depletion was in muscle (-1.23).

Under control group the total RNA content was present in different tissues of fish *Labeo*

rohita exposed to Ethion 50% EC for 10days, the maximum amount present in kidney (4.96) and followed by liver (4.20), gill (3.61), brain (2.58) and minimum amount of total RNA content was present in muscle (1.76). Under Ethion 50% EC for 10days sublethal, the percentage of depletion was found in all the tissues of test fish *Labeo rohita*, maximum percentage of depletion was in liver (-2.38) and followed by kidney (-1.61), gill (-1.41) and minimum depletion was in muscle (0.90).

Table 3: Changes in the RNA (mg/g wet weight of the tissue) and % change over the control, in different tissue of the freshwater fish, *Labeo rohita* exposed to sublethal and lethal concentrations of Ethion 50% EC for 24hr.

RNA Tissues 24hr	Control	Sublethal (mg/g)	% change	lethal(mg/g)	% change
Gill	3.70±0.01	3.68±0.02	-0.54	3.56±0.15	-3.78
Liver	4.30±0.03	4.21±0.15	-2.09	4.08±0.26	-5.11
Kidney	5.09±0.05	4.92±0.03	-3.40	4.86±0.05	-4.51
Brain	2.68±0.14	2.71±0.24	+1.12	2.74±0.05	+2.23
Muscle	1.85±0.05	1.79±0.01	3.24	1.45±0.04	-2.16

Values are the mean of five observations ;(±) indicates the standard deviation: Values are significantly at $P < 0.05$

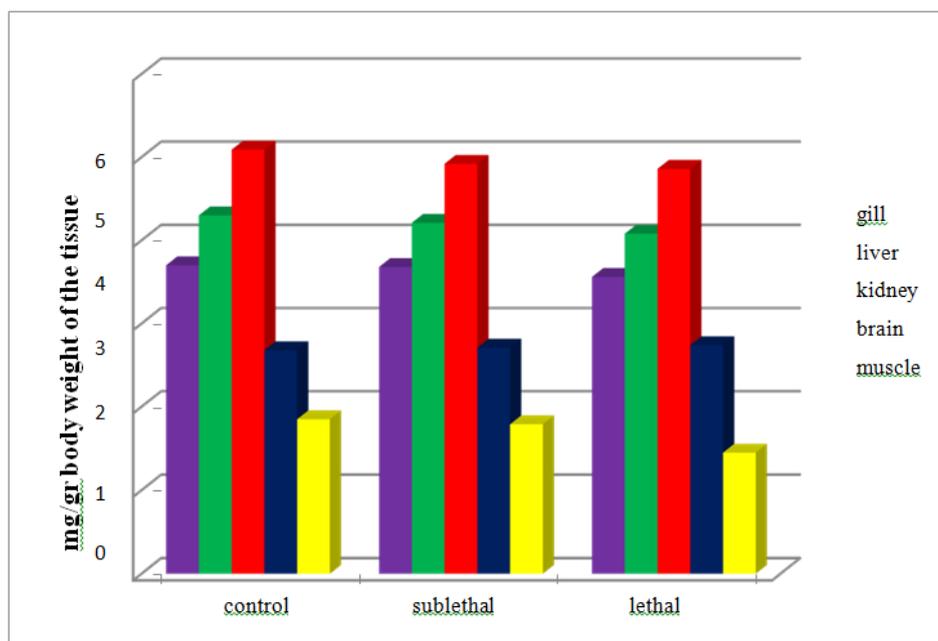


Fig. 3: Changes in the RNA (mg/g wet weight of the tissue) and % change over the control, in different tissue of the freshwater fish, *Labeo rohita* exposed to sublethal and lethal concentrations of Ethion 50% EC for 24hr.

Table 4: Changes in the RNA (mg/g wet weight of the tissue) and % change over the control, in different tissue of the freshwater fish, *Labeo rohita* exposed to sublethal concentrations of Ethion 50% EC for 5 and 10 days.

RNA Tissues	5 days			10days		
	Control	Sublethal (mg/g)	% change	Control	Sublethal (mg/g)	% change
Gill	3.64±0.01	3.58±0.04	-1.64	3.61±0.02	3.10±0.32	-3.58
Liver	4.25±0.05	4.16±0.08	-2.11	4.20±0.05	4.10±0.12	-4.16
Kidney	5.00±0.01	3.80±0.01	-2.4	4.96±0.08	4.88±0.05	-1.61
Brain	2.62±0.08	2.65±0.05	+1.14	2.58±0.13	2.61±0.07	+1.16
Muscle	1.78±0.12	1.56±0.32	-1.23	1.76±0.24	1.60±0.05	-1.74

Values are the mean of five observations ;(±) indicates the standard deviation: Values are significantly at $P < 0.05$.

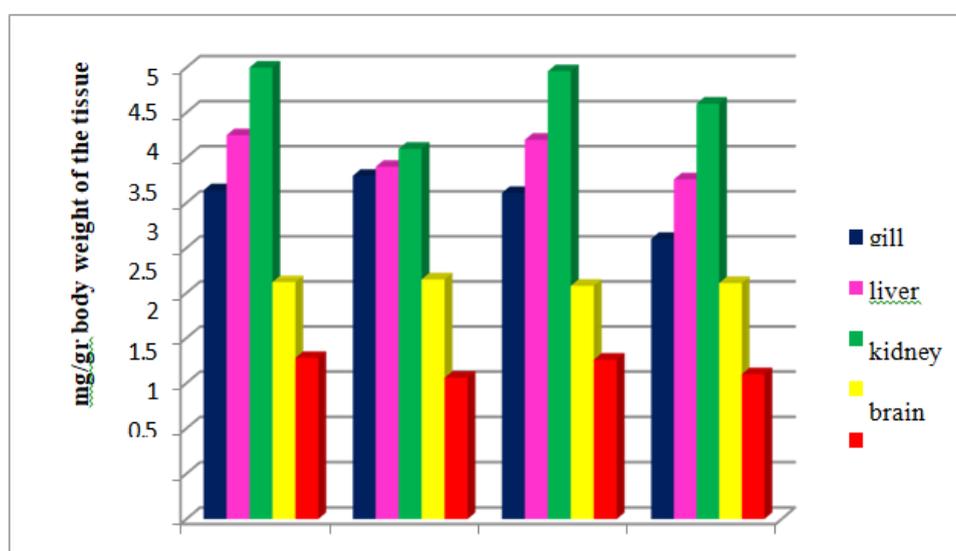


Fig. 4: Changes in the RNA (mg/g wet weight of the tissue) and % change over the control, in different tissue of the freshwater fish, *Labeo rohita* exposed to sublethal concentrations of Ethion 50% EC for 5 and 10 days

control	sublethal	control	sublethal
5 th day			10 th day

IV. DISCUSSION

Decreased DNA-RNA levels in fish *Colisa fasciatus* exposed to cypermethrin at different seasons (Shailendra kumar singh *et al.*, 2010). DNA and RNA content was decreased in liver, brain and gill tissues of *Channa punctatus* treated with pyrethroid, due to inhibitory action of synthetic pyrethroid on DNA synthesis machinery or increased degradation (Tripathi and Singh, 2013), (Thenmozhi *et al.*, 2011) decreased nucleic acids (DNA and RNA) content liver, muscle, gill tissues of freshwater fish *Labeo rohita* treated with malathion, decline in nucleic

acid content due to decreased protein synthesis and damage to liver, which is the major tissue for detoxification mechanism. Similar findings were observed by (Kumar *et al.*, 2007), the DNA and RNA content was increased in gill, liver, brain and kidney of fish *Channa punctatus* exposed to different concentrations of cypermethrin and L-cyhalothrin. The decline DNA content could be due to the disturbance in the normal DNA synthesis.

Inhibition of DNA synthesis, thus might affect both protein as well as amino acid levels by decreasing the level of RNA in protein synthesis machinery. Pesticides are potential inhibitor of DNA synthesis, which might result in reduction of RNA level. Because of electrophilic nature, the Carbamate compounds may attack many enzymes responsible for normal metabolic pathway. Thus, it is possible that the enzyme necessary for DNA synthesis might have been inhibited by toxicant. On compilations of the result, it appears that the disruption of DNA synthesis might have affected RNA synthesis and consequently protein synthesis (ravikiran *et al.*, 2012).

Carbamate compounds exhibit strong mutagenic, genotoxic (Guilherme *et al.*, 2012) and clastogenic potentiality, which might responsible for the alteration of DNA level. (Marc Andre, 2008) a number of chemicals, associate with DNA damage, have been tested on liver of aquatic animals, isolated tissues or different cell types. Chemicals that act directly on DNA, chemicals whose metabolites cause DNA damage, chemicals that cause the production of reactive oxygen species that can damage DNA, chemicals that inhibit DNA synthesis and repair. Inhibition, many chemical contaminants damage DNA by multiple mechanisms.

In the present study decrease in levels of RNA was observed in all the tissues except brain of fish exposed to sublethal and lethal concentrations of Ethion 50% EC, whereas RNA followed by damage to neuron cells (Mcilwain and Bachelard, 1971) resulting in demyelination (Health, 1961). Minimum depletion of RNA content was observed in brain exposed to phosalone 35% EC (Nirmala, 2016). No significant changes in DNA levels in liver and muscle but RNA level were significantly increased in liver and muscle tissues of *L. rohita* treated with dietary pyridoxine, (Akhtar *et al.*, 2012).

According to (Mukhopadhyay and Dehadrai, 1980), the decrease of RNA might also be due to interference in the incorporation of precursor in the nucleic acid synthesis or inhibition of the RNA polymerase function. The present observations supported by the pesticide-mediated reduction in protein contents of various tissues including blood of other species of fish reported

by (Thripathi and Priyanka Verma, 2004; Jin Y *et al.*, 2011). DNA damaging agents capable of inducing strand breakage, cross-links and alkali-labile sites (Pandey *et al.*, 2008). The DNA and RNA contents have been studied in gill, liver and brain of a common carp, *Cyprinus carpio* exposed to cadmium chloride and lead acetate by (Muley *et al.*, 2000) found that decreased DNA content in all the tissues along with RNA content in liver and brain, it was increased in gill due to cadmium and lead toxicity.

V. CONCLUSION

Pesticides negatively affect nucleic acids by causing DNA damage through mechanisms like oxidative stress. Studies show that exposure to various pesticides results in decreased DNA and RNA levels in fish tissues, impacting metabolic processes. The present study reveals that Ethion 50% EC caused variability in the nucleic acids content in different tissues and the degree of variability or extent of alterations caused by the Ethion 50% EC.

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