Some Physiological and Biochemical Effects of Oshar Extract and Abamectin Biocide on Male Albino Rats

El- Shafey[1], A. A. M.; Seliem[1], M. M. E.; El-Mahrouky[2], F.; Gabr[2], W. M. and Kandil[2], R. A.

[1]Zoology Department, Faculty of Science, Benha University, Benha, Egypt
[2]Plant Production Research institute, Agric. Res. Centre, Dokki, Giza, Egypt
Rosy.mohamed78@yahoo.com

Abstract: The impact of the two natural products; extract of oshar leaves (*Calotropis procera*) and Vertimic biocide (abamectin) were studied on some physiological and biochemical parameters of mature male albino rats (*Rattus norvegicus*). The LD_{50} was determined for both compounds and its values were 95.52 and 8.7 mg/kg b.w. for oshar and abamectin, respectively. Animals were treated orally with (1/4 LD_{50}) of each compound as a single dose. Blood and semen samples were collected after 1, 2, 3 and 7days of treatment. Plasma was separated and stored at -20°C until biochemical and hormonal analysis. The results revealed that total count of red blood corpuscles (RBCs) and white blood corpuscles (WBCs) were non significantly decreased in animal group treated with oshar extract compared to control group. Total count of RBCs was significantly decreased, while that of the WBCs was significantly increased post abamectin treatment compared to control ones. Haemoglobin content was significantly decreased, while haematocrit value was significantly increased post extract and abamectin treatments compared to control group. Plasma levels of amino transferase enzymes (ALT & AST), urea, uric acid and creatinine were significantly increased, while that of total protein, glutathione-s-transferase (GST), catalase (CAT) and testosterone were significantly decreased post extract and abamectin treatments compared to control group. Sperm count was non significantly decreased post extract treatment, while the decrease was significant post abamectin treatment compared to control group. Sperm motility was significantly decreased in animal groups treated with oshar and abamectin compared to control group. In conclusion, abamectin was found to be more effective than oshar on the measured parameters so, abamectin was more toxic for rat.

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1. Introduction

Rodent pests are controlled by chemical compounds that cause health hazards and environmental pollution in addition to the toxic effect to non-target organisms. These problems provided an impetus to get poisonous natural materials for using as rodenticides. Some natural products as oshar leaves extract and Vertimic biocide (abamectin) proved promising efficiency for control of rodent species **(Gabr, 2005).**

The widespread loss of livestock and low animal production were attributed to the existence of *Calotropis procera* in the arid Northern regions of Nigeria **(Burkill, 1985).** Administration of *Calotropis procera* leaves to sheep causes tachycardia and transitory cardiac arrhythmia at auscultation 30 min after dosage **(Jmaia *et al.*, 2011).**

Al-Robai *et al.* (1993) and Hussein *et al.* (1994) reported the presence of alkaloids, flavonoids, cardiac glycosides as well as sterols and uscharin in the entire plant, *Calotropis procera*. A significant decrease of Hb, RBCs, WBCs, and Hct value post ethanolic *Calotropis procera* extract was reported by **Ali (2006)**. **Mourad (2007)** studied the effect of 1/4 LD_{50} of ethanolic leaves extract *Calotropis procera* on rats and reported significant increases of AST, ALT enzyme activities and serum protein level.

Abamectin is highly toxic to insects and may be highly toxic to mammals (**Lankas and Gordon, 1989).** Vertimec caused reduction of RBCs, WBCs and Hb concentration. These effects were significantly more pronounced in Vertimec treated rats at the high dose **(Eissa and Zedan, 2010)**.

Abamectin revealed significant increases in the liver function parameters (i.e. ALT, AST activities, acid phosphatase activity, serum albumin, glucose and total protein levels). Also, kidney function parameters (uric acid and creatinine concentration) were severely affected **Eissa and Zedan (2010)**. The activities of the antioxidant enzymes like superoxide dismutase (SOD), glutathione peroxidase (GSH-Px) and glutathione-S-transferase (GST) were decreased by fenitrothion incubation more than endosulfan and abamectin **(El-Shenawy, 2010).** Decreased catalase levels in rat were reported with oshar leaves extract

and abamectin treatments by **EL-Deeb *et al.* (2002)** and **Khider *et al.* (2006).**

Intramuscular administration of aqueous and ethanolic flower extracts of *Calotropis procera* at doses of 10.0 or 5.0 mg/mouse/alternate day for a period of 20 days to sexually mature male albino mice induced functional sterility and has a potent antispermatogenic activity **Nidhi *et al.* (2001)**.

Abamectin caused a significant increase in the level of plsma testosterone. Sperm counts and sperm motility were significantly decreased in exposed males **Eissa *et al.* (2003)**.

The present work aims to study the effects of the two natural compounds on male albino rat, *Rattus norvegicus* to clarify the physiological and biochemical responses.

2. Materials and Methods

I- Pesticides:

Leaves of oshar plant, *Calotropis procera* (family: Asetipiadaceae) were collected from El-kilo 4 ½ Cairo- Suez Road. Oshar leaves were extracted by ethanol according to **Freedman *et al.* (1979).** Abamectin is a natural product produced by the soil microorganism *Strptomyces avermitillis*. The common name: Vertimic (1.8% EC), it was obtained from Syngenta Agro. Co. Switzerland.

- Determination of Half Lethal Dose (LD_{50}):

Mortality percentages were recorded up to 28 days after treated rats with oshar extract and abamectin biocide and LD_{50} was calculated according to **Weill (1952).**

II- Animal groups:

The present experiment was carried out on 100 mature male rats *Rattus norvegicus* (200-220gm) obtained from animal farm (Ministry of Health). Rats were kept at a constant environmental conditions throughout the period of the experiment, water and food were supplied *ad libitum*. The rats were divided into 3 groups. The first group acted as control. The second and third groups administrated $1/4LD_{50}$ of oshar leaves extract and abamectin, respectively as a single dose.

III- Blood sampling and analysis:

Blood samples were collected by heparinized syringes from the orbital vein of rats after 1, 2, 3 and 7 days of oshar and abamectin treatments.

Plasma was separated after centrifugation (3000 rpm for 15 min.) and stored at -20 °C until used for biochemical and hormonal determinations.

The total count of red blood cells (RBCs) and white blood cells (WBCs) were estimated as described by **Schalm *et al.* (1975),** haemoglobin content was determined according to the method of **Wintrobe (1967)** and haematocrit value (Hct %) was determined according to **Britton (1963).**

Plasma AST and ALT, urea, uric acid, creatinine and total protein were determined calorimetrically by spectrophotometer according to the method of **Reitman and Frankel (1957), Fawcett and Soctt (1960), Barham and Trinder (1972), Schirmeister (1964)** and **Barawill and David (1949),** respectively using El-Gamhoria kits**.** Glutathion-S-transferase and Catalase activity were determined by **Habig *et al.* (1974)** and **Aebi (1984),** respectively using Biodiagnostic kits**.** Testosterone level was measured by Radioimmunoassay kit from Monobind Inc. USA according to **Horton and Tait (1966).**

VI- Sperm count and sperm motility:

Sperm count was estimated according to the method described by **Robb *et al.* (1978)** and sperm motility was determined according to **Bearden and Fuquay (1980)**.

VII- Statistical analysis:

The obtained results were statistically analyzed by one way ANOVA and Least Significant Difference (LSD) at ($p< 0.05$) using Costat program **(Cohort, 2005)**.

3. Results

1- Acute oral toxicity:

The LD_{50} of oshar extract and abamectin biocide of male albino rat is shown in Table (1) which revealed that mortality percentages through 28 days increased gradually with increasing dose for the two tested compounds. Also, the LD_{50} values were 95.52 and 8.70 mg/kg b.w. for oshar and abamectin, respectively. It was cleared that abamectin exhibited high toxicity to male albino rat than oshar extract. In addition, abamectin toxicity was about 10 times more than that of oshar.

2-Effect of pesticides on haematological parameters:

As shown in Table (2) total count of red blood corpuscles (RBCs) and white blood corpuscles (WBCs) were non significantly decreased in animal groups treated with oshar extract compared to control group. Total count of RBCs was significantly decreased ($p< 0.05$), while that of the WBCs was significantly increased ($p< 0.05$) post abamectin treatment compared to control ones. Haemoglobin content was significantly decreased ($p< 0.05$), while haematocrit value was significantly increased ($p< 0.05$) post extract and abamectin treatments compared to control group.

Data in Table (3) revealed that oshar and abamectin treatments induced significant ($p< 0.05$)

elevations of plasma ALT and AST activities compared to control values at all tested times. Oshar and abamectin treatments induced significant ($p< 0.05$) decreases of plasma protein with prolongation of the period post treatment. Abamectin showed more toxic effect than oshar on ALT, AST activities and protein.

4- Effect of pesticides on kidney function:

Table (4) showed that plasma urea, uric acid and creatinine levels were significantly increased ($p< 0.05$) with prolongation of treatment period with oshar and abamectin. Abamectin showed more toxic effect than oshar on urea, uric acid and creatinine.

5- Effect of pesticides on glutathione-s-trasferase and catalase:

Data in Table (6) showed that the plasma level of glutathione-s-transferase was significantly decreased ($p< 0.05$) in animal groups treated with oshar leaves extract after 1 and 7 days, and the decrease was non-significant after 2 and 3 days compared to control group. The level was significantly decreased($p< 0.05$) in animal group treated with abamectin compared to control group. Abamectin was more effective than oshar on G-S-T activity. Catalase level of animal groups treated with oshar leaves extract and abamectin was significantly ($p< 0.05$) decreased compared to the control group.

6- Effect of pesticides on sperm count, sperm motility and testosterone:

The sperm count in animal groups treated with oshar leaves extract was non significantly decreased after 1, 2, 3 and 7 days compared to that of the control group and the decrease was significant ($p<0.05$) in animal group treated with abamectin after all tested times. Abamectin was more effective than oshar on sperm count.

Sperm motility was significantly decreased ($p< 0.05$) in animal groups treated with oshar leaves extract and abamectin after 1, 2, 3 and 7 days compared to that of the control groups.

Testosterone level was non significantly decreased at all tested times with oshar extract and the decrease was significant ($p< 0.05$) at all tested times with abamectin biocide (Table 7).

Table (1): Acute oral toxicity (LD_{50}) of oshar leaves extract and abamectin biocide on the male albino rats through 28 days.

compound	Dose (mg/kg)	Mortality (%)	LD_{50} (mg/kg)
Oshar leaves extract	31.25	0	95.52
	62.50	20	
	125.00	60	
	250.00	100	
Abamectin biocide	2.50	0	8.70
	5.00	20	
	10.00	80	
	20.00	100	

Table (2): Effect of oral administration of a single sublethal dose (1/4 LD_{50}) of oshar leaves extract (23.88 mg/kg) and abamectin biocide (2.18 mg/kg) on blood parameters of male albino rats.

Days of sampling	Parameters							
	RBCs (Million /mm^3)		WBCs (Thousand/mm^3)		Hb (mg/100ml blood)		Hct (%)	
	Oshar	Abamectin	Oshar	Abamectin	Oshar	Abamectin	Oshar	Abamectin
0 (control)	4.33 ±0.46	4.33^{a} ±0.46	11.35 ±0.05	11.35^{c} ±0.05	13.88^{b} ±3.21	13.88^{a} ±3.21	30.21^{d} ±4.00	30.21^{c} ±4.00
1	4.25 ±0.29	3.94^{a} ±1.31	10.88 ±1.47	10.06^{d} ±0.49	15.93^{aA} ±5.22	13.67^{aB} ±0.78	39.00^{a} ±0.79	38.04^{b} ±5.22
2	4.21^{A} ±0.27	3.01^{bB} ±1.47	10.79^{B} ±0.83	13.08^{bA} ±0.98	14.32^{b} ±1.96	11.98^{b} ±0.93	38.79^{a} ±2.05	39.39^{a} ±3.33
3	4.07^{A} ±0.04	2.62^{bB} ±0.83	11.04^{B} ±0.49	$14.21^{a\,A}$ ±2.11	11.33^{cA} ±0.69	11.87^{bB} ±1.01	36.36^{bB} ±1.11	$39.18^{a\,A}$ ±2.10
7	3.67^{A} ±0.21	2.60^{bB} ±0.68	11.19^{B} ±0.68	$14.69^{a\,A}$ ±1.45	10.89^{cA} ±2.01	9.19^{bB} ±0.56	33.05^{cB} ±2.33	$39.71^{a\,A}$ ±2.00

Values are expressed as means (5 rats) ± standard errors

^{abcd} values in column with different letters are significantly different at ($P \leq 0.05$).

^{AB} values in row with different letters are significantly different at ($P \leq 0.05$).

Table (3): Effect of oral administration of a single sublethal dose (1/4 LD_{50}) of oshar leaves extract (23.88 mg/kg) and abamectin biocide (2.18 mg/kg) on plasma (ALT), (AST) and total protein of male albino rats.

Days of sampling	Parameters					
	ALT (U/L)		AST (U/L)		Protein (g/dl)	
	Oshar	Abamectin	Oshar	Abamectin	Oshar	Abamectin
0 (control)	39.00^{d} ±0.59	39.00^{e} ±0.59	36.00^{e} ±5.85	36.00^{d} ±5.85	5.02^{aA} ±0.30	5.02^{aB} ±0.30
1	48.00^{cA} ± 0.53	43.00^{dB} ±0.44	41.00^{dA} ±2.50	41.00^{cdA} ±2.31	4.83^{aA} ±0.27	4.27^{bB} ±0.14
2	48.00^{cA} ±1.03	52.00^{cA} ±0.10	42.00^{cA} ±3.77	44.67^{cA} ±2.89	4.27^{bA} ±0.30	3.08^{bB} ±0.53
3	52.00^{bA} ±0.06	57.00^{bA} ±0.28	47.00^{bB} ±0.00	52.00$_{bA}$ ±0.00	3.98^{bA} ±0.18	1.43^{cB} ± 0.03
7	57.00^{aA} ±0.19	62.00^{aA} ±2.00	48.00^{aB} ±0.00	59.00^{aA} ±0.00	3.53^{cA} ±0.98	1.73^{cB} ± 0.10

Values are expressed as means (5 rats) ± standard errors

^{Abcde} values in column with different letters are significantly different at ($P \leq 0.05$).

^{AB} values in row with different letters are significantly different at ($P \leq 0.05$).

Table (4): Effect of oral administration of a single sublethal dose (1/4 LD_{50}) of oshar leaves extract (23.88 mg/kg) and abamectin biocide (2.18 mg/kg) on plasma kidney function parameters (urea, uric acid and creatinine) of male albino rats.

Days of sampling	Parameters					
	Urea (mg/dl)		Uric acid (mg/dl)		Creatinine (mg/dl)	
	Oshar	Abamectin	Oshar	Abamectin	Oshar	Abamectin
0 (control)	32.83^{d} ±0.44	32.83^{d} ±0.44	0.92^{d} ±1.45	0.92^{d} ±1.45	0.25^{c} ±0.12	0.25^{e} ±0.12
1	35.17^{cA} ±0.33	35.17^{cA} ±0.21	1.89^{cA} ±0.96	1.75^{cA} ±0.00	1.95^{abA} ±0.09	1.18^{dB} ±0.08
2	38.32^{bB} 1.11	39.02^{bA} ±3.01	2.28^{bcA} ±0.65	1.93^{cA} ±0.22	1.70^{bA} ±0.22	1.88^{cA} ±1.08
3	40.56^{bA} ±1.69	39.12^{bB} ±2.25	2.75^{abB} ±0.94	7.01^{bA} ±0.87	2.04^{abA} ±0.64	2.14^{bA} ±1.42
7	42.81^{aB} 2.00	50.82^{aA} ±4.00	3.22^{aB} ±0.38	8.56^{aA} ±0.53	2.29^{aB} ±0.58	4.30^{aA} ±0.79

Values are expressed as means (5 rats) ± standard errors

^{Abcd} values in column with different letters are significantly different at ($P \leq 0.05$).

^{AB} values in row with different letters are significantly different at ($P \leq 0.05$).

Table (5): Effect of oral administration of a single sublethal dose (1/4 LD_{50}) of oshar leaves extract (23.88 mg/kg) and abamectin biocide (2.18 mg/kg) on plasma antioxidant enzymes of male albino rats.

Days of Sampling	parameters			
	G-S-T (µmol/min/mg protein)		Catalase (µmol/g)	
	Oshar	Abamectin	Oshar	Abamectin
0 (control)	0.46^{a} ±0.12	0.46^{a} ±0.12	53.92^{a} ±1.39	53.92^{a} ±1.39
1	0.34^{b} ±0.40	0.34^{bc} ±4.62	47.50^{bA} ±0.89	41.75^{bB} ±2.92
2	0.43^{aA} ±0.44	0.31^{cB} ±0.12	48.00^{bA} ±0.32	41.94^{bB} ±0.37
3	0.45^{aA} ±1.41	0.35^{bB} ±0.53	45.21^{cA} ±0.80	40.10^{bB} ±1.83
7	0.29^{c} ±0.06	0.30^{bc} ±0.22	46.29^{bcA} ±1.93	42.66^{bB} ±3.02

Values are expressed as means (5 rats) ± standard error

^{abc} values in column with different letters are significantly different at ($P \leq 0.05$).

^{AB} values in row with different letters are significantly different at ($P \leq 0.05$).

Table (6): Effect of oral administration of a single sublethal dose (1/4 LD_{50}) of oshar leaves extract (23.88 mg/kg) and abamectin biocide (2.18 mg/kg) on sperm count, motility and plasma testosterone of adult male albino rats.

Days of sampling	parameters					
	Sperm count/ ml X 125 X 104		Sperm motility (%)		Testosterone (ng/ml)	
	Oshar	Abamectin	Oshar	Abamectin	Oshar	Abamectin
0 (control)	29.23 ±1.51	29.23^{a} ±1.51	84.30a ±3.71	84.30a ±3.71	4.36 ±0.47	4.36a ±0.47
1	28.25^{A} ±0.98	26.48^{cB} ±0.53	77.75bA ±1.20	72.87bB ±2.19	4.50 ±1.20	4.06a ±0.18
2	25.33^{B} ±1.00	28.25b^{A} ±1.18	77.50bA ±4.36	68.07cB ±2.58	3.90A ±1.00	2.85bB ±0.18
3	25.25 ±2.16	24.72^{c} ±2.22	73.50cA ±5.01	40.18eB ±3.13	3.97A ±0.98	2.54bB ±0.00
7	25.25^{A} ±3.01	20.88^{dB} ±1.19	69.00dA ±6.21	65.18dB ±1.73	3.15A ±1.01	2.44bB ±0.25

Values are expressed as means (5 rats) ± standard errors

^{Abcde} values in column with different letters are significantly different at ($P \leq 0.05$).

^{AB} values in row with different letters are significantly different at ($P \leq 0.05$).

4. Discussion

The LD_{50} values through 28 days were 95.52 and 8.70 mg/kg b.w. for oshar and abamectin, respectively which are closely agreed with those obtained by **Mourad (2007)** who found LD_{50} of oshar plant extract to rat was 82.0 mg/kg b.w. and 92.6 mg/kg by **Ali (2006).** On the other side, the value ranged between 8.7 to 12.8 mg/kg for abamectin **(Lankas & Gordon, 1989 and Converge, 2010).** Toxic effects of whole latex were reported for *Calotropis procera* following its oral and parenteral administrations **(El Badwi *et al*., 1998).** The whole latex is rich in rubber like poly-isoprene fraction and predominantly exhibits proinflammatory effects that may account for its toxicity **(Singhal and Kumar, 2009).** The presence of cardiac glycosides, alkaloids, saponins, tannins and flavonoids was also reported by **Mossa *et al*. (1991).**

The obtained non significant decreases of RBCs and WBCs count post oshar extract treatment were in line with those of **Guy *et al.* (2011)** in rabbits. Abamectin caused reduction in RBCs count and hemoglobin content. Similar results were also reported in rats by **Eissa and zidan (2010)** who mentioned that this reduction may be attributed to more than one factor i.e. the failure to supply the blood circulation with cells from haemohepatic tissue, since the liver has an important role in the regeneration of erythrocyte and the possible destructive effect on erythrocyte by the toxicants. The obtained results are in agreement with those reported by **El-Abd (2001)** who found that abamectin significantly decreased the total number of RBCs, haemoglobin and hematocrit, while increased total number of WBCs due to the bone marrow stimulation. The decrease in hemoglobin content of the extract treated animals, suggested that administration of the extract may cause anemia as previously reported by **Mahmoud *et al.* (1979)** or due to the presence of some toxic principles in the extract as saponins **(Jato *et al*., 2009).**

Obtained results revealed significant ($p< 0.05$) increase of ALT and AST levels which may be due to damage of liver cells under the effect of extract or biocide **(Tilkian, *et al*., 1983**). In addition, the increases of plasma AST and ALT activities may be referred to diffusion of these enzymes from the intracellular sites due to the damage caused by the pesticides on the sub cellular level **(Amer *et al*., 1994).** In addition, ALT activity in the blood increased in conditions in which cells are damaged or dead **(Jimoh and Odutuga, 2001).** Elevation in the activities of serum ALT and AST treated with ivermactin may have been due to leakage from the organs into extracellular fluids due to change in endothelial permeability **(Arise and Malomo, 2009).**

On the other hand, **Ali (2006)** recorded decreases in ALT and AST after 15 days of treatment with 1/3 LD_{50} of oshar.

In the present study oshar and abamectin treatments revealed significant decreases of plasma total protein, which is in accordance with the previously recorded findings of **Al- Robai *et al.* (1993**) The rate of protein synthesis and/or catabolism in the muscles altering the activities of transaminases and the enzymes concerned with gluconeogenesis**.** Since liver is a major organ of protein synthesis, any diseases in liver can be seen as damage of hepatocytes with alteration of its

production capacity or, in case of kidney damage and increase loss of protein or muscle wasting via catabolism **(Wallace, 2007).** In addition**,** the administrated pesticides may containing compounds could cause bloat, thereby reducing appetite in animals **(Trease and Evans, 1989).**

Significant increases of plasma urea, uric acid and creatinine post oshar and abamectin treatments in the present study may be due to damage of the kidney cells and/or failure of kidney under the toxic effect of oshar and abamectin biocide **(Eissa and Zidan, 2010)**. This damage could be due to accumulation of active principles of the plant extract into the kidney, accumulation of hazards can be toxic to the tubular epithelial cells **(Park,1982).** Elevation of serum uric acid and creatinine concentrations of treated male albino rats may be attributed to reductions in glomerular filtration in kidney and reflect dysfunction of the kidney tubules **(Walmsley and White, 1994).** Reduced renal blood flow associated with higher serum urea concentration may impair the secretory function of the kidney **(Whealton *et al.*, 1994).**

Present work revealed occurrence of oxidative stress induced by oshar leaves extract and abamectin. Pesticides may induce oxidative stress **(Kale *et al.*, 1999)** and disturb membrane structure **(Michelangeli *et al.*, 1990).** This in turn can impair cellular structure and function **(Bergamini *et al.*, 2004).** Decreased plasma GST levels in the present study are in consistent with the finding of **(El-Shenawy, 2010)** who reported decreased GST activities in rat liver following exposure to insecticides fenitrothion, endosulfan and abamectin. He also added that organophosphorus insecticides consume GSH through a detoxification reaction and/or that GST catalyzes this reaction between GSH and xenobiotic regulating possible harm **(Mulder *et al.*, 1990).** The decrease in GST level in the present study may be due to that GST involved in detoxification of the oshar leaves extract and abamectin to non-toxic products or by rapidly binding and very slowly turning over the insecticide.

The activity of H_2O_2 scavenging enzyme CAT decreased significantly post oshar and abamectin treatments. The present results are coincident with **El-Demerdash (2011)** who reported that significant decreases in the antioxidant enzyme activities (GST and CAT) in liver proved the failure of antioxidant defense system to overcome the influx of reactive oxygen species generated. However, the inhibition of enzymes involved in free radical removal led to the accumulation of H_2O_2, which promoted lipid peroxidation of DNA, altered gene expression and cell death **(Halliwell and Gutteridge, 1999).** The decline in the enzyme levels may be due to an excessive formation of superoxide anions, thus resulting in an inactivation of H_2O_2 scavenging enzyme.

Obtained results revealed a non significant decrease in both sperm count and plasma testosterone post oshar treatment. However, the decrease was significant for sperm motility. These decreases may be due to the effect of pesticides on sex gland. In support to this view, **Akinloye *et al.* (2002)** observed that rat treated with extract of *Calotropis procera* showed varying degrees of testicular lesions, significant reduction in the seminiferous tubular diameter of the testis, which may affect sperm volume negatively and has probably affected testosterone production. These observations may partially explain why *Calotropis procera* was reported being used as anti-fertility agent **(Malhi and Trivedi, 1972)**. **Nidhi *et al.* (2001)** reported that the antifertility effect of *Calotropis procera* on mice can be attributed to the highly reduced sperm concentration and altered biochemistry of the genital organs.

Abamectin administration during this investigation was associated with decreased both sperm count and motility. These results are in consistent with those previously obtained by **Celik-Ozenci *et al.* (2011)** who reported that abamectin exposure for 6 weeks induces testicular damage and effects sperm dynamics in rats. The reduction in sperm concentration may be attributed to reduction in meiotic index of the testicular cells as a result of the passage of the insecticides, across the blood testis barrier and gain access to the germ cells in seminiferous tubules **(Dixon and Lee, 1973)**.

The level of testosterone was significantly decreased post abamectin treatment. These results are in accordance with the results reported by **El-betieha and Da'as (2003)** in rat treated with abamectin which could be explained by the fact that the pesticide acted directly on the testis and effected the androgen biosynthesis pathway. In addition, an agent acting directly on the brain, hypothalamus, or anterior gland will indirectly affect the testis and will possibly affect sexual activity **(Amman, 1982)**.

On the other hand, serum testosterone concentration did not show any significant change after abamectin exposure in rat **(Celik- Ozenci *et al.*, 2011)**.

Corresponding author
El- Shafey[1], A. A. M
Zoology Department, Faculty of Science, Benha University, Egypt
Rosy.mohamed78@yahoo.com

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