Protective Effects of Moringa Oleifera Leaf Extract on Mercury Induced Renotoxicity in adult wistar Rats

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Abstract- Moringa oleifera leaf extract has been reported after analysis of its phytochemical constituents to have natural antioxidants that aid in natural defence. The hepatoprotective evaluation of leaf extract of moringe oleifera on mercury induced renotoxicity was studied. Twenty four healthy adult wistar rats weighing between 190-270g were grouped into four groups (A, B, C & D) of six animals each. Group A served as the control and were orally administered with 0.5ml of distilled water; the experimental groups (B, C & D) received the following: Group B received 0.5ml of Moringa oleifera leaf extract, group C received 0.3ml of mercury while group D received 0.3ml of mercury + 0.5ml of Moringa oleifera leaf extract orally for twenty eight days. The animals were weighed after the last administration and sacrificed. Kidney tissues were removed, weighed and trimmed down for histological studies. There was weight gain in group B and D relative to the control while group C had a reduction in weight. Histological results showed normal cytoarchitecture of the kidney tissues of group B and D relative to the control A while group C animals had distortion of cytoarchitecture of kidney tissues.

Index Terms- Wistar rats, Kidney weight, Body weight, Renotoxicity, Kidneys.

I. INTRODUCTION

Moringa oleifera is a fast growing evergreen deciduous tree. It can reach a height of 10-12m [1] and the trunk can reach a diameter of 4.5cm [2].The Moringa tree is grown mainly in semiarid, tropical and subtropical areas. It is grown in home gardens and as living fences in southern India and Thailand where it is commonly sold in local markets [3].

In the philipines, it is commonly grown for its leaves which are used in soup. Moringa is also actively cultivated by the world Vegetable center in Taiwan with a mission to reduce poverty and malnutrition in developing countries through improves production and consumption of vegetables [4].

In some regions, the young seed pods are most commonly eaten [5] while in others, the leaves are the most commonly used part of the plant [6].The leaves are the most nutritious part of the plant, being significance source of B-vitamins, vitaminC, provitaminA, vitaminK,manganese and protein among other nutrients [7].

When compared with common food particularly high in certain nutrient per 100g fresh weight, cooked Moringa leaves are considered source of these same nutrients [8, 9]. Moringa oleifera tree have been used to combact malnutrition especially among infant and nursing mothers [10]. The nutritional properties of Moringa oleifera are now so well known that there seems to be a little doubt of the substantial health benefit to be realized by consumption of Moringa leaf powder in a situation where starvation is imminent [11].

Therefore, there is need to investigate the hepatoprotective effect of Moringa oleifera leaf extrct on mercury induced renotoxicity in adult wistar rats.

II. MATERIALS AND METHODS

2.1 Procurement of plant

Moringa oleifera leafs were plugged from Nibo in Awka South Anambra State. It was authenticated in the department of Botany, Nnamdi Azikwe University Awka.

2.2 Drug Preparation

Fresh leafs of Moringa oleifera were plugged, shade dried and grinded into powder weighing 700g before extraction. The powder was macerated into absolute alcohol at room temperature. The filtrate was concentrated under reduced pressure and later evaporated in a water bath using evaporating dish at 45 °C.

2.3 Experimental Protocol

Twenty adult wistar rats weighing between 190-270g were procured for the study. The animals were allowed to acclimatize to the laboratory environments in the department of Anatomy for two weeks and were fed ad libitum with guine feed and water. The animals were grouped into four groups (A, B, C & D) of five animals each. Group A served as the control and were orally administered with 0.5ml of distilled water; the experimental groups (B, C & D) were orally administered with different doses of drugs as follows: group B received 0.5m of Moringa oleifera leaf extract; group C received 0.3ml of mercury plus 0.5ml of Moringa oleifera leaf extract. The administration lasted for twenty eight days using intubation method. The animals were weighed after last administration and anaesthetized under chloroform vapour and dissected. Kidney tissues were removed, weighed, and trimmed down for histological studies.

2.4 Tissue Processing

The tissues were processed through process of fixation, dehydration, clearing, infiltration, embedding, sectioning and staining. Fixation was carried out in zenkers fliud. The tissues were washed overnight in running tap water after four hours in zenker fluid. Dehydration of the fixed tissues were carried out in different percentages of alcohol 50%, 70% and 90% absolute. The tissues were then cleared in xylene and embedded in paraffin wax. Serial sections were deparaffined hydrated and stained

using the routine haematoxylin and eosine method. The stained sections were then examined under the light microscope.

III. RESULTS

3.1: Morphometric Analysis of Body Weight

Table 1: Comparison of mean initial and final body weight and weight change in all groups (A, B, C & D)
(Mean ± SEM given for each measurement)

	GP A	GP B	GP C	GP D	F-RATIO	PROB OF SIG
INITIAL BODY WT	217.33±4.79	231.60±4.64	263.86±7.63	248.50±6.94	56.32	<0.05
FINAL BODY WT	225.50±6.60	242.51±7.21	234.25±8.53	257.65±9.10	27.52	<0.05
WT. CHANGE	6.17± 0.120	6.05 ± 0.161	8.75 ± 0.225	6.71 ± 0.172	51.84	<0.05

The final body weight of group B and D increased significantly ($<$0.05) relative to the control while group C body weight decreased significantly when compared with control and other experiment groups (B, D).

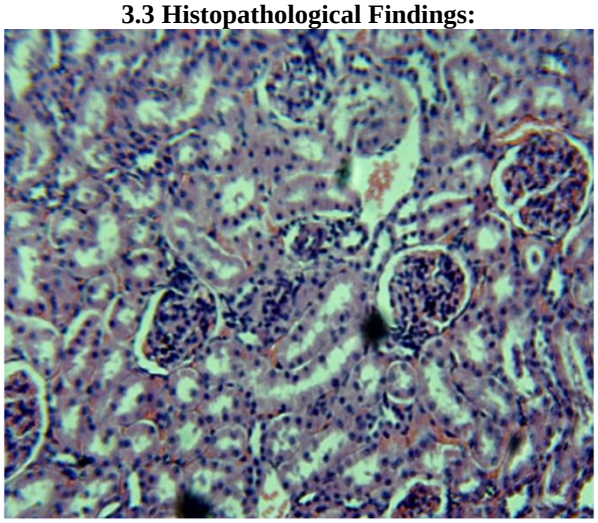
3.2: Morphometric Analysis of organ (kidney) Weight

Table 2: comparison of mean relative kidney weight in all the groups (A,B,C & D)
(Mean ± SEM given for each Measurement)

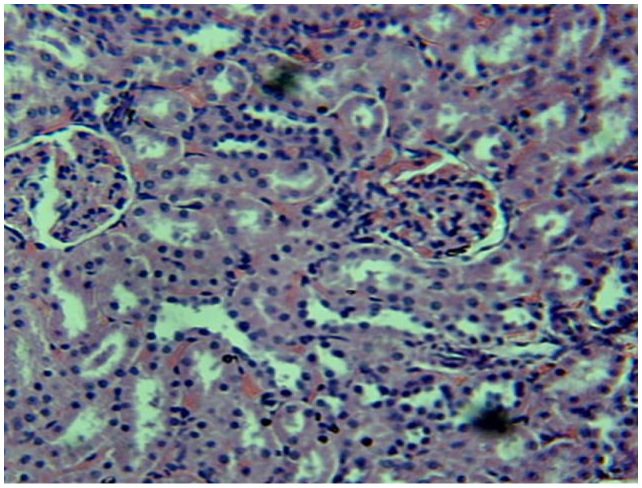
	GP A	GP B	GP C	GP D	F. RATIO	PROB OF SIG
SPLEEN WEIGHT.	5.20±0.170	5.28±0.217	7.10±0.420	5.32±0.140	54.80	<0.05

The relative kidney weight of group B and D increased significantly ($<$0.05) relative to the control while group C had elevated weight when compared with the control and groups B and D.

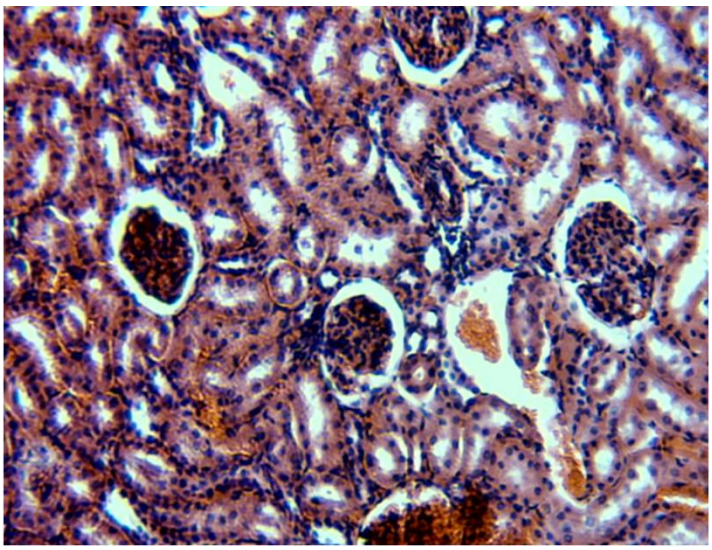
3.3 Histopathological Findings:



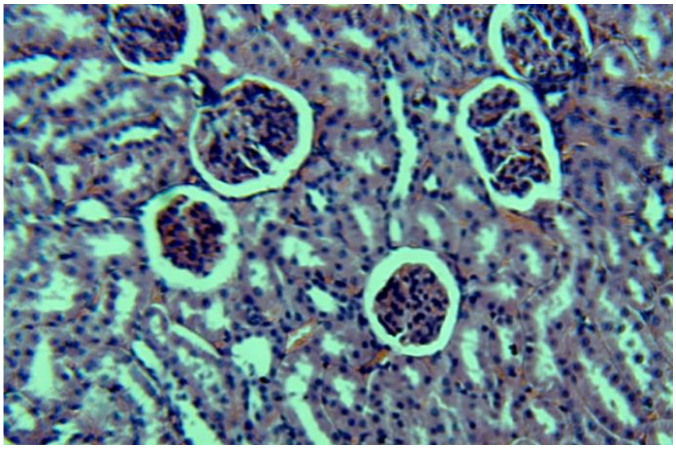
Micrograph 1(control) showing normal histological structure of renal corpuscle, proximal convoluted tubule ,distal convoluted tubule, henles loop, and collecting tubule stained by H & E technique,



Micrograph 2 Group B, (treated with 0.5ml of Moringa oleifera leaf extract) showing normal histoarchitecture of the kidney, stained by H & E technique, x 200.



Micrograph 3 Group C, (treated with 0.3ml of mercury), showing distortion of the histological structure of the kidney, stained by H & E technique, x 200.



Micrograph 4 Group D,(treated with 0.3ml of mercury + 0.5ml of Moringa oleifera leaf extract), showing normal histological structure of the kidney, stained by H & E technique, x 200.

IV. DISCUSSION

Moringa has been used in folk medicine [12] including siddha medicine and Ayurvedic traditional medicine and in the philipians [13].

In Ayurvedic traditional medicine, the leaves are believed to affect blood pressure and glucose level [14] In Africa, Indonesia and philipians Moringa leafs are given to nursing mother on the believed that they increased lactation [15] When measuring in urinary proteins and sugar in rats model of diabetes, Moringa oleifera appears to abolish all urinary proteins and sugar with 14 days of treatment with 200mg/kg of water extract of the leaf [16].

The antioxidant properties appear to underlie a reduction in urinary proteins and glucose in diabetic animals, suggesting a protective effect that may attenuate the rate of kidney failure in diabetes.

In presence study, the final body weight of groups B and D animals increased significantly relative to the control while group C have reduction in body weight.The relative kidney weight of group B and D are similar with control group A while C had elevated organ weight. There were no Histopathological lesions observed in groups B and D animals when compare with the control, but group C animals had destruction of the kidney cytoarchitecture. The dynamic result of groups B and D animals when compared with the control could be as a result of hepatoprotective and antioxidant properties possessed by Moringa oleifera leaf extract.

Therefore, the present study agrees with previous researches on hepatoprotective and antioxidant properties possessed by Moringa oleifera leaf extract.

V. CONCLUSION

From this study, Moring oleifera leaf extract has protective effect and antioxidant properties that could prevent damage to the kidney cells.

REFERENCES

[1] Parotta, John A Moringa Oleifera lams. Reseda, horseradish tree, Moringaceae. Horseradish tree family. USDA Forest Service, international institute of Tropical Forestry. Retrieved 1993, 2013-11-20.

[2] Moringa oleifera lam. Plant Resources of Tropical Africa. Retrieved 2013-11-20.

[3] Food and Agriculture organization of the United Nations. The vegetable sectors in Thailand, 1999.

[4] Countries where Moringa grows. Tress for life international.com.retrieved 2013-11-25.

[5] Drumstick. Vahrehvah.com.Retrievered 2012-04-18.

[6] Horseradish tree, leafy tips, cooked boiled, drained, without salt. Nutritional data.com.conde nast.2012. Retrieved 6 May 2013.

[7] KV peter underutilized and underexploited Horticultutre crops, Vol $ New india publishing 2008, p. 112.

[8] Gopalan C, Rama BY, Sastri SC Nutritive Value of Indian Foods. Natural Institute of Nutrition, Indian council of Medical Research 1989, 1 (2) 116-9.

[9] Fuglie LJ Moringa: Natural Nutrition for the tropics. Dakar church world service 1999, pp. 213.

[10] Olsin ME, Carlquist S Stem and root anatomical correlations with life from diversity, ecology and systemic in Moringa. Botanical journal of the linnem society 2001, 135(4):315.

[11] National Research Council Moringa. Lost crops of Africa: Volume 11: Vegetables. Lost Crops os Africa 2. National Academies press. 2006, ISBN 978-0-309-10333-6.

[12] Fahey, Jed W Moringa Oleifera: A review of the Medical Evidence for its Nutritional, therapeutic and prophylactic properties. Part 1 Tress for life journal, 2005.

[13] Malunggay: The Miracle Vegetable. Agri Bussiness Week August 1 2008. Retrieved 2012.

[14] Drumstick.Taminadu.com.11 January 2013.

[15] Astuti, DA, Becker K, Richter N Utilization of methanol extracted of Moringa and mulberry leaves to evaluate energy and protein balance of Nile tilapia. Proceeding of the mini workshop southeast Asia germany Alumni Network (Manado, Indonesia: Kassel university Press) 2001, ISBN-89958-389-2.

[16] Jaiswal D, Kumar Rai P, Kumar A, Mehta S, Watal G Effects of moringa Oleifera lam leaves Aqueous extract therapy on hyperglycemic rats. J. Ethnopharmacol 2009, 123, 392-396.

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