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HISTOLOGICAL AND HISTOPATHOLOGICAL CHANGES INDUCED BY DIMETHOATE (PESTICIDE) ON TESTES, KIDNEY AND LIVER OF MALE RABBITS IN YEMEN.

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ABSTRACT

The present study deals with the changes induced by dimethoate pesticides, which commonly used in Yemen especially in khat plant and other vegetables and fruits. Twenty of adult male rabbits were divided into three groups, the first one was served as control group. The rest administered 1/20 (1.34 mg. Kg. b.wt.) and 1/10 (2.68 mg. kg. b.wt.) of LD_{50} of pesticides respectively. All Animals were housed in separate cages under standard condition and stayed for two weeks before starting the experiments. The results revealed structural changes which more sever in rabbits given high doses of pesticide especially in liver and testes. The liver showed degenerative changes of hepatic cells and focal necrotic hepatocytes with lymphocytic infiltration and destructive of bile ducts lining epithelium in addition to congestion and widening of sinosoides and hepatic venules. The seminiferous tubules of the testes showed a considerable atrophy associated with marked recuction of spermatogonial cell number, partial failur of spermatogenesis was clearly detached. The spermatogonial cells revealed pyknotic nuclei, sertoli cells were detached from the basal lamina. The spermatids were undergoing several degenerative changes involved shrinkage or collaps of chromatin. The kidney tissue showed renal oedema and focal areas of tubular necroses and high vacuolated cytoplasm.

INTRODUCTION

The widespread of use the pesticides all over the world for many year in plant production and public health programs has the main causes of serious environmental problems. These pollution reach the human body and from animals in the daily diet and in the long term exposure those pollulants exert serious heath hazards on the cells and tissues[1, 2]. The most important widespread and insecticides are four classes, organochlorines, carbamates, organophosphates and pyrethroides[3].

These pesticides are usually mixed with water and sprayed on plants. They are usually introduced into the body of various biological system by impregnation through the cuticle or skin, through inhalation or through ingestion. The acute toxicity of these pesticides in human beings is a serious health problem in numerous regions of the world, particularly in the developing countries, where more toxic organophosphate and carbamate insecticides are increasingly replacing the less toxic and more persistent organochlorine pesticides[4]. Dimethoate is one of the class of insecticides referred to as organophosphates, these chemical act by interfering with the activities of cholinesterase an enzyme that is essential for the proper working of the nervous system of both humans and insects.

The present research designed to evaluate the possible toxicity of the dimethoate in some organs of rabbits like liver, tests and kidneys.

MATERIALS AND METHODS

Twenty mature male rabbit were divided into four equal groups, All rabbit were housed and marked, then stayed fore one week before starting the experiments. They fed on standard rodent pellets and vegetables as a sourse of vitamins.

Applied pesticide. Dimethoat is blue liquid organaphosphorus pesticide (40% pure). The first group is control and received saline solution. The second, third, and fourth groups treated with 1/20 LD_{50} of dimetheate (75 mg/kg. b.w.) 1/15 LD_{50} (10.0 mg.kg b.w.) and 1/10 LD_{50} (15.0 mg kg. b.w.).

The administration of all doses was received orally using stomach tube day after day (Ten doses were treated). Control and pesticides treated rabbits were sacrificed and rapidly dissected the morphological features of the organs were recorded and tissue samples of liver, testes and kidneys were cut into small pieces, then fixed rapidly in neutral buffered formalin 10%. Then processed for paraffin embedding, histological section of 7 micron thick were cut and stained with haematoxylin and eosin. They were then microscopically examined.

RESULTS

Liver: The livers of the investigated control rabbit consisted of the classical hepatic lobules. The hepatocytes were arranged in a cords radiating from the central veins with intervening blood sinusoids (figures 1 and 2). The hepatic cells or hepatocytes are polyhedral in shap, large in size and has well defined cell bounders, one or two prominent nucleli are distinct between these cells certain phagocytic stellate cells known as Kupffer cells.

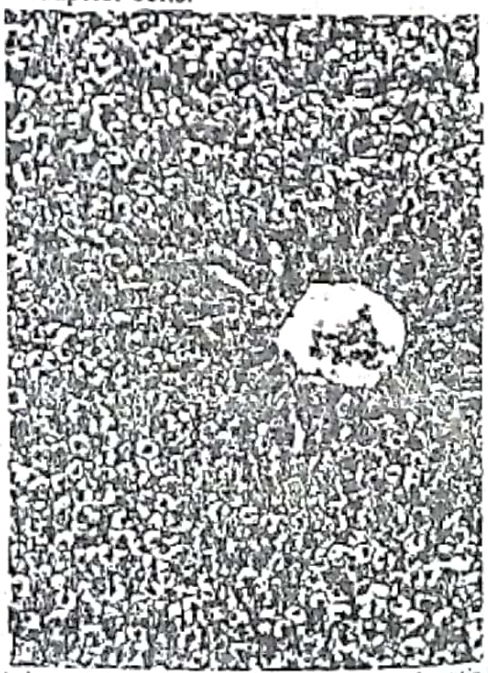

Fig. (1): Liver (Gr.1) showing hexagonal classic hepatic lobules. H& E Stain X 100

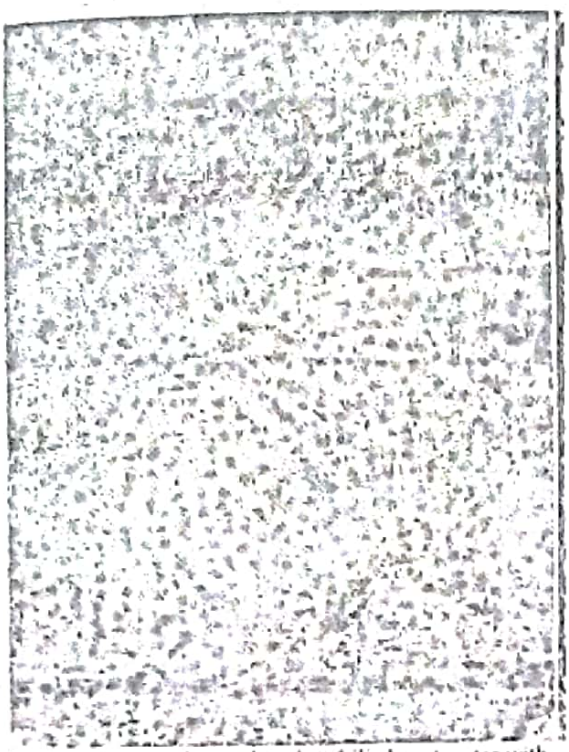

Fig. (2): Liver (Gr I) polygonal eosinophilic hepatocytes with spherical basophilic nuclei. H&E stain X 1000

Liver tissue of group II, III and IV:

The liver cells showed variable changes of degeneration depend on the dose, vascular degeneration the nuclei of the liver cell showed pyknosis, and karyolyses and disintegrate of the chromatin into several fragments (figure 3). Some of blood vessels appeared dilated and filled with blood cells. The wall of the blood vessels showed more thickening. The hepatic cell showed hydropic degeneration evidenced by vaculation of their cytoplasm.

Non-Kupffer cells were prominent, there was venous congestion of hepatic parenchyma in which the sinusoids were mostly dilated and engorged with blood (figure 4).

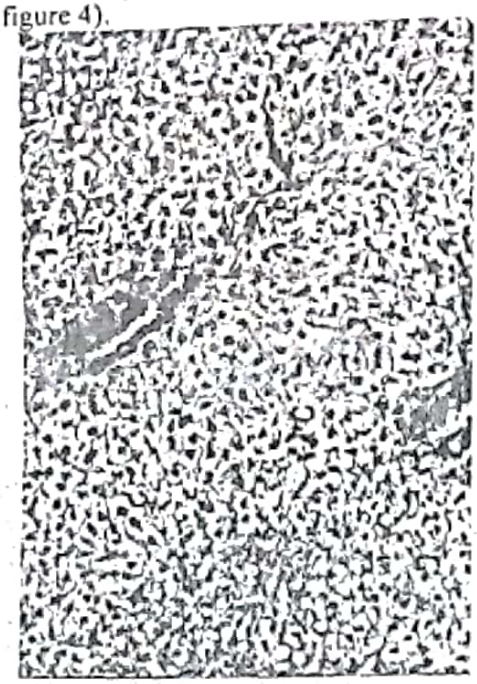

Fig. (3) : Liver (Gr. II & III), showing congestion of portal area, prevascular oedema and hydropic degeneration H&E stain X 1000

Fig. (4): Liver. (Gr. IV). Showing pyknosis and karyorhesis of hepatocyts H&E stain X 1200

Kidney: The control kidney (group I) showed normal cellular pattern and arranged of the renal glomeruli and tubules (figure 5). The Kidney showed number of uriniferous tubules which composed of nephron and collecting tubules. The malpighian corpusles consisted of tuft of blood capillaries. The layers of glomerulus is formed of two layer, externally simple squamous epithelium rest on basement membrane. Internally consisted of flattened epithelial cell (figure 6).

Treated animals the kidney tissues showed more histological changes. According to the induced doses. The tissue showed extensive haemorhagic areas and congested blood vessels in between the renal tubules of cortical and medullary regions of the kidney tissues. Degeneration of renal epithelium. Renal oedema and focal areas of tubular necrosis in the form of ill defined cell membranes and highly vaculated cytoplasm (figures 7 and 8).

Fig. (5): Kidney: (Gr. I) showing renal cortex with renal corpuscles and proximal and distal convoluted tubules. H&E stain X 1000

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Fig. (6): Kidney:.(Gr. I): showing renal corpuscle and glomelar capillaries. H&E stain X 1000

Fig. (7): Kidney: (Gr. II, III). Sowing necrosis of tubules of kidney . H&E stain X 1000

Fig. (8): Kidney: (Gr. IV). showing infiltration with lymphocytes and degeneration of epithelium lining of duct. H&E stain X 1000

Testis: In the control group the testis, the seminefrous tubules possessed well differentiated spermatogenic cells. The latter cells and spermatocytes were arranged in four layers. The sertoli cells were observed at regular intervals of testes lobules. Each seminferous tubules showed of typical arrangement of spermatogenic cells, including spermatagonia, spermatacytes and spermatids (figures 9 and 10).

Fig. (9): Testis: (Gr. I). showing seminiferous tubules with spermatogenic cells in a normal state. H&E stain X 1000

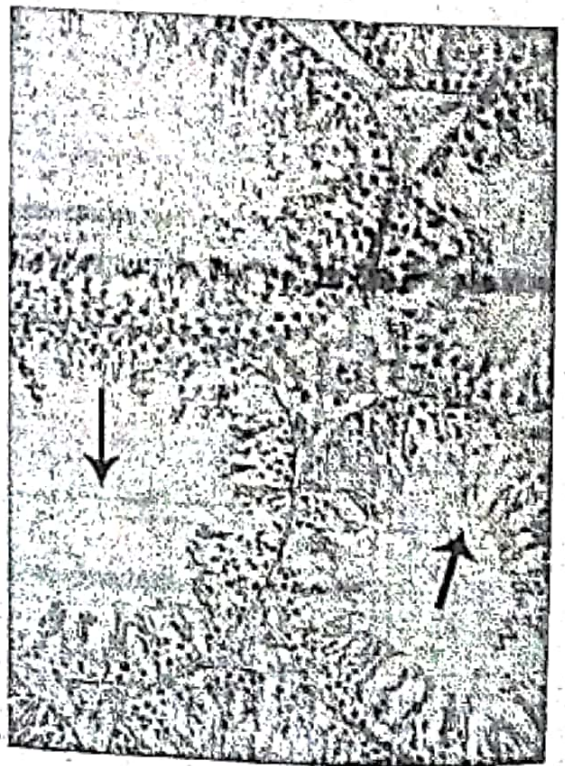

Fig. (10): Testis (Gr. I). showing testis lobules with typical arrangement of spermatogenic cells with sperm. H&E stain X 1000

Treated testes: They showed marked changes of the semineferous tubules according to the dose there was maked reduction in the number of spermatogonia and spematocytes. Many of these cells appeared lysed or degenerated. The basement membrane showed more thickening and stromal fibrosis (figure 11). The inter tubular connective tissues appeared loose and degenerated. The spermatogonia appeared markedly atrophied and degenerated and necrosis of the sartoli cells and spermatocytes series (figure 12) detached from the basal lamina.

Fig. (11):Testis (Gr III) Showing pervascular and interstitial oedema H&E stain X 1200

Fig. (12): Testis (Gr IV) Showing congestion in interstitial blood vessel and haemorrhage & necrosis of tissue H&E stain X 1200

DISCUSSION

Testis is considered to be the most important organ in the reproduction system of males. It serves two roles the first is hormonal and the second is reproductive. The hormonal roles in values in the synthesis and secretion of the testosterone by the interstitial cells which found in groups between the semniferous tubules. The second function involves spermatogenesis.

Our result revealed that there were degeneration and necroses of spermatocytes, there results agreed with that mentioned[3 and 4] by the toxicity uses of mercuric chloride in rats.

Also the some observation also recorded by the toxicity of midazolum[5] causes sever histological abnormalities of spermatogenesis. The same results were elucidated[6 and 7] recorded that nicotine has the same toxic effect on fine structure of the testis. Degeneration of human male germ cells was recorded[8] the same result recorded in treated rabbit[9] by light.

Liver is an organ of vital importance and it is considered to be the first organ in detoxification of any toxicants. Degenerative changes in the liver of animals administered excessive amount of Dime thoate have been reported[10]. Also, there were mononuclear cell and lymphatic cell infiltration in the parenchyma and portal area, these finding are in agreement with those reported[10, 11] in mercury intoxicated rabbit. The hepatocytes in animals under experiment suffered from fatty changes, vascular degeneration in addition to other areas of Coagulative necroses. The same result recorded[8].

The results obtained in the present study showed that dimethoate induced hepatic focal areas cell hyperplasia accompanied by areas of liver cell necrosis, congested and dilated central veins and sinusoids were also observed[9] by barium intoxication and fluoride[10] intoxication.

Kidney: The present observation about the extensive haemorrhag and congested blood vessels between the renal tubules in cortical and medullary regions. The samillar results obtained[8] after injection with carbamate in kidney of adult male rats. Also reported on mice[9] after feeding with daily dose of lannate (25 g b. wt.) for 5010 days.

The same results also recorded[10] of female mice after induced of methomyl insecticide.

The damaging effects of organophosphorus compounds on malpighian corpuscles were noticed[9, 10] in mice, rabbits.

Observed tubular degeneration in kidney tissue of rat exposed to azadirachtin pesticides observed the same result of dimethaat in rat[11, 12].

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التغيرات النسيجية والمرضية بواسطة الدايمثويت (مبيد حشري) في الخصية، الكلي والكبد لذكور الأرانب في ذمار باليمن

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تتناول هذه الدراسة تأثير أحد المبيدات العضوية الكاربامينية والذى يستخدم حاليا فى اليمن فى مقاومة الأفات الزراعية مثل زراعات القات والفاكهة والخضروات المنتشرة فى اليمن وهو الدايمثويت على الأرانب الذكور.

تم تحديد الاصابة على بعض الذكور من الأرانب فى مرحلة البلوغ وقد استخدم فى هذه الدراسة عدد ٢٠ أرنب وقسمت على أربعة مجموعات الأولى ضابطة بينما تمت معالجة الثانية والثالثة والرابعة بالجرعات المختلفة من المبيد (١/٢٠ ، ١/١٠ ، ١/٥) من الجرعة المميته على الترتيب. تم اعطاء الجرعة لمدة ٤ جرعات على مدى ٨ أيام (يوم بعد يوم) عن طريق الفم باستخدام لى معوى وذبحت هذه المجموعات بعد اسبوع من نهاية الجرعات.

وقد اظهر الفحص النسيجى لكل من كبد – كلى وخصية هذه الارانب المعالجة بالجرعات المختلفة تأثير مباشر مثل احتقان فى الاوردة المركزية للكبد وقد تعرضت الخلايا الكبدية من مظاهر التحلل مصحوبة بوجود فجوات فى السيتوبلازم وتحلل فى انوية الخلايا وازدياد فى نشاط خلايا كوفر. أما الكلى ادت الى تحلل أنبوبات الكلوية داخل محفظة ملبيجى وكذلك ضمور في محفظة مليجى وتحلل الأوردة والشرايين الدموية وكذلك التحلل المائى فى الخلايا الطلائية المبطنة لأنبيبات البولية للكلي .

أما الخصية التى حقنت بالجرعة المضاعفة فقد ظهرت بالنبيبات المنوية للخصية تغيرات نسيجية مرضية تمثلت فى تهدم وضمور كل من الخلايا الجرثومية وخلايا المنى الانبيبابت وندرة الطلائع المنوية . وكذلك ظهور تجاويف داخل الانبيبات التي ظهرت خالية من المكونات تماما.