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Effect Of Some Vegetables And Fruits To Get Rid Of Toxic Heavy Metals In Rat's

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Abstract

The main target of the present investigation was to study the effect of some vegetables and fruits to get rid of toxic heavy metals (Leadand Mercury)in albino rats. Fifty four healthy adult male albino rats "Sprague Dawley strain" were used and divided into 9 equal groups, one was kept as a negative control group,while the second Group(5rats) fed on basal diet with lead 0.2%(control positive group) and third group (5 rats) was fed on diet with mercury0.02% (control positive group) ,while group (4) was fed on diet with(lead+ Ficussycomorus), group (5) was fed on diet with(MercuryFicussycomorus), group (6) was fed on diet with(lead +Malvasylvestris) , group (7) was fed on diet with(Mercury +Malvasylvestris), group (8) was fed on diet with(lead+ Coriander sativum) and group (9) was fed on diet with (Mercury+ Coriander sativum)The results indicated that rats infected lead, mercury which fed on diet with Coriander, Malvasylvestris and Ficussycomorus caused a significant increase in body weight gain feed intake and feed efficiency liver functions and kidney functions.Treating rats which were fed on diet with Coriander, Malvasylvestris and Ficussycomorus showed an improvment in all tested parameters. The histopathological examination confirmed the improvements in biological parameters and cell structure.

Key Words : Rats, Heavey metals, some vegetables and fruits and Biochemical analysis

1. Introduction

Human activity in the last few decades has led to global contamination by organic and inorganic compounds **(Sahu*et al.*, 2007) and(Chaerun*et al.*, 2011) .** The presence of the pollutants generated from industrial and agriculture activities in the waterways has been identified to produce potential harmful effect on the aquatic living organisms and the food webs **(Oliveira *et al*., 2004)and(Katnoria*et al*., 2011).** Nowadays, heavy metalscontamination are considered to be among the most serious environmental problems. Heavy metals are any inorganic metallic compounds that can exert their toxicity via binding to the thiol group and disulfide bond that contribute to the stability of the enzyme **(Frasco *et al.*, 2005).** The metals have high affinity to the disulfide bridge between two cysteine residues in any protein compound. Heavy metals are very dangerous to living organisms especially for humans since they can cause DNA damage and exert carcinogenic effects.Medicinal plants play important role in individuals and communities health. The medicinal value of these plants depends on some chemical compounds that produce a definite physiological action in the human body. The most important of these bioactive constituents of plants are alkaloids tannins flavonoids and phenolic compounds **(Hill, 1952).** The state of medicinal plants research has been emphasized in many developing countries **(Edeoga *et al*., 2005).** The appropriate utilization of local resources to cover drugs needs is dependent on the preliminary scientific study to determine the efficacy and safety of any preparation **(Burkill, 1984).**The awareness of the role of medicinal plants in health care delivery of developing countries has resulted in researches into traditional medicine with a view to integrating it with modern orthodox medicine**(Sofowara, 1993).** Metal poisoning is a global problem with humans being exposed to a wide range of metals in varying doses and varying time frames. Traditionally, treatment involves removal of the toxic source or chelation therapy. An intermediate approach is needed. This study reported that the use of essential metal supplementation was very important as a strategy to induce metallothionein expression and displace the toxic metal from important biological systems, improving the metal burden of the patient. Specific recommendations are given for supplementation with calcium, zinc and vitamin E as a broad strategy to improve the status of those exposed to toxic metals **(Wayne,2014)**. *Coriander* nutrition is basically due to its green leaves and dried fruits. Like all other green leafy vegetables, its leaves are a rich source of vitamins, minerals and iron. Its leaves contain high amount of vitamin A (β-carotene) and vitamin C. The green herbs contain vitamin C upto 160 mg/100 g and vitamin A upto 12 mg/100 g It is very low in saturated fat and cholesterol and a very good source of thiamine, zinc and dietary fiber. Green coriander contains 84% water**(Girenko, 1982)**.*Malvasylvestris*, the biological activity of this plant may be attributed to antioxidants, such as polyphenols vitamin C vitamin E beta carotene and other important pythochemicals**(Barro*et al*., 2010).** In a previous investigation gossypetin 3-sulphate-8-O-b-Dglucoside and hypolaetin 3-sulphate were identified as the major flavonoid constituents in the leaf tissue of Malvasylvestris**(Nawwar and Buddrus, 1981).** Other compounds with chemotaxonomic significance for the Malvaceae are the 8-hydroxyflavonoids so far the isolation of three 8-hydroxyflavonoid sulphates has been reported from *Malvasylvestris* leaves **(Billeter *et al.*, 1991).**Acomparative study of the composition in nutraceuticals (phenolics, flavonoids, carotenoids, ascorbic acid,tocopherols sugars and fatty acids) and antioxidant properties of different parts of *Malvasylvestris* (leaves flowers immature fruits and leafy flowered stems) was evaluated by **(Barro*et al.*, 2010).** *Malvasylvestris* extracts are reported for their radical scavenging effect **(Karakaya, 2004)** as well as E. camaldulensis and C. sativa; the later demonstrated also antineoplastic activity in B16 cells **(Calliste *et al*., 2001)**. Studies reveal a negative correlation between the consumption of diets rich in fruit and vegetables and the risks for chronic diseases such as cardiovascular diseases, arthritis, chronic inflammation and cancers **(Saleem *et al*., 2002; Prior, 2003; Chen *et al*., 2005 and Zhang *et al*.,2005).**

Ficuscontain relatively high amounts of crude fibers and polyphenols which represent 1230 and 360 mg/100 g in the dried form, respectively **(Vinson *et al*., 2005 and Solomon *et al*., 2006).** The fruit can be consumed fresh dried and canned being an interesting source of carbohydrates, essential amino acids, vitamins A, E,B1, B2, and C and minerals **(Solomon *et al*., 2006).**

So, this study was designed to investigate the effect of*coriander*, *malvasylvestris*and *ficussycomorus* to get rid of toxic heavy metals in albino rats.

Materials and Methods

Materials:

Malvasylvestris, *Coriandersativum* and *Ficussycomorus* were purchased from local market at Shebin El-komMenoufiagovernorat . Casein as main source of protein obtained from Morgan Company, Cairo, Egypt. Vitamins mixture, salt mixture and biological kits were purchased from El – Gomhoria Company., Cairo, Egypt. Fifty four healthy adult male albino rats "Sprague Dawley strain" weighing 150±5gwere used in this study. The rats were obtained from Research Institute of Ophthalmology, Medical Analysis Department, Giza, Egypt. They were housed in galvanized iron cages measuring 40 × 24 × 20 cm (5 rats to each cage).

Methods:

A . Preparation of samples:

Malva, coriander and ficus were cleaned and wished for removing dust and impurities, then cut them and dried at 50˚C for 6h. in case of malva and coriander while for 24h in case of ficususing a fan oven. Then, they were milled by a precession mill to give powder. A grinder mill and sieves were used to obtain a powder particle size of less than 0.2mm .

B. Biological Experiments

Basal diet was prepared from fine ingredients per 100g. The diet had the following composition :corn starch 67%, casein 13% **(AIN, 1993)** corn oil 10%, fiber 5%, Salts mixture4% **(Hegsted*et al*., 1941)** vitamin mixture 1% **(Campbell, 1963)** .*Malvasylvestris*, *Coriandersativum* and *Ficussycomorus*were added to the tested diet at the level 15%.

C. Experimental Design

Biological experimental was done at the central laboratory of Research Institute of Ophthalmology, Medical Analysis Department, Giza, Egypt. Rats (n = 54 rats) were housed individually in wire cages in a room maintained at 25 ± 2 ºC and kept under normal healthy conditions. All rats (54 rats) were fed on basal diet for one – week before starting the experiment for to learn non-lethal dose. After this week, they were divided into nine main groups:

Group(1): Rats were fed on basal diet as negative control group.

Group(2): Rats were fed on basal diet with lead (0.2%) as apositive control.

Group(3): Rats were fed on diet on dietwith mercury (0.2%) as appositive control.

Group(4): Rats were fed on diet with lead (0.2%) and *ficussycomorus* at the level 15%.

Group(5): Ratswere fed on diet with mercury(0.2%)and *ficussycomorus* at the level 15%.

Group(6): Rats were fed on diet with lead(0.2%)and *malvasylvestris* at the level 15%**.**

Group(7): Rats were fed on diet with mercury(0.2%) and malvasylvestris at the level 15%.

Group(8): Rats were fed on diet with lead(0.2%) and *coriander sativum* at the level 15%.

Group(9): Rats were fed on diet with mercury(0.2%) and *coriander sativum* at the level 15%.

D.Biological evaluation

During the experiment period (28days), the quantities of diet which were consumed and / or wasted were recorded every day. In addition, rat's weight was recorded weekly. The body weight gain (BWG), food intake(FI), feed efficiency ratio(FER) were determined according to **(Chapman *et al*., 1959).**

E. Biochemical evaluation and Histopathological examination

At the end of the experiment period, the rats were fasted overnight before sacrifice and the blood samples were collected from each rat and centrifuged to obtain the serum. Serum was carefully separated and transferred into dry clean ebendorf tubes and kept frozen at-20ºc for analysis as described by **(Schermer, 1967**). Liver and brain were removed from each rat by careful dissection , cleaned from the adhesive matter by a saline solution(0.9%) , dried by filter paper ,weighed and kept in formalin solution (10%), according to the method described by **(Drury and Walling,1980)**

F. Hematological analysis

Different tested parameters in serum were determination using specific methods as follow: Glotamicoxaloacetictransaminas (GOT), glotamic pyruvic transaminas (GPT), urea and createnineaccording to**Kakkar*et al*., (1984); Aebi (1974) ; Ellman (1959) &Reitman and Frankel (1957)**respectively

G. Statistical analyses

Statistical analysis was carried out using the programmer of Statistical Package for the Social Sciences (SPSS), PC statistical soft ware (Version 20; Untitled–SPSS Data Editor). The results were expressed as mean ± Standard deviation (mean ± S.D.). Data were analyzed using one way classification, analysis of variance (ANOVA). The differences between means were tested for significance using least significant difference (LSD) test at $p<0.05$ **(Sendcor and Cochran, 1979).**

Results and Discussion

In the current study the effect of some vegetables and fruit to get rid of toxic heavy metals in rat's body.

1-Effect of some vegetables and fruits treated with high doses of lead and mercury on body weight gain (BWG).

Data presented in table (1) showed the effect of some vegetables and fruittreated with high doses oflead and mercuryon body weight gain (BWG).

It could be noticed that differences between all mean values of tested groups were significant when compared to control negative group. With expecting,0.02% mercurygroup was recorded the lowest value of body weight gain**.** There were no significant differences in BWG among group 4,5 and 8. Also there is no significant between groups 6 and 7. The best result recorded with group 9 which fed on 0.02% mercury and *coriander sativum* at the level 15%.

These results are im agreement with **Katnoria*et al.* (2011)**Potential health problems associated with a high intake of vegetables and meat products which contain salt of Lead and mercury have been linked to decreased energy intakes, weight gain and the weight loss epidemic as indicated **.**

Meanwhile,**Oliveira *et al*. (2004)** found that the rising consumption of vegetables fertilizer and meat additives provides a rising intake of mercury and Lead which can contribute to weight loss and underweight.

Also, **Frasco*et al*. (2005)**reported that increased mercury consumption would decrease total energy intake by decreased appetite and decreased fat intake**.**

Barro*et al*.(2010)found that high intake of15%*Malvasylvestris* and15% *ficussycomorus* which used as food additives in soft foods, has been linked to increase body weight. This effect led to high content of dietary fiber, phenols as antioxidants compound. Also, **Karakaya (2004)**who found that15%*coriander sativum*seeds increased weight gain to contained many biological active compounds including chymopapain and papain which is the ingredient that aids digestive system and a good supply of vitamin A and C that are highly essential for maintaining a good health.

Table (1): Effect of some vegetables and fruittreated with high doses of lead and mercuryon body weight gain (BWG).

Groups	BWG g / 4 weeks
Negative control.(G1)	43.64a ± 4.21
Lead 0.2% as a positive control.(G2)	4.61e ± 0.13
Mercury0.02% as appositive control.(G3)	1.83f ± 0.18
Lead0.2% and *ficussycomorus* at the level 15%.(G4)	15.74d± 0.21
Mercury 0.02% and *ficussycomorus* at the level 15%. (G5)	14.12d ± 1.19
Lead 0.2% and *Malva sylvestris* at the level 15%**.**(G6)	17.54c ± 1.11
Mercury0.02% and *Malva sylvestris* at the level 15%.(G7)	16.68c ± 1.2
Lead0.2% and *coriander sativum* at the level 15%**.**(G8)	15.15d ± 2.19
Mercury 0.02% and *coriander sativum* at the level 15%.(G9)	18.03b ± 3.21
LSD: P ≤0.05	0.48

Means in the same column with different litters are significantly different (P ≤0.05).

2-Effect of some vegetables and fruits treated with high doses of lead and mercury on Feed Intake (FI)and feed efficiency ratio (FER).

Data present in table (2) showed the effect of some vegetables and fruittreated with high doses of lead and mercuryon food intake (FI) and feed efficiency ratio (FER) (mean± SD).

It is clear that no significant differences in food intake (FI) between both positive controls which was 2.83 ± 0.18 and2.69 ± 0.04g/day groups. From the same table, it could be moticed that the differences in values of food intake between all treated groups were considerable as compared to negative and positive control groups. The obtained data revealed a high variation in food intake between treatments and the controls group, this may be due to the acceptability of the added materials. These results are in accordance with those reported by **Frasco *et al*.(2005)** who found that mercurydecreased appetite and decreased fat intake**.Calliste *et al*.(2001)** reported that15%*coriander sativum* is a source of antioxidants vitamin as A that prevents damage caused by free radicals that may cause some forms of cancer.

According to data present in the same table (4) , it could be observed that feed efficiency ratio (FER)for groups which fed on 15% tested vegetables and fruit were 0.055± 0.003, 0.059 ± 0.001, 0.054 ± 0.001, 0.049 ± 0.003, 0.052 ± 0.001 and 0.052 ± 0.001 for G (3, 4, 5, 6,7, 8 and 9),respectively. While, in control negative group was 0.089±0.001.These results denote that there were significant increases in feed efficiency ratio (FER)for all groups when compared with both control positive groups. The highest value of feed efficiency ratio (FER) was found in 15%*Malvasylvestris* group. It is noticed that a significant decreases in BWG for control group compared to all groups, was indicated and confirmed that the real effect for BWG due to vegetables and fruit administration.

From the obtained results, it could be observed that treating rats with the tested vegetables and fruit led to increase in BWG, FI and FER when compared with both positive controls while lower than negative control. These results were in agreement with those reported by **Calliste *et al*.(2001**) who said that dietary fiber (DF) derived from fruits and vegetables have a relatively high proportion of SDF.**Barro*et al*.(2010**)stated that dietary fiber of15%*Malvasylvestris*had bioactive compounds with antioxidant properties, such as flavonoids and vitamin C.

Table (2): Effect of some vegetables and fruit treated with high doses of Lead and mercuryon feed intake (FI) and feed efficiency ratio (FER) (mean± SD).

Groups	FI (g/day)	FER
Negative control.(G1)	$11.71^{a} \pm 0.22$	$0.089^{a} \pm 0.001$
Lead 0.2% as a positive control.(G2)	$2.83^{e} \pm 0.11$	$0.038^{d} \pm 0.001$
Mercury0.02% as appositive control.(G3)	$2.69^{e} \pm 0.02$	$0.016^{e} \pm 0.001$
Lead0.2% and *ficussycomorus* at the level 15%. (G4)	$6.76^{c} \pm 0.12$	$0.055^{b} \pm 0.002$
Mercury 0.02% and *ficussycomorus* at the level 15%. (G5)	$5.68^{d} \pm 0.27$	$0.059^{b} \pm 0.002$
Lead 0.2% and *Malva sylvestris* at the level 15%.(G6)	$7.7^{b} \pm 0.24$	$0.054^{b} \pm 0.001$
Mercury0.02% and *Malvasylvestris* at the level 15%. (G7)	$7.98^{b} \pm 0.042$	$0.049^{c} \pm 0.001$
Lead0.2% and *coriander sativum* at the level 15%.(G8)	$6.86^{c} \pm 0.37$	$0.052^{b} \pm 0.002$
Mercury 0.02% and *coriander sativum* at the level 15%. (G9)	$8.32^{b} \pm 0.43$	$0.052^{b} \pm 0.002$
LSD P ≤ 0.05	0.32	0.006

Means in the same column with different litters are significantly different (P ≤ 0.05).

3- The effect of some vegetables and fruit treated with high doses of lead and mercury on kidney functions(mean± SD).

Data given in table (3)showed the effect of some vegetables and fruittreated with high doses of lead and mercury on serum urea levels(mean± SD).

It could be observed that the highest value of serum urea levels was found in rats which receive lead as positive control group. No significant changes were found in serum urea levels between groups 4 and 9. also, there is no significant among the other treated groups.

It is clear to motice that creatinine levels in control negative group was 0.46 ± 0.02 mg/dl which significantly decreased when compared with rats which received the levels 2g mercury salt and lead salt as positive controls and groups fed on these material with all types of vegetables and fruit. Meanwhile, rats of groups 4, 5,6,7 and 8 which received vegetables and fruit ,creatinine levels of these groups were significant differences between each other and showed significantly increasing when compared to control negative group. Groups 9 recorded the lowest creatinine value which showing a significant decreased as compared to the other groups and a significant increased when compared with control negative group .

Table (3): Effect of some vegetables and fruit treated with high doses of lead and mercuryon serum urea and creatininelevels(mean± SD).

Groups	**Urea (mg/dl)**	**Creatinine (mg\dl)**
Negative control(G1)	37^{c} ± 4.23	0.46 d ± 0.12
Lead 0.2% as a positive control.(G2)	48.33 a ± 3.21	1.45 a ± 0.22
Mercury0.02% as appositive control.(G3)	47.33 a ± 3.31	1.45 a ± 0.15
Lead0.2% and *ficussycomorus* at the level15%.(G4)	44.33 b ± 4.12	1.33 b ± 0.35
Mercury 0.02% and *ficussycomorus* at the level 15%.(G5)	45.3 b ± 1.1	1.35 b ± 0.50
Lead 0.2% and *Malvasylvestris* at the level15%**.**(G6)	42.6 bc ± 2.4	1.31 b ± 0.64
Mercury0.02% and *Malva sylvestris* at the level 15%. (G7)	42.23 bc ± 2.72	1.27 bc ± 0.15
Lead0.2% and *coriander sativum* at the level 15%**.**(G8)	44 b ± 3.6	1.30 b ± 0.45
Mercury 0.02% and *coriander sativum* at the level 15%. (G9)	40 c ± 0.7	1.15 c ± 0.24
LSD: P≤0.05	3.03	0.063

Means in the same column with different litters are significantly different (P ≤0.05).

The effect of some vegetables and fruit treated with high doses of lead and mercuryon liver functions(mean± SD)**.**

Data presented in table (4) showed the effect of some vegetables and fruit treated with high doses of lead and mercuryon levels of serum AST(mean± SD).

It could be observed that in control negative group GOT was39± 2 u/l which significantly increased in both controls group being 103 ± 3 u/l and105 ± 3. But, the levels of GOT in groups 4, 5, 6, 7, 8 and 9 which were 90± 5, 94 ± 7 , 84 ± 6, 80 ± 5, 84 ± 7 and 72 ± 6 u/l, respectively showed significant increases as compared to control negative group and significant decreases as compared to control positive groups. Also, there were no significant changes between groups of 4 and 5, between groups 6,7 and8. The strongest effect in serum GOT levels recorded for group 9 which fed on basal diet with 15%coriander sativum.

It is clear that the serum level of (GPT) in group 9 which fed on mercurywith 15%*coriander sativum*was the lowest level which being 50 ± 1.08 U/L and showing no significant change with group which fed on lead with 15%*coriander sativum* which was 55 ±3.6 U/L. At the same time, rats which received lead with 15% *ficussycomorus* andlead with15%*Malvasylvestris*showed no significantly different oflead with 15%*Malvasylvestris* in serum level of GPT. Meanwhile, rats which received vegetables and fruit with mercury and lead showed a significant increase in the level of GPT as compared to control negative group while, its decreased when compared with both positive controls.Group fed on lead with15%*Malvasylvestris* group was the highest value of GPT and the lowest group wasmercury with 15%*coriander sativum* group.

These results are im agree ment with *coriander sativum***Edeoga*et al.*(2005**) they revealed that mercury had a potential role to cause injuries in several organs and tissues.The increased consumption of mercury and Lead sources in foods and drinks is linked with the hepatic metabolism and caused lipogenesis and ATP depletion, which leads to fat accumulates in the liver by the primary effect of NO oxidation. It could be hypothesized that increased mercury and Lead sources consumption contributes to the development of non-alcoholic fatty liver disease (NAFLD) which can progress to cirrhosis over time in some individuals**.**

Also,**Billeter*et al.* (1991**)memtioned that *Malvasylvestris* (*Mangiferaindica* L.) seed is one of the most important food waste which containing phenolic antioxidant compound which protected liver from any free radical.

Stahu*et al*. (2007) found that the*Malva sylvestris* seed extraction contained dietary fiber or essential oils , the flavonoids hesperidin and narirutin which reduced the residual mercury levels and the degree of lipid oxidation.

Foda (1998) stated that*ficussycomorus* had high antioxidant activity and might be rich source of natural antioxidants which protect liver tissues from damage.

Girenko (1982) found that*coriander sativum* contained significant antioxidant activity and hadhepatoprotection effect seeds by restoring the normal hepatic architecture**.**

Table (4): Effect of some vegetables and fruit to high doses of Lead and mercuryon serum levels of GOT and GPT(mean± SD)**.**

Groups	**GOT(U\L)**	**GPT(U\L)**
Negative control.(G1)	**39^{e}± 2**	**45 c ± 0.6**
Lead 0.2% as a positive control.(G2)	**103 a± 3**	**87 b ± 2.3**
Mercury0.02% as appositive control.(G3)	**105 a ±3**	**95 a ± 5.4**
Lead0.2% and *ficussycomorus* at the level 15%. (G4)	**90 b ± 5**	**72.66 c ± 0.34**
Mercury 0.02% and *ficussycomorus* at the level 15%. (G5)	**94 b ± 7**	**77 c ± 3.8**
Lead 0.2% and *Malva sylvestris* at the level 15%**.**(G6)	**84 c ± 6**	**55 e ± 3.6**
Mercury0.02% and *Malva sylvestris* at the level 15%. (G7)	**80 c ± 5**	**62.66 d ± 3.34**
Lead0.2% and *coriander sativum* at the level 15%**.**(G8)	**84 c ± 7**	**67 d ± 1.4**
Mercury 0.02% and *coriander sativum* at the level 15%. (G9)	**72 d ± 6**	**50 e ± 1.8**
LSD: P≤ 0.05	**7**	**7**

Means in the same column with different litters are significantly different. (P ≤ 0.05).

Histopathological results

A- Brain:

Photo (1),showed brain's rat which fed on basal diet, the brain structure showing nohistopathological changes. In Photo (2), brain' s rat which fed on basal diet with lead 0.2% showed that cellular oudema, meuronophagia and perivascular glia cells, meuronal degeneration and meuronophagia. In Photo (3), brain's rat which fed on basal diet with mercury 0.02% showed thatmecrosis of some meurous. In Photo (4), brain' s rat which fed on basal diet with lead 0.2% and 15% Ficusshowed thatpyknosis of some meurous and proliferation of glia cells. In Photo (5), brain' s rat which fed on basal diet with mercury 0.02% and 15% Ficusshowed that no histopathological changes . In Photo (6),brain' s rat which fed on basal diet with lead 0.2% and 15% *malvasylvestris* showed that pyknosis of meurons. In Photo (7),brain's rat which fed on basal diet with mercury 0.02% and 15% *malvasylvestris* showed that no histopathological changes. In Photo (8),brain' s rat which fed on basal diet with lead 0.2% and 15% *coriander*showed thatmeuronal degeneration and meuronophagia. Brain's rat which fed on basal diet with mercury 0.02% and 15% *coriande*r showed that no histopathological changes (Photo9).

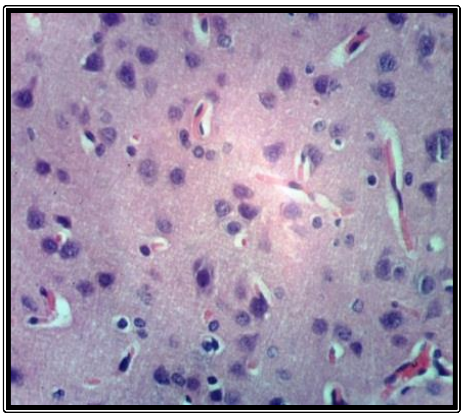


Photo (1): Brain of rat fed on diet as control negative

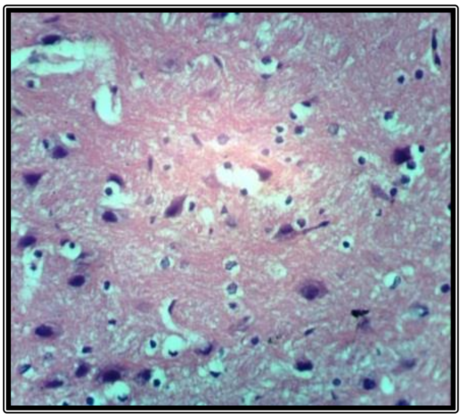
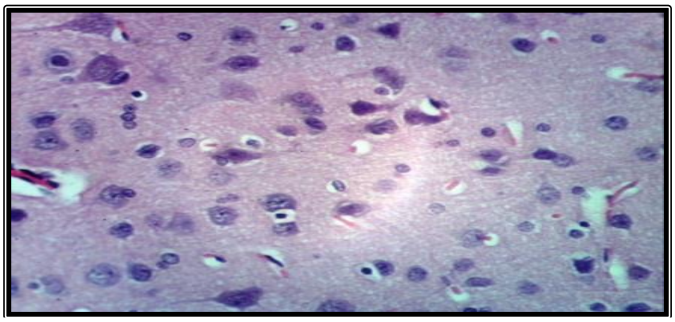
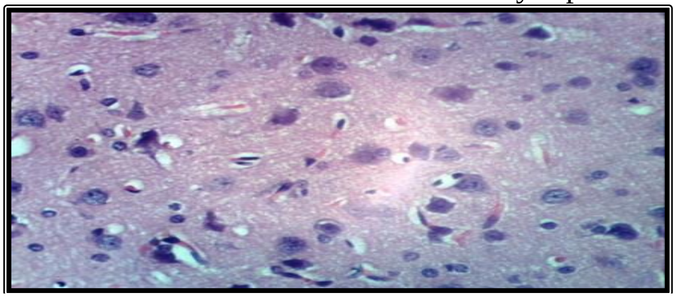


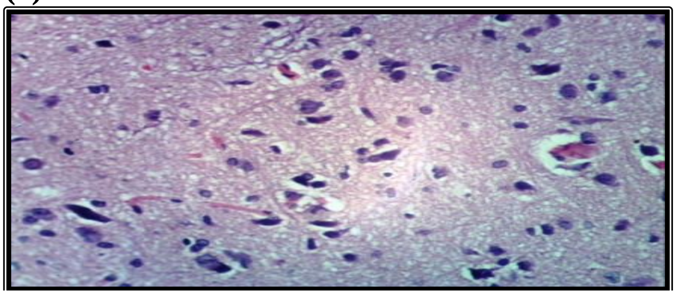
Photo (2): Brain of rat fed on diet with 0.2% lead as positive control



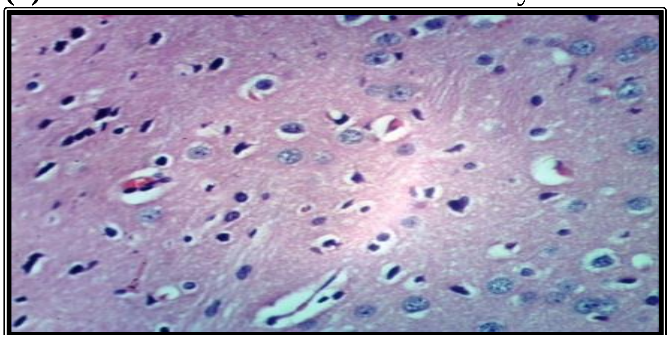
Photo(3): Brain of rat fed on diet with 0.02% Mercuryas positive control



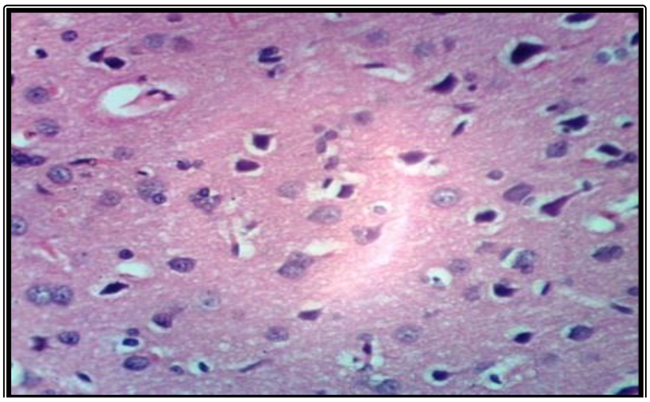
Photo(4): Brain of rat fed on diet with lead anddd15% ficus



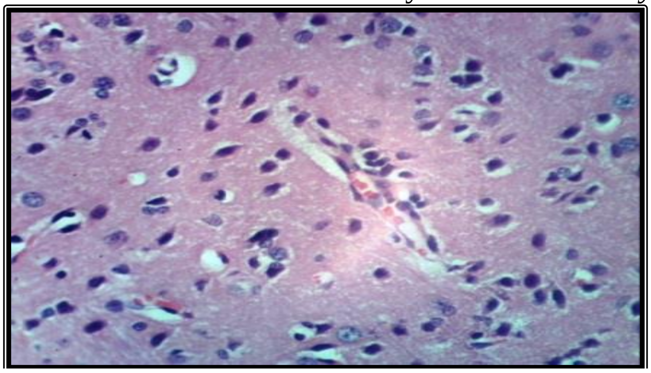
Photo(5): Brain of rat fed on diet with mercury and 15% ficus



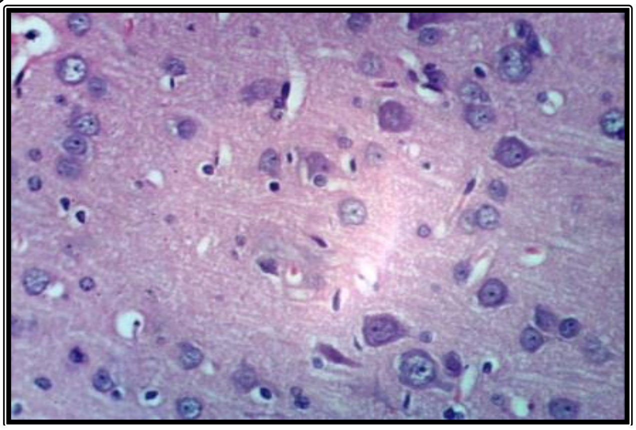
Photo(6): Brain of rat fed on diet with lead and 15% *malvasylvestris*



Photo(7): Brain of rat fed on diet with mercury and 15% *malvasylvestris*



Photo(8): Brain of rat fed on diet with lead and 15% *coriander*



Photo(9): Brain of rat fed on diet with mercury and 15% *coriander*

B-Liver:

Liver' s rat which fed on basal diet,the liver structure showing the normal histological (photo 10). In photo(11), Liver' s rat which fed on basal diet with lead0.2% showed the congestion of central vienand hepatic simusoids andkupjjer cells activation and with local hepatic mecrosis associated mononuclear cells infiltration. In Photo (11), Liver' s rat which fed on basal diet with mercury 0.02% showed local hepatic mecrosis associated mononuclear cells infictrationalso, showed that slight vacuoligation of hepatocytes Liver's rat which fed on basal diet with lead.2% and Ficus15% showed that hydropic degeneration of hepatocytes (Photo 11).:Liver's rat which fed on basal diet with mercury.o2% and Ficus15% showed no histopathological changes (Photo 12). Liver's rat which fed on basal diet with lead.2% and *malvasylvestris* 15% showed that slight activation of kupjjer cells (Photo 13). Liver's rat which fed on basal diet with lead.2% and *malvasylvestris*15% showed that kupjjer cells activation (Photo14) . Liver's rat which fed on basal diet with mercury.02% and *malvasylvestris*15% showed that kupjjer cells activation and cytoplasmic vacuoligation of hepatocytes (Photo 15) . Liver's rat which fed on basal diet with mercury.02% and malvasylvestris 15% showed that slight kupjjer cells activation (Photo 16). Liver's rat which fed on basal diet with lead.2% and *coriander*15% showed that kupjjer cells activation (Photo 17). Liver's rat which fed on basal diet with mercury.o2% and *coriander*15% showed slight hydropic degeneration of hepatocytes (Photo 18).

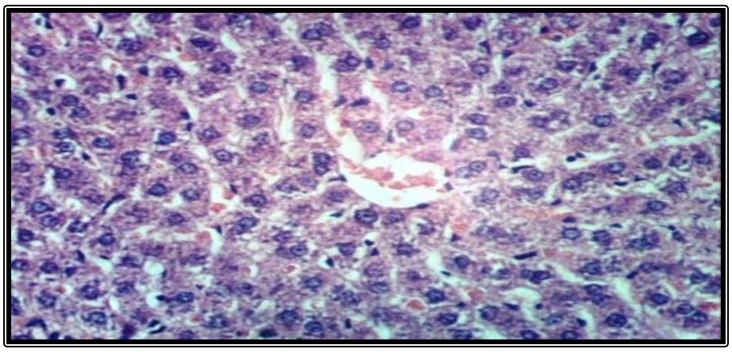


Photo (10): liver of rat fed on diet as control negative

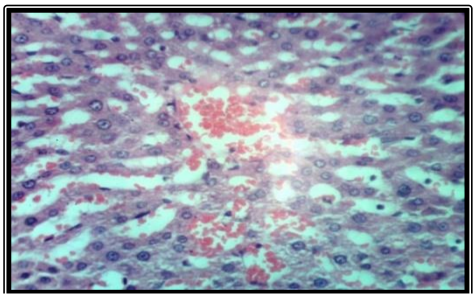
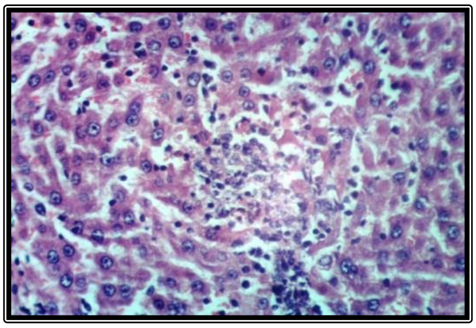
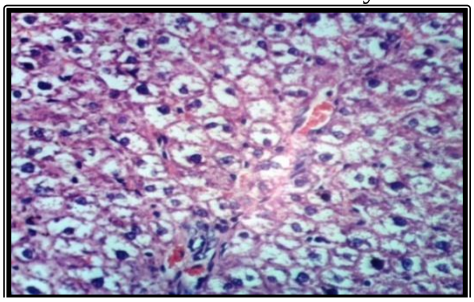


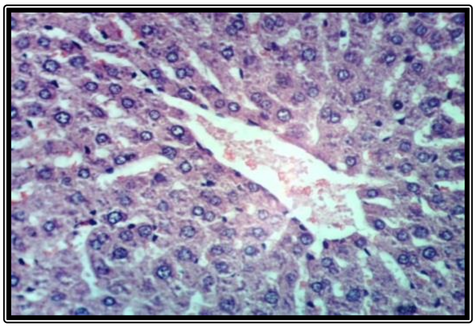
Photo (11) : liver of rat fed on diet with lead 0.2% as positive control



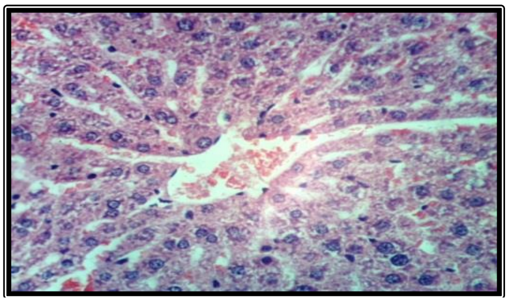
Photo(12): liver of rat fed on diet with mercury 0.02% as positive control



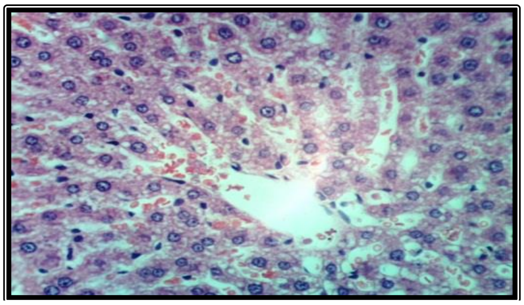
Photo(13): liver of rat fed on diet with lead and15%ficus



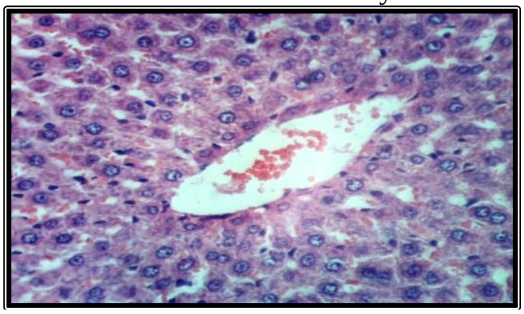
Photo(14): liver of rat fed on diet with mercury and 15% ficus



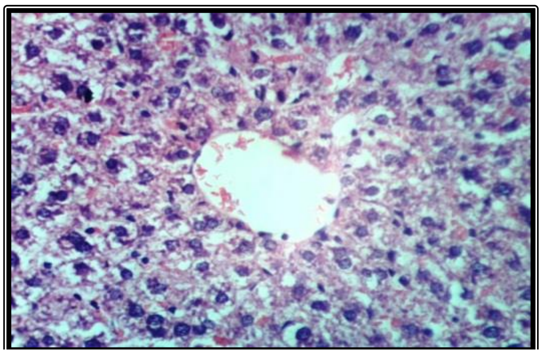
Photo(15): liver of rat fed on diet with lead and 15% *malvasylvestris*



Photo(16): liver of rat fed on diet with mercury and 15% *malvasylvestris*



Photo(17): liver of rat fed on diet with lead and 15% *coriander*



Photo(18): liver of rat fed on diet with mercury and 15% *coriander*

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