Effect of mango and banana peels induced on toxicity by lead acetate in rats

***Ereny Wilson Nagib, *Hala Rashed Ataya**
*Home Economics Department, Nutrition & Food Science, Faculty of Specific Education, Ain, Shams University.

Abstract

This study was carried out to determine the effect of dry banana peels (Musa Acuminate) and dry mango peels *(Mangifera indica L.)* against lead toxicity in weaning rats. Forty five growing male albino rats with weighting (70 ± 5g), and were divided into two main groups. The first group was the negative control group (9) rats, the second group (36) rats were exposed to lead acetate (200 mg/ kg from weight rat) daily drinking orally and divided into four subgroups. The subgroup one positive control group fed on basal diet only, the subgroup two fed on basal diet fortified with (15%) banana peels, the subgroup three fed on basal diet fortified with (15%) mango peels, the subgroup four fed on basal diet fortified with (15%) combination of (banana and mango peels) for (6) weeks. Blood samples were collected and hemoglobin was determined, then iron, lead, liver enzymes and kidney function were estimated. Calcium, phosphorus and lead were also evaluated in the bones.

The best result found in the group fed on basal diet fortified with (15%) combination banana and mango peels improved daily feed intake, body weight gain; feed efficiency ratio, hemoglobin and serum iron level. Moreover, lead concentration was decreased in serum and also it was improved the concentration of calcium, phosphorous as well as lead in bone of intoxicated rats. Dry peels of fruits were improved liver enzymes and kidney functions compared with positive group.

The histopathology results were agreed with the results of serum parameters. These results recommend increasing the consumption of banana and mango peels. Nutrition Education Programs are needed to illustrate the importance of banana and mango peels in reducing lead toxicity.
Key words: lead toxicity, banana, mango peels.

Introduction

Lead (Pb) is one of the pervasive and persistent poisonous metals from the environment. Despite significant attempts to identify and eliminate sources of pb exposure, this metal continues for decades leading to negative health impacts (**khodamoradi et al., 2015**). According to **(WHO, 2013)** Due to long-term health impacts, lead exposure accounted for 853 000 deaths, with the greatest burden in low and middle-income nations. IHME also reported that lead exposure accounted for 9.3% of the worldwide burden of idiopathic intellectual impairment, 4% of heart illness, and 6.6% of the worldwide stroke burden. Lead (Pb) was used in ancient medicine in limited proportions, but today it is used in many products such as the production , storage of lead-acid batteries , the combustion of alkali oils, manufacturing of cement , leaded glass, the production of plastic and ceramics as well as cosmetics **(karamian et al., 2015). Lead (Pb)** can harm different body structures, including the brain and central nervous system **(karamian et al., 2015 and li et al., 2016).** Several studies have shown that lead exposure has adverse effects on the mind, body, nervous system and can lead to mental retardation such as reduced intelligence, cognition and memory as well as severe behavioral illnesses **(khodamoradi et al., 2015 and De-Ming et al., 2020).** The developmental toxicity of lead has become an important study area as kids are much more susceptible to learning disability after low exposure to lead than adults. **(David et al., 2017)**.

Lead (Pb) poisoning negatively influenced various body systems particularly, hematopoietic and renal system, gastrointestinal pathologies, reproductive, circulatory and immunological**,** reproductive dysfunctions, **(patrick, 2006 and Chibowska *et al.*, 2016).** In addition, cause inhibition of antioxidant enzyme activity, including glutathione peroxidase, catalase and dismutase of superoxides **(Silbergeld et al., 2000 and Mielke et al., 2017).** In addition, stimulation of lipid peroxidation and depletion of antioxidant reserves was assumed to be significant contributors to lead-exposure associated illnesses **(Patrick, 2006 and Xiaoqing et al., 2020)**

Banana *(Musa Acuminate)* Peeling could be a potential source of antimicrobial and antioxidant activities. Ethyl acetate and water soluble parts of green banana peel have shown high antioxidant and antimicrobial activity. Most of the compounds isolated from the green peeling of the distributors, malic acid, stearic acid, 12-hydroxystearic, showed low antioxidant activity and antibacterial activities. These compounds were isolated from water-soluble extracts, mono-polysaccharides, glycoside, low antimicrobial activity and significant antioxidants **(Matook and Fumio, 2005).** Banana peel is approximately 40% of the complete new fruit weight **(Anhwange et al., 2008)**.

The complete quantity of phenolic compounds in banana husks ranged from 0.90 to 3.0 g/100 g dry weight and galactin was determined at 160 mg/100 g dry weight concentration.**Someya et al., (2002).** In mature banana pulp and husks, other phytochemicals such as snakes, anthocyanins, cyanides; cacticolamines and Seymour **(Kanazawa and Sakakipara, 2000)** were recognized. Recent research has shown that banana peel includes **Kondo et al. (2005) and Suleiman et al. (2011)** elevated phenolic compounds. **Supaggio et al. (1996)** identified carotenoids such as b-carotene, acarotene and various xanthophylls in the range of 300-400 lgin equivalent / 100 g. Banana peel. **Gonzalez- Montelongo et al. (2010).** Extraction study resulting in maximum antioxidant activity (acetone: water (1:1), 25 ° C, 120 min). In addition, there have been reports of the amount of extraction steps, temperature, time, and most efficient variables connected with banana peel antioxidant.

Mango *(Mangifera indica L.)* consumer adoption and manufacturing is one of the most significant fruits in the globe **(FAO, 2012).** Mango includes big quantities of phytochemicals, making them appropriate for use in food and functional foods with added value. **(Ajila et al., 2007, 2010).** Mango peel includes carotenoids, polyphenols, vitamins and antioxidants in different categories **(Schieber et al., 2003; Ajila et al., 2008; Manthey & Perkins-Veazie, 2009).**

Therefore, the present work was conducted to study the protective effect of banana and mango peels against lead toxicity in rats.

Materials and Methods

Materials:

Banana (*Musa Acuminate*) and mango (*Mangifera indica L.)* were purchased from local market in Egypt.

Albino rats (Sprague - Dawley Strain) weighting (70 ± 5g) were purchased from Helwan Experimental Animals Station.

Casein, vitamins, minerals, cellulose, choline chloride obtained and pure lead acetate were purchased from El-Gomhorya Company, Cairo, Egypt.

Kits measurement of all parameters for biological experimental were purchased from Bicon Diagnosemittel GmbH and Co. KG Hecke 8 made in Germany.

Methods:

Banana and mango peels preparation

The peels have been separated from the fresh and presented to:

1. Fresh peels: fresh peels of banana and mango were cleaned and sliced into tiny bits with water.
2. Dried peels: peel samples were dried at 50 C in a 12-hour warm water oven and ground to be less than 1.0 mm in particle size (**Adejuyitan et al., 2008**).

Chemical composition analysis:

Moisture, total protein, total lipid, carbohydrates, ash and fiber were analyzed in banana and mango peels according to **AOAC (2010**).

Determination of total phenolic compounds:

The samples were extracted by **Garcia-Salas et al. (2010)** and used for spectrophotometric analyses. The total phenolic content of the extracts was determined by a Folin-Ciocalteu phenol reagent method **(Xu and Chang, 2007)** using gallic acid as standard. The absorbance was measured with UV/vis spectrophotometer (Varian Cary 50 Scan, Australia) at 760 nm. A mixture of 80% methanol and reagents was used as a blank solution.

Mineral composition of fruit peels

The mineral composition of the banana and mango peels was determined according to the methods of the **A.O.A.C. (2005).**

Biological investigations:

Albino rats forty five (Sprague – Dawley strain) of weaning rats, weighting 70 ± 5 g each were housed in an individual stainless steel cage under hygienic controlled condition. The basal diet was prepared by **(Reeves et al., 1993)** the rats were split into two main groups after this period, as follows: The first main group (9 rats) was fed on the basal diet for another six weeks (42 days) and considered as negative control. The second main group (36 rats) were exposed to lead acetate at (200 mg/ kg from weight rat) daily drinking orally according to **(Newairy and Abdou., 2009)** and divided into four sub groups (9 rats for each). The first one (9 rats) was continued to be fed on basal diet and considered as positive control. From the second to four subgroups (9 rats for each) were fed on basal diet fortified with 15% separately from dried banana, mango peels and mixed from them, respectively. The diets eaten and body weights were reported twice a week during the experimental period (6 weeks) and the feed efficiency ratio was based on **(Chapman et al., 1959).**

The animals were fasting overnight at the end of the experiment, then the rats were anesthetized and sacrificed, collecting blood samples. In order to estimate some biochemical parameters, blood samples were centrifuged and the serum was separated.Blood haemoglobin (Hg) was determined using enzymatic calorimetric method was described by **Young, (1990)**. Lead and iron concentrations in serum were determined according to **Parson (2001) and Ramsay (1957).** Tibia and organs as liver, kidney were weighted. Moreover, calcium, phosphorus and lead in bone were determined according to **Carter and Gregorich (2006).** The samples were digested using a mixture of nitric and perchloric acid at ratio of 3:1, then P,Ca and Pb were determined by using atomic absorption spectrophotometer. Liver functions (AST and ALT enzymes) was estimated by **Sherwin (1984)** and kidney function as uric acid, urea and creatinine were determined according to **Haisman and Muller (1977), Henry et al. (1974) and Larsen (1972)**.

Histopathological examination:

The tissues of liver and bones were fixed immediately after dissection in 10% neutral formalin for 24h, then dehydrated in ascending concentration of alcohole, cleaned in xyline and embedded in paraffin wax. Tissues were sectioned at a thickness of 406 micron and stained with hematoxylin and fosin stains (Carleton, 1987). All tissues were examined by the light microscope for detection of any histopathologyical alterations.

Statistically analysis:

The obtained data were exposed to analysis of variance. Duncan multiple range test at 0.05% level and were used to compare between means. The analysis was carried out using the ANOVA procedure of Statistical Analysis System **(SAS, 2008).**

Results and Discussion

Chemical Composition of banana and mango peels:

The results presented in Table (1) showed that carbohydrate, fiber, moisture and protein content of dried banana and mango peels were the highest, there were 63.0, 13.70, 6.70 and 6.25% in dried banana peels, meanwhile; mango peels were 61.70, 17.33, 4.92 and 3.61%, respectively. Whereas, the total lipids and ash content were recorded 7.70 and 2.50 in dried banana and also it was 4.23 and 4.88% in dried mango peels, respectively. This result agree with **Phaviphu et al. (2018)** indicated that Moisture content (%) of fresh banana and mango peels were 19.4% and 15.6 % respectively for total weight peels but after drying were 6% and 4% respectively. **Happi Emaga et al. (2007)** showed that the banana peel contains a high percentage of fat and total dietary fiber content, but starch and protein content was less than the content of banana peel **Figuerola et al. (2005), Marin et al. (2007) and Llobera and Canellas (2007)** illustrated that there were decreasing in the total fiber content obtained from various sources of industrial by products (60-78 g / 100 g dry matter).

In the line with **Ashoush and Gadallah (2011*)*** who showed that the impact of mango peels powders (MPPs) on the rheological, physical, sensory and antioxidant characteristics of cookies at distinct replacement concentrations (5, 10, 15 and 20%) and mango kernel powders (MKPs) at (20, 30, 40 and 50%) was assessed. The findings indicated that ash, crude fiber and water holding ability were high in MPP.

(Serafini et al., 1998 and Carbonnea et al., 1998) the consumption of high-calorie diets of fruits and vegetables significantly increases the antioxidant capacity of plasma, and cannot be attributed to increased carotenoids **(Cao et al., 1998)**. In addition, studies have found that there is a significant negative correlation between heart disease, fruit and vegetables **(Hertog et al., 1993, 1995; Knekt et al., 1996).** Flavonoids and other phenolic plant species such as phenolic acids, stilbenes, tannins, lignans and lignin are particularly prevalent in leaves, flowering tissues and woody components such as stems and barks

(Larson, 1988). Phenolics ' antioxidant activity is primarily due to their redox characteristics, enabling them to behave as reduction agents, donors of hydrogen, and quenchers of single oxygen. They also have a capacity for metal chelation **(Rice-Evans et al., 1995).**

According to the study by **(Someya et al. 2002 and** Sogi **et al., 2013)** showed that total phenolics in peels (907 mg/100 g dry wt.) are more abundant than in pulp (232 mg/100 g dry wt), evaluate various mango peel and kernel drying techniques and assess their nutrient, antioxidant and functional effects, using various techniques such as freeze drying, hot air, mango peel and kernel were dried, dried mango frozen waste had higher antioxidant properties than other techniques, due to its elevated antioxidant content, dried mango waste can be used in many food apps.

Table (1): Chemical composition of dry banana and mango peels (g / 100g)

Fruits nutrients	Banana peels	Mango peels
Moisture	6.70	4.92
Protein	6.25	3.61
Total lipid	7.70	4.23
Total carbohydrates	63.00	61.70
Fiber	13.70	17.33
Ash	2.50	4.88
Total phenolic (µg of GAE/g)	10.90	23.06

Mineral composition of dry banana and mango peels (g / 100g):

The mineral composition of fruit peels is represented in table (2) show that mango peels are high content of calcium 59.33mg and banana peels are high in iron 14.15 mg.

Adlin (2008) and Faigin (2001) showed that the banana peel content was 55.591%, phosphorus 0.10%, calcium 0.361% and total energy 3727 kcal / kg. Bananas also contain vitamins B6, C and E, while serotonin was thought to play an important role as an antidepressant and cause increased body weight and food intake under stress conditions. And agree with **(Calín-Sánchez, et al 2013)** who observed that mango peels contain calcium, zinc and iron were 55.63, 0.62, 13.79 respectively for 100 g

Table (2): Mineral composition of dry banana and mango peels (mg / 100g)

	Fruits	
Elements (mg/100g dry peel)	**Banana**	**Mango**
Calcium	18.86 ± 0.17	59.33± 3.58
zinc	1.62 ± 0.19	0.56 ± 0.06
Iron	14.15 ± 0.26	11.79±1.56
Manganese	8.05 ± 0.25	3.77 ± 0.32

Values are means ± standard deviations of three independent analyses.

Body weight gain, total feed intake and feed efficiency ratio of rats suffering from lead toxicity.

The results in Table (3) showed that the control positive group had a reduction in feed intake, body weight gain and feed efficiency when rats exposed to lead toxicity (-8.0, 5.48 and-0.44) compared to negative control group was 13.01, 7.96 and 0.62, respectively. While rats were fed on basal diet fortified with 15 % banana peels, mango peels and mixture banana and mango peels showed that significant increasing values compared with the positive group and subgroup 3 (15% mixture with banana and mango peels) recorded the best result. The present results were supported by the study of the **Mingeum Jeong et al. (2015)** who reported that the body weight of 17α-ethinyl oestradiol treated rats for 6 weeks were smaller than that measured in the control group. Dietary guidelines have suggested higher fruit and vegetable intakes **(Willett et al., 1995)**. The reasoning behind such a weight loss hypothesis with enhanced fruit consumption is based on three premises: Low-energy density of most fruits, greater fiber structure and lower fruit-high dietary variation. In support of this assumption, **(Howarth et al., 2001)** indicated that, under fixed energy intake, soluble or insoluble fiber intake, decreases subsequent hunger. So that high fiber diets decrease energy intake and body weight. Fruit consumption has a potential role in the prevention of overweight and obesity **(Tetens and Alinia, 2009)**.

Table (3): Body weight gain, total feed intake and feed efficiency ratio of rats suffering from lead toxicity

Groups	Initial body weight (g)	Body weight gain (g)	Total feed intake (g/day)	Feed efficiency ratio
Control negative	74.0 ± 2.60[a]	15.01±2.25[a,b]	7.96±1.02[b]	0.53±1.02[a]
Control positive	71.2 ± 3.58[a]	- 8.0±1.30[d]	5.48±1.01[c]	-0.44±0.03[b]
Group 1	73.2±2.44[a]	12.93±2.21[a,b]	7.18±0.97[b]	0.45±0.07[a,b]
Group 2	72.8 ± 3.47[a]	13.33±0.77[a,b]	7.28±0.87[b]	0.47±0.06[a,b]
Group 3	69.4±9.85[a]	19.31±2.97[a]	9.91±1.01[a]	0.48±0.92[a,b]

Values are expressed as mean ± SD.- Significant at p<0.05 using one way ANOVA test.- Values *which have different letters in each column differ significantly, while those with have similar or letters are not significant*

Weight of relative organs rats suffering from lead toxicity

Table (4) revealed that the results of mean weight value of organs as liver, kidney and tibia. These organs were increased when rats exposed to lead toxicity (control positive) 5.12, 1.21 and 1.93 %, respectively compared with negative control group was 2.92, 1.08 and 0.89%, respectively.

Table (4): Percent of relative organs weight in rats suffering from lead toxicity

.Groups	Weigh of organs rats		
	Liver (%)	Kidney (%)	Tibia (%)
Control negative	2.92±0.42[b]	1.08±0.24[a]	0.89±0.08[b]
Control positive	5.12±0.22[a]	1.21±0.76[a]	1.93±0.43[a]
Group 1	2.99±0.35[b]	0.89±0.11[a,b]	1.47±0.41[a,b]
Group 2	2.15±0.32[b]	0.92±0.52[a,b]	1.39±0.43 [a ,b]
Group 3	2.32±0.07[b]	1.18±0.16[a]	1.31±0.54[a]

Values are expressed as mean ± SD.- Significant at p<0.05 using one way ANOVA test.- Values *which have different letters in each column differ significantly, while those with have similar or letters are not significant*

Serum lead, iron and blood hemoglobin of rats suffering from lead toxicity.

The concentration of lead and iron in serum and blood hemoglobin were determined and the results were reported in Table (5). The concentration of lead in serum was increased significantly when rats were exposed to lead toxicity by 41.13 mg/dl (control positive) compared with negative control group was 29.29 mg/dl. When rats fed on 15% mixture of banana and mango peels significant reduction in serum lead level compared with positive control group which was close to the normal rats control group. These results were agreement with **Esfandiar and Mahmoud (2012) and El-Nahal (2010)** who showed that, serum lead levels decreased significantly (p< 0.05) in the artichoke- treated group compared to lead- intoxicated rats without treatment.

While the serum concentration of iron and the value of hemoglobin in blood were significantly decreased in control positive (26.11 and 9.79 mcg/dl) than the negative control group were 38.93 and12.91 mcg/dl. The rats fed on mixture of banana and mango peels was significant increased in serum iron level and hemoglobin in blood (33.91 and 12.96 mcg/dl) than positive control group. Which are similar results to that recorded by **Khan et al. (2008) and El-Nahal (2010)** who showed that the lead acetate administration lead to reduced Hb and PCV. Similarly, **Szymezak et al. (1983)** observed that Hb level was reduced after intoxication with lead acetate in dose of 400 mg / kg of the fodder. The results were agreed with that obtained by **Ali and Blunden (2003)** who reported that treatment of rats with the black cumin seeds extract for 12 weeks has induced an increased in the hemoglobin level.

Table (5): Serum lead, iron and blood hemoglobin of rats suffering from lead toxicity

Groups	Serum lead (mg/ dl)	Serum iron(mcg/dl)	Blood hemoglobin (mg/dl)
Control negative	29.29±5.07[b]	38.93±4.71[a]	12.91±1.50[a]
Control positive	41.13±5.74[a]	26.11±5.38[b]	9.79±0.40[b]
Group 1	31.42±3.45[a,b]	32.87±7.06[b]	11.94±1.05[a,b]
Group 2	32.81±2.41[a,b]	31.73±1.06 [b]	11.54±0.68[a,b]
Group 3	29.52±0.32[b]	33.91±5.08[a]	12.96±1.06[a]

Values are expressed as mean ± SD.- Significant at p<0.05 using one way ANOVA test.- Values *which have different letters in each column differ significantly, while those with have similar or letters are not significant*

Calcium, phosphorus and lead in Tibia of rats suffering from lead toxicity

Table (6) revealed that the results concentration of both calcium and phosphorus in tibia rats experimental were significantly decreased when rats were exposed to lead toxicity (control positive) 6.11, 5.11g/100g and 443 mg/kg compared with negative control group were 9.81, 8.16 g/100g and 0.311mg/kg, respectively. The rats fed on mixture from banana and mango peels the results showed that significant increased in calcium and phosphorus concentration in tibia 8.50 and 7.16 g/100g compared with the positive control group. On the contrary lead concentration in bone was significant decreased (0.351 mg/kg) compared with rats fed on banana and mango peels was 0.361 and 0.390 mg/kg, respectively. These results were agreement with **Abd - Elhalim et al. (2008) , Hamiltom and Flaherty (1994) and Bagchi and Preuss (2005)** who found that lead accumulation in rats has caused reduction in femoral bone mass density (BMD) compared with the untreated rats with lead intoxicated of similar age. **Imran et al. (2011), Chen et al. (2010) and Naser et al. (2015)** concluded that banana and mango peels improve the concentration of calcium, phosphorous in bone as well as lead in bone of intoxicated rats

Table (6): Calcium, phosphorus and lead in Tibia of rats suffering from lead toxicity

Groups	Calcium (g/100g)	Phosphorus (g/100g)	Lead (mg/Kg)
Control negative	9.81±1.00[a]	8.16±0.96[a]	0.311±0.465[b]
Control positive	6.11±0.30[b]	5.11±2.05[b]	0.443±0.510[a]
Group 1	7.80±0.50[a,b]	6.18±1.80[a]	0.361±0.115[a,b]
Group 2	7.11±0.10[a,b]	6.00±1.10[a]	0.390±0.345[a,b]
Group 3	8.50±1.00[a]	7.16±0.70[a]	0.351±0.362[b]

Values are expressed as mean ± SD.- Significant at p<0.05 using one way ANOVA test.- Values *which have different letters in each column differ significantly, while those with have similar or letters are not significant*

Effect of banana and mango peels on serum liver enzymes of rats suffering from lead toxicity.

Results in Table (7) showed that rats were exposed to lead toxicity control positive was significantly increased level of aspartate amino transferase (AST) and alanine amino transferase (ALT) in serum (104.92 and 35.94 U/L) compared with negative control group was 65.00 and 12.92 U/L, respectively. The result in the same table revealed that the rats fed on banana peels; mango peels and mixture of them were recorded reduction in the elevated serum activity of AST and ALT level compared with positive group. These results agreement with **(Khan et al., 2008, Saeed .,2015 and El - Tantawy ., 2015)** who reported that, the activities of ALT and AST in serum were significantly increased in lead exposed rats **(Mosa and Khalil, 2015, El Makawy et al , 2015)** showed that banana peels and mango peels have good protective effects against acute hepatic injury in rats. In the line with **(Maryam et al., 2020)** who showed curcumin-loaded cockle shell-derived calcium carbonate nanoparticlese improve of lead-induced hepato-renal toxicity in rats

Table (7):- Effect of banana and mango peels on serum liver enzyme of rats suffering from lead toxicity

Groups	Serum AST(U/L)	Serum ALT(U/L)
Control negative	65.00±11.10[c]	12.92±3.63[c]
Control positive	104.92±3.11[a]	35.94±26.79[a]
Group 1	85.67±24.51[b]	21.10±17.54[b]
Group 2	89.61±31.14[b]	25.34±17.11[a,b]
Group 3	82.11±51.10[b]	19.61±13.17[b]

Values are expressed as mean ± SD.- Significant at p<0.05 using one way ANOVA test.- Values *which have different letters in each column differ significantly, while those with have similar or letters are not significant*

Effect of banana and mango peels on serum kidney functions of rats suffering from lead toxicity.

Results in Table (8) also showed that increased in the concentration of uric acid, urea and creatinine in positive group (2.87, 147.92 and 0.98 mg/dl) than negative control group was 1.82, 97.21 and 0.57 mg/dl, respectively. Whereas, the rats fed banana peels, mango peels and combination of them were significant reduction and the best result group was fed on mixture banana and mango peels. These results are agreement with **El- Shenawy et al. (2009), Nabil et al. (2013), Abd El-Ghany et al. (2015) and Salah et al. (2015)** In serum creatinine, urea, uric acid, and globulin, they reported significant rises in lead-intoxicated rats. The findings of this research showed that rats treated with the aqueous extracts of Musa acuminata's three cultivars pose no liver danger. In contrast, Saro cultivar aqueous extracts showed an rise in kidney biomarkers. Consequently, intake of M peel extracts. In the management and/or treatment of hypertension and other cardiovascular diseases, acuminata, particularly Saro cultivar, as a medication can trigger potential renal problems. (**Chidi Edenta et al, 2017)**. And agree with **(Fankun et al., 2019 and Sefa et al 2021)** who exposure the heavy metals (MM) lead (Pb), cadmium (Cd) and mercury caused histopathological changes in the brain, liver, kidney and testicle.

Table (8):- Effect of banana and mango peels on serum kidney functions of rats suffering from lead toxicity

Groups	Uric acid (mg/dl)	Urea (mg/dl)	Creatinine (mg/dl)
Control negative	1.82±0.26[c]	97.21±16.10[d]	0.57±0.27[c]
Control positive	2.87±0.71[a]	147.92±43.60[a]	0.98±0.47[a]
Group 1	2.00 ±0.04[a,b]	104.91±4.00[c]	0.64±0.07[c,b]
Group 2	2.01±0.034[a]	109.05±83.10[c]	0.68±0.08[c]
Group 3	1.81±0.27[c]	103.12±3.11[c]	0.63±0.53 [b, c]

Values are expressed as mean ± SD.- Significant at $p<0.05$ using one way ANOVA test.- Values *which have different letters in each column differ significantly, while those with have similar or letters are not significant*

Histopathological results:

The histopathological results were agreed and in same line with the results of serum parameters.

Liver of rats for control negative group revealed the normal histological structure of hepatic lobule **Photo (1)**, and in positive control group showed focal area of hepatic necrosis completely replaced by leucocytic cells infiltration **Photo (2)**, while subgroup 1 that rats fed on diet fortified with "15% banana peels " showing no histopathological changes **Photo (3)**, and subgroup 2 that rats fed on diet fortified with " 1 5% mango peels " observed dilatation and congestion of central vein **Photo (4)**, beside subgroup 3 that rats fed on diet fortified with " 7.5% banana peels and 7.5 mango peels " showing no histopathological changes **Photo (5)**. This results agree with **(Anet et al 2016)** who showed that intake mango peels caused to dilatation and congestion of central vein in liver for rats, and in the line with**(Rui et al 2016)** who showed that no histopathological changes in liver for rats who were intake banana peels.

Histopathological Changes of liver:

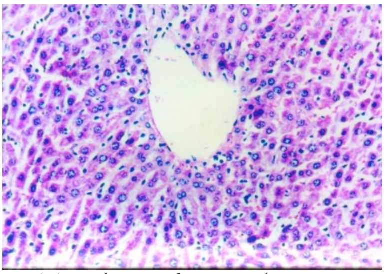

Photo. (1): Liver of control –ve rat showing the normal histological structure of hepatic lobule (Hand E X 200).

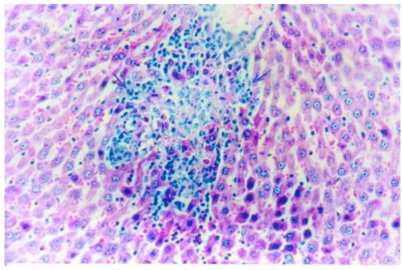

Photo. (2): Liver of control +ve rat showing focal area of hepatic necrosis completely replaced by leucocytic cells infiltration (Hand E X 200).

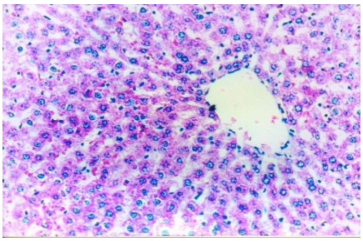

Photo. (3): Liver of intoxicated rat fed on diet fortified with "1 5% banana peels " showing no histopathological changes (Hand E X 200).

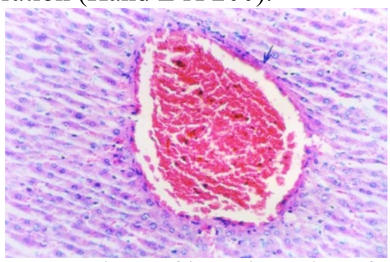

Photo (4): Liver of intoxicated rat fed on diet fortified with "1 5% mango peels" showing dilatation and congestion of central vein (Hand E X 200).

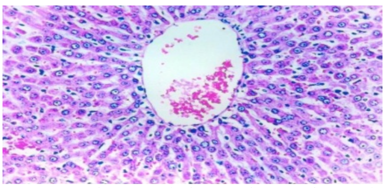

Photo (5): Liver of intoxicated rat fed on diet fortified with " 7.5% banana peels and 7.5 mango peels " showing no histopathological changes (Hand E X 200).

Histopathological Changes of bones:

Bones of rats for control negative group revealed the normal histological structure of hepatic lobule **Photo (6)**, while in positive control group showed thin trabecular bones and enlarged medullary cavity **Photo (7)**, However subgroup 1 that rats fed on diet fortified with "1 5% banana peels " showed normal thickness cortical bone **Photo (8)**, beside subgroup 2 that rats fed on diet fortified with " 1 5% mango peels " observed no histopathological changes **Photo (9)**, and subgroup 3 that rats fed on diet fortified with " 7.5% banana peels and 7.5 mango peels " showing no histopathological changes **Photo (10)**. This result agree with **(Muhammad, et al 2013 and Mahendranath et**

al 2016) who showed mango peels were benefits for bones and intake mango peels observed no histopathological changes on bones.

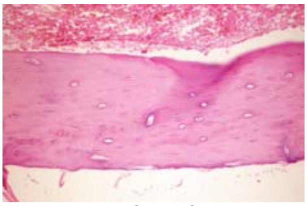

Photo. (6): Bone of rat from control negative group fed on basal diet showing no histopathological changes (H & E X 200).

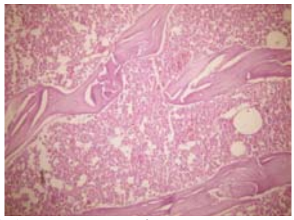

Photo. (7): Bone of rat exposed to lead toxicity as "positive control group" showing thin trabecular bones and enlarged medullary cavity (H & E X 200).

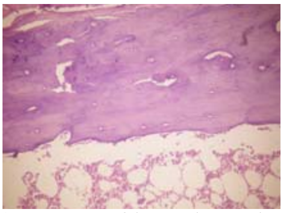

Photo. (8): Bone of intoxicated rat fed on diet fortified with 15% banana peels showing normal thickness cortical bone (H & E X 200).

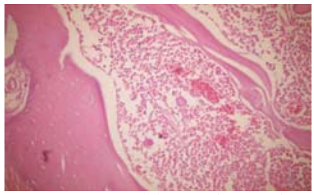

Photo. (9): Bone of intoxicated rat fed on diet fortified with 15% mango peels showing no histopathological changes (H & E X 200).

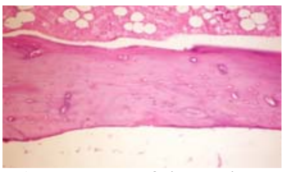

Photo. (10): Bone of intoxicated rat fed on diet fortified with 15% mix. of all dried peels showing no histopathological changes (H & E X 200).

Conclusion and recommendations:

The present study is scientifically proved that dried banana peels and dried mango peels intake produced great therapeutic effects against lead toxicity and improvements serum lead, iron, blood hemoglobin, calcium, phosphorous, bone, liver enzyme activities and kidney function. The best results showed in group fed diet contain (15%) mix of dried banana and mango peels compare another groups .They could be considered a cheapest nutritious food supplement for sensitive groups .Raising the nutrition awareness with such fruit type for its qualities and biologically effects, it deserves and paying attention for its cultivation, marketing, storage and technological food industries.

References

Abd El- Ghany, M., sedky, A and El- Metwally, D (2015): Effect of consumption different legumes in diets fortified with black cumin and guava seeds on Nephrotoxicity in rats. Current Science International. 4 (13):45- 55.

Abd El- Halim, A., Moustafa, T, Mohamed ,M., and Ahmed, A (2008): Effect of soybean on bone and gonad hormones in lead intoxicated rats. journal of Biological Research- Thessaloniki.13(4):25-34.

Adejuyitan, J., Adelakun, O., Olaniyan, S and Popoola, F., (2008): Evaluating the quality characteristics of kunun produced from drymilled sorghum. Afr. J. Biotechnol. 7 (3): 2244–2247.

Adlin, N (2008): Correlation between total phenolics and mineral content with antioxidant activity and determination ofbioactive compounds in various local bananas (Musa sp.). Thesis, Universitas Diponegoro, Semarang. 22(11):125-35.

Ajila, C., Aalami M., Leelavathi K and Prasada, U (2010): Mango peel powder: A potential source of antioxidant and dietary fiber in macaroni preparations. Inn. Food Sci. Emerg. Technol. 11(21): 219–224.

Ajila C., Prasada, A and Rao, U (2008): Protection against hydrogen peroxide induced oxidative damage in rat erythrocytes by *Mangifera indica* L. peel extract. Food Chem. Toxicol, 12(46) 303–309.

Ajila C., Bhat,G and Prasada Rao, U (2007): Valuable components of raw and ripe peels from two Indian mango varieties. Food Chem. 12(102): 1006–1011.

Ali, B. and Blunden, G (2003): Pharmacological and Toxicological Properties of Nigella sative. Phytotherapy Research. 4(17): 299 - 305.

Anhwange, B., Ugye, T., Nyiaatagher, D (2008): Chemical composition of Musa sapientum (banana) peels. Electron. J. Environ. Agric. Food Chem. 8 (6): 437–442.

Anayt, U., Tariqur, R., Zaki, F., Moshfequr ,R., Nusrat, S andBiswajit, S (2016): Mango peel powder supplementation prevents oxidative stress, inflammation, and fibrosis in carbon tetrachloride induced hepatic dysfunction in rats. Journal of Food Biochemistry. 18 (3): 257–272.·

A.O.A.C (2005): In Official Methods of Analysis, vol. 8. Association of Official Analytical Chemists, Arlington, Virginia, D.C., USA,pp. 242–273.

AOAC (2010): Official Methods of Analysis of Association of Official Chemists. 18th Ed., Washington, D.C., USA.

Ashoush, I and Gadallah, M (2011): Utilization of Mango Peels and Seed Kernels Powders as Sourcesof Phytochemicals in Biscuit. *World Journal of Dairy and Food Sciences*, 6(1): 35 42.

Bagchi, D and Preuss, H (2005): Effect of acute and chronic oval exposure of lead on blood pressure and bone mineral density in rats. Journal of inorganic biochemistry. 12 (9): 1155- 1164.

Calín-Sánchez, A., Figiel, A., Hernández, F., Melgarejo, P., Lech, K. and Carbonell- arrachina, A. (2013): Chemical composition, antioxidant capacity, and sensory quality of pomegranate (Punica granatum L.) arils and rind as affected by drying method, Food and Bioprocess Technology. 6(2): 1644–1654.

Carter M. and Gregorich. E (2006): Soil Sampling and Methods of analysis. Journal of inorganic biochemistry. 13(5): 3586 - 8493.

Cao, G., Booth, S., Sadowski, J., and Prior, R (1998): Increases in human plasma antioxidant capacity after consumption of controlled diets high in fruit and vegetables. *The American journal of clinical nutrition,* 68(5): 1081-1087.

Carbonneau, M. Léger, C., Descomps, B., Michel, F and Monnier, L (1998): Improvement in the antioxidant status of plasma and low-density lipoprotein in subjects receiving a red wine phenolics mixture. Journal of the American Oil Chemists' Society, 25(2), 235-240.

Chapman, D., Gastilla, R and Campbell, J (1959): Evaluation of protein in food. I. A. Method for the determination of protein efficiency ratio. Can J Biochem Physiol. 37(5):679-686.

Chen, J., Lazarenko, O., Wu, X., Kang, J., Blackburn, M., Shankar, K., Badger, T and Ronis, M (2010): Dietary-induced serum phenolic acids promote bone growth via p38 MAPK/β-catenin canonical Wnt signaling. J Bone Miner Res., 25(11):2399-411.

Chidi Edenta, Stanley I., Okoduwa, I and Oche Okpe, A (2017): Effects of Aqueous Extract of Three Cultivars of Banana (Musa acuminata) Fruit Peel on Kidney and Liver Function Indices in Wistar Ratsjournal/medicines 10(3):.3380-91.

Chibowska, K., Baranowska-Bosiacka I., Falkowska, A., Gutowska, I., Goschorska, M and Chlubek, D (2016): Effect of lead (Pb) on inflammatory processes in the brain. Int. J. Mol. Sci. 17(5)::2140-50.

David, A., Geier, A., Janet, K., Kern,C and Mark, R (2017): Blood Lead Levels and Learning Disabilities: A Cross-Sectional Study of the 2003–2004 National Health and Nutrition Examination Survey (NHANES). Int J Environ Res Public Health. 14(10): 1202-18.

De-Ming, Y., , Robeth, V., Yu-Syuan, L., , Tai-Yu, C., Wei-Qun, L., Yu-Fen, C and Tsai-Feng, F (2020): Monitoring the Heavy Metal Lead Inside Living Drosophila with a FRET-Based Biosensor. Chemosphere. 20 (6), 1712-22.

El-Nahal, M. D (2010): Effect of using pectin on lead toxicity The Journal of American Science, 6(12):334-341.

El- Shenawy, N., Al- Eisa, R., El- Salmy, F. and Salah,O (2009): Prophylactic effect of vitamin E against hepatoxicity, nephrotoxicity, haematological induces and histopathology induced by diazinon insecticide in mice. Curr. Zool. 55(3):219- 226.

El- Tantawy, W (2015): Antioxidant effects of Spirulina supplement against lead acetate - induced hepatic injury in rats. Original articale.doi: 10. 1016/j. jtcme.02.001.

El Makawy, A., Ihab, S., Ashoush, O and Abd-Elmoneim, A. (2015): Evaluation of Mango Byproduct Extracts as Antioxidant Against Pb-Acetate-Induced Oxidative Stress and Genotoxicity in Mice . J. Food Nutr. Sci. 65(2): 39–47.

Esfanddiar, H and Mahmoud, R (2012): Protective effect of artichoke (Cynara scolymus) leaf extract against lead toxicity in rats. 51(4): 1104 - 1109.

Faigin, R (2001): Meningkatkan Hormon Secara Alami. PT Raja Grafindo Persada, Jakarta.Figuerola Fibre concentrates from apple pomace and citrus peel as potential fibre sources for food enrichment. Food Chem. 9(2) 395–401.

Fankun, Z., Guangming, Y., Yanyan, G., Dong, L., Jie, X., Lu, O., Ying, F., 1, Han Y., Zhipeng, Z., Kai, W., Lijian, S., Chang, F and Guangqin, F. (2019): Toxicity assessment due to prenatal and lactational exposure to lead, cadmium and mercury mixtures. Epub. 133(10):105-120

FAO, (2012): Food and Agriculture Organization, FAOSTAT database collections, agricultural data, food and agriculture organization of the United Nations.

Figuerola, F., Hurtado, M., Estevez, A., Chiffelle, I and Asenjo, F (2005): Fibre concentrates from apple pomace and citrus peel as potential fibre sources for food enrichment. Food Chem. 9(1): 395–401.

Garcia-Salas P, Morales-Soto A, Segura-Carretero A, Fernández-Gutiérrez A (2010): Phenolic compound extraction systems for fruit and vegetable samples. *Molecules*, 15(3):8813-8826

Gonzalez-Montelongo, R.M., Gloria Lobo, G and Gonzalez, M (2010) Antioxidant activity in banana peel extracts: testing extraction conditions and related bioactive compounds. Food Chem. 119(4):1030–1039.

Happi Emaga, T., Andrianaivo, R., Wathelet, B., Tchango, J and Paquot, M (2007): Effects of the stage of maturation and varieties on the chemical composition of banana and plantain peels. Food Chem. 103(6): 590–600.

Haisman, P. and Muller, B (1977): Quantitative enzymatic colorimetric determination of uric acid in serum. Clin Chem.12(2) 216-227.

Hamilton, J and Flaherty, E (1994): Effects of lead exposure on skeletal development in rats. Fundamental and applied toxicology,22(5):594- 604.

Hertog, M., Kromhout, D., Aravanis, C., Blackburn, H., Buzina, R., Fidanza, F., Ciampaoli, S., Jansen, A., Menotti, A., Nedeljkovic, S., Pekkarinen, M., Simic, S., Toshima, H., Feskens, E., Hollman, P and Katan, M (1995): Flavonoid intake and long-term risk of coronary heart disease and cancer in the seven countries study. *Arch. Int. Med.* 155(4): 381-386.

Hertog, M., Feskens, E., Kromhout, D., Hollman, P and Katan, M (1993): Dietary antioxidant flavonoids and risk of coronary heart disease: the Zutphen Elderly Study. *The Lancet*, 342(88):1007-1011.

Henry, R (1974): Determination of creatinine by kinetic method. In " Clinical Chemistry, Principles and techniques "(2nd edition), Harper& Rowe, 525.

Howarth, N Saltzman, S and Roberts, A (2001): Dietary fiber and weight regulation. Nutr. Rev. 59(5): 129-139.

Imran, A., Jat, R., and Varnika, S (2011): A Review On Traditional, Pharmacological, Pharmacognostic Properties Of Ficu Carica (Anjir). IRJP. 2 (12): 124- 127.

Kanazawa, K and Sakakibara, H (2000): High content of dopamine, astrong antioxidant, in Cavendish banana. J. Agric. Food Chem. 48 (3), 844–848.

Karamian, R., Komaki, A., Salehi, I., Tahmasebi, L., Komaki, H., Shahidi, S and Sarihi, A (2015): Vitamin C reverses lead-induced deficits in hippocampal synaptic plasticity in rats. Brain research bulletin. 12(2)123-133.

Khan, M., Mostofa, M.,Jahan, M., Sayed, M and Hossain, M (2008): Effect of garlic and vitamin b-complex in lead acetate induced toxicities in mice. Bangl. J.V.Med. 6(2): 203-210.

Knekt, P., Jarvinen, R., Reunanen, A and Maatela, J (1996): Flavonoid intake and coronary mortality in Finland: a cohort study. *Bmj*, 312(29):478-481.

Khodamoradi, N., Komaki, A., Salehi, I., Shahidi, S and Sarihi, A (2015): Effect of vitamin E on lead exposure-induced learning and memory impairment in rats. Physiology & behavior, 144(10): 90-94.

Kondo, S., Kittikorn, M and Kanlayanarat, S (2005): Preharvest antioxidant activities of tropical fruit and the effect of low temperature storage on antioxidants and jasmonates. Postharvest Biol. Technol. 36(6): 309–318.

Larson, R (1988): The antioxidants of higher plants. *Phytochemistry*, 27(10): 969-978.

Larsen, K (1972): Creatinine colormitric method. J. of Clin. Chem., 41:209.

Li, X., Ye, F., Li, L., Chang,W., Wu, X., and Chen, J (2016): The role of ho-1 in protection against lead-induced neurotoxicity. Neurotoxicology, 52(3):22-31.

Llobera, A and Canellas, J (2007): Dietary fibre content and antioxidant activity of **Manto Negro red grape (Vitis vinifera): pomace and stem. Food Chem. 101(11): 659–666.**

Mahendranath,G., Veeresh, s., Ummiti, P and Shaik, A(2016): Supplementation of Mango (Mangifera indica L.) Peel in Diet Ameliorates Cataract in Streptozotocin-Induced Diabetic Rats: MANGO PEEL AMELIORATES CATARACT IN DIABETIC RATS, Journal of Food Biochemistry. 41(1):239-244.

Manthey J.A and Perkins-Veazie P (2009): Influences of harvest date and location on the levels of -carotene, ascorbic acid, total phenols, the *in vitro* antioxidant capacity, and phenolic profiles of five commercial varieties of mango (*Mangifera indica* L.). J. Agri. Food Chem. 57(7): 10825–10830.

Marin, F., Soler-Rivas, C., Benavente-Garcia, O., Castillo, J and Perez-Alvarez, J (2007): By-products from different citrus processes as a source of customized functional fibres. Food Chem. 100(8): 736–741.

Maryam, M., Kabeer, A., Samaila, M., Abubakar, D., Ezamin, B., Mohamad, A and Zuki, A (2020): Curcumin-loaded cockle shell-derived calcium carbonate nanoparticles: A novel strategy for the treatment of lead-induced hepato-renal toxicity in rats. Epub. 27(6):1538-1552.

Matook, S and Fumio, H (2005): Antibacterial and antioxidant activities of banana (Musa, AAA cv. Cavendish) fruits peel. Am. J. Biochem. Biotechnol. 1 (3): 125–131.

Marchlewicz, M., Protasouicki, l., Rozewicka, M., Piasecka, M and Laszczynska, C (1993): Effect of long-term exposure to lead on testis and epididymis in rats. Folia-histochem. Cytobiol. 31 (2):55–62.

Mielke H., Gonzales C and Powell E (2017): Soil Lead and Children's Blood Lead Disparities in Pre- and Post-Hurricane Katrina New Orleans (USA) Int. J. Environ. Res. Public Health. 33(5):94 - 103.

Mingeum, J., Dong, S., Hyung, J and Yooheon, P (2015): Aspergillus Oryzae fermented germinated soybean extract alleviates perimenopausal symptoms in ovariectomised rats. Journal of Veterinary Sciences. 38(7):69 - 83.

Mosa, Z and Khalil, A (2015): The effect of banana peels supplemented diet on acute liver failure rats ,Annals of Agricultural Science. 60(2): 373–379.

Muhammad, I., Masood, S and Faqir, M (2013): Chemical Profiling of Different Mango Peel Varieties Pakistan Journal of Nutrition .12(10):934-942.

Nabil, T., Mahdy, K., Abdel- Wahab, M. and Mohamed, L (2013): Effect of lead toxicity on mineral metabolism and immunological factors in rats. Alexandria Journal of Veterinary Sciences. 39(8):64 - 73.

Naser, B., El-Bahy, A., Abd El-Aziz. A, Mohamed H and Ibrahem M. Aniess. W (2015): Effect of Soybean and Some Dried Fruits in Osteoporotic Rats. M.SC. In Education Faculty of Education - Ain Shams University. 164 - 173.

Newairy, A and Abdou, H (2009): Protective role of flax lignans against lead acetate induced oxidative damage and hyperlipidemia in rats. Food Chem Toxicol. 47(4): 813-818.

Parsons, P (2001): Analytical procedures for the determination of lead in blood and urine, approved guideline. Wayne, PA, National Committee for Clinical Laboratory Standards. 113 (8):1669- 1647.

Phaviphu, K., Kamlai, L., Paiboolya, G., Klanarong,S., and Kunruedee, S (2018): Characterization of pectin extracted from banana peels of different varieties. Food Sci Biotechnol. 27(3): 623–629.

Patrick, L (2006): Lead toxicity part II: the role of free radical damage and the use of antioxidants in the pathology and treatment of lead toxicity. Altern. Med. Rev.11(2): 114–127.

Ramsay, W (1957): The determination of iron in blood plasma and serum Clin. Chem. Acta. 29(3):214-221.

Reeves, P., Nielsen, F and Fahey, G (1993): AIN-93 purified diets for laboratory rodents: final report of the American Institute of Nutrition ad hoc writing committee on the reformulation of the AIN-76A rodent diet. J Nutr., 123(11):1939-51.

Rice-evans, C., Miller, J., Bolwell, G., Bramley, M and Pridham, J (1995): The relative antioxidant activities of plant-derived polyphenolic flavonoids. Free radical research, 22(4): 375-383.

Saeed A (2015): Haemato - biochemical changes induced by lead intoxication in male and female albino mice. International Journal of Recent Scientific Research.6(5):2999 - 4004.

RUI, W., Xia, F., Kai., Z and Huay, B (2016): Preventive activity of banana peel polyphenols on CCl4-induced experimental hepatic injury in Kunming mice. Experimental and Therapeutic Medicine. 11(5): 1947–1954.

Salah, A., Zadjali, N, Mohamed, Y., Fahim, S, Azimullah,A, Subramanian,D, Yasin, Y., Amir,N, Hassan,M, and Adem, A (2015): Lead exposure causes thyroid abnormalities in diabetic rats. Int J Clin EXP Med.8(5): 7160- 7167.

SAS System for Windows (Statistical Analysis System) (2008). Version 9.2. Cary, USA: SAS Institute Inc. S.

Schieber A., Berardini N and Carle R (2003): Identify cation of fl avonol and xanthone glycosides from mango (*Mangifera indica* L. Cv. ‘‘Tomy Atkins’’) peels by high performance liquid chromatography–electrospray ionizations mass spectrometry. J. Agr. Food Chem. 51(7):5006–5011.

Sefa, K., Fulya, B., Serkan, Y., Cihan, G., Fatih, M., Aydin, S., Adnan, A., , Cuneyt, C and Muhammet, B (2021): Protective Effects of Chrysin Against Oxidative Stress and Inflammation Induced by Lead Acetate in Rat Kidneys: a Biochemical and Histopathological Approach. Epub. 199(4),1501-1514.

Serafini, M., Maiani, G., and Ferro-Luzzi, A (1998): Alcohol-free red wine enhances plasma antioxidant capacity in humans. *The Journal of Nutrition*,128(6): 1003-1007.

Silbergeld, E., M. Waalkes and Rice, J (2000): Lead as a carcinogen: experimental evidence and mechanisms of action. Am. J. Ind. Med. 38(9): 316–323.

Sherwin, J.(1984): Liver function. In: Kaplan LA, pesce AJ eds, clinical chemistry, theory, analyses, and correlation. 33(3): 420- 438.

Sogi, D., Siddiq, M., Greiby, I and Dolan, K (2013):Total phenolics, antioxidant activity, and functional properties of ‘Tommy Atkins’ mango peel and kernel as affected by drying methods. *Food chemistry*, 141(3): 2649-2655.

Someya, S., Yoshiki, Y and Okubo, K (2002): Antioxidant compounds from bananas (Musa Cavendish). Food Chem. 79(4): 351–354.

Subagio, A., Morita, N and Sawada, S (1996): Carotenoids and their fatty-acid esters in banana peel. J. Nutr. Sci. Vitaminol. 42 (6): 553–566.

Sulaiman, S., Yusoff, N., Eldeen, I., Seow, E., Sajak, A and Ooi, K (2011): Correlation between total phenolic and mineral contents with antioxidant activity of eight Malaysian bananas (Musa sp.). J. Food Compos. Anal. 24(1): 1–10.

Szymezak, J., Zechalko, A and Biernat, J (1983): Effect of foodder fat type on blood plasma lipids in mice intoxicated with lead. Bromatol Chem Toksykol 16(2): 98 -94.

Tetens, I. and Alinia (2009): The role of fruit consumption in the prevention of obesity. Journal of Horticultural Science & Biotechnology (Special Issue): 47-51.

The World Health Report (2015): The double burden: Emerging epidemics and persistent problems. Available at: <http://www.who.org>.

Willett, W., Sacks, A and Trichopoulou, A (1995): Mediterranean diet pyramid: a cultural model for healthy eating. Am. J. Clin. Nutr., 61: 1402S-1406S.

World Health Organization (WHO) statistics the Institute for Health Metrics and Evaluation (IHME) 2013: GBD compare, Seattle, WA: IHME, University of Washington.

Xiaoqing, K., Yiqie, D., Lu, F., Min, Z., Haobo, H (2020): Contamination and health risk assessment of heavy metals in China's lead-zinc mine tailings: A meta-analysis. Epub. 12(4):137:128.

Xu, B and Chang, S (2007): A comparative study on phenolic profiles and antioxidant activities of legumes as affected by extraction solvents. *J Food Sci*, 72(4):159-166.

Young, D. (1990): Effects of drugs on clinical laboratory test. Third Edition. 9(2):164 - 174.

ملخص البحث

تاثير قشور المانجو والموز علي السميه المحدثه بواسطه اسيتات الرصاص في الفئران

أجريت هذه الدراسة لمعرفة تأثير قشور الموز الجاف وقشور المانجو الجاف ضد سمية الرصاص للجرذان في فتره النمو .خمسه واربعون جرذ من نوع ذكر الالبينو البيضاء فى فترة النمو بوزن (٧٠ ± ٥ جم) ، وتم تقسيمها إلى مجموعتين رئيسيتين، المجموعة الاولى الضابطه السالبه (٩) جرذان. اما المجموعة الثانيه (٣٦) جرذ تعرضت لخلات الرصاص من خلال تجريعهم (٢٠٠ مجم / كجم من وزن الجرذ) يومياً، وتم تقسيمها إلى أربع مجموعات فرعية. تم تغذيه المجموعة الفرعية الأولى الموجبة الضابطة على النظام الغذائي الأساسي فقط، المجموعة الفرعية الثانية تغذت على النظام الغذائي الأساسي المدعم بنسبة (١٥٪) من قشور الموز، المجموعة الفرعية الثالثة تغذت على النظام الغذائي الأساسي المدعم بنسبه (١٥٪) قشور المانجو، المجموعة الفرعية الرابعة تغذت على النظام الغذائي الأساسي المدعم بنسبه (١٥٪) مزيج من (قشر الموز والمانجو) لمدة (٦) أسابيع. تم تجميع عينات الدم وتقدير هيموجلوبين الدم ثم تقدير كلا من الحديد، الرصاص، انزيمات الكبد، ووظائف الكلى فى السيرم و تقدير كلا من مستوى الكالسيوم و الفسفور و الرصاص فى العظام. أظهرت النتائج ان الجرذان التى تناولت خليط قشور الموز و المانجو كانت تمثل أفضل النتائج فى معدل الزياده فى الوزن و الطعام المتناول و معدل كفاءة الطعام و تحسين فى مستوى الهيموجلوبين و الحديد و انزيمات الكبد ووظائف الكلى و حدوث انخفاض فى مستوى الرصاص فى السيرم مقارنه بالمجموعة الضابطة الموجبة و أكدت نتائج الفحص الهستوباثولوجى نفس النتائج السابقه. لذلك توصى الدراسه بعمل برامج للتوعيه الغذائيه لتوضيح أهميه قشور الموز و المانجو فى خفض خطر الاصابه أو التلوث بالتسمم بالرصاص.

الكلمات المفتاحيه: التسمم بالرصاص ، قشر الموز، قشر المانجو.