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The Effect of *Moringa oleifera* Leaves on Blood Parameters and Body Weights of Albino Rats and Rabbits

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Abstract

This study is aimed at finding out the effect of *Moringa oleifera* on blood parameters and body weights of albino rats (n= 24) and rabbits (n= 10). The rats were divided into four groups; a control group and three experimental groups, while the rabbits were divided into two groups; a control group and an experimental one. The three experimental groups of rats were provided consecutively with100, 200 and 300 mg *M. oleifera* leave extract/kg of body weight daily for 21 days, while the experimental group of rabbits with 2.5 g fresh leaves of *M. oleifera*/Kg of body weight which was added to their feed daily for 21 days, and the control groups were fed on their diets without *M. oleifera*. The results showed significant differences ($P < 0.05$) in mean cell hemoglobin concentration (MCHC) and platelets (PLT) in the third group of rats (AL_3) and red blood cells (RBCs) count, hemoglobin (Hb) and MCHC in the fourth group (AL_4) while no significant differences ($P > 0.05$) were shown in the second group (AL_2). For the rabbits, the mean values of 39.30 ± 1.73, 741.80 ± 65.5 and 5.06 ± 0.54 for PCV, PLT and RBCs in the experimental group were significantly higher ($P < 0.05$) than 33.12 ± 4.32, 344.20 ± 66.6 and 4.68 ± 0.81 for the same parameters in the control group, respectively.

K**eywords:** *Moringa Oleifera,* Medicinal Plant, Blood Parameters, Body Weights, Nutritional Anaemia, Rabbits, Rats.

1. Introduction

Plants as medicinal agents were mentioned in historic documents dating back many thousands of years (Rasonavivo *et al*., 1992). Currently, medicinal herbs as a whole were reported to be used against a wide range of health problems such as cough, cold, stomach, cataract, constipation and many other ailments (Jimenez *et al*., 2003). The plant *M. oleifera* as one of these herbs was reported to prevent effectively, morphological changes and oxidative damage in lens of rats by enhancing the activities of anti-oxidant enzymes, reducing the intensity of lipid peroxidation and inhibiting generation of free radicals (Sreelatha and Padma, 2009). In addition, blood parameters namely: PCV, WBC counts, differentiation of WBC, hemoglobin (Hb) and platelets (PLT) were also found to be positively affected by using this plant (Chinwe and Isitua, 2010). Moreover, *M. oleifera* was found to be of a nutritional value as it contains a number of important vitamins, including: vitamins A, B complex (B1, B3, B6 and B7), C, D, E and K (Dorga and Tandon, 1975; Booth and Wickens, 1988). However, for treatment it was used against high blood pressure, diarrhea, inflammation of colon, intestinal worms, skin antiseptic, as a diuretic agent (Lowell, 2002) and to maintain the levels of blood glucose in diabetic patients (Jaiswal *et al*., 2009, Chinwe and Isitua, 2010). Moreover, *M. oleifera* was used as antimicrobial agent (Caceres *et al.,* 1990), to treat ulcers (Pal and Sahib, 1995) and to promote the immune system against various infections (Jaiswal *et al.,* 2009). So far, most of the work about the effect of *M. oleifera* was carried out on the seeds of this plant. In this paper, we aim to find out the effect of leaves of this plant on various blood parameters as well as the body weights in albino rats and rabbits.

2. Materials and Methods

2.1. Experimental Animals

Albino rats (n= 24, average body weight= 275 g) and rabbits (n= 10, local breed, average body weight = 685g) were used in this study. Body weights of animals before and after experiments were measured using Mettler sensitive balance (number 202845). Albino rats were divided into four groups of six animals; one to act as a control group and denoted AL_1 and the other three to act as experimental groups and denoted AL_2, AL_3 and AL_4. Similarly, rabbits were divided into two groups of five animals; one control (RG_1) and one experimental (RG_2). The control group of rats was provided with normal diet concentrate (dried meat, milk powder, oil and flour in some water) without *M. oleifera* while the experimental groups were provided, in addition to the concentrate, with doses of 100 mg/kg, 200 mg/kg and 300 mg/kg of *M. oleifera* leave extraction, respectively, for 21 days. However, for the rabbits, the control group was provided with fresh clover leaves only, whereas the experimental

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group was fed with both fresh leaves of clover and *M. oleifera* (2.5 g/kg of body weight) for 21 days.

2.2. Preparation of M. oleifera *Leaves Extract*

Leaves of *M. oleifera* were first dried in the shade, left in ethanol (70%) for more than two days in Soxhlet apparatus. Then the 70% ethanol extract was dried in Rotary Evaporator apparatus, weighed and dissolved in distilled water to give the final concentration of 100 mg extract/kg, 200 mg extract /kg and 300 mg extract /kg and were administrated orally by Gavage for the three groups of rats; AL_2, AL_3, and AL_4, for 21 days.

2.3. Hematological Measurements

Blood samples were collected from retro-orbital of the experimental rats in capillary tubes coated with ethylene diamine tetra-acetic acid (EDTA). The tubes were immediately capped, kept at – 4 °C and were immediately analyzed for blood parameters using automated coagulating Sysmex apparatus of the type 8999. The parameters included: hemoglobin (Hb), mean cell volume (MCV), red blood cells count (RBCs), white blood cells count (WBCs), mean cell hemoglobin concentration (MCHC), platelets (PLT), lymphocytes (LYM) and packed cell volume (PCV). However, MCV and MCHC values were calculated from RBCs count, Hb and PCV (Androw, 1972; Merghani, 2010).

2.4. Statistical Analysis

Mean values of blood parameters and body weights were analyzed by student *t*- test using computer package program (PASW statistics 18).

3. Results

3.1. Blood parameters

The results of blood parameters in rats are shown in Table 1. The results show that MCHC and platelets numbers increased significantly ($P < 0.05$), in group 3 (AL_3) and RBCs count Hb concentration and MCHC increased similarly in group 4 (AL_4). However, the remaining blood parameters changed slightly, but insignificantly (Table 1).

Blood parameters in rabbits are shown in Table 2. Only RBCs, platelets and PCV numbers were increased significantly ($P < 0.05$), whereas the other blood parameters remained more or less unchanged (Table 2).

Table 1. Mean values of blood parameters in rats provided daily with *M. oleifera* leave extracts for 21 days in captivity (mean ± SD)

Parameters	AL_1	AL_2	AL_3	AL_4	Normal range[Ⅱ]
WBCsx10^3/mm^3	7.4 ± 0.42	7.6 ± 0.72	12.9 ± 3.63	10.3 ± 4.4	6.9 -11.2
RBCsx10^6/mm^3	6.9 ± 0.43	6.8± 0.42	7.4 ± 0.54	7.08±0.56**	6.9 -11.2
Hb g/dl	12.6 ± 0.64	13.2± 1.25	12.4 ± 3.63	13.7±0.67**	10 – 14
MCV mm^3	51 ± 1.71	52.3± 2.82	55.1 ± 4.9	53.3 ± 2	41 – 48
PCV %	36.2 ±0.87	36.6± 0.23	36.5 ± 0.3	36.8 ± 0.45	30 – 48
MCHC%	32 ± 0.84	33.0± 0.76	34.1 ± 0.92**	35.8±1.46**	28.2 – 32.4
PLTx10^3/mm^3	1075±259.8	1093±108.9	1121.8±262.8**	901 ± 81.7	500–1300
LYM%	53 ± 29.8	74.1 ± 7.9	44.4 ± 11	69.3 ± 15.8	65 – 85

** Highly significant. [Ⅱ](David *et al.*, 2002).

Table 2. Mean values of blood parameters in rabbits provided daily with fresh leaves of *M. oleifera* being mixed with their clover feed for 21 days in captivity (mean ± SD)

Parameters	RG_1	RG2	Normal range[Ⅱ]
WBCs x10^3/mm^3	6.0±3.2	6.5±1.2	5.6 – 16.5
RBCs x 10^6/mm^3	4.68 ± 0.81	5.06± 0.54**	3.7 – 7.5
Hb g/dl	9.46 ± 1.29	9.52 ± 1.75	8.9 – 15.5
MCHC %	31.5 ± 0.91	32.7 ± 1.43	31.1 – 37
PLT x 10^3/mm^3	344.20 ± 66.6	741.80± 65.5**	112 – 795
MCV mm^3	65.54 ± 2.31	68.08 ± 2.57	58 –79.6
PCV %	33.12 ±4.32	39.30 ± 1.73**	26.7 – 47.2
LYM %	60.0 ± 3.39	49.3 ± 18.91	43 – 80

** Highly significant. [Ⅱ] (Hewltt *et al.*, 1989).

3.2. Body weights

Mean values of body weights of rats are shown in Table 3. With the exception of group 2 (AL_2), rats in groups 3 and 4 (AL_3 and AL_4) showed significant ($P < 0.05$) increase in their body weights compared to the control group (AL_1).

For rabbits, the mean values of their body weights are shown in Table 4. In these animals, the results revealed that they didn't change significantly in their body weights ($P > 0.05$).

Table 3. Mean body weight (g) of rats provided daily with *M. oleifera* leave extracts for 21 days in captivity

Parameters	AL_1	AL_2	AL_3	AL_4
Initial weight	292.2 ± 25.4	288.3± 32.8	263.2 ± 37.1	292.5 ± 48
Final weight	296.3 ± 22.7	292.5± 25.4	300.3± 23.6	312.5 ± 42.1
Difference (g)	3.9 ± 2.7	4.2 ± 7.4	37.1± 13.5**	20.3± 5.9**
Difference (%)	1.3%	1.4%	14%**	6.9%**
Weight gained (g/day)	0.19	0.2	1.8	0.96

**Highly significant.

Table 4. Mean body weight (g) of rabbits fed with fresh leaves of *M. oleifera* daily for 21 days in captivity

Parameters	RG_1	RG_2
Initial weight	718 ± 108.1	653.8±125.5
Final weight	720 ± 108.4	674 ± 124.4
Difference (%)	0.28%	3.2%
Weight gained (g/day)	0.1	1

4. Discussion

The tree, *M. oleifera* (*Moringaceae*), is cultivated widely around the world (Odee, 1998; Jed and Fahey, 2008) and used for various purposes one of which is as a feed supplement to livestock (Martin, 2007; Fadiyimu *et al.*, 2010). In this study, albino rats and rabbits were used to test the nutritional values of *M. oleifera* via its effect on blood parameters as well as on changes in the animals' body weights. Dietary components of *M. oleifera* were reported to have measurable effect on blood constituents (Church *et al.*, 1984). With the exception of MCHC, Hb, RBCs and platelets in rats and PCV, RBCs and platelets in rabbits, the other blood parameters did not change significantly with inclusion of *M. oleifera* leaf extract in rats and fresh leaves in rabbis. However, mean values of each parameter were within the normal range (Hewltt *et al.*, 1989; David *et al.*, 2002). In contrast, the body weights of rats increased significantly with increased *M. oleifera* concentration, while no significant change occurred in rabbits. The highest body weight gain of rats in AL_3 could support earlier reports that *M. oleifera* is of a high nutritional value (Ram, 1994; Makkar and Becker,1996; Anwar *et al.*, 2007), but this was not reflected in increased lymphocytes as reported by Fox (2006).

The increase in the body weight of rats might be due to the fact that *M. oleifera* is rich in amino acids, vitamins and minerals particularly iron (Subadra *et al.*, 1997; Faye, 2011). The significant increase in body weights of rats might also be attributed to captivity, where energy expenditure is minimal (Fadi *et al.*, 2010).

5. Conclusion

In conclusion, the results of this study supported the reports about *M. oleifera* in having medicinal effect in curing some health problems associated with nutritional status (Mahajan *et al.*, 2007) and this was indicated in this study by its positive effect on some blood parameters and body weights of the experimental animals.

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