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EFFECT OF MORINGA LEAVES EXTRACTS AGAINST POISONED BY PB IN RATS

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ABSTRACT: ***This study was carried out to evaluate the effect of Moringa leaves extracts for treatment the toxicity by Lead in rats. Lead toxicity often to various clinical conditions, Batteries, power cables, computer, water pipes, found in petroleum oil, coal and tobacco. Moringa leaves were found to contain antioxidants. (237.1 mg/g) phenols and (141.7 mg/g) flavones. Phenols were found to contain 23 phenolic compounds, vanillic, salicylic, and Catechins phenols are present in large amounts. Exposure to Lead increased the activity of liver enzymes AST, ALT and ALP while the level of albumin was decreased there is a significant increase in the level of urea and creatinine. The addition of the water and acetone extracts reduced the harmful effect of lead poisoning the treatment with Moringa leaf extracts improved the activity of antioxidant parameters (SOD,CAT and MDA),and decrease in the accumulation of lead in both liver and brain in the experimental rats.***

Key words: ***Moringa leaves Poisoned by pb.***

INTRODUCTION

Environmental pollution is the presence of a pollutant in the environment such as air, water, soil and consequently in food which may be poisonous or toxic and will cause harm to living things in the polluted environment. Lead affects every one of the body's organ systems, especially the nervous system but also the bones, teeth, the kidneys, the cardiovascular, immune and reproductive systems (White *et al* 2007). Lead has been used widely since 5000 BC for application in metal products, pipelines, cables, as well as in paints and pesticides Adhikari, *et al.,* (2001)

This abundant ecological pollutant enters the atmosphere via fabrication of coal, oil, iron, batteries, and steel, and also from smelters, refuge, and tobacco smoke. It can enter the human body via uptake of food (65%), water (20%) and air (15%) Clayton *et al.,* (2002).

Target organs affected by lead are bones, brain, blood, kidneys and thyroid glands Shalan *et al*., (2005).

***Moringa oleifera*, is the new challenge of tradition medical plant use both *in vitro* and *in vivo* for reducing metal toxic in environment and living organism. (Paliwal *et al.*, 2011).**

Moringa provides a rich and rare combination of nutrients, amino acids, antioxidants, antiaging and anti-inflammatory properties used for nutrition and healing. The particular plant family is rich in a fairly unique group of glycoside compounds called glucosinolates and isothiocyanates. Small proteins/ peptides were isolated from the leaves of Moringa oleifera possessing antifungal and antibacterial activity (Dahot, 1988).

MATERIALS AND METHODS.

1- Leaves of Egyptian *Moringa Oleifera* were collected from Elmedoran, Elmesharak Keblly, Senoris, Faiom,

Egypt in February.The Leaves were dry and grounded into powder.

2- Chemical composition.

2.1. Crude protein was determined (dry basis) according to the modified micro-Kjeldahl (Pirjo, and Pekka, 1996).

2.2 Crude Lipid, Moisture content, ash and crud fiber were determined according to A.O.A.C. (2000).

2.3 Total carbohydrate determined by difference = 100 – (ash %+Protein %+ Fat%).

2.4 Total phenolic compounds was Extraction and determination according to the method described by Daniel, and George, (1972). Free phenolic compounds in the ethanolic extract was determined colorimetrically by the method of Folin as described by (Gulcin, *et al.,* 2002).

2.5 Extraction and determination of flavonoid compounds using the method reported by Dewanto *et al*., (2002).

2.6. Quantitative identification of phenolics and flavonoids by HPLC.

According to the modified method reported by Zuo, *et al.,* (2002).

2.7 Reducing power (Ferric chloride method)

A spectrophotometric method (Oyaizu 1986) was used for the measurement of reducing power.

3. Experimental animals.

Adult male albino rats (180 ± 20 g) were kept in plastic cages under hygienic for two weeks to acclimatized to laboratory conditions. The rats were fed on diets consisting of carbohydrates as starch 80 %, protein as Casein 10 %, cotton seed oil 5% salts mixture 4%, Hegested *et al.,* (1941). And vitamins mixture 1% Schneeman *et al.,* (1989). The animals were divided into one regime of them consists of 6 groups, each having 5 rats as follows (for 30 days). The first group was kept without any treatments as (Negative control), fed on standard diet. The second group were kept without any treatments as control fed on standard diet plus (CH3.coo) 2pb 4.4 mg/kg.bw. Positive Pb control. The third and for groups :rats were allowed to feed on standard diet plus Aqueous extract of *Moringa Oleifera* leaves at dose of 300 and 600 mg/kg b.w. orally respectively.

Groups 5 and 6 were feed on standard diet plus Acetone extract of. M. Oleifera leaves at doses 300 and 600 mg/kg bw. Orally respectively.

The experimental animals were killed by decapitation at the end of 30 days, then blood samples were collected and subjected to plasma separation.

Liver function:

A) Aspartate transaminase (AST) and Alanine transaminase (ALT) activity were determined in plasma by enzymatic colorimetric method as described by Young (1990).

B) Alkaline phosphatase (ALP) activity was determined colorimetrically as described by Moss, *et al* (1987).

C) Albumin (Alb) Concentration was determined as described by Canon *et al* (1974).

Kidneys function:

Urea and creatinine were determined as described by Young (2001).

Oxidative stress parameters:

- Superoxide dismutases (SODs) activity was determined in plasma as described by (Nishikimi *et al*., 1972).
- Catalase activity was determined in plasma as described by (Aebi 1984).
- Lipid peroxidation (LPO) level: determining the concentration of malondialdehyde (MDA) as described by Ohkawa *et al.*, (1979).

Statistical analysis was done using the analysis variance according to Landue and Everitt (2004).

RESULTS AND DISCUSSION

The *moringa oliefera* leaves contain total ash 7.98 %, crude lipid 3.22 %, crude protein 25.86 %, crude fiber 16.11 %, moisture 6.01 % and total carbohydrates 40.83 %.The results are in accordance with those of Borges, *et al.,* (2014).

They refer that *moringa* leaves chemical composition is complex, total ash 7.1 %, total lipids 4.7 %, crude protein 25.0 %, crude fiber 19.9 %, moisture 9.0 % and total carbohydrates 43.9 %.

Total phenolics and total flavonoids contents in watery extracts for the leaves were 237.1 mg/g and 141.7 mg/gbw respectively.

HPLC analysis of the ethanolic extract for the phenolic and flavonoids compounds (Table 1) showed the presence of 23 phenolic compounds which were varied in their amounts. Ten of thime are found in high levels, they are e-vanillic, Pyrogallol, Salycilic, Catechin, P-OH-benzoic, Ellagic, Alpha-coumaric, 3,4,5-methoxy-cinnamic, Protocatechuic and Chlorogenic , its amounts ranged between 1348.52 to 154.38 mg/100gm b.w. mean, Catechol , Caffeine , Caffeic , Epicatechin and Ferulic were found in moderate amounts. Rinsed between 131.51 – 108.41 mg/100 g dry wit. Coumarin, Benzoic, Iso-ferulic, Vanillic, Gallic, Cinnamic, 4-aminobenzoic and P-coumaric were found in low amounts.

Table (1): HPLC analysis of polyphenolics and flavonoids in of moringa leaves.

Phenolic compounds	Mg / 100g D.W	flavonoids	Mg / 100g D.W
Pyrogallol	739.22	Luteo.6-arabinose 8-glucose	214.22
Gallic	41.81	Luteo.6glocose 8-arabinose	3.71
4 – Amino-benzoic	11.21	Apig. 6-rhamnose 8-glucose	61.13
Protocatechuic	159.43	Apig. 6-glucose 8- rhamnose	34.25
Catechin	424.93	Naringin	24.14
Catechol	131.51	Luteolin	49.71
Chlorogenic	154.38	Hesperidin	167.38
Epicatechin	110.35	Rutin	3.94
P-OH-benzoic	219.84	Quercetrin-3-O-glucoside	26.39
Caffeine	121.59	Rosmarinic	131.04
Caffeic	118.94	Apig.7-O-neohespiroside	5.14
Vanillic	54.92	Kamp.3,7-dirhamoside	12.14
P-coumaric	10.89	Apig.7-glucose	20.83
Ferulic	108.41	Quercetrin	29.84
Iso-ferulic	68.37	Quercetin	2.41
e-vanillic	1348.52	Kaemp.3,(2-p-comaroyl) glucose	53.18
Ellagic	215.21	Naringenin	5.01
Alpha-coumaric	192.17	Hesperetin	28.71
Benzoic	79.23	Kampferol	6.84
Coumarin	84.93	Rhamnetin	5.03
3,4,5-methoxy-cinnamic	184.51	Apigenin	4.35
Salycilic	593.82	Acacetin	19.01
cinnamic	19.71		

Data in Table (1) showed that there are 22 components of flavonoids. Three of theme are found in high levels Luteo-6-arabinose 8-gloucose 214.22, Hesperidin 167.38 and Rosmarinic 131.04.

In vitro antioxidant activity (reducing power assay).

Data in Fig (1) showed that the reducing power of moringa leaves watery extracts (2.5% and 5%)/ were 36.1 and 199.2 mmol Ascorbic Eq, while such parameter for (2.5% and 5%) acetone extracts were 23.41 and 152.31 mmol Ascorbic Eq. The result are in accordance with that of Hossain, *et al.,* (2012) who found that reducing power was (53.925 ± 5.25 mmol Ascorbic Eq) for moringa leaves ethanol extract and it was(50.675 ± 3.699 mmol Ascorbic Eq) for methanol extract of the same sample.

- **Effect of moringa leaves extracts against Toxicity of Pb in rats.**
- **Effect of moringa leaves extracts on liver function test in rats against Pb Toxicity.**
- **From the data presented in Table (2)**
- **Data indicated that AST Activity were 20.0 and 19.0 U/L at zero time for negative and positive controls respectively. After 30 days, AST activity reached to 35 and 150 U/L for the two former controls.**
- **The addition of one of 300 and 600 mg/kg watery extracts to rats poisoned by Pb revealed significant reduction in AST and ALT comparing with Positive controls.**
- **The data in Table (2) show that (600 mg/kg) aqueous extracts group exhibited the highest effect (55 U/L AST) and (50 U/L ALT) comparing with all treated groups.**
- **AST / ALT ratio Table (2) showed marked increases for all treatments (20 and 30 days) comparing with positive control. The AST / ALT ratio recorded values under 5 (between 1.02 and 1.07) this proved that the harmful of induced diabetes affect liver but not heart (ratio more than 20) as reported by Murray *et al.,* (2006).**

Data in Table (2) show that The addition of one of 300 and 600 mg/kg watery or 300 and 600 mg/kg acetone extracts to rats poisoned by Pb revealed significant reduce in ALP activity which recorded 225, 192, 231 and 210 U/L after 30 days of treatment respectively comparing with Positive control. (360 U/L).

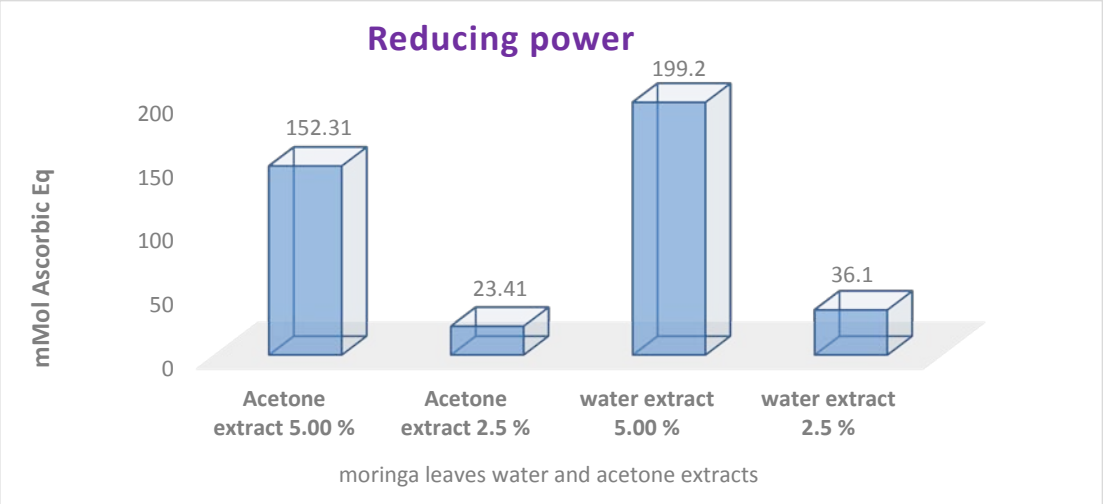

Fig (1): Reducing power activity for moringa leaves extracts

Table 2

Data in Table (2) showed that albumin levels in negative control (100 %) was reduced to (65 %) in the positive control (Pb toxicity), after 30 days of treatment, this decrease in serum albumin may be due to the effect of lead toxicity and cirrhosis of liver cells, which has lost the ability of RNA and protein synthesize.

The treated group one of (300 and 600 mg/kg/ Watery or acetone extracts) showed an increased in albumin values its comparing to positive control in most of tested groups. The present results are in a good agreement with obtained by Nabil *et al* (2011) and Bukola *et al* (2015).

They proved that there was marked decrease in the serum albumin content of rats poisoned by Pb when compared with that of the normal control rats, whereas feed supplemented with medical plants could significantly correct this metabolic disturbance.

- **Effect of moringa leaves extracts on kidneys function test in rats against Pb Toxicity.**
- **Blood urea level.**

Table (3) show that there is ahighly increased in serum urea and creatinine concentration as aresult of Pb toxicity on rats (positive controls) may be due to depletion of serum protein. The breakdown of amino acids and deamination that takes place to the formation of large amount of ammonia, and there fore an increase in ammonia circulation which is eventually converted to urea. Addition of water or acetone extracts of moringa leaves to the diet of rats poisoned by Pb readjusted the level of serum elevated urea and creatinine as compared to positive controls.

Effect of moringa oleifera leaves extract on oxidative stress in rats poisoned by Pb.

Data in Table (4) showed SOD and CAT activities in all groups, it can be noticed that, the negative control group showed the lowest values (50.9 U/mL) and (4.45) after 30 days, for SOD and CAT respectively while, the positive controls afforded the highest values (124.54 U/mL) and (9.91 U/L) for SOD and CAT respectively after 30 days of treatment. The addition of one of (300 and 600 mg/kg) watery or acetone extracts to poisoned group by Pb revealed significant reduction in SOD and CAT activity comparing with Positive controls. The obtained results agreed with those found by Debosree *et al.,* (2012). they demonstrated that the effectiveness of the antioxidant activities of *moringa oleifera* extracts on protecting against oxidative stress may be attributed to plant phenolics direct reactivity towards reactive oxygen species (ROS) caused by Pb toxicity .

The data show also that (600 mg/kg watery extracts) group exhibited the highest effect for SOD and CAT activities comparing with all treated groups.

Malondialdehyde Level (MDA):

Data in Table (5) show that the positive control exhibited the highest values, The addition of one of (300 and 600 mg/kg) watery or acetone extracts to poisoned groups by Pb revealed significant reduce in MDA level which recorded 0.361, 0.342, 0.373 and 0.340 U/mL after 30 days respectively.

Level of lead in organs rats poisoned by Pb.

Table (6) showed Pb levels in liver and brain tissues. it can be noticed that, the negative control group showed the lowest values (0.31 and 0.15 ug/g tissue) for liver and brain after 30 days, respectively comparing with Positive control (2.91 and 0.79 ug/g tissue) for liver and brain respectively

Table 3

Table 4

Table 5

Table 6

The treatment with Moringa leaf extracts resulted in a decrease in the accumulation of lead in both liver and brain in rats.

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تاثير مستخلصات اوراق المورينجا كمضاد للتسمم بالرصاص فى الفئران

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الملخص العربى

هذه الدراسة تهدف الى تقييم تاثير مستخلصات اوراق شجرة المورينجا على التسمم بالرصاص فى فئران التجارب التسمم بالرصاص يحدث نتيجة استخدام الرصاص فى كثير من الصناعات مثل البطاريات – كابلات الكهرباء – الكمبيوتر – انابيب المياة ويوجد كذلك فى البترول والفحم والدخان ثم دراسة التركيب الكيماوى لاوراق المورينجا ووجد انها تحتوى على مواد مضادة للاكسدة (237,1 مليجرام /جرام) فينولات وكذلك (141,7 مليجرام/جرام) فلافونات احتوت الفينولات على 23 فينول كان الفانيلك والساليسيليك والكاتشين موجودين باكبر كمية . ان التسمم بالرصاص فى الفئران زاد من وقلل من كمية الالبيومين وكان هناك زيادة فى كمية اليوريا AST,ALT,ALP نشاط انزيمات الكبد والكرياتينين وعند اضافة مستخلصات الماء والاسيتون لاوراق المورينجا ادى الى تحسين نشاط CAT–SOD–MDA الانزيمات المضادة للاكسدة وكذلك ادى الى تقليل كمية الرصاص المتراكم فى كبد وطحال الفئران .

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Table (2) Effect of moringa leaves extracts against liver function in rats poisoned by Pb

	Treatments / Exp. Period	(I) Negative control		(II) Positive control		(III) water extract 300 mg/kg bw		(IV) water extract 600 mg/kg bw		(V) acetone extract 300 mg/kg bw		(VI) acetone extract 600 mg/kg bw	
		Result	%	Result	%	Result	%	Result	%	Result	%	Result	%
AST	Zero Time	20^{a} ±1.14	100 %	19^{a} ±2.4	95 %	21^{b} ± 1.00	105 %	23^{c} ± 1.00	115 %	20^{a} ± 1.94	100 %	21^{b} ± 2.00	100%
	10 days	27^{a} ± 0.83	100 %	47^{c} ±0.83	174 %	42^{d} ± 1.00	155 %	35^{b} ± 1.00	129 %	43^{d} ± 0.83	159 %	40^{c} ± 0.83	148 %
	20 days	32^{a} ± 1.22	100 %	97^{f}± 1.92	303 %	64^{d} ±1.51	200 %	43^{b} ± 1.14	134 %	70^{c} ±0.83	218 %	56^{c} ± 1.14	175 %
	30 days	35^{a} ± 0.83	100 %	150^{f} ±5.1	428 %	75^{d} ± 1.14	214 %	55^{b} ± 1.14	157 %	80^{c} ± 1.14	228 %	61^{c} ± 1.14	174%
ALT	Zero Time	18^{a} ±1.14	100 %	19^{b}±1.48	105 %	19^{b} ±1.81	105 %	20^{c} ± 2.3	111 %	20^{c} ±0.89	111 %	20^{c} ±1.51	111%
	10 days	25^{a} ±1.51	100 %	44^{c} ± 0.70	176 %	40^{d} ± 1.00	160 %	32^{b} ± 1.48	128 %	41^{d} ± 1.14	164 %	37^{c} ± 1.48	148 %
	20 days	28^{a} ±1.51	100 %	94^{f} ±1.00	335 %	62^{d} ± 2.54	248 %	41^{b} ± 1.92	149 %	68^{c} ± 2.16	241 %	55^{c} ± 1.14	196%
	30 days	32^{a} ±1.14	100 %	144^{f} ±1.8	450 %	70^{d} ±1.3	218 %	50^{b} ± 0.7	157 %	73c ± 2.7	228 %	56^{c} ±1.81	175%
AST/ALT	Zero Time	1.05 ±0.03	100%	1.05±0.04	95%	1.04±0.02	99%	1.04±0.04	99%	1.00±0.04	95%	1.05±0.02	100%
	10 days	1.00 ±0.04	100%	1.02±0.02	102%	1.02±0.01	102%	1.05±0.017	105%	1.02±0.02	102%	1.02±0.02	102%
	20 days	1.06 ±0.03	100%	1.03±0.01	97%	1.01±0.01	96%	1.02±0.02	96%	1.02±0.01	96%	1.01±0.01	95%
	30 days	1.05 ±0.02	100%	1.02±0.01	97%	1.05±0.01	100%	1.05±0.02	100%	1.06±0.01	101%	1.06±0.02	101%
ALP	Zero Time	92^{a} ±1.3	100 %	92^{a} ±2.68	100 %	91^{b} ± 1.51	99 %	93^{b} ± 1.78	101 %	90^{b} ± 2.16	97 %	92^{c} ± 2.4	100 %
	10 days	93^{a} ±1.34	100 %	159^{f} ±3.3	170 %	125^{d} ±1.30	134 %	115^{b} ± 1.67	123 %	132^{c} ± 1.58	141 %	121^{c} ±1.67	130 %
	20 days	95^{a} ± 1.14	100 %	240^{f}±2.96	252 %	186^{d}± 1.51	195 %	160^{b} ± 2.7	168 %	196^{c} ± 1.14	205 %	177^{c} ± 0.7	186 %
	30 days	98^{a} ±1.51	100 %	360^{f}±2.07	367 %	225^{d} ± 1.81	229 %	192^{b} ± 1.58	195 %	231^{c} ±1.87	235 %	210^{c} ± 1.92	214 %
Albumin	Zero Time	4.1^{a} ± 0.08	100 %	4.23^{b} ±0.1	103 %	4.0^{b} ± 0.19	97 %	4.1^{a} ± 0.082	100 %	4.09^{a}± 0.07	100 %	4.1^{a}± 0.13	100 %
	10 days	4.18_{a}±0.02	100 %	3.3^{f} ±0.07	78 %	3.9^{d} ± 0.01	93 %	4.0^{b} ± 0.011	95 %	3.81^{c} ± 0.02	92 %	3.95^{c}± 0.02	94 %
	20 days	4.12^{a}±0.02	100 %	3.1^{f} ±0.02	74 %	3.62^{d} ±0.03	87 %	3.85^{b} ± 0.03	93 %	3.55^{c}± 0.02	86 %	3.7^{c}± 0.01	89 %
	30 days	4.08^{a}±0.01	100 %	2.7^{f} ±0.05	65 %	3.4^{d} ± 0.03	84 %	3.71^{b}± 0.018	90 %	3.3^{c}± 0.02	80 %	3.51^{c}± 0.01	86 %

The same letters in each column represents the insignificant different at ($p \geq 0.5$)

Table (3): Effect of moringa leaves extracts against urea and creatinine in rats poisoned by Pb.

Treatments	Urea								Creatinine							
	Exposure period								Exposure period							
	Zero Time		10 days		20 days		30 days		Zero Time		10 days		20 days		30 days	
	Result	%	Result	%	Result	%	Result	%	Result	%	Result	%	Result	%	Result	%
(I) Negative control	17 [a] ± 0.83	100%	20 [a] ± 0.83	100%	22 [a] ±1.14	100%	25 [a] ± 1.51	100%	0.4 [a] ± 0.83	100%	0.49 [a] ± 0.04	100%	0.67 [a] ±0.02	100%	0.76 [a] ±0.01	100%
(II) Positive control	15 [a] ± 1.64	88 %	34 [f] ± 0.83	170 %	44 [f] ± 1.58	200 %	66 [f] ± 1.3	264 %	0.45 [a] ±0.05	112 %	1.01 [f] ± 0.03	206 %	1.2 [f] ± 0.07	179 %	1.63 [f] ±0.02	214 %
(III) water extract300 mg/kg bw	16 [a] ± 1.3	94 %	28 [d] ± 0.83	140 %	31 [d] ±1.58	140 %	45 [d] ± 1.22	180 %	0.4 [a] ± 0.08	100 %	0.87 [d] ±0.01	177 %	1.01 [d] ±0.03	150 %	1.21 [d] ±0.01	159 %
(IV) water extract 600 mg/kg bw	18 [a] ± 0.83	105 %	24 [b] ±1.00	120 %	26 [b] ± 1.14	118 %	35 [b] ± 1.14	140 %	0.48 [b] ±0.05	120 %	0.74 [b] ±0.01	151 %	0.81 [b] ± 0.02	120 %	0.96 [b] ±0.01	126 %
(V) acetone extract 300 mg/kg bw	18 [a] ± 0.7	105 %	30 [e] ± 0.83	150 %	35 [e] ±1.58	159 %	50 [e] ± 1.30	200 %	0.54 [b] ± 0.03	135 %	0.95 [e] ±0.01	193 %	1.09 [e] ±0.02	162 %	1.28 [e] ±0.02	168 %
(VI) acetone extract 600 mg/kg bw	17 [a] ± 1.14	100 %	27 [c] ± 0.83	135 %	28 [c] ± 1.17	127 %	46 [c] ± 1.3	184 %	0.4 [a] ± 0.03	100 %	0.81 [c] ±0.01	165 %	0.91 [c] ± 0.01	135 %	1.08 [c] ±0.01	142 %

The same letters in each column represents the insignificant different at ($p \geq 0.5$)

Table (4): Effect of moringa leaves extracts against SOD and CAT activity in rats poisoned by Pb.

Treatments	SOD								CAT U/L							
	Exposure period								Exposure period							
	Zero Time		10 days		20 days		30 days		Zero Time		10 days		20 days		30 days	
	Result	%	Result	%	Result	%	Result	%	Result	%	Result	%	Result	%	Result	%
(I) Negative control	47 [a] ± 1.0	100 %	51 [a] ± 3.11	100 %	49.9[a] ±0.25	100 %	50.9 [a] ±0.29	100 %	0.49 [a] ± 0.03	100 %	3.42 [a] ±0.06	100%	4.11 [a] ±0.01	100%	4.45 [a] ±0.13	100 %
(II) Positive control	46 [a] ±1.14	97 %	95.02[f] ± 0.55	186 %	113.[e] ± 0.29	226 %	124.5[f] ±0.54	244 %	0.54 [a] ±0.01	110 %	5.8 [f] ±0.08	169 %	7.6 [f] ± 0.13	184 %	9.55 [f] ±0.05	214 %
(III) water extract300 mg/kg bw	46 [b] ± 1.14	97 %	84.0[d] ± 0.75	164 %	98.[d] ±0.28	196 %	108.1[d] ±0.41	212 %	0.48 [a] ±0.04	97 %	5.51 [d] ±0.01	161 %	6.3 [d] ±0.21	153 %	7.34 [d] ±0.02	164 %
(IV) water extract 600 mg/kg bw	46 [b] ± 1.14	97 %	79.8[b] ±0.56	156 %	89.3 [b] ± 0.21	178 %	98.12[b] ±0.22	192 %	0.4 [b] ± 0.07	81 %	4.5 [b] ±0.01	131 %	5.4 [b] ± 0.15	131 %	6.59 [b] ±0.03	148 %
(V) acetone extract 300 mg/kg bw	47 [a] ± 1.14	100 %	88.9[e] ± 0.53	174 %	98.2[d] ±1.08	196 %	110.1[e] ±0.24	216 %	0.4 [b] ± 0.07	81 %	5.73 [e] ± 0.02	167 %	6.5 [e] ±0.11	158 %	8.02 [e] ±0.04	180 %
(VI) acetone extract 600 mg/kg bw	46 [b] ± 1.3	97 %	81.8[c] ±0.63	160 %	92.5 [c] ±1.17	185 %	103.9[c] ±1.15	204 %	0.4 [b] ±0.08	81 %	5.48 [c] ±0.02	160 %	6.1 [c] ±0.15	148 %	7.73 [c] ±0.01	173 %

The same letters in each column represents the insignificant different at ($p \geq 0.5$)

Table (5): Effect of moringa leaves extracts against MDA activity in rats poisoned by Pb.

Treatments	MDA nmol/ml							
	Exposure period							
	Zero Time		10 days		20 days		30 days	
	Result	%	Result	%	Result	%	Result	%
(I) Negative control	0.106 [a] ± 0.001	100%	0.112 [a] ± 0.003	100%	0.101 [a] ±0.004	100%	0.110 [a]± 0.001	100%
(II) Positive control	0.099[b] ±0.007	93%	0.314 [f] ± 0.017	280%	0.389[e] ±0.001	385%	0.420 [f]± 0.001	381%
(III) water extract300 mg/kg bw	0.098 [b] ± 0.005	93%	0.283 [d] ± 0.002	252%	0.311[c] ±0.001	307%	0.361[d]± 0.001	328%
(IV)water extract 600 mg/kg bw	0.106 [a] ± 0.005	100%	0.252 [b] ±0.003	225%	0.291[b] ±0.001	288%	0.342 [b]± 0.001	310%
(V)acetone extract 300 mg/kg bw	0.107 [a] ± 0.001	101%	0.292 [e] ± 0.001	260%	0.322[d]±0.01	318%	0.373 [e]± 0.001	340%
(VI) acetone extract 600 mg/kg bw	0.098 [b] ± 0.005	93%	0.274[c] ± 0.001	244%	0.311 [c]±0.001	307%	0.340 [c]± 0.006	309%

The same letters in each column represents the insignificant different at (p ≥ 0.5)

Table (6): Effect of moringa leaves extracts on organs rats poisoned by Pb.

Treatments		*Concentration of lead in liver and brain tissue*	
		Liver Tissue	brain Tissue
(I)	Negative control	0.31 [a] ± 0.012	0.15 [a] ± 0.012
(II)	Positive control	2.91 [f] ± 0.020	0.79 [f] ± 0.016
(III)	water extract300 mg/kg bw	2.11 [d] ± 0.028	0.61 [d] ± 0.019
(IV)	water extract 600 mg/kg bw	1.88 [b] ± 0.048	0.21 [b] ± 0.016
(V)	acetone extract 300 mg/kg bw	2.22 [e] ± 0.062	0.72 [e] ± 0.012
(VI)	acetone extract 600 mg/kg bw	2.11 [c] ± 0.009	0.22 [c] ± 0.023

The same letters in each column represents the insignificant different at (p ≥ 0.5)