The Egyptian Journal of Hospital Medicine (2008) Vol., 33: 604– 621

# The Toxicological effects of fenitrothion and vitamin E as antioxidant agent on the biochemical, cytogenetic and histopathological parameters of white rats

**Fouad Abdel Reheim* Awad Abbas Ragab * Fatma.M. Hammam** ; Hossam El-Din Hamdy****

*Department of Biochemistry, Faculty of Agriculture, Cairo University.
**Department of Mammalian Toxicology, Central Agricultural Pesticides Laboratory, Agricultural Research Centre.

## Abstract

**Background:** The use of pesticides has been increased considerably nowadays compared to the past. The hazards of using such chemical compounds have been accentuated by the sharp rise of their use in agriculture, industry, by householders and governments. Exposure to organophosphorus insecticides (OPI) in agriculture is one of the occupational hazards. Fenitrothion is one of the most important OPI. The major object of the present study was to evaluated the toxicological (biochemical, mutagenic and histopathological) effects of tested insecticide "fenitrothion" alone or combined to vitamin E as an antioxidant agent to decrease their toxic effect.

**Material and Method** male albino rats were tested orally for 30 days, three doses of fenitrothion were used in absence and presence of vitamin E (1/20, 1/40 and 1/80 LD50).

**Results** the obtained data showed marked changes in biochemical parameter, highly inhibition of AchE activity; highly significant increase in the frequency of micronucleus (PCEM) in rat bone marrow cells at all doses of fenitrothion alone or combined to vitamin compared to control group. Also, the histopathological examination of liver and kidney tissues revealed high alternation in these tissues corresponding to biochemical changes.

**Conclusion** From these results we concluded that fenitrothion exert biochemical, mutagenic and histopathological effects in white rats. In addition, vitamin E has mild role in alleviating these toxicological effects.

**Key words**: Organophosphorus, Fenitrothion, Antioxidant agent, Micronucleus.

## Introduction

Organophosphorus (OP) compounds are among the pesticides which are widely used in agriculture. Their application and usage have increased astronomically in the last decade and will likely increase further in further. Some of these which are used at present in Egypt are dangerous when mishandled or wrongly used (Zahran *et al.*, 2005). OP represents one group of pesticides that has been shown to have toxic effects in humans (Tastsakis *et al.*, 1998). The biochemical effects produced by pesticides can be enzyme induction or enzyme inhibition, the effect of pesticides may be detected by ensuring biochemical changes even before adverse clinical health effects can occur (Sivapiriya *et al*., 2006). Fenitrothion is one of the organophosphorus (OP) insecticide controlling a wide range of insects and other pests, although fenitrothion exhibits low mammalian toxicity, biochemical, morphological and functional alternations in animals tissues have been reported (El-halwagy *et al*., 2008). The prolonged administration of fenitrothion increased the concentration of corticosterone and glucose in plasma of male rats. It also increased the weight of the adrenal gland of male rats and altered its functions (Khan *et al*., 1990). Dermal, inhalation and oral exposure to fenitrothion inhibits acetylchloinestrase enzyme (AchE) in plasma, erythrocytes and brain of mammals (Ishimats *et al*., 1988), in addition to a considerable liver and kidney damage evidenced by elevation in serum

aminotransferase [AST and ALT] (Alsahhaf, 2006). In corresponding study found that fenitrothion caused a significant increase in aspartate aminotransferase (AST) and a significant decrease in alanine aminotransferase (ALT) when treated with combination of vitamin E and C. Interaction of plasma protein and pesticides have toxicological importance, because it control the degree and time of pesticides actions in the body (Cszerhasti and Forgacs, 1995). Pesticides bound to albumin can serve as a new biomarker of pesticides exposure in humans. A recent study recorded reduction in albumin when rats treated with 1/30 and 1/60 of fenitrothion for 28 days (El-halwagy *et al*., 2008).

Genotoxic effects are considered among the most serious side effects of pesticides. Several studies all over the world showed the cancer risk after exposure to insecticides (Wild, 1978 and IARC, 1991). Previous studies have demonstrated that some pesticides have mutagenic and clastogenic activities in several biological test system (Celik *et al*., 2003). Organophosphorus pesticides are chemical alkylating agent and therefore could be mutagenic/ carcinogenic (Chen *et al*., 1981). There is evidence that some organophosphorus pesticides may have *in-vivo* genotoxic effect suggesting a possible link with long term or repeated heavy exposures (Hatjian *et al*., 2000). The micronucleus test has been used as an *in-vivo* cytogenetic test to estimate the clastogenic potential of chemicals. Micronuclei (MN) are a centric chromosome fragments or whole chromosome left behind during mitotic cellular division and appear in the cytoplasm of interphase cells as small additional nuclei. Many studies have demonstrated the efficiency of the micronucleus assay to detect DNA damage, produced under the effect of pesticides (Holland *et al*., 2002 and Abdel-Aziz, 2004). The genotoxic effect of organophosphorus on rat bone marrow was studied by many authors using the micronucleus assay (Zhou *et al*., 2005; Hammam, 2006 and Hammam and Abdel-Mottaleb., 2007). They found significant increase in the induction of polychromatic erythrocytes micronuclei (PCEM). This study aims to investigate the toxicological effect of fenitrothion on biochemical, histopathological and mutagenic changes on white rats after three different doses for 30 days and the role of vitamin E as antioxidant agent to minimize its mutagenicity.

## Material and methods

**Materials:**

Pesticide: Fenitrothion insecticides in the formulated form, Sumithion 50, which contains fenitrothion 50% was purchased from Kafr El-zayat co. for Insecticides IND.

Antioxidant used: Vitamin E (150 µg/kg bw).

**Animals and experimental design:**

Male albino rats, weighting between (150-200 g), were used. Animals were supplied by the breeding of the Egyptian Organization for the Biology ND Vaccine Production, Egypt. The animals were housed in plastic cages and allowed to acclimate to environment for two weeks before starting the experiment. Animals were caged in 8 groups (5 animals for each group), they were given oral administration of OP or vitamin E by gastric tube daily for 30 days. Groups classified as following:- G1 [negative control], G2 [control of vitamin E), G3 [20.70mg/kg(1/20 LD50 of fenitothion)], G4 [10.35mg/kg(1/40 LD50 of fenitrothion)], G5 [ 5.17mg/kg(1/80 LD50 of fenitrothion)], G6 [ 1/20 LD50 +vitamin E], G7 [ 1/40 LD50 + vitamin E], G8 [ 1/80 LD50 + vitamin E].

**Sampling:**

Blood collected from the retro-orbital plexus vein according to Schermer (1967), on heparinized tubes at 10, 20 and 30 days of treatment period. Plasma samples were separated by centrifugation of the blood samples at 3600 rpm for 15 min. Plasma samples were kept at -20$^0$C for biochemical analysis. At the end of the experiment, animals were sacrified and samples of liver and kidney were excised for histopathological studies, as well as femur for cytogenetic assay.

**Histopathology:**

Histopathological examination was carried out according to Drury and Wallington (1980). The liver and kidney tissues were dissected and tissue samples

were fixed in 10% formalin solution for 14-18h, passed in a series of graded ethanol and embedded in paraffin. Parrafin sections were cut with at 5um thickness and stained with hematoxylin and eosin for light microscopic examination.

**Biochemical assay:**

Plasma transaminases (AST and ALT) activities were determined according to Reitman and Frankal (1957). Plasma cholinesterase (CHE) was assayed by the method of Waber (1966). Albumin, creatinine and urea concentrations were determined according to Dumas *et al*. (1971). Total protein was carried out according to the method of Domas (1975).

Cytogenetic assay "Micronucleus test":

The frequency of micronucleated erythrocytes in femoral bone marrow preparation was evaluated according to the procedure described by Schmid (1976), with some modification recommended by Alder *et al*. (1991).

After the sacrifice of animals, both femurs were desiccated out, cleaned from muscular tissue and both cartilaginous epiphyses were cut off. The marrow was flushed out with 2 ml fetal calf serum (FCS) into a centrifuge tube, using a clean syring. The samples were centrifuged at 2000 rpm for 3 min. Following centrifugation, the supernatant was discarded and the cells resuspended in a drop of FCS. The suspension were spread on slides and air dried. The slides were fixed in methanol, stained in wright stain followed by giemsa stain and rinsed in distilled water. A thousand of polychromatic erythrocytes (PCE) was scored. The frequency of micronucleated cells was expressed as percent of total polychromatic cells.

Statistical analysis:

The obtained data were calculated and statistically analyzed using students't-test for cytogenetic assay (Micronucleus) according to Sendecore (1969) and one way analysis of variance (A NOVA) by using Computer Micro stat program, Copyright C 1978-85 by ECOSOFT for biochemical results.

## Results

**Biochemical results**

**-Effect on aminotransferases enzyme activities:**

The data presented in table (1) showed that ALT activity decreased markedly with significant difference than control group ($p<0.05$), vitamin E showed the same effect. Comparing between fenitrothion treatments alone and combined with vitamin E exhibited non significant change at the end of experiment at all doses.

The result obtained in table (2) showed decrease in AST activity in all doses when compared to control group. Wile vitamin E not caused any significant change. Marked decrease in AST activity was observed in all doses when comparing between fenitrothion treatments alone and combined with vitamin E .

**- Effect on total protein concentration:**

Table (3) showed that the total protein was increased significantly in all doses of fenitrothion at the end of treatment when compared to control group. Vitamin E exhibited significant decrease at all doses after 30 days. Comparing between fenitrothion alone and combined with vitamin E showed significant decrease in total protein in all doses at the end of treatment.

**-Effect on albumin concentration:**

Albumin showed significant decreased in all doses after 30 days when compared to control rats. It has been found that vitamin E ameliorates albumin level to the present vitamin, table (4).

**-Effect on creatinine concentration:**

The data presented in table (5) showed that fenitrothion treatment with or without vitamin E caused significant decrease in creatinine level at all doses after 30 days when compared to control group. There was non significant change when comparing between fenitrothion treatment and fenitrothion with vitamin E in all doses at the end of experiment.

**-Effect on urea concentration:**

The data obtained in table (6) showed that fenitrothion treatment with or without vitamin caused significant increase in urea concentration in all doses when compared to control group.

Comparing between fenitrothion alone and combined with vitamin E showed significant decrease of urea concentration after 30 days in all doses.

**-Effect on cholinesterase (ACHE) :**

The results showed that AchE activity was markedly inhibited as a result of fenitrothion treatment, the statistical analysis showed highly significant decreased through all periods at all doses of fenitrothion treatment with or without vitamin E when compared to control group. Addition of vitamin did not improve AchE activity in all doses and periods when compared to control, while comparing fenitrothion alone and fenitrothion with vitamin groups showed significant increase in all doses and periods (table 7).

**Histopathological results:**

**-Hisology results of Liver tissues:**

Microscopically, liver of control (untreated rat) "G1,G2" revealed the normal histological structure of hepatic lobule (fig .1). In the other hand, liver of rat from group G3 treated with "1/20 LD50" of fenitrothion showed vacuolar degeneration of hepatocytes (fig.2a) and focal hepatic hemorrhage (fig.2b).

However, liver of rat from group G6 treated with 1/20 LD50 of fenitrothion combined with vitamin E revealed vacuolar degeneration of sporadic hepatocytes (fig.3). Liver of rat from group G4 treated with 1/40 LD50 of fenitrothion showed vacuolar degeneration of hepatocytes as well as appearance of apoptotic body (fig.4). Meanwhile, liver of rat from group G7 treated with 1/40 LD50 of fenitrothion combined with vitamin E showed vacuolar degeneration of centrilobular hepatocytes (fig.5). Examined liver of group G5 treated with 1/80 LD50 of fenitrothion revealed vacuolar degeneration of hepatocytes (fig.6). However, liver of rat treated with 1/80 LD50 of fenitrothion "G8" combined to vitamin E revealed apparent normal hepatocytes (fig.7).

**-Histology results of kidney tissues:**

Examination of kidney tissues of control group (untreated rat) "G1,G2" revealed normal histological structure of renal parenchyma (fig 8). On the other hand, kidney of rat from group G3 treated with 1/20 LD50 of fenitrothion showed vacuolations of endothelial lining glomerular tufts (fig.9a) and epithelial lining renal tubules as well as focal renal hemorrhage (fig.9b). Moreover, kidneys of rat from group G6 treated with 1/20 LD50 of fenitrothion combined to vitamin E revealed vacuolations of endothelial lining glomerular tuft and epithelial lining renal tubules (fig.10). Kidneys of rat from group G4 treated with 1/40 LD50 of fenitrothion showed presence of eosinophilic protein cast in the lumen of some renal tubules (fig.11). However, kidneys of rats from group G7 treated with 1/40 LD50 of fenitrothion combined with vitamin E revealed no histopathological changes (fig.12). Also kidneys of rat from group G5,G8 treated with 1/80 LD50 of fenitrothion with or without vitamin E revealed no histopathological changes (fig.13)

**Cytogenetic results (micronucleus assay):**

The number of micronuclei was evaluated and compared with both negative control and positive control (ethyl methane sulfonate "EMS"). 500-1000 cells were examined per rat and the numbers of micronucleated PCE were counted and the data obtained are illustrated in table (8).

In normal sample (negative control), 28 of micronucleated polychromatic erythrocytes (PCE) cells were obtained among 2000 examined cells which represent 1.4%, while in the EMS treatment 68 PCE cells were counted which represent 1.7%. The treatment with 1/20, 1/40 and 1/80 of LD50 gave 177, 89 and 81 PCE cells with the percentage of 8.8%, 4.45% and 4.5% respectively. The obtained results showed that fenitrothion at all doses showed an increase in the frequency of micronucleated polychromatic erythrocytes (PCE) cells. Also the statistical analysis of these results indicated that the tested pesticide exert high significant increase in the induction of micronuclei in 1/20 LD50 of treatment, while the 1/40 and 1/80 LD50 of fenitrothion produced significant increase in

the number of PCE cells when compared to control group.

Table (8) summarizes the numbers and percentage of polychromatic erythrocytes in bone marrow of rats after fenitrothion treatment alone or combined to vitamin E

The results showed an increase in the frequency of micronucleated erythrocytes PCE cells in the three doses of fenitrothion with the presence of vitamin E when compared to control group. The obtained data revealed slight decrease in the number of micronuclei after addition of vitamin when compared to fenitrothion treatment. The micronuclei in PCEM in bone marrow of rats were shown in fig (14).

**Table ( 1 ) Effect of fenitrothion alone and fenitrothion with vitamin E on ALT (U/l) activity in male rats**

| Treatment | 10 days | 20 days | 30 days |
|---|---|---|---|
| G1 Negative control | 9.25± 0.62 | 10.62± 0.46 | 11.25± 0.15 |
| G2 Control of vitamin E | 9.00± 0.70 | 9.75 ± 0.11 | 10.75± 0.53 |
| G3 (1/20LD50) of Fenitrothion | 15.00± 0.81 a | 18.75± 0.10 a | 4.50± 0.27 a |
| G4 (1/40LD50) of Fenitrothion | 12.25 ±0.94 a | 12.50± 0.37 a | 4.75± 0.29 a |
| G 5 (1/80LD50) of Fenitrothion | 11.37± 0.11 a | 12.80 ±0.38 a | 5.75± 0.29 a |
| G 6 1/20 LD50+vitamin E | 9.5± 0.81 b | 8.25± 0.29 c,b | 3.95± 0.37 c |
| G 7 1/40 LD50+vitamin E | 8.75± 0.50 b | 7.25 ±0.18 c,b | 4.12± 0.05 c |
| G 8 1/80 LD50 +vitamin E | 8.77± 0.58 b | 7.75± 0.67 c,b | 5.30± 0.23 c |
| L.S.D | 2.197 | 1.842 | 0.782 |

All data are expressed as means ± SE (four rats).
a significant different between fenitrothion treatmet and control. (P< 0.05)
b significant different between fenitothion and fenitrothion treatmet with vitamin E. (P< 0.05)
c significant different between fenitrothion treatment with vitamin E and control. (P< 0.05)
L.S.D =Least Significant Difference

**Table ( 2 )Effect of fenitrothion alone and fenitrothion with vitamin E on AST (U/l) activity in male rats**

| Treatment | 10 days | 20 days | 30 days |
|---|---|---|---|
| G1 Negative control | 70.00 ±6.33 | 75.00± 7.46 | 65.00±0.81 |
| G2 Control of vitamin E | 72.00± 7.02 | 74.75± 4.28 | 62.90± 4.51 |
| G3 (1/20LD50) of Fenitrothion | 78.00 ±8.09 | 85.00± 5.15 | 48.00± 4.08 a |
| G4 (1/40LD50) of Fenitrothion | 74.00 ±5.29 | 97.75± 8.16 a | 42.25± 2.51 a |
| G 5 (1/80LD50) of Fenitrothion | 60.00 ±4.33 | 79.75± 4.28 | 52.00 ±2.20 a |
| G 6 1/20 LD50+vitamin E | 70±10.43 | 70.00±5.51 b | 65.25±2.26 |
| G 7 1/40 LD50+vitamin E | 58.00± 5.29 | 67.00 ±4.50 b | 68.25 ±7.49 b |
| G 8 1/80 LD50 +vitamin E | 57.50 ±5.92 | 52.00± 3.28 c,b | 68.00± 4.83 b |
| L.S.D | 16.11 | 13.31 | 10.98 |

All data are expressed as means ± SE ( four rats).
a significant different between fenitrothion treatment and control. (P< 0.05)
b significant different between fenitrothion treatmet and fenitrothion with vitamin E. (P< 0.05)
c significant different between fenitrothion treatmet with vitamin E and control. (P< 0.05)
L.S.D =Least Significant Difference

**Table (3) Effect of fenitrothion alone and fenitrothion with vitamin E on total protien (gm/100ml) concentration in male rats**

| Treatment | 10 days | 20 days | 30 days |
|---|---|---|---|
| G1 Negative control | 3.00 ± 0.12 | 3.96 ± 0.34 | 3.21 ± 0.10 |
| G2 Control of vitamin E | 3.76 ± 0.10 b | 3.10 ± 0.16 | 3.50 ± 0.10 |
| G3 (1/20LD50) of Fenitrothion | 2.88 ± 0.05 a | 3.66 ± 0.40 a | 4.23 ± 0.29 a |
| G4 (1/40LD50) of Fenitrothion | 2.45 ± 0.09 a | 3.51 ± 0.16 a | 3.73 ± 0.12 a |
| G 5 (1/80LD50) of Fenitrothion | 2.43 ± 0.10 a | 2.69 ± 0.09 a | 3.82 ± 0.17 a |
| G 6 1/20 LD50+vitamin E | 3.65 ± 0.13 c,b | 3.66 ± 0.04 c | 2.67 ± 0.11 c,b |
| G 7 1/40 LD50+vitamin E | 3.67 ± 0.11 c,b | 3.91 ± 0.03 c,b | 3.0 ± 0.16 c,b |
| G 8 1/80 LD50 +vitamin E | 3.59 ± 0.07 c,b | 3.61 ± 0.06 c,b | 2.85 ± 0.10 c,b |
| L.S.D | 0.245 | 0.289 | 0.466 |

All data are expressed as means ± SE ( four rats).
a significant different between fenitrothion treatment and control. (P< 0.05)
b significant different between fenitrothion treatment and fenitrothion with vit. (P< 0.05)
c significant different between fenitrothion treatmet with vitamin E and control. (P< 0.05)
L.S.D =Least Significant Difference

**Table (4 ) Effect of fenitrothion alone and fenitrothion with vitamin E on Albumin (g/dl) concentration in male rats**

| Treatment | 10 days | 20 days | 30 days |
|---|---|---|---|
| G1 Negative control | 2.46 ± 0.11 | 3.16 ± 0.14 | 3.88 ± 0.09 |
| G2 Control of vitamin E | 2.01 ± 0.15 | 2.95 ± 0.16 | 3.17 ± 0.29 |
| G3 (1/20LD50) of Fenitrothion | 4.26 ± 0.08 a | 4.01 ± 0.33 a | 3.08 ± 0.59 a |
| G4 (1/40LD50) of Fenitrothion | 4.26 ± 0.21a | 3.20 ± 0.27 | 3.25 ± 0.13 a |
| G 5 (1/80LD50) of Fenitrothion | 3.23 ± 0.25 a | 3.08 ± 0.15 | 3.20 ± 0.12 a |
| G 6 1/20 LD50+vitamin E | 2.46 ± 0.24 b | 3.91 ± 0.07 | 3.91 ± 0.25 b |
| G 7 1/40 LD50+vitamin E | 2.16 ± 0.19 b | 3.40 ± 0.11 | 3.93 ± 0.16 b |
| G 8 1/80 LD50 +vitamin E | 2.89 ± 0.17 b | 2.68 ± 0.11 | 3.95 ± 0.11 b |
| L.S.D | 0.565 | 0.681 | 0.574 |

All data are expressed as means ± SE ( four rats).
a significant different between fenitrothion treatment and control. (P< 0.05)
b significant different between fenitrothion treatment and fenitrothion with vitamin E. (P< 0.05)
c significant different between fenitrothion treatment with vitamin E and control. (P< 0.05)
L.S.D =Least Significant Difference

**Table (5 ) Effect of fenitrothion alone and fenitrothion with vitamin E on creatinine (mg/dl) concentration in male rats for 30 days.**

| Treatment | 10 days | 20 days | 30 days |
|---|---|---|---|
| G1 Negative control | 44.58 ± 2.37 | 63.59 ± 1.10 | 64.64 ± 2.20 |
| G2 Control of vitamin E | 49.55 ± 0.87 | 54.96 ± 1.82 | 50.62 ± 1.99 |
| G3 (1/20LD50) of Fenitrothion | 51.78 ± 0.74 a | 55.37 ± 1.74 a | 59.30 ± 1.38 a |
| G4 (1/40LD50) of Fenitrothion | 52.22 ± 2.58 a | 51.53± 1.09 a | 58.33 ± 2.24 a |
| G 5 (1/80LD50) of Fenitrothion | 49.55± 2.36 | 55.28 ± 1.46 a | 57.94 ± 1.77 a |
| G 6 1/20 LD50+vitamin E | 43.78 ± 1.94 b | 58.41 ± 1.92 c | 58.20 ± 1.03 c |
| G 7 1/40 LD50+vitamin E | 44.22 ± 0.92 b | 54.73 ± 2.03 c | 53.51 ± 1.91 c |
| G 8 1/80 LD50 +vitamin E | 43.01 ± 1.91 b | 52.96 ± 2.39 c | 52.32 ± 0.63 c |
| L.S.D | 5.143 | 4.946 | 5.670 |

All data are expressed as means ± SE ( four rats).
a significant different between fenitrothion treatment and control. (P< 0.05)
b significant different between tfenitrothion treatment and fenitrothion with vitamin E. (P< .05)
c significant different between fenitrothion treatment with vitamin E and control. (P< 0.05)
L.S.D =Least Significant Difference

**Table (6 ) Effect of fenitrothion alone and fenitrothion with vitamin E on urea (mg/dl) concentration in male rats for 30 days.**

| Treatment | 10 days | | 20 days | | 30 days | |
|---|---|---|---|---|---|---|
| G1 Negative control | 45.89 ± 2.14 | | 57.53 ± 2.07 | | 30.57 ± 1.86 | |
| G2 Control of vitamin E | 43.45 ± 2.25 | | 35.63 ± 3.04 | | 26.84 ± 1.98 | |
| G3 (1/20)LD50 of fenitrothion | 42.45 ± 3.07 | | 48.02 ± 1.50 | a | 62.83 ± 2.33 | a |
| G4 (1/40)LD50 of fenitrothion | 56.34 ± 3.56 | | 44.62 ± 1.67 | a | 50.83 ± 3.68 | a |
| G 5 (1/80)LD50 of fenitrothion | 45.21 ± 1.71 | | 47.05 ± 0.65 | a | 62.05 ± 3.40 | a |
| G 6 1/20 LD50+vitamin E | 43.08 ± 4.81 | | 38.77 ± 3.82 | b,c | 44.89 ± 1.34 | b,c |
| G 7 1/40 LD50+vitamin E | 49.73 ± 3.61 | | 35.02 ± 2.31 | b,c | 40.27 ± 2.09 | b,c |
| G 8 1/80 LD50+vitamin E | 42.33 ± 1.92 | | 37.19 ± 0.66 | b,c | 41.15 ± 0.52 | b,c |
| L.S.D | 8.52 | | 9.12 | | 6.84 | |

All data are expressed as means ± SE ( four rats).
a significant different between fenitrothion treatment and control. (P< 0.05)
b significant different between fenitrothion treatment and fenitrothion with vitamin E. (P< 0.05)
c significant different between fenitrothion treatment with vitamin E and control. (P< 0.05)
L.S.D =Least Significant Difference

**Table (7 ) Effect of fenitrothion alone and fenitrothion with vitamin E on AChE (U/l) activity in male rats for 30 days.**

| Treatment | 10 days | | 20 days | | 30 days | |
|---|---|---|---|---|---|---|
| G1 Negative control | 229.34 ± 3.08 | | 271.0 ± 2.45 | | 284.73 ± 4.08 | |
| G2 Control of vitamin E | 297.78 ± 6.48 | | 286.27 ± 2.60 | | 268.46 ± 4.5 | |
| G3 (1/20)LD50 of fenitrothion | 217.78 ± 5.92 | a | 207.82 ± 4.99 | a | 157.88 ± 14.47 | a |
| G4 (1/40)LD50 of fenitrothion | 200.33 ± 2.25 | a | 218.63 ± 3.22 | a | 131.05 ± 10.67 | a |
| G 5 (1/80)LD50 of fenitrothion | 228.97 ± 5.96 | | 239.29 ± 1.18 | a | 235.31 ± 13.48 | a |
| G 6 1/20 LD50+vitamin E | 250.92 ± 7.75 | c,b | 223.36 ± 3.26 | c,b | 194.59 ± 3.23 | c,b |
| G 7 1/40 LD50+vitamin E | 271.83 ± 8.30 | c,b | 228.21 ± 1.73 | c,b | 202.33 ± 3.13 | c,b |
| G 8 1/80 LD50+vitamin E | 262.26 ± 5.83 | c,b | 260.08 ± 3.42 | c,b | 250.11 ± 10.46 | c,b |
| L.S.D | 29.52 | | 8.99 | | 32.58 | |

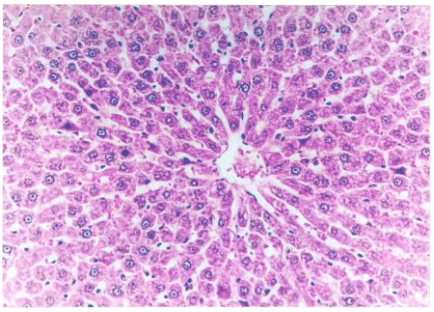
All data are expressed as means ± SE ( four rats).
a significant different between fenitrothion treatment and control. (P< 0.05)
b significant different between fenitrothion treatment and fenitrothion with vitamin E. (P< 0.05)
c significant different between fenitrothion treatment with vitamin E and control. (P< 0.05)
L.S.D =Least Significant Difference

**Table ( 8 ) Micronuclei in polychromatic erythrocytes in rats bone marrow cell treated with fenitrothion alone or combined with vitamin E for 30 days.**

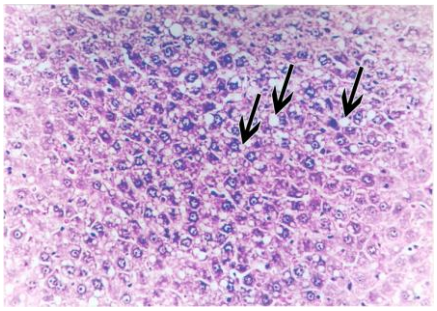
| Treatment | Total no examined cell | No of micronucleated PCE | | Total No of micronucleated PCE | % micronucleated PCE | Mean ± SD |
|---|---|---|---|---|---|---|
| | | Big | Samll | | | |
| G1 Negative control | 2000 | 20 | 8 | 28 | 1.40% | 7.00 ±0.70 |
| Positive Control (EMS) | 2000 | 38 | 30 | 68 | 1.70% | 17 ± 1.29 |
| G3 1/20 $LD_{50}$ | 2000 | 110 | 67 | 177 | 8.80% | 44.25* * * ± 0.98 |
| G4 1/40 $LD_{50}$ | 2000 | 70 | 19 | 89 | 4.45% | 22.25* * ± 1.03 |
| G5 1/80 $LD_{50}$ | 2000 | 72 | 9 | 81 | 4.50% | 20.25* * ± 0.47 |
| G6 1/20LD50+ vitamin E | 2000 | 138 | 11 | 141 | 7.05% | 35.25* * * ± 1.75 |
| G7 1/40 LD50+ vitamin E | 2000 | 70 | 8 | 78 | 3.90% | 19.50* * ± 0.28 |
| G8 1/80 LD50+ vitamin E | 2000 | 70 | 3 | 73 | 3.65% | 18.25* * ± 0.75 |

EMS: Ethyl methan sulfonate (250 mg/kg b.wt)

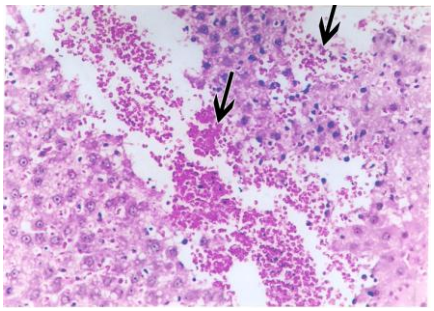
*** $p < 0.001$ : This difference is considered to be very highly statistically significant ** $p < 0.01$ : This difference is considered to be highly statistically significant



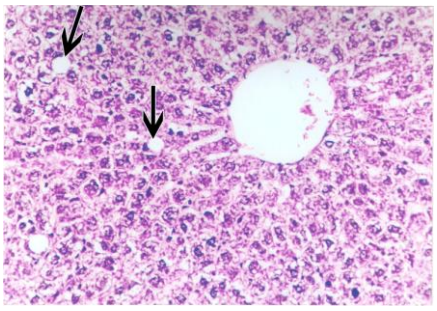
**Fig(1)** Liver of control ,untreated rat showing the normal histological structure hepatic lobule.(Hand E X 200)



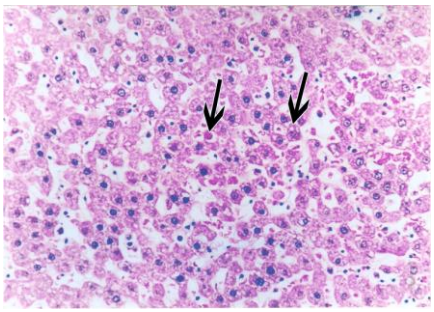
**Fig(2a)** Liver of rat from group (a)1/20 $LD_{50}$ showing vacuolar degeneration of hepatocytes (Hand E X 200)



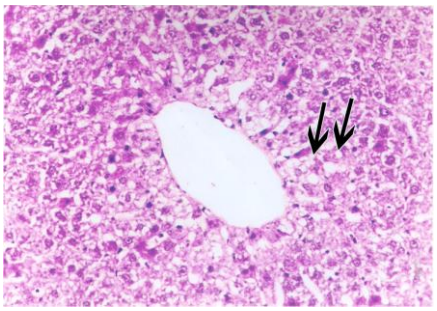
**Fig(2b)**Liver of rat from group (b)1/20 $LD_{50}$ showing focal hepatic hemorrhege (Hand E X 200)



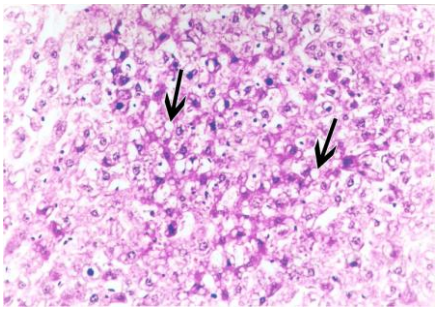
**Fig(3)**Liver of rat from group 1/20 $LD_{50+v}$ showing vacuolar degeneration of sporadic hepatocytes. (Hand E X 200)



**Fig(4)** Liver of rat from group 1/40 $LD_{50}$ showing vacuolar degeneration of as well as appearance of apoptotic body (Hand E X 200)



**Fig(5)**Liver of rat from group 1/40 $LD_{50}$ +V showing vacuolar degeneration of centrilobular hepatocytes. (Hand E X 200)



**Fig(6)** Liver of rat from group 1/80 $LD_{50}$ showing vacuolar degeneration of hepatocytes (Hand E X 200)

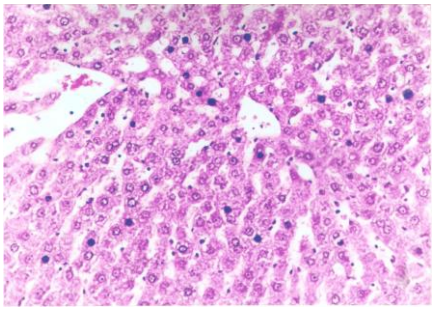


**Fig (7)**Liver of rat from group 1/80 $LD_{50}$ +V showing apparent normal hepatocytes. (Hand E X 200)

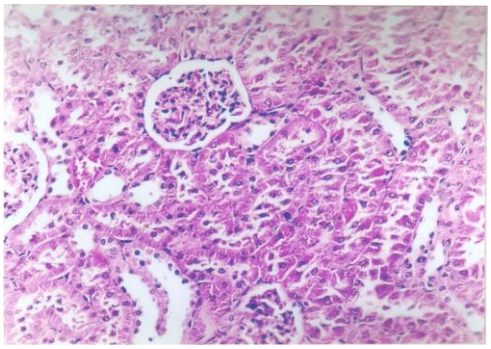
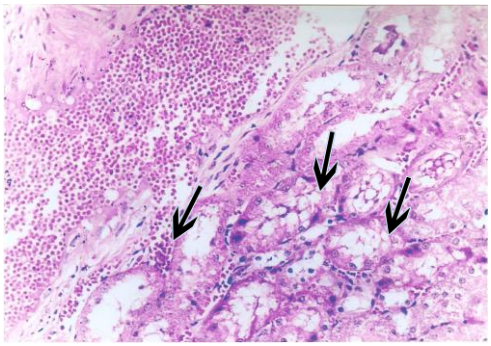
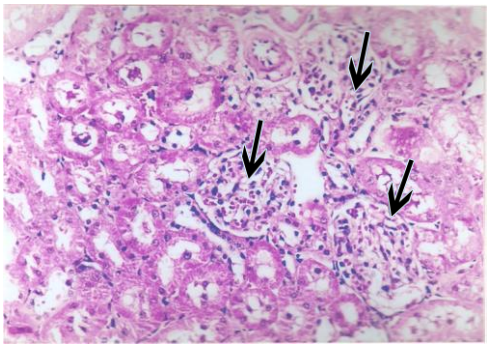


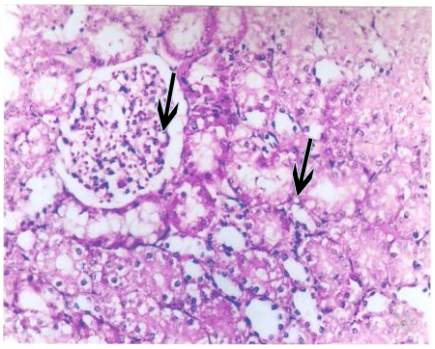
**Fig.(8):**Kidney of control ,untreated rat showing the normal histological structure of renal parenchyma. (Hand E X 200)



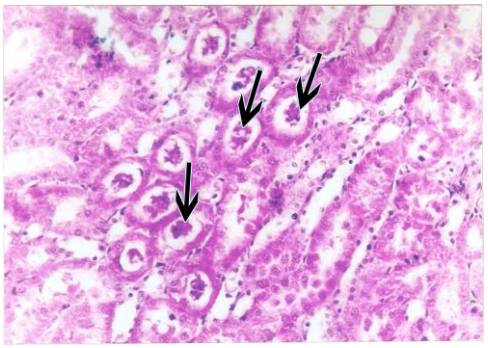
**Fig(9a)** Kidney of rat from group 1/20 $LD_{50}$ showing vacuoletions of endothelial (Hand E X 200)



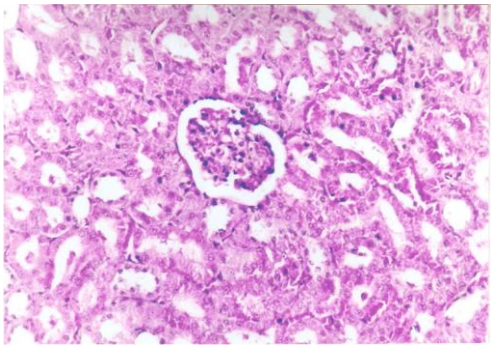
**Fig(9b):** Kidney of rat from group 1/20 showing vacuoletions of epithelial liming renal tubules and focal renal hemorrhege (Hand E X 200)



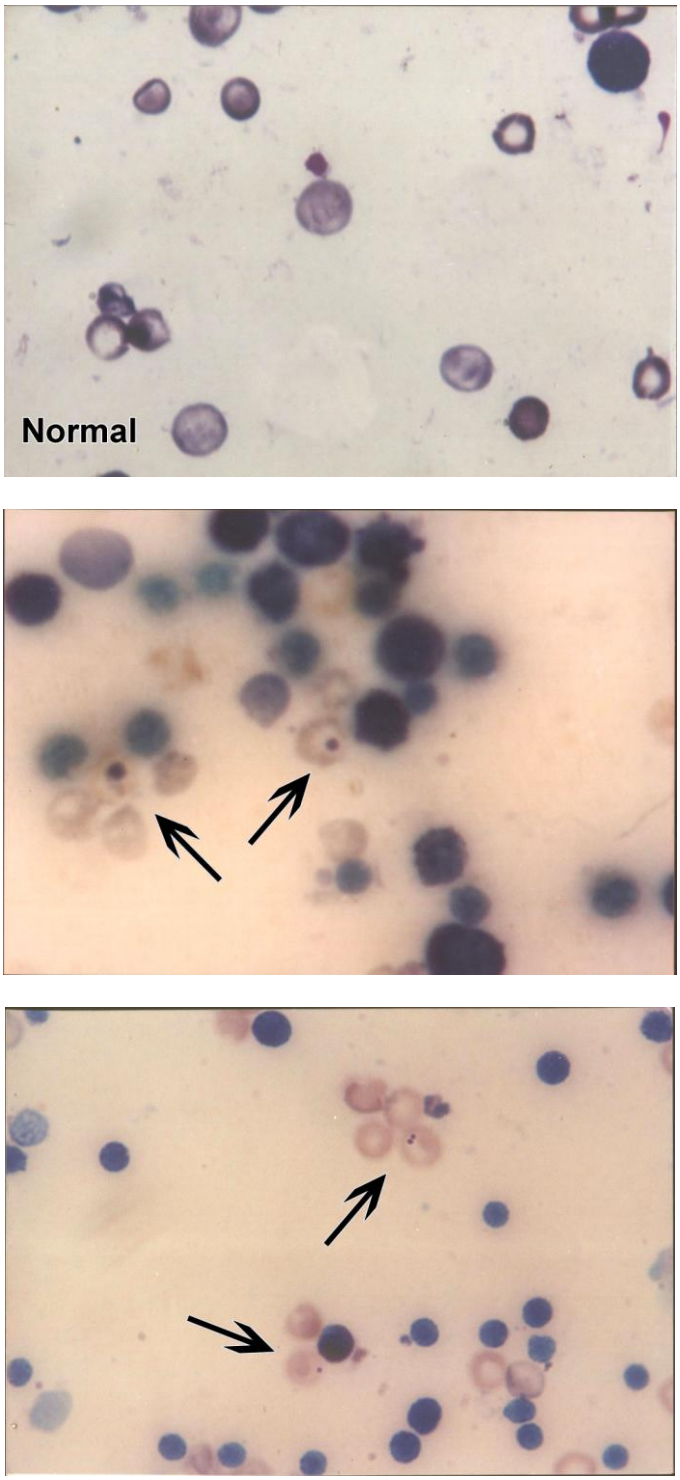
**Fig(10):** Kidney of rat from group 1/20 $LD_{50}$+V showing vacuoletions of endothelial liming glomeruler tuft and epithelial liming renal tubules (Hand E X 200)



**Fig(11):** Kidney of rat from group 1/40 showing losinophilic protein cast in the lumen of some renal tubules (Hand E X 200)



**Fig(12,13):** Kidney of rat from group 1/40 +V, 1/80, 1/180+V showing no histological change. (Hand E X 200)




**Fig(14) micronuclei in rat bone marrow cells treated with different doses of fenitrothion alone and combined with vitamin E**

## Discussion

Extensive application of pesticides is usually accompanied with serious problems of pollution and health hazards. It is established that many pesticides, in common use can produce some toxic and adverse effects on the liver, kidney and other biological systems when tested on various types of experimental animals through their mode of action or by production of free radicals that damage all cell components (Khan *et al*., 2006).

Concerning the toxic effect of fenitrothion insecticide on liver enzymes, our study revealed a significant increase in AST and ALT activity after 10, 20 days of treatment followed by significant drop after 30 days. The same results were reported in fenitrothion combined with vitamin E treatment groups.

Similar studies were reported on different animals' species showing significant changes in aminotransferase enzymes activity as a result of organophosphorus treatment (Ayyat *et al*., 2000; Varisk *et al.,* 2004). Our finding are in harmony with those obtained by Irfan-Altutas and Nemik-Delibas (2002),who reported that fenthion caused significant decrease in ALT activity and treatment with combination of vitamin E and C led to significant decrease in aminotransferase activity (AST and ALT).

On the other hand, our results are in contrast with those obtained by Hassan *et al*. (2002) who reported that fenitrothion caused significant elevation in AST activity. Some studies recorded an increase in ALT and AST activities after fenitrothion treatment (Fahmy and Darwish, 2002; El-halwagy *et al.,* 2008).

In the present study, a reduction in plasma transaminases was prominent in animals treated with fenitrothion may be attributed to either the effect of pesticide metabolite which inhibited several endogenous enzymes particularly ALT, AST and /or to the increased rate of catabolism of these enzymes in plasma of treated animals (Kramer, 1989). Moreover, Hashem (1980) and Talcott (1979), reported that the depression in the activity of transaminases may be due to the formation of complex compounds with AST or ALT in the liver.

Low albumin levels in our results may be attributed to impaired synthesis as a result of liver diseases, increased breakd-own of protein due to tissue damage or inflammation, increased protein loss associated with renal disease.

On the contrary, the results of the present work agree with (Hassan *et al*, 2002), they found that fenitrothion orally administration into rabbits resulted in significant changes in total protein and albumin. In our study the protective role of vitamin E were observed by decreasing total protein concentrations compared to fenitrothion treatment alone.

Our results in line with (El-halwagy *et al*. 2008), who found reduction in albumin after treated 1/30 LD50 of fenitrothion for 4 days.

The creatinine level was declined markedly in treated groups with fenitro-thion and vitamin E, which may be attributed to decrease in the muscle mass of treated animals (Lees *et al.,* 1994).

An elevated in blood urea level in our data may be due to decrease in the glomerular filtration rate (GFR)/ or total renal blood flow in treated animals and may reflect an accelerated rat of protein catabo-lism rather than decreased urinary excretion of urea (Finco, 1989). Also, elevated blood urea may be due to faulty excretion, as occurs in renal failure (Hood, 1980).

Our results showed that vitamin E may have protective effect in decreasing urea concentration. Pararell result was recorded in two comparative studies by (Hassan *et al.,* 2002 and El-halwagy *et al*., 2008), they reported increase in urea levels following fenitrothion treatment.

Regarding the plasma cholinesterase (ChE) activity, considered a standard biomarker of organophosphorus poisoning. The present study revealed that fenitrothion treatment at all doses induces the classical inhibitory effect of organophosphorus insecticides. Similar result carried out by Okahashi *et al*. (2005), who reported the inhibition in ChE activity occur when animals intoxicated with different doses of

fenitrothion for different periods. The inhibition of ChE that restricts the activity of acetylcholine (Ach) in space and time causes an increase in Ach content at sites of cholinergic transmission in the body. The inhibition of ChE is the most plausible explanation for much of the symptom-otology following OP intoxication (Yamashita *et al*., 1997). Our data are in line with several studies which reported a marked inhibition of ChE activity followed organophosphorus insecticides administration in different animal species (Abdallah, 2004; Antonijevic et al., 2005; Hammam and Abdel-Mottaleb, 2007).

Our finding in accordance to EL-halwagy *et al*. (2008) reported inhibition in ChE activity when rat treated with different doses of fenitrothion for 28 days.

The above findings were confirmed by histopathological changes in liver and kidney under the intoxication effect of fenitrothion. The present study revealed that fenitrothion showed varying pathological signs depending on the dose; high dose caused marked damage of the liver tissues in the form of vacuolar degeneration of hepatocytes and focal hepatic hemorrhage. The kidney exhibited focal renal hemorrhage, vacuolations of endothelial lining glomerular tufts and eosinophilic protein cast in the lumen of some renal tubules. These findings support the results of the study which stated that fenitrothion was found to induce ultra structural changes in liver cells especially after 12 h exposure; where nuclear membrane was completely distorted (El-halwagy., *et al.,* 2006). Nuclear intactness was totally lost and smooth endoplasmic reticulum and Golgi apparatus was abnormally enlarged after 24 h of intoxication (Kumar *et al.,* 1993).
These finding are supported by that previously recorded by El-kashoury (1999), El-halwagy (2000) who found that rats treated with Ops induced changes in hepatocytes, infiltration of inflammatory cells and hemorrhages in liver tissues.

The micronucleus test is considered one of cytogenetic test in this study where chromosome damage could be detected as a result of mutagenic effects of some chemical and physical agent. The cytological recognition of chromosome damage is limited to cells that undergo proliferation after exposure to the damage agent (Hammam and Abdel-Mottalab, 2007). Several studies in population exposed to pesticides have showed that the micronucleus assay is good method of detecting increase of cytogenetic damage in exposed individuals (Gomez-Arroyo *et al.,* 2000).

Many studies have demonstrated the efficiency of the micronucleus assay to detect DNA damage under the effect of pesticides (Holland et al., 2002 and Abdel-Aziz, 2004).

In the present study fenitrothion separately and in combination with vitamin E induce micronucleated cells, this may indirectly reflect chromosome breakage or impairment of the mitotic apparatus. Similar results were reported by many authors (Titenko-Holland *et al*., 1997; El-kahtib and Shalaby, 2001; Hammam and El-kahtib, 2004). They found increase in the frequency of micronucleus in bone marrow of rats after exposure to organophosphorus insecticides. Organophosphorus pesticides are chemical alkylating agents and therefore could be mutagenic or carcinogenic (Chen *et al.,* 1981). There is evidence that some organophosphorus pesticides may have *in-vivo* genetic effects, suggesting a possible link of cancer with long term or repeated heavy exposure (Hatjian *et al*., 2000). Our findings of increase in micronucleus frequency in bone marrow of rats indicate a potential hazard posed by pesticides exposure. These data are in line with several studies which reported a high prevalence of micronucleus frequency as a biomarker of chromosome damage (Davis *et al.,* 1998; Holland *et al.,* 2002 and Gomez-Arroyo *et al.,* 2000). In agreement to our results Liberman *et al*. (1998), reported that organophosphorus compounds have very specific toxic effects; they are also neurotoxic, immunotoxic and genotoxic.

In Conclusions, our results demonstrated that, intoxication with fenitrothion induced significant damage of liver and kidney tissues leading to imbalance in liver and kidney enzymes. However, supplementation with vitamin E during our experimental period partially ameliorates the toxic effect of fenitrothion on the liver and kidney tissues and their

functions. Further studies are recommended to assess the level of recovery of the organs and their functions in case of stopping the intoxication with fenitrothion and prolonging the duration of vitamin E supplementation.

## References


1. **Abd Allah A A (2004):** Biochemical and histopathological studies on the effect of some organophosphorus insecticides "profenofos" on albino rats. M.Sc. thesis. Faculty of Agri. Cairo. Univ.
2. **Abdel Aziz M M (2004)** : Biochemical and genotoxic changes in white rats as exposed to butachlor and thiobencarb herbicides. M. Sc. Thesis, Faculty of Agriculture. Cairo Univ.
3. **Alder I D, U K Liesch, Van Hummelen P and Kirsch-Volders M (1991)** : Mouse micronucleus test with known and suspect spindle poisons: results from two laboratories. Mutagenesis, 6 : 47-53.
4. **Alsahhaf Z Y (2006):** Toxicity of sumathion on albino rats: hematological and biochemical studies, J. Appl. Sci., 6 (14).
5. **Antonijevic B, Bokonjic D, Stojiljkovic M P, Kilibarda V, Milovanovic Z A, Nedeljkovic M and Maksimovic M (2005) :** Efficacy of trimedoxime in mice poisoned with dichlorvos, heptenophos or monocrotophos. Basic Clin Pharmacol Toxicol., 96 (2) : 111-7.
6. **Ayyat M S, Abd-El-Monem U M, El-Gendy H M and El-Fatah H (2000)** : Profenofos effects on rabbit performance and their amelioration by using natural clay minerals. World Rabbit Science., 8 (4) : 169-175.
7. **Chen H H, Hsueh J L, Sirianni S R and Huang C C (1981)** : Induction of sister chromatid exchanges and cell cycle delay in cultured mammalian cells treated with eight organophosphorus pesticides. Mutat. Res., 88 : 307-316.
8. **Cleik A, Mazmanci B, Camlica Y and Askin A (2003)** : Cytogenetic effects of lambda-cyhalothrin on wistar rat bone marrow. Mutat. Res., 539 : 91-97.
9. **Cszerharti T, Orgacs E F (1995) :** Charge transfer chromatographic study of the binding of commercial pesticides to various albumins, J. Chromatgr., A. 699 :285-290.
10. **Davis H W, Kennedy S M, Teschke K and Quintana P J E (1998)** : CCytogenetic analysis of South Asian berry pickers in British Columbia using the micronucleus assay in peripheral lymphocytes. Mutat. Res., 416 : 101-113.
11. **Drury R A and Wallington E A (1980)** : Carletons histological techniques, fifth ed., Oxford Univ press. London New York, Toronto pp.2411-242.
12. **Domas B L (1975):** Quantitative colorimeteric determination of total protein. Clin Chem.,21-1:159-66.
13. **Doumas B T, Watson W A and Biggs H G (1971):** Quantitative colorimetric determination of albumin in serum or plasma, Clin. Chem. Acta., 31: 87-91.
14. **El-halwagy M E A, Darwish N S and Zaher E M (2008):** Prophylactic effect of green tea polyphenols against liver and kidney injury induced by fenitrothion insecticide. Pesticide Biochemistry and Physiology, 91: 81-89.
15. **El-Halwagy M S (2000):** Protective effect of vitamin C and zinc on organophosphorus insecticides toxicity in albino rat. Ph.d. thesis, Faculty of Scien,, Cairo Univ.
16. **El-kashoury A A (1999)**: Subchronic toxicity studies of imidacloprid, profenofos and carbosulfan and their mixtures on albio rats. Ph..d. thesis, Faculty of Agri, Cairo Univ.
17. **El-Khatib E N and Shalaby R H (2001) :** Genotoxic effects of the two pesticides and their mixture : *In-vivo* chromosomal aberrations and micronucleus asay. J. Union. Arab. Biol., V 16A : 335-380.
18. **Fahmy G A and Darwish F M (2002)** : Biochemical and pathological comparative results of fenitrothion and carbofuran pesticides and their residues in fat and meat of poultry. Vet Med. J., 50 (4) : 821-841.
19. **Finco D R (1989):** Kidney function. In: clinical Biochemistry of Domestic Animals. 4th Ed., J. Kaneko, Academic press, pp. 496-542.
20. **Gomez-Arroyo S, Diaz-Sanchez Y Meneses M A, Villalobos-Pietrini R and**
21. **J De leon-Rodriguez (2000) :** Cytogenetic biomonitoring in a Mexican Floriculture worker group exposed to pesticides. Mutat. Res., 466 : 117-124.
22. **Hammam F M (2006) :** Genetic polymer-phism for NAT2, GSTM1 and GSTT1 genes in Egyptian workers exposed to pesticides and micronucleus analysis in peripheral blood lymphocytes. J. Appl. Sci., 21 (8) : 248-273.
23. **Hammam F M and El-Khatib E N (2004)** : Trial for minimization the antifertility action and the genotoxicity of diazinon to male rats by using the different patterns of dipping. J. Appl. Sci., 19 (2) : 280-315.

24. **Hammam F M A and Abdel-Mottaleb E M (2007) :** Studies of the genotoxic and histopathological effects of the organophosphorus insecticide "profenofos" on white rats. The Egyptian. J. of Hospital Medicine, V 29 : 685-706.
25. **Hashem A (1980)** : A study of the mode of action of paraquat in isolated perfused rat liver and its influencing by means of an SO-active cu-complex. Thesis, Tierarzr-liche Fakultat Ludwig Moximilians Universit at Muchen.
26. **Hassan Y M, Zidan Z H, Abd El-Daim Y A and Ashoush I S (2002) :** Effects of fenitrothion and cadmium xenobiotics on some biological systems in male rabbits as indicated to human nutrition practices. The first Conf. of the Central Agri. Pesticide Lab., 3-5 sep, Egypt, 58-265.
27. **Hatjian B A, Mutch E, Williams F M, Blain P Q and Edwards J W (2000) :** Cytogenetic response without changes in peripheral cholinesterase enzymes follow-ing exposure to a sheep dip containing diazinon *in-vivo* and *in-vitro*. Mutat. Res., 472 (1-2) : 85-92.
28. **Holland N T, Durmand P, Rothman N, Figgs L W, Blair A, Hubbard A and Smith M T (2002)** : Micronucleus frequency and proliferation in human lymphocytes after exposure to herbicide 2,4-dichlorophenoxyacetic acid *in-vitro* and *in-vivo*. Mutat. Res., 521 : 165-178.
29. **Hood W (1980)** : A-Z of clinical chemistry "A Guide for the Trainee", MTP Press Limited, Falcon House, Lancaster, England, 1st Ed.
30. **IARC (1991)** : Monograph on the evaluat-ion of carcinogenic risks to human, vol. 53, occupational exposures in insecticides application and some pesticides. Intern-ational Agency for Research on Cancer, Lyon : 53:70.
31. **Irfan-Altantas M and Namik-Denibas W (2002) :** The effects of fenthion on lipid peroxidation and some liver enzymes: the possible protective role of vitamin E and C. Turk. J. Med Sci., (32): 293-297.
32. **Ishimatsu S, Igisu H, Tanaka I, Inoue N, Akayama T (1988):** Effect of repeated inhalation exposure to fenitrothion powder on blood cholinesterase activity in rats. J. LIOEH , 10 (1): 71-75.
33. **Khan M F, Abidi P, Anwar J, Roy P K and Anuns M (1990)** : Pulmonary biochemical assessment of fenitrothion toxicity in rats. Bull. Environ. Contam. Toxicol., 45 : 598-603.
34. **Kramer J W (1989):** Clinical Enzymo-logy. In: Clinical Biochemistry of Domestic Animals. 4th Ed., J.J. Kaneko, Academic press, Inc., pp. 338-363.
35. **Kumar R, Roy S, Rishi R and Sharma C B (1993)**: Matabolic fate of fenitrothion in liver, kidney and brain of rat, Biomed Chromatogr., 7: 301-305.
36. **Lees G E, Willard M D and Green R A (1994) :** Urinary disorder, In: Willard M D H Tvedten and G H T Urnwald (eds). Small animals clinical diagnosis by laboratory methods. Pp : 141-145. W B Sunders Company. Philadelphia.
37. **Liberman A D, Craven M R, Lewis H and Namanza J H (1998)** : Genotoxicity from domestic use of organophosphate pesti-\cides.J. Occup. Env. Med., 40 : 954-957.
38. **Okahashi N, Sano M, Migeta K, Tamano S , Higuchi H, Kamita Y and Seki T (2005) :** Lake of evidence for endocrine disrupting effects in rats exposed to fenitrothion in utero and from weaning to maturation. Toxicology, 206: 17-31.
39. **Reitman C and Frankal S (1957) :** A colorimetric method for the determination in serum glutamic oxaloacetic and glutamic pyruvic transaminases. Am. J. Clin. Path., 28: 65.
40. **Schermer S (1967):** In blood Morphology of Laboratory Animals. Third ed., F.A. Davi, co., Philadelphia p. 42.
41. **Schmid W (1976) :** Chemical mutagen testing on in-vivo somatic mammalian cells. Agents Actions, 3: 77-89.
42. **Sendecore G W (1969)** : "Statistical method" Aiwa State Univ. press. Ames., USA. Fourth Edition.
43. **Sivapiriya V, Karan J A and Venkatraman S (2006)** : Effects of dimethoate (o,o- dimethyle-S-methyl carbamoyl methyl phosphorodithioate) and Ethanol in antioxidant status of liver and kidney of experimaental mice. Pesticides. Biochem and Physiology, 85 : 115-121.
44. **Talcott R E, Shu H and Wei E T (1979) :** Dissociation of microsomal oxygen reduction and lipid peroxidation with the electron acceptors paraquat and manadione. Biochem. Pharmacol., 28 (5) : 665.
45. **Titenko-Holland N, Windham G, Kolachana P, Reinisch F , Parvatham S, Osorio A M and Smith A M (1997) :** Genotoxicity of malathion in human lymph-ocytes assessed using the micronucleus assay in-vitro and in-vivo: A study of malathion exposed worker. Mutat. Res., 388 : 85-95.
46. **Tsatsakis AM, Manousakis A, Anastasaki M, Tzatzarakis M, Katsanoulas K, Delakiv C and**

**Agouridakis P (1998) :** Clinical and toxicological data in fenthion and omethoate acute poisoning. J. Environ. Sci. Health, 33 (6) : 657-670.

47. **Varsik P, Pechan I, Buranova D and Kuceru P (2004):** An acute toxic neuropathy caused by organophosphate poisoning in hens. Brutis LLek Listy, 105 (3): 91-4.
48. **Waber H (1966):** Cholinestrase kinetic colorimetric method. Dtsch. Med. Wschr., 91 : 1927.
49. **Wild D (1978)**: Cytogenetic effect in the mouse of 17 chemical mutagens and carcinogens evaluated by micronucleus test. Mutat. Res., 56 : 319-327.
50. **Yamashita M, Tanaka J and Ando Y (1997) :** Human mortality in organophosphate poisoning, Vet Hum. Toxicol., 39: 84-85.
51. **Zahran M M, Abdel-Aziz B, Abdel-Raof A and Nahas E M (2005):** The effects of subacute doses of organophosphorus pesticides, Nuvacron, on the biochemical and cytogenetic parameter of mice and their Embryo. Research. J. of. Agriculture and Biological Sciences, 1 (3): 277-283.
52. **Zhou P Liu B and Lu Y (2005):** DNAdamaging effects of carbsulfan and its main metabolites on mice by micronucleus test and single cell gel electrophoresis. Sci. China C Life Sci., 48 (1) : 40-47.

# التأثيرات السمية لمبيد الفينتروثيون وفيتامين E كعامل مضاد للاكسدة على العوامل البيوكيمائية , الطفرية و الهستوباثولوجية فى الجرذان البيضاء

**فؤاد عبد الرحيم* –عوض عباس رجب* - فاطمة محمد همام**- -حسام الدين حمدي****

*قسم الكيمياء الحيوية- كلية الزراعة – جامعة القاهرة

**قسم سمية المبيدات للثدييات والاحياء المائية- المعمل المركزى للمبيدات- وزارة الزراعة

---

زاد استخدام المبيدات بمعدلات كبيرة. مما أدى الى زيادة الخطر من التعرض لمثل هذه الكيماويات فى مجالات الصناعة والزراعة على جميع المستويات. أن التعرض للمركبات الفسفوعضوية والمستخدمة كمبيدات فى مجال الزراعة يعتبر من عوامل الخطورة للجنس البشرى. يعتبر الفينتروثيون من أهم مبيدات الفسفوعضوية والتى تم دراستها على الفئران البيضاء فى وجود بعض مضادات الاكسدة مثل فيتامين E . الهدف الاساسى من هذه الدراسة هو تقييم التأثيرات البيوكيمائية والطفرية والهستوباثولوجية لمبيد الفينتروثيون منفردا أو بالاضافة الى فيتامين E كعامل مضاد للاكسدة لتقليل التأثير السمى للمبيد المختبر. تم اختبار ذكور الجرذان البيضاء عن طريق التجريع بالفم لمدة 30 يوم باستخدام ثلاث مستويات للجرعة 20/1 , 40/1 و 80/1 من الجرعة القاتلة النصف مميتة فى وجود وعدم وجود فيتامين E.

أوضحت النتائج تغير واضح فى معدلات الاختبارات البيوكيمائية,و تثبيط ملحوظ لانزيم اسنيل كولين استيريز, كذلك زيادة معنوية فى احداث النويات الصغيرة فى خلايا نخاع عظام الجرذان البيضاء على مستوى الجرعات المستخدمة. وظهر انخفاض فى المؤشرات البيوكيمائية وكذلك عدد النويات الصعيرة فى الجرذان المعاملة بالفينتروثيون فى وجود فيتامين E مقارنة بمجموعة الجرذان المعاملة بالفينتروثيون فى غياب فيتامين E . اظهرت ايضا الاختبارات الهستوباثولوجية تغير ملحوظ فى انسجة الكبد والكلى للجرذان المعاملة بالمبيد سواء كان منفردا أو متعاقبا مع فيتامين E . نستخلص من هذه الدراسة أن فيتامين E له دور فى تقليل التأثيرات السمية للفينتروثيون .