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# Ameliorative Effect of Aqueous Seed Extract of *Citrullus Lanatus* (Water Melon) on Liver Function Parameters and Markers of Oxidative Stress in Lead Treated Rats

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## ABSTRACT

Extensive and unmonitored use of lead in developing and industrialized countries is posing a serious threat to human health. Prolonged exposure of a sub-lethal dose of this toxicant is closely related to its accumulation in various soft tissues and its interference with bio elements that hamper several physiological processes. The study was designed to investigate the potential effect of aqueous seed extract of *Citrullus lanatus* on liver function parameters and oxidative stress markers. Forty healthy albino rats of both sexes were randomly divided into four groups: Group 1: Normal, Group 2 Lead untreated, dose 15mg/kg lead acetate. Group 3 and 4 were dosed 15mg/kg lead acetate and aqueous seed extract 50mg/kg and 100 mg/kg respectively for 21 days. The present study revealed that AST, ALT and ALP levels were significantly increased ($P < 0.05$) in lead induced untreated group compared to control. There was no observed difference in serum total proteins ($P > 0.05$) among all the groups but albumin, significantly decreased ($P < 0.05$) compared to control. Serum vitamin A and E concentration were shown to have decreased in lead untreated groups while Vitamin C level remained unchanged. The level of GSH and catalase activity increased in the treatment groups with decreased in MDA level. It is therefore suggested that aqueous seed extract of water melon might be rich in antioxidants, hence effective in preventing lipid peroxidation.

**Keywords:** Antioxidants, *Citrullus lanatus*, Lead, Oxidative stress.

## INTRODUCTION

Lead (Pb) is fifth most abundant metal and one of the earliest metals discovered by human race (Chakrabarty *et al*., 2014). The Uniqueness of its properties like softness, high malleability, ductility, low melting point and resistance to corrosion, have resulted in its widespread usage in different industries like automobiles, paint, ceramics, plastics and cosmetics. This in turn has led to a manifold rise in the occurrence of free lead in biological systems and the environment (Tong *et al*., 2000). Humans are exposed to lead via natural and anthropogenic activities such as mining and smelting, construction works, ingestion contaminated food and water, cosmetics etc (Flora *et al.,* 2006). Therefore, lead has been marked as an environmental pollutant known to inflict public health effects to animals and humans. It has been reported that lead damages central nervous system, hematological, cardiovascular, renal, hepatic and reproductive systems (Sodeke *et al*., 2005).

*Citrullus lanatus* (Watermelon) belongs to the family of *cucurbitaceae*. (Schipper, 2000). Watermelon plays a very important role in Africa as food, beverages and to quench thirst. The fruit is an excellent source of vitamin A, B & C. Traditionally, it has been used to cleanse kidney and bladder, lowers high blood pressure, prevent erectile dysfunction and to treat liver enlargement and jaundice (Schipper,2000).

A wealth of information from the literature had shown that lead induced oxidative stress through generation of reactive oxygen species (Debasish *et al.,* 2014). The preliminary phytochemical analysis showed that the water melon seeds is rich in some bioactive constitute such as saponins, flavonoids, cyanogenic glycosides,

alkaloids, tannins and oxalate and vitamins (Schipper,2000; Braide *et al,* 2012).Therefore, water melon seed might be potential against lead-induced oxidative stress.

## MATERIALS AND METHODS

### EXPERIMENTAL ANIMALS

A total of forty (40) white albino rats (Rattusnovergicus) weighed 170-200g. The animals were purchased from Animal House of the Biochemistry Department, Usmanu Danfodiyo University Sokoto. The rats were kept in a well-ventilated room under careful supervision with free access to feeds (vital feeds Nigeria limited) and water.

### PREPARATION OF PLANT EXTRACT

Water melon was purchased from the Sokoto main market, Sokoto State, Nigeria, the seeds were separated and allowed to dry under shade, and then pulverized into fine powder using pestle and mortar. The dried seeds were soaked overnight in double distilled water (7.5g per 100 ml) and filtered then dried in an oven at $45^0$C. The filtrate was stored at -$20^0$C until use.

### EXPERIMENTAL DESIGN

The animals were allowed for a week to acclimatize to laboratory conditions, the rats were randomly divided into 4 groups, with 10 rats each
Group I: Normal
Group II: Lead treated (dosed 15 mg/kg) Control
Group III: Lead treated (dosed 15 mg/kg) + *Citrullus Lanatus* extract, dosed 50 mg/kg
Group IV: Lead treated (dosed 15 mg/kg) + *Citrullus Lanatus* extract, dosed 100 mg/kg
The treatment lasted for 14 consecutive days.

### COLLECTION AND PREPARATION OF BLOOD SAMPLES

Animals were sacrificed and blood samples were collected into plain labeled test tubes, allowed to clot and centrifuged for 15 minutes at 400rpm.

### Assessment of Biochemical Parameter

Total Protein was determine by Biuret Reaction Method, Gomall *et al*., (1949),

Determination of serum Aspartate aminotransferase AST and Alanine Aminotransferase (ALT) were achieved by the Colorimetric Method of Reitman and Frankel, (1957); estimation of Serum Alkaline Phosphatase (ALP) was carriedout using the Method of Bessey *et al.* (1946). Catalase was assayed based on the method described by Aebi (1974); reduced glutathione was determined according to the method of Beutler *et al*. (1963). Estimation of serum β-carotene was done by the method of Latimer (2007). Vitamin C was assayed by the method of Rutkowski . and Grzegorczyk . (1998). Vitamin E was estimated using the method of Rutkowski *et al.* (2005). Estimation of serum malondialdehyde wss achieved by the method of Hartman, (1983)

### Data Analysis

Data generated were presented in tabular form and expressed as mean ± Standard Deviation. The results obtained were statistically analyzed by one way ANOVA, using Graph pad Instat software version 3.0 Sen Diego USA. The differences in mean were considered statistically significant at $P<0.05$.

## RESULTS

The result of effect of aqueous *Citrullus lanatus* seed extract on liver enzymes in Lead induced rats was presented in Table 1 below. From the results, it was observed that AST level significantly increased ($P < 0.05$) in lead induced untreated group in comparison to other groups. Non- significant difference ($P >0.05$) was observed between the group dosed with 50 mg/kg of the extract and control. No statistical difference ($P > 0.05$) observed in ALT and ALP levels across the groups.

The results of serum total proteins and albumin concentration were presented in Table 2 below. There was no observed difference in serum total proteins ($P > 0.05$) among all the groups. In contrast, significantly decrease in albumin levels ($p < 0.05$) was evident in lead treated groups compared to other groups. Slight increase in

serum albumin levels in extract treated groups was observed.

**Table 1**: Effect of aqueous *Citrullus lanatus* (watermelon) seed extract on some liver Enzymes in Lead induced rats.

| Groups | AST(U/L) | ALT(U/L) | ALP(U/L) |
|---|---|---|---|
| I | 65.27±27.15 | 36.28±9.43 | 9.68±5.44 |
| II | 124.18±32.19[a] | 35.87±11.56 | 14.81±3.59 |
| III | 61.72±41.92 | 34.14±19.70 | 13.24±7.84 |
| IV | 56.60±38.37[b] | 33.63±20.99 | 11.03±0.60 |

Data are presented as Mean ± SD. Values with different superscript alphabets in column are significantly difference (P<0.05)

**Table 2:** Effect of aqueous *Citrullus lanatus* (watermelon) seed extract on total protein and albumin levels in lead treated rats.

| Groups | Total Proteins(g/dl) | Albumin(g/dl) |
|---|---|---|
| I | 6.38±1.03 | 7.75±0.27 |
| II | 3.65±0.62 | 2.22±0.24[a] |
| III | 4.02±2.14 | 2.63±1.50[a] |
| IV | 4.30±2.46 | 3.02±1.70[a] |

Data are presented as Mean ± SD. Values with different superscript alphabets in column are significantly difference (P<0.05).

The results of serum antioxidant vitamins concentration were presented in table 3. Serum vitamin A was significantly decreased (P < 0.05) in lead treated groups. However, there were slight increased in serum vitamin A levels in extract treated groups. There was no observed difference in serum Vitamin C concentrations (P > 0.05) among all the groups. The levels of vitamin E was significantly decreased (P < 0.05) in lead induced untreated group compared to control. There was non-significant difference (P > 0.05) between the extract treated groups compared to positive and negative controls.

**Table 3:**. Effect of aqueous seed extract of *Citrullus lanatus* on antioxidant vitamins levels in lead induced albino rats

| Groups | Vitamin A(mg/dl) | Vitamin C (mg/dl) | Vitamin E(mg/dl) |
|---|---|---|---|
| I | 15.98±1.99 | 3.27±0.67 | 6.79±1.40[a] |
| II | 8.15±1.90[a] | 2.67±0.39 | 3.67±1.02[b] |
| III | 10.88±1.20[a] | 3.10±0.77 | 5.75±1.09[ab] |
| IV | 9.28±1.40[a] | 3.47±0.52 | 5.93±0.89[ab] |

Data are presented as Mean ± SD. Values with different superscript alphabets in column are significantly difference (P<0.05)

The results of serum MDA, catalase and reduced glutathione (GSH) levels were presented in table 4.The level of GSH and catalase in Lead induced untreated group was significantly decreased compared to control (P < 0.05). The GSH concentration and catalase activity in extract treated groups were significantly increased (P < 0.05) compared to untreated group. Similarly, MDA level in lead untreated group was significantly high compared to control group. Non-significant difference (P > 0.05) was shown between treated groups and control while significant decreased (P < 0.05) of MDA level was observed between the extract treated groups and lead untreated group.

## DISCUSSIONS

The significant increase observed in the lead untreated group for liver enzymes activity particularly AST indicates that the damaging effect of lead in the hepatocytes. Interestingly, the aqueous seed extracts of water melon had reversed the effect in dose defendant fashion. It was noted that the ALT and ALP activities decreases with increased in extract concentration. This finding is contrary to that of Nabil et al. (2013) and in agreement with the findings of Ebuehi et al. (2012)

**Table 4:** Effect of aqueous seed extract of *Citrullus lanatus* on MDA,catalase and reduced glutathione (GSH) levels in lead induced rats.

| Groups | GSH(mg/dl) | Catalase(U/mg) | MDA(mmol/L) |
|---|---|---|---|
| I | 0.24±0.03 | 261.58±8.36 | 0.05±0.01 |
| II | 0.14±0.01[a] | 183.00±7.94[a] | 0.93±0.08[a] |
| III | 0.20±0.02 | 225.77±6.69[b] | 0.06±0.01 |
| IV | 0.23±0.03 | 260.05±5.68 | 0.06±0.01 |

Data are presented as Mean ± SD. Values with different superscript alphabets in column are significantly difference (P<0.05)

The effect of lead in the liver has resulted in decreased concentration of total protein and albumin in lead untreated group. This indicated that the synthetic function of the liver has been altered and our results showed that water melon seed extract could alleviate this effect.

The results had indicated that lead administration has resulted in significant decreased (P<0.05) in serum vitamin A concentration and treatment with the extract could not avert the change. The non-significant difference (P>0.05) observed due to lead in serum vitamin C concentration have been normalized in extract administered group. A total reverse of the effect of lead on vitamin E was observed in the group treated with extract. This results is contrary to the results obtained by Anetor et al. (2008)

A remarkable result observed in GSH concentration and catalase activity in lead treated groups because the extract has effectively regularized the adverse effect of lead. Undoubtedly the MDA results proved that lead is potent inducer of oxidative stress. However, the water melon seed extracts have successfully restored the antioxidant status and prevent lipid peroxidation. This finding is in agreement to the results reported by Ebuehi *et al.* 2012; Ikpeme *et al*. 2016

## CONCLUSION

From the result of this study, it can be concluded that lead is potential inducer of oxidative stress and may damage the hepatocytes resulting to alteration in the synthetic function of the liver in rats. Aqueous extract of watermelon seed extracts are antioxidants reservoir with the potency to ameliorate lead-induced oxidative stress and improve liver function in rats in dosed defendant fashion.

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