

Effect of *Moringa oleifera* aqueous leaf extract on some haematological indices in Wistar rats.

¹Otitoju, O., ²Nwamarah, J.U., ²Otitoju, G.T.O., ³Okorie, A.U., ⁴Stevens, C. and ⁴Baiyeri, K.P.

¹Department of Biochemistry, Federal University Wukari, Taraba State, Nigeria.

²Department of Home Science, Nutrition and Dietetics, University of Nigeria, Nsukka, Enugu state, Nigeria.

³Department of Crop Science, University of Nigeria Nsukka, Enugu state, Nigeria.

Corresponding E-mail: otitoju.olawale@gmail.com

Abstract

The use of *Moringa oleifera* leaf extract in the treatment of virtually all ailments calls for further research to support the claim for its ability to boost blood. Thirty six albino rats of the Wistar strain weighing 200-230g were sorted into groups according to their weights and sex. The animals were divided into two groups, male and female. Three (3) test groups (1%, 5%, and 10% w/w) for the males containing five (5) animals each and a control group, for the females, three (3) test groups (1%, 5%, and 10% w/w) and control group with four (4) animals each. The result of haematological indices in female Wistar rats administered aqueous extract of *M. oleifera* shows that Hb count generally increased significantly in all the groups compared with their control group. Similarly, PCV and WBC generally increased in all the groups, this increase was significant for WBC in all the groups. RBC values showed a non-significant ($p>0.05$) value at 1% treated group but a significant increases ($p<0.05$) were obtained in the 5% and 10% treated groups. In the male animals, the result showed that hemoglobin count (Hb) was significantly higher ($p<0.05$) in the group that was given 1% *M. oleifera* compared with the control group while there was a non-significant ($p>0.05$) increase Hb count in the 5% treated group. Generally, PCV count shows a dose dependent increase with 10% having the highest PCV count when compared with the control. Similarly, the WBC count also shows a dose dependent increase when compared with the control. RBC count showed a general decrease in all the exposed groups compared with their relative control. In conclusion, *M. oleifera* may increase PCV, HB and RBC counts, its use must be well regulated because of the fact that it increases WBC count, a possible toxicological response.

Key words: haematology, *Moringa oleifera*, toxicological response, haemoglobin,

Introduction

The use of medicinal plants in most developing nations is a development that has attracted more concerns among health workers and researchers. *Moringa oleifera* tree is a rapid growing plant of about 13m tall and 35 cm in diameter (Faizi et al., 1995). In Nigeria, this plant is seen as a curative agent to virtually all ailments among the populace. It is been use as purgative, antihypertensive, antifertility, antidiabetic, antifibroid agent among many other uses. Many researchers have also reported that, *Moringa oleifera* oil and micronutrients contain antitumor, antiepileptic, antidiuretic, anti-inflammatory and venomous bite characters (Peltzer et al. 2008) Oral information among many of its users indicates that *M. oleifera* is a potent blood booster and this property is being exploited in the treatment of anaemia especially in among women and children. Anemia is a widespread public health problem associated with an increased risk of morbidity and mortality, especially in pregnant women and young children (WHO, 2002). Among the numerous factors, both nutritional (vitamin and mineral deficiencies) and non-nutritional (infection and hemoglobinopathies), that contribute to the onset of anemia; iron deficiency and malaria play an important role. Recently there has been an alarming increase in the use of medicinal plants in the treatment of myriads disease conditions including anemia. For half a billion women in developing regions worldwide, anemia is a life-long burden, one which affects most of their infants and young children as well. Controlling anemia in these vulnerable groups could significantly reduce maternal and infant morbidity. It would also enhance intellectual and work capacity, thereby improving family, community and national socioeconomic development (Erin et al., 2007). The use of *M. oleifera* leaf extract by many patients as haematenic agent calls for further research to ascertain the mechanism of this claim. Against this background, we examined the effects of *M. oleifera* leaf extract on some haematological parameters using experimental rats.

Materials and methods

Plant materials

Moringa oleifera leaves were obtained from the experimental farm of Prof. K.P. Baiyeri of Crop Science Department, University of Nigeria, Nsukka Nigeria in the month of January. The leaves were cleaned and made free from sand and other impurities. The fresh air-dried leaves were powdered in an electric kitchen blender. Finely pulverized (300 g) of *Moringa oleifera* leaf was weighed out into a 2.5 liters macerating flask. 1.2 L of distilled water was added into the macerating flask and manually agitated intermittently for 12 hr. and stored at 4°C. The maceration flask and content were gently heated in an oven (Gallenkamp Model OV-355) for 45 mins at 50°C. After cooling, the sample was filtered with a cheese cloth and then with Whatman filters paper (24 cm). The filtrate was concentrated using rotary evaporator, and the concentrate was dried in a Plus 11 Gallenkamp oven at 45-50°C to dryness. 1 g of the extract was re-suspended in 10 ml distilled water.

Animals/Animal treatment

Thirty six albino rats of the Wistar strain weighing 200-230g were used in this work. The animals were obtained from the animal house, Faculty of Veterinary Medicine, University of Nigeria. They were maintained under standard laboratory condition with rat chow (Guinea Feed Ltd. Nigeria) and water *ad libitum*. All animal experiment was carried out in line with the guidelines of Institutional Animal Ethic committee. The animals' were sorted into groups according to their weights, three (3) test groups (1%, 5% and 10% w/w) for the males containing five (5) animals each and a control group, containing 5 animals; for the females, three (3) test groups (1%, 5% and 10% w/w) and control containing four (4) animals each. The experimental animals were housed in the Animal House of Home Science, Nutrition and Dietetics Department, University of Nigeria Nsukka. During this period, they were fed with rat chow (Vita feed Nigeria) and water *ad libitum*. All the animals were given graded doses of *M. oleifera* leaf extract (1g/kg/bw, 5g/kg/bd and 10g/kg/bw) for fourteen (14) days after which blood samples were collected through cardiac puncture in heparinized sample bottles. The extract was administered daily by oral intubations. Haematological analysis was carried out two hours after sample collection.

Animal sacrifice.

All experimental animals were anaesthetized using chloroform fumes 24 hours after the last administration of the extract. Blood samples were collected in heparinised anticoagulant tubes for haematological studies.

Determination of haematological parameters.

Determination of haemoglobin concentration was carried out according to the method described by Jain (1986) using the cyanomethaemoglobin method. Packed cell volume (PCV) was carried out using the micro haematocrit method according to Allexander and Griffiths (1993). Red blood cell count (RBC) and White blood cell count (WBC) were estimated by visual means using the new improved Neubauer counting chamber according to Dacie and Lewis (1991).

Results

Table 1 shows the result of *M. oleifera leaf extract* on Hb, PCV, RBC and WBC values in male Wistar rats. The result shows that Hb count increased significantly ($p < 0.05$) in the groups 1% and 10% but there was an observed slight decrease in Hb count of the group given 5% *M. oleifera*. PCV count showed a general increase in all the groups when compared with their control group. This increase was only significant ($p < 0.05$) in the 5% and 10% treated groups. However, there was a general significant ($p < 0.05$) decrease in the RBC values while the result shows that WBC values increased significantly in the 5% and 10% treated groups when compared with the control group. Table 2 Shows the result of haematological indices in female Wistar rats administered aqueous extract of *M.*

oleifera. The result shows that Hb count generally increased significantly in all the groups compared with their control group. Similarly, PCV and WBC generally increased in all the groups, this increase was significant for WBC in all the groups. RBC values showed a non-significant value at 1% treated group but a significant increases ($p < 0.05$) were obtained in the 5% and 10% treated groups.

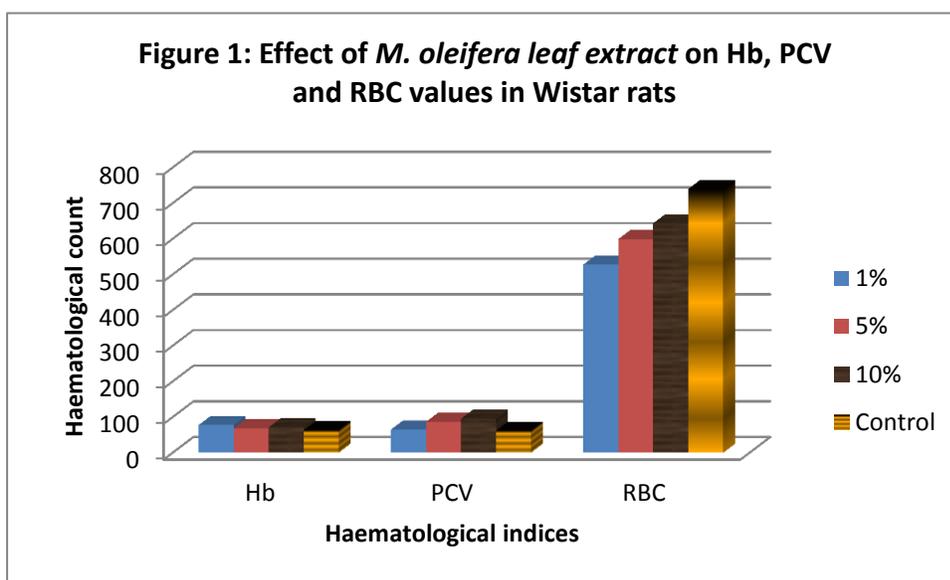
Fig. 1 and 2 showed that hemoglobin count (Hb) was significantly higher ($p < 0.05$) in group A that was given 1% *M. oleifera* compared with the control group while there was a non-significant ($p > 0.05$) increase Hb count in the 5% treated group. Generally, PCV count shows a dose dependent increase with 10% having the highest PCV count when compared with the control. Similarly, the WBC count also shows a dose dependent increase when compared with the control. RBC count showed a general decrease in all the exposed groups compared with their relative control.

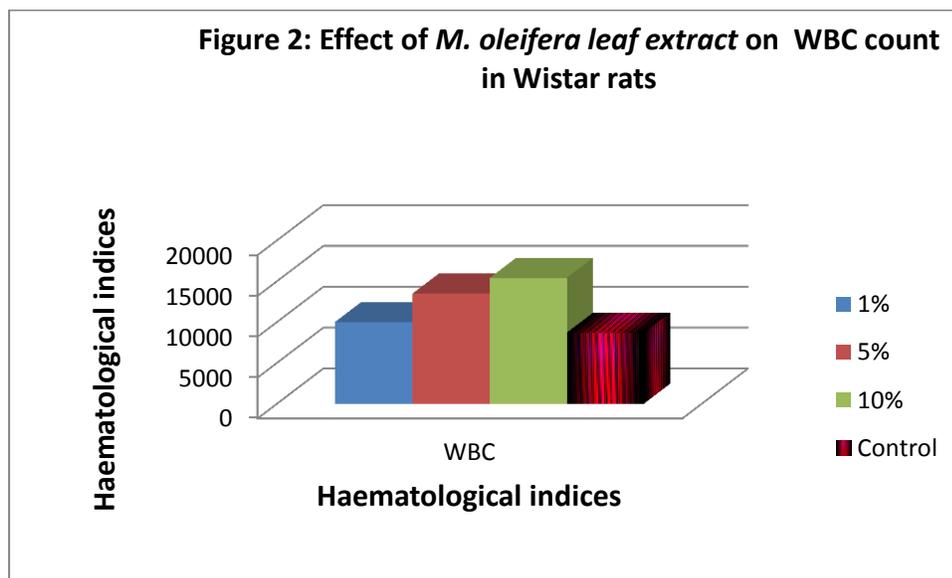
Table 1: Effect of *M. oleifera* leaf extract on Hb, PCV, RBC and WBC values in male Wistar rats

GROUP	Hb	PCV	WBC	RBC
M1 (1g /kg b.wt)	75.67	65.833	9540.67	507.33
M5 (5g /kg b.wt)	63.00	82.000	13533.00	505.00
M10 (10 g /kg b.wt)	71.50	93.750	16400.00	541.00
MControl	65.00	63.500	10100.00	838.00

Table 2: Effect of *M. oleifera* leaf extract on Hb, PCV, RBC and WBC values in female Wistar rats

GROUP	Hb	PCV	WBC	RBC
F1 (1g /kg b.wt)	84.00	62.000	11386.00	581.00
F5 (5g /kg b.wt)	75.00	92.000	13400.00	694.00
F10 (10 g /kg b.wt)	71.50	96.860	14500.00	741.00
FControl	62.00	61.000	7300.00	642.00





DISCUSSION

Moringa oleifera has gained wide range of applications both as nutritional and therapeutic agent globally and among many users in Nigeria. This plant is being used as food supplement, condiment and beverages to cure or ameliorate several disease conditions in the general populace. Anaemia is a leading cause of death among pregnant women and infants. The extract of *M. oleifera* is being used as hematinic in the treatment anaemia by different categories of people. Our result showed that *M. oleifera* was able to increase the haemoglobin count (Hb) in male Wistar rats administered 1% or 10% aqueous extract. However, in the female rats, there was a general increase in the Hb count. The increase in Hb count may be an indication that the plant extract could boost blood production when consumed within certain limits. This observation is in agreement with earlier work reported by Adedapo *et al.*, (2009) who reported a slight increase in Hb count among rats given 400mg/kg body weight of *M. oleifera* leave extract. Although there was a general increase in Hb count, the lowest (1mg/kg) concentration of *M. oleifera* brought about the highest Hb count. Similarly, the result also shows that PCV count increased slightly when compared with the control group. This increase however may be a positive factor in boosting blood parameters in anaemic patients. This result may underscore the local use of this plant as blood booster in anemic patients.

Since higher PCV and Hb values were obtained in the test groups than the control, we may therefore suggest that this plant can use as possible haematinic agent in the treatment of anaemia. However, we also observed a significant increase in WBC count in all the concentration used, this increase was dose dependent. This study shows that the extract at 1%, 5% and 10% caused significant increase in the level of WBC count. This observation shows that the principal function of WBC as phagocytes to defend against invading microorganisms or xenobiotic. This observation was in agreement with the work of Adedapo *et al.*, 2009; Songpol *et al.*, 2011. This may explain why *M. oleifera* should be consumed at low concentration and not indiscriminately as its being used now. White blood cells are produced naturally by the body system in response to any foreign substances in the body. In order to avoid overproduction or induction of WBC, minimum quantities sufficient to perform the nutritional and or therapeutic function by which it is used for must be taking into consideration by consumers or patients. The use of *Moringa* or other herbal supplements without a standardized dose may not be good for the health of consumers because at higher dosage, the plant extract may elicit unhealthy reactions capable of destroying cellular functions and integrity.

Traditionally, women use herbal preparations for the process of labour. Herbs are also prescribed by traditional birth attendants and healers for various reasons including increasing chances of having twins, correcting mal-positioned fetus, anaemia in pregnancy among others (Azriani *et al.*, 2007). Although, the use of herbal medicine is not contentious, it must be balanced with their perceived toxicity. In conclusion, although *M. oleifera* may increase

PCV, HB and RBC counts, its use must be well regulated because of the fact that it increases WBC count in order to reduce possible oxidative stress.

Reference

- Adedapo, A.A., Mogbojuri, O.M. and Emikpe, B.O. (2009). Safety evaluation of the aqueous extract of the leaves of *Moringa Oleifera* in rats. *Journal of Med. plants Res.* 3(8):586-591.
- Azriani R et al. (2007). The use of herbal medicines during pregnancy and perinatal mortality in Tumpat District, Malaysia. *Southeast Asian J Trop Me.* 38(6):1150-7.
- Erin McLean, Ines Egli, Mary Cogswell, Bruno de Benoist and Daniel Wojdyla (2007). Worldwide prevalence of anemia in preschool aged children, pregnant women and non-pregnant women of reproductive age. In *Nutritional Anemia.*(Ed) Klaus Kraemer and Michael B. Zimmermann pp. 1-12.
- Faizi S et al. (1995). Isolation and structure elucidation of new nitrile and mustard oil glycosides from *Moringa oleifera* and their effect on blood pressure. *J Nat Prod.* 57(9):1256-61.
- Ntulume R. D. (2010). Effect of *Moringa oleifera* leaf extracts on the isolated rabbit, heart and uterus. A dissertation submitted to graduate school in partial fulfillment of the requirements for the award of the degree of Master of Science in Physiology of Makerere University Uganda.
- Peltzer K *et al.* (2008). Use of traditional, complementary and alternative medicine for HIV patients in KwaZulu-Natal, South Africa. *BMC public Health* (8):255.
- Songpol C., Pornchai, S., Nalinphat, S., Aussavachai, S., Pratom, T., Apirak, S. and Anudep, R. (2011). Acute and Chronic Toxicity of *Moringa oleifera* Linn Leaves Extracts *Thai J Vet Med.* 41(4): 417-424.
- World Health Organization (2002). *The world health report 2002: reducing risks, promoting healthy life.* Geneva.