RESEARCH ARTICLE

The Annals of Zoology
ISSN (Print): 0003-5009
Annals of Zoology, Vol. 28, December 2012: 26-32

Effect of Quinalphos in the Intestine of *Rattus Norvegicus* (Albino Rat)

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ABSTRACT

Organophosphorus (Quinalphos) insecticides commonly called as organophosphates constitue a major portion of modern synthetic insecticides. These are true phosphates or other types of organophosphorus compounds. The.se chemicals have the common characteristic of inhibiting cholinesterases thus resulting in to the accumulation of acetylcholine and disruption of nerve function, either centrally or peripherally. Anticholinesterases have diverse applications. These pesticides possess a number of characteristics which determine their hazardous nature to man. The present study has revealed that quinalphos caused significant histological changes in the intestine of rats both at acute and chronic levels of intoxication. It has also has been observed that extent of damage caused by quinalphos is dependent on the duration of treatment rather than that of a dose.

INTRODUCTION:

In the field of agriculture, it is estimated that about one third of the total world's agriculture production is lost every year due to the harmfull activities of many organisms. Due to economical loss man is going to use various types of pesticides as a means protection against them. The production and consumption of these pesticides show a gradual hike throughout the world. Pesticides have a serious impact on ecosystem. They are picked up by different biological systems either directly or indirectly from atmosphere, Hydroshphere, Lithosphere or Biosphere during contact. Some times they are ingested as food additives or food residues. Ultimately they are transformed to other toxic and non toxic substances.

These pesticides cause disturbances in equilibrium between insect pests and parasites, increased diseases bio-accumulation, development of pesticide tolerance, abnormalities in reproduction etc. According to Sharma (1993) Pesticides are also responsible for mutagenecity, Carcinogenecity and repductive toxicity etc. Organophosphorus (Quinalphos) insecticides commonly called as organophosphates constitue a major portion of modern synthetic insecticides. These are true phosphates or other types of organophosphorus compounds. The.se chemicals have the common characteristic of inhibiting cholinesterases thus resulting in to the accumulation of acetycholine and disruption of nerve function, either centrally or peripherally. Anticholinesterases have diverse applicatications. These pesticides possess a number of characteristics which determine their hazardous nature to man.

Organophosphorus insecticides are absorbed by skin, gastrointestinal and respiratory tract. An undesirable property of many of these compounds is the narrow zone of their toxic action that is the small difference between the lethal doses and the concentrations and qualities giving rise to initial signs ofpoisoning.

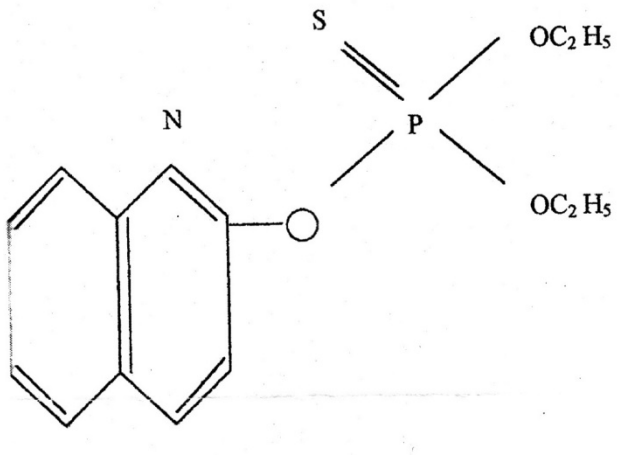
Besides physico-chemical properties of a chemical, its solubility, Concertration, Circulation, site of absorption and the route of administration also inftyence its

absorption. The most common routes by which xenobiotics enter the body are skin, lungs and gasrointestinal tract. The oral route is most important for the purpose of entry of xenobiotics either directly or indirectly. The chemical properties of any xenobiotic determine whether it will be absorbed in strongly acidic stomach or in the neutral intestine. The principles governing the absorption of chemicals from the gastrointestinal tract are same as for the passage of chemicals across the biological membranes elsewhere.

According to Duffus (1980) metabolism can not reduce levels of toxicant in an organism exposed to a constant exeternal concentration once a substance has been absorbed, its harmful effects will be minimized if it is rapidly excreted. Histopathology, the study of the structure of abnormal tissue has important applications in the toxicology. Examinations of tissues after death of organisms may serve to identity the cause of deathe and possibly the causative agent. Tucker and Crabtree (1970) are of the view that acute toxicity data alone can not totally represent the ecological hazard of any pesticide and chronic toxicity of insecticides may be quite different from the short term toxicity.

MATERIALS AND METHODS:

Rattus norvegicus (Albino) commonly known as Albino rat is soft skinned with white coat, weighing 150-200 gm with a gestation period of 25 days. Insecticide selected for the present study is Quinalphos. The structural formula of quinalphos is:-



It is odourless with melting point 31-32'C and boiling point 142'C at $3x10^4$ mm Hg. It is used as stomach and contact poison and as fumigant also. In the market it is available under the trade name Ekalux-25 EC of Sandoz India Ltd.

Rats were kept in cages on maintained diet. The quantity consumed by the rats was taken to know in 24 hours. The process was repeated for 15 days. For administering the insecticide oral rout was employed. Infant feeding tube was also applied for administering the dose of the insecticide. 12 rats were intially selected out of which two rats were kept as control. One rat was slaught in the begning. The intesttinal material after dissection was fixed in Bouin's soluticen for 24 hours.

For acute toxicity, two rats were subjected to a sublethal duses of quinalphos (30 mg/Kg). They were sacrificed after 24 hours. The desired material was fixed in aquous Bouin's solutian for 24 hours. For chronic toxicity studies sublethal lower doses of quinalphos (8.5 mg/Kg) were given to 8 rats. The doses were repeated of every after 48 hours. The rats were slaught after 7 days 15 days, 30 days and 60

days of treatment. The desired material was fixed in aquous Bouin's solution for 24 hours. The material was washed in running tap water till the fixative got completly removed. After washing, the material was gradually dehydrated up to 70 % alchohal. The stored material for histopathological was fixed in paraffin wax. Blocks were prepared and serial sections of 5-8 micron thickness were cut and stained in Delafield's haematoxylin.
Photograps were taken to show histopathological detailes.

OBSERVATIONS:

Histopathology of the Intestine Quinalphos treated with rats (PIate I- A & B):
It consists of four layers, the mucosa, the submucosa, the musculasis and the adventitia from inside to outside

Effect of Acute toxicity of single dose of 30 mg/kg body Weight after 24 hrs. (PIate II- A & B):
The columnar epithelium of the intestinal villi was severely damaged. The cytoplasm appeared coagulated. Nuclei enlarged with indistinct chromatin material. The Submucosa and muscularis appeared shrunk and dehydrated.

Effect of Chronic Toxicity of 8.5 mg/kg Body Weight of Quinalphos after 7 days (PIate III- A & B):
There is no any significant histological alternation in the intestinal only hyper secretory activities were evident and the brush border was found slightly disrupted.

After 15 days (PIate IV):
The lamina propria was appeared shrunk and gave dehydrated appearance. No apparent sign of intoxication was observed in the submucosa and muscularis region at this stage. Observed shrinkge of the cytoplasm and nuclei in the columnar epithelium. No effect was seen in the submucosa and muscularis. Hyperactivity of the goblet cells was also evident.

After 30 days (PIate V):
The muscularis mucosa was not clearly seen as it appeared thin and compact. Both circular and longitudinal muscles appeared shrunk and dehydrated. The villi were severely damaged. Cytoplasms of the columnar cells have become vacuolated and their brush boreder was largely disrupted. Karyolysis has also been observed. Crypts of Lieberkuhn were seen ruptured. Epithelium and Submucosa were also seen degenerated with patches of haemorrhage.

After Sixty Days (PIate VI- A & B):
Sixty days intoxication of quinalphos has caused severe degenerative changes in the intestine. Epithelium and Submucosa was also seen degenerated with patches of haemorrhage. Villi severely shrunk and degenerated and desquamation of epithelium was also seen at few places. The nuclei greatly, shrunk, pycnotic and have shifted apically. Karyolysis was also shown. Lamina propria was also seen shrunk. Submucosa and Muscularis were appeared degenerated. Mitotic activities were seen increased in the crypts. Increased Secretory activities have also been obsereved in the crypts and few of them have also been found to be filled with secretory meterial.

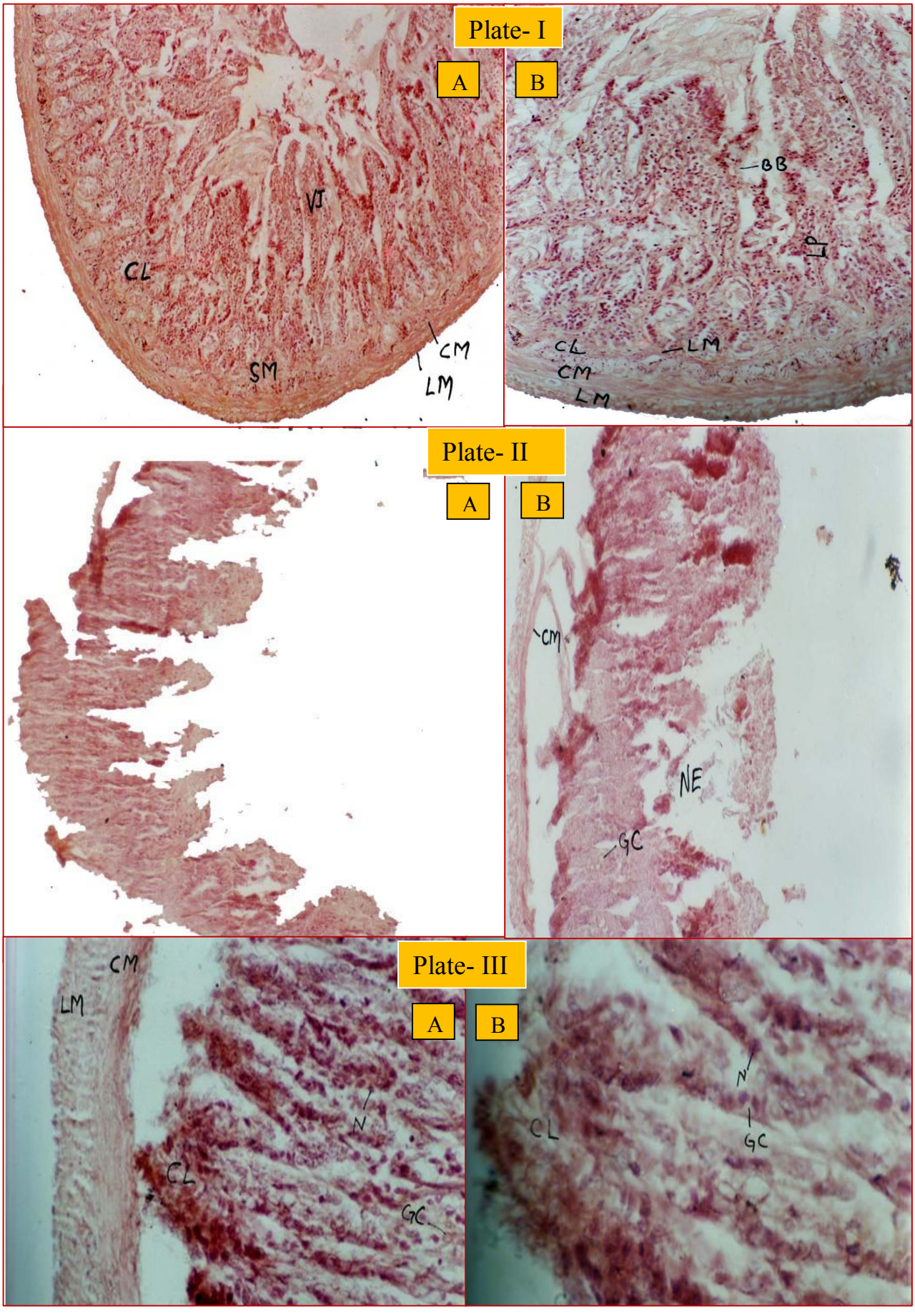


Plate- I
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Plate- IV

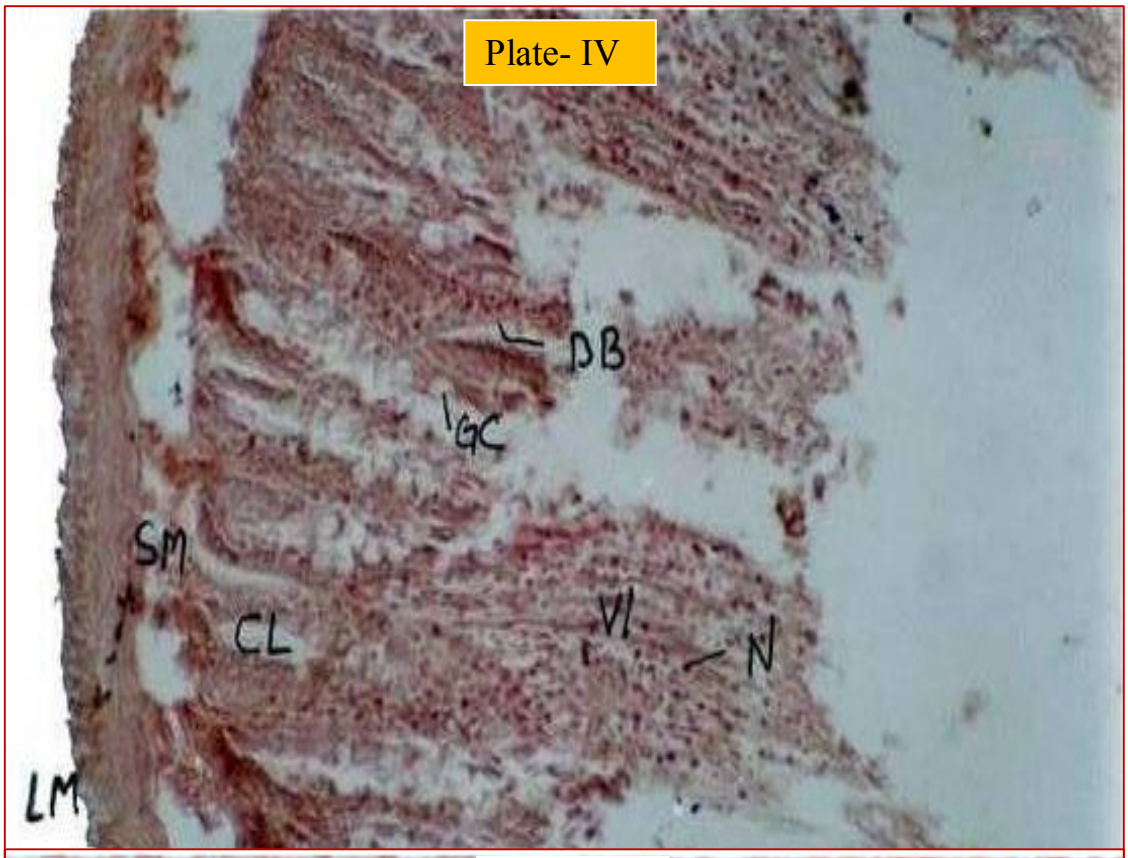
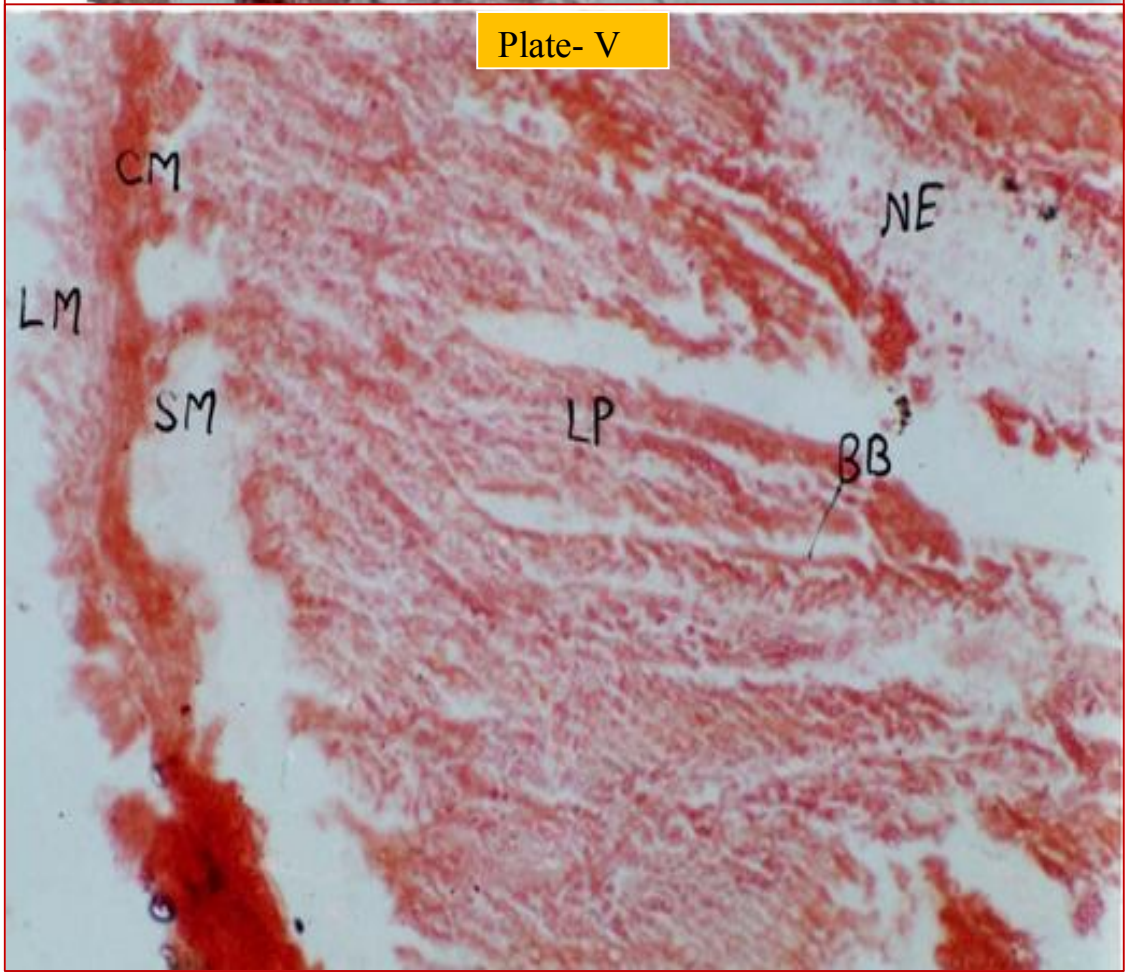
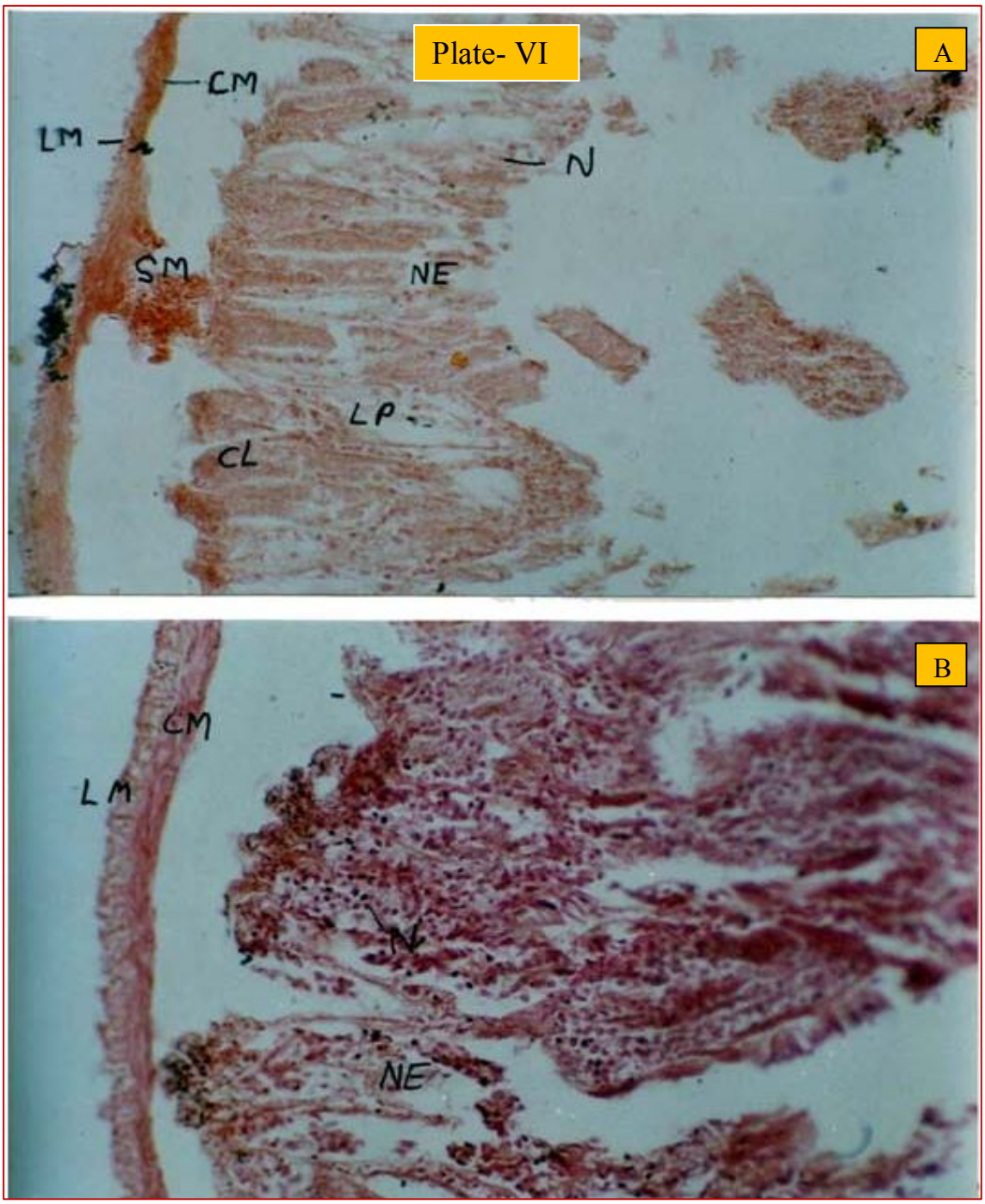


Plate- V





DISCUSSION:

The present study has revealed that no significant histological alteration took place in the intestine of rats repeatedly treated with sublenthal doses of quinalphos for 7 days. The histological alterations were observed in 60 days rats treated with quinalphos. (PIate VI- A & B). Das *et al* (1986) reported the degeneration of intestinal mucosa caused by sublethal doses of quinalphos.

The histological degenerations were found at acute and subacute levels of the toxicant. According to Ray and Bhattacharya (1985) long term exposure of low doses of quinalphos was more harmfull. Morgan and Smith (1974B) could not observe any histological change in the intestine of rates after administration of acute and subacute doses of DPTA.

CONCLUSION:

The present study has revealed that quinalphos caused significant histological changes in the intestine of rats both at acute and chronic levels of intoxication. It has also has been observed that extent of damage caused by quinalphos is dependent on the duration of treatment rather than that of a dose.

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