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Bioremedial effect of *Curcuma Longa* on endosulfan induced kidney and liver of swiss albino mice

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ABSTRACT

With advancement in green revolution and hard core crop production, there is an enormous enhancement in the use of pesticide. Endosulfan is an organochloride insecticide used on various wide ranges of food crop and cash crops. It is a neurotoxicants causes mild headache to saviour poisoning and may even result in death depending on dose and other factor according to United States Environmental Protection Agency (USEPA). Endosulfan is restricted in use and it is banned in Bihar and Kerala states. The present study was used to assess the Bio remedial effect of *curcuma longa* on endosulfan administrated Swiss albino mice. Healthy male and female mice were used for the study of Bio remedial effect of cu*rcuma longa* on liver and kidney of Swiss albino mice. In this study mice were administrated with Endosulfan @3mg/kg b.w (body weight) for 28 days followed by 28 days of administration of *curcuma longa* @200mg/kg b.w. After administration of Endosulfan serum glutamic-pyruvic transaminase (*SGPT*), Urea and Urea Nitrogen level was increased then restored by administration of *curcuma longa.* Different degenerated bowmen's capsules, glomerulus and PCT were observed after endosulfan administration. Degeneration was increased with increase duration of dose, while it is restored to greater extent after *curcuma longa* administration. Hepatic cell central vain hepatic vain was denatured. Thus it is concluded from entire study that endosulfan alters liver and kidney profile by alteration in biochemical parameters and histological degeneration while *curcuma longa* play very effective role against endosulfan toxicity on biochemical and histological parameter of kidney and liver.

Keywords: - curcuma longa, Endosulfan, SGPT, Swiss albino mice.

INTRODUCTION

The countervailing risks in terms of the health and environmental effects of the pesticide alternatives as well as the economic effects on farmers, rural communities, nutrition, food security, developing countries and foreign constituencies could be so large that they outweigh the direct effects. Exposure to pesticides both occupationally and environmentally causes a range of human health problems. Humans are exposed to pesticides found in environmental media by different routes of exposure such as inhalation, ingestion and dermal contact. Exposure to pesticides results in acute and chronic health problems. Endosulfan is a broad range nonsystemic organochlorine insecticide. It is used to control sucking, chewing, and boring insects on a wide variety of vegetables, fruits, grains, cotton, and tea, as well as ornamental shrubs. Exposure to pesticides causes temporary acute effects like irritation of eyes, excessive salivation to chronic diseases like cancer, reproductive and developmental disorders etc (Arun et al., 2011). Use of pesticide is

accompanied by a number of problems such as resistance of ectoparasites to pesticides (Beugnet and Chardonnet, 1994), destruction of beneficial insects, and the risk of some of the chemicals accumulating in body fat and milk for long periods, e.g. organochlorines that are lipid soluble (Fayez V and Bahig, 1992), thus becoming health hazards for both animals and man.

Endosulfan causes spermatozoa degeneration (George and Wilson, 1994) as well as declined testosterone level. Endosulfan exposure leads to ovarian nuclear degeneration[5] (Harper et al., 1977), The presence of chemicals in the environment that have antiandrogenic activity and thus the ability to disrupt the endocrine system is a source of concern (Kelce et al., 1998), as androgens are critical for male sexual differentiation (Lapage, 1968). Thus the present study is designed to study effect of Endosulfan on hepatocytes and biochemical parameters of liver and kidney of mice.

MATERIALS AND METHODS

Animals: The mice were reared in laboratory. The age group of mice selected for the study was 12 weeks old with 30±2 gm. b.w.

Chemicals: Pesticide Endosulfan, manufactured by Excel India Pvt.Ltd., Mumbai with EC 35% was utilized for the experiment.

Study groups & sampling: The control group of 10 mice received distilled water as drinking water. The 'treatment' groups (n=10) received Endosulfan 3 mg/kg b.w daily by gavage method for one, two and four weeks. Animals were sacrificed after the scheduled treatment. Serum was collected for S.G.P.T, The liver and kidney from all the animals were removed and washed three times in isotonic saline (0.85 v/w%) and fixed in neutral formaline for Light Microscope (LM) study.

RESULTS

In control group SGPT level were 21 IU/ml while after one week Endosulfan administration it become 39 IU/ml, it increased to 63 IU/ml on two weeks and on four weeks of Endosulfan administration it increased to 89 IU/ml. In control group of mice liver show normal hepatocites, sinusoids were also normal in structure. Central vein was normal in structure (Figure 1).

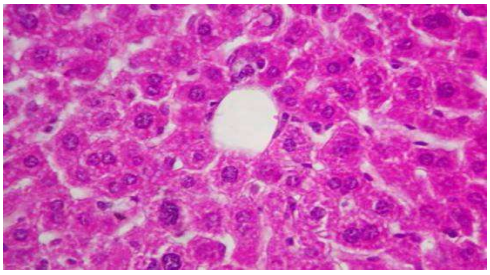

Figure 1. *Section of liver showing normal structure of hepatic cell and central vain.* ***X300***

Endosulfan one week administered group show degeneration in hepatocytes with degenerated nucleus. Vacuolated spaces were also observed in between hepatic cells (Figure 2).

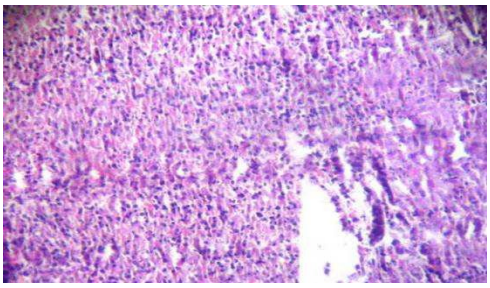

Figure 2. *Section of liver show degeneration in nucleus and cluster of cytoplasm.* ***(300X)***

Endosulfan weeks administered group show heterochromatised nucleus in hepatic cells. Dilated sinusoids were observed. Frequent vacuolization were also observed (Figure: 3). Degeneration in cytoplasm was clearly observed (Figure: 4).

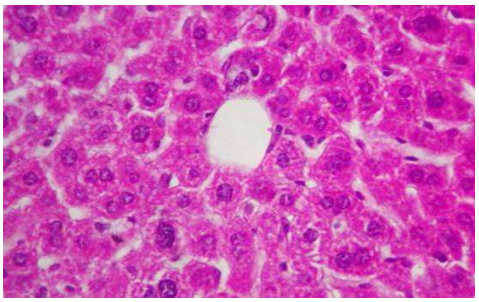

Figure 3. *Section of liver show fragmentation in central vein and degradation in cell membrane.* ***(500X)***

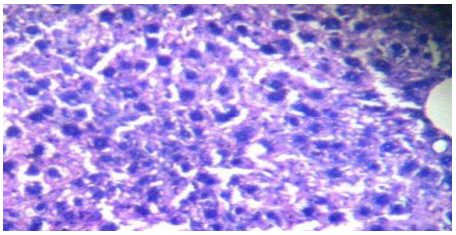

Figure 4. *Section of liver show vacuolization and degeneration of cell membrane.* ***(300X)***

Endosulfan four weeks administered group show degenerated cytoplasmic material to greater extent. Vacuolated spaces were also observed in nucleus, so nucleus looks like ring (Figure 5). Frequent vacuolated spaces were also observed. Rudimentary central vein were also observed (Figure 6).

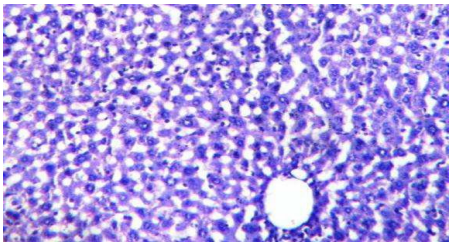

Figure 5. *Section of liver show degradation in nucleus and, crescent shape.* ***(300X)***

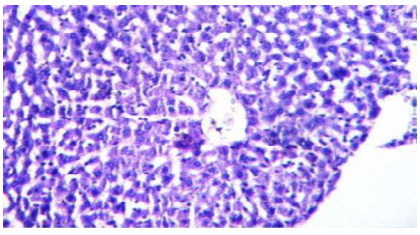

Figure 6. *Section of liver showing crescent shape nucleus and degeneration of nucleus.* ***(300X)***

Endosulfan one week administered group show enlargement of vacuole spaces in cortex region of kidney and degenerated cytoplasm, DCT and glomerulus (Figure 7,8,9).

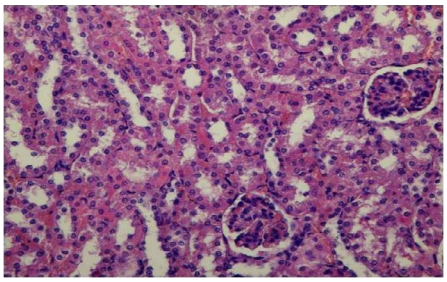

Figure7. *Section of kidney showing normal structure of glomerulus with bowman's capsule, thin PCT wall and thick DCT wal,.* ***(300X)***

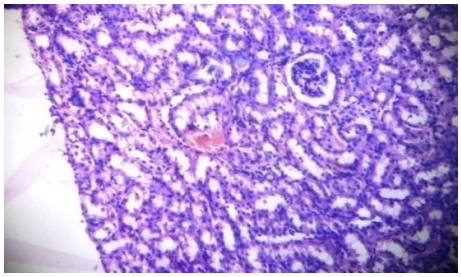

Figure 8. *Section of kidney showing degeneration, enlargement of vacuole spaces in cortex region of degenerated cytoplasm in ductile system of kidney observed in DCT, glomerulus shrinked with clumped nucleus.* ***(300X).***

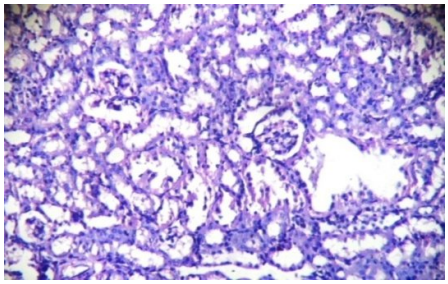

Figure 9. *Section of kidney showing large vacuolated spaces, PCT and DCT is not distinct due to fragmentation* ***(500X).***

Section of kidney and liver of 28 days Endosulfan administrated mice followed by 28 days *Curcuma Longa* showing regeneration and recovery (Figure 10,11).

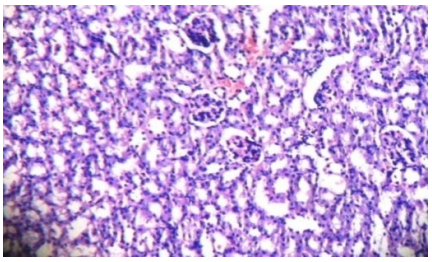

Figure 10. *Section of kidney of 28 days Endosulfan administrated mice followed by 28 days Curcuma Longa showing enlarged view of glomerulus reforming, PCT and DCT formation, vacuolisation is less.* ***(500X)***

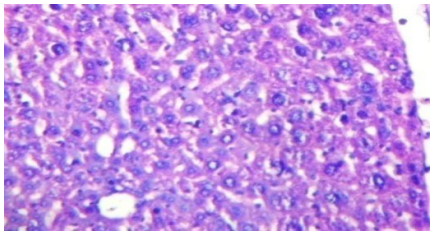

Figure 11. *Section of liver of 28 days Endosulfan administrated mice followed by 28 days Curcuma Longa showing developed central vain and hepatic cell with nucleus.* ***(500X)***

HORMONAL CHANGE ENDO ADMINISTERED MICE

GROUP	SGPT	UREA	UREA N2
7 Days Mice	28 IU/ML	25.5 mg/dl	11.91 mg/dl
14 Days Mice	34 IU/ML	94.40 mg/dl	44.08 mg/dl
28Days Mice	58 IU/ML	45.71 mg/dl	21.35 mg/dl

HERBAL *(Curcuma Longa)* TREATED MICE

GROUP	SGPT	UREA	UREA N2
7 Days Mice	52 IU/ML	64 mg/dl	29.8 mg/dl
14 Days Mice	46 IU/ML	56 mg/dl	26 mg/dl
28 Days Mice	40 IU/ML	33.68 mg/dl	15.73 mg/dl

DISCUSSION

It has been reported that prolonged exposure of Endosulfan caused decrease in the level of protein in the liver of female and male mice. Significant decrease in total protein level might be due to catabolism of protein or malfunction of liver (Mascolo et al., 1998). Liver damage is always associated with cellular necrosis, increase in lipid peroxidation and depletion in the tissue GSH levels. In addition serum levels of many biochemical markers like SGOT, SGPT, ALP and bilirubin levels are elevated (Nath and Kumar, 2007).

In present study we have observed increased level of S.G.P.T. with increased duration of exposure of Endosulfan in mice. Liver tissues of the tadpoles revealed that exposure to 250 and 500 µgl of carbofuran for one week induced histopathological alterations, although the degree of damage varied. No drastic structural changes were noted in the liver apart from greater vacuolation in hepatocytes, sinusoidal dilations and the formation of bile plugs in the treated larvae (Sahay et al., 2007). The alterations in liver tissue such as the increase in vacuolation, sinusoidal dialation and formation of bile plugs, has been also reported by Sakr et al., 2001 in fish.

Methomyl inhibits cholinesterase activity and causes toxicity. A decrease in hemoglobin may be because of the inhibition of heme synthesis. It may be said that a decrease in cytochrome P450 content and the activity of drug metabolizing enzymes due to methomyl treatment indicate the inhibition of mixed function oxidases in dose and duration dependent manner. A significant increase in SGOT, SGPT,serum proteins and alkaline phosphatase indicates liver damage (Sharkoori et al., 1990). Hepatic damage induced by Profenofos caused significant increase in marker enzymes SGPT, SGOT and serum bilirubin. Oral administration of cumin and coriander significantly lowers the levels of marker enzymes SGPT and SGOT. It also lowers

serum bilirubin level (Yassi et al., 2001). In present study Endosulfan administration causes degeneration in hepatocytes with degenerated chromatin materials of nucleus. Ring like nucleus were also observed after prolong exposure of Endosulfan. Cytoplasmic materials were almost degenerate and form vacuolated spaces.

CONCLUSION

Thus it is concluded from study that Endosulfan causes increase in S.G.P.T. level. It also causes degeneration of hepatocytes with degenerated chromatin material. Cytoplasmic materials were also degenerated to greater extent with frequent vacuolization which finally leading to malfunction of liver in mice and causes different types of digestive problems.

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