

## Assessment of Some Haematological Parameters of Male Wistar Rats Treated with Leaf Extract of *Momordica Charantia*

Chibuikwe Obiandu<sup>1\*</sup>, Karibo Okari<sup>2</sup> and Adesua C. Obiandu<sup>3</sup><sup>1</sup>Department of Human Physiology, Faculty of Basic Medical Sciences, University of Port Harcourt, Nigeria<sup>2</sup>Department of Medical Biochemistry, Faculty of Basic Medical Sciences, University of Port Harcourt, Nigeria<sup>3</sup>Post Primary Schools Board, Port Harcourt, Rivers State, NigeriaDOI: [10.36347/sjams.2020.v08i01.049](https://doi.org/10.36347/sjams.2020.v08i01.049)

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\*Corresponding author: Chibuikwe Obiandu

## Abstract

## Original Research Article

*Momordica charantia* is a medicinal plant found mainly in East Africa and Asia. It is applied in folklore remedies in the treatment of diabetes, cough etc. The plant has been reported to contain important substances especially necessary for erythropoiesis. This study investigated the effects of the leaves of *Momordica charantia* on haematological parameters of male wistar rats. The animals were divided into three (3) groups of six (6) rats each. Group one (1) served as control and received distilled water. Group two (2) and group three (3) rats were treated with 200mg/kg bw and 400mg/kg bw of the hydromethanolic extract of the leaves of *Momordica charantia* respectively, for a period of 30 days. The results indicated that the extract did not significantly ( $p < 0.05$ ) affect the red blood cell count, packed cell volume and haemoglobin concentration. The white blood cell (WBC) count and platelet count were significantly increased following extract administration. This study has shown that the extract may be useful in promoting haemostasis due to observed increase in platelets counts, in male wistar rats.

**Keywords:** *Momordica charantia*, haematological parameter, hydromethanolic, wistar rats.

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## INTRODUCTION

*Momordica charantia* (*M.charantia*), also known as bitter melon is a cucurbitaceous vegetable which grows mainly in the tropics including East Africa, Asia, the Caribbean and parts of the Amazon. It is very popular in South America and Bangladesh where it is grown extensively for use as food and medicine [1-3]. The folkloric application of *M. charantia* is a common practice in Nigeria. The fruits and leaves are used in Asian traditional medicine practice in preventing and treating various diseases such as, asthma, burns, constipation, cough, diabetes, fever, gout, helminthiasis, inflammation, leprosy, skin diseases, ulcer and wound. The Juice from the leaves are used to treat piles, purify blood and even used in liver damages, dyspepsia, jaundice and cholera [4, 5].

Some scientific studies have shown that *M. charantia* exhibited anticancer [6, 7], antiviral [8], and anti-ulcer effects [9]. Other studies have authenticated its hypoglycemic effect [10, 11]. The effects on the female reproductive system have also been documented and findings show that the fruit and leaf extracts demonstrated an *in-vivo* anti-fertility effect [12, 13]. The seed extract have been reported to induce abortions

in rats while the root extract showed uterine stimulant effect [14].

A spectrum of biologically active substances have been identified in *M. charantia* including proteins and steroids, triterpenes, alkaloids, momordicin and charantin, cucurbitins, cucurbitacins, momorcharins, momordenol, momordicillin, momordicinin, momordin, oleic acid [15, 16]. The leaves of *M. charantia* are also rich in minerals like calcium, potassium, magnesium, iron and phosphorus, as well as a great source of different vitamins including, thiamine, riboflavin, vitamin B6, folate and niacin [17]. Some of these substances are necessary for erythropoiesis [18]. However, there is scarcity of scientific information on the effects of *M. charantia* on haematological parameters. This study was carried out to investigate the effects of the leaves of *M. charantia* on haematological parameters of male wistar rats.

## MATERIALS AND METHODS

### Plant Materials (Collection and identification)

The leaves of *Momordica charantia* was procured from Choba town, Obio/Akpor Local Government Area, Rivers State Nigeria. The leaves

were identified and authenticated by the taxonomist in the Plant Science and Biotechnology Department of the University of Port Harcourt, Nigeria, where the voucher number was allotted (UPH/V/1422) and voucher specimen deposited.

### Processing/Preparation of leaf extract

The leaves were dried and blended to powder form which were then weighed and soxhlet extraction done using hydromethanol (20%:80%) volume ratio as solvent. The constitution of the appropriate formulation was equivalent to 500g of *M. charantia* leaves in 2000ml solvent.

### Animal models

This study was done with 18 healthy adult male rats of wistar strain weighing  $150 \pm 15$ g each and obtained from the animal house of Department of Human Physiology, University of Port Harcourt, Nigeria. They were housed in well-ventilated plastic cages and exposed to standard animal house conditions (temperature: 27°C to 31°C; approximately 12 hour light with 12 hours dark cycle per day; humidity; 50 to 55 %). The rats had access to feeds and water *ad libitum*. Animals were allowed two weeks to acclimatize to the laboratory environmental condition. They were weighed at the start of experiment and weekly subsequently.

### Experimental Protocol

The rats were divided into 3 experimental groups of 6 rats per group. Group 1 rats received distilled water and acted as control. Group 2 received 200mg/kg of the extract while group 3 received 400mg/kg of extract. The extract was administered orally as once daily dose for 30 days. To enable animal oral feeding, the extract yield was reconstituted in

distilled water to obtain 200mg/ml. appropriate volumes based on the individual weights of the rats were calculated by simple proportion and administered orally.

### Blood collection and estimation of haematological parameters

The animals were sacrificed under chloroform anaesthesia on day 31, after 24 hours of last extract administration. Blood was collected through cardiac puncture and put into labeled sample tubes containing ethylene diamine tetra-acetic acid (EDTA) anticoagulant for use in determination of haematological parameters based on documented methods [19].

Haematological parameters estimated include, red blood cell (RBC) count, packed cell volume (PCV), haemoglobin (Hb) concentration, white blood cell (WBC) count and platelets count.

## STATISTICAL ANALYSIS

Statistical tests were done using the Statistical Package for Social Sciences (SPSS) version 20.0 software. Data were analyzed using one-way ANOVA (analysis of variance of means). Comparisons between the groups were made using post hoc LSD test. Differences at the probability level  $P < 0.05$  were considered statistically significant. The results were expressed as mean  $\pm$  standard error of mean (Mean  $\pm$  S.E.M) and presented in tables.

## RESULT

### Result presentation

The results are presented in tables 1 and 2.

**Table-1: Effect of hydromethanolic extract of *Momordica charantia* on RBC count, PCV and Hb**

Groups	Haematological parameters		
	RBC count ( $\times 10^6/\text{MM}^3$ )	PCV (%)	Hb (g/dl)
Group 1 (Control)	6.16 $\pm$ 0.15	41.00 $\pm$ 1.03	13.65 $\pm$ 0.35
Group 2 (200mg/kg)	5.88 $\pm$ 0.18	39.16 $\pm$ 2.13	13.06 $\pm$ 0.29
Group 3 (400mg/kg)	6.36 $\pm$ 0.20	41.66 $\pm$ 3.07	13.88 $\pm$ 0.41

Values expressed as Mean  $\pm$  SEM. n=6

**Table-2: Effect of hydromethanolic extract of *Momordica charantia* on WBC count and platelet count.**

Groups	Haematological parameters	
	WBC count ( $\times 10^3/\text{MM}^3$ )	Platelets ( $\times 10^9/\text{L}$ )
Group 1 (Control)	8.25 $\pm$ 1.06	219.00 $\pm$ 13.05
Group 2 (200mg/kg)	12.05 $\pm$ 0.77*	332.00 $\pm$ 31.58*
Group 3 (400mg/kg)	8.31 $\pm$ 1.10**	269.66 $\pm$ 28.11

Values expressed as Mean  $\pm$  SEM. n=8. Significant at [(\*) and (\*\*), ( $P < 0.05$ )] when Compared to control group and between tests groups respectively

## RESULT ANALYSIS

In the result presented, the extract was administered at low dose of 200mg/kg bw to group 2 and higher dose of 400mg/kg bw to group 3. Group 1 served as control and received no extract.

In table 1, the red blood cell count, packed cell volume and Hb concentration were not significantly ( $p < 0.05$ ) altered in groups 2 and 3 when test groups were compared to control group.

The effect of the extract on white blood cell count and platelet counts are highlighted in table 2. The WBC count was significantly ( $p < 0.05$ ) increased in group 2 when compared to control but reduced significantly ( $p < 0.05$ ) in group 3 compared to group 2. The platelet count was significantly ( $p < 0.05$ ) increased in group 2 when compared to control.

## DISCUSSION

This study was carried out to investigate the effects of the hydromethanolic extract of *Momordica charantia* on the haematological indices of male wistar rats. The assessment of the haematological indices provides clear understanding of both the physiological and pathological changes in an animal [20]. In the present study, red blood cell count was not significantly changed in the treated groups. The red blood cells are the non nucleated formed elements of blood which are also referred to as erythrocytes and produced from the red bone marrow in adult life [21]. The extract of *Momordica charantia* did not appear to have significantly influenced the growth and differentiation of the red blood cell series in the bone marrow, even though, it reportedly contains some amounts of ascorbic acid [22], which is known to be a stimulating factor for erythropoiesis. The findings on effect of the extract of *Momordica charantia* on the red blood cell concentration at both lower dose (200mg/kg bw) and higher dose (400mg/kg bw) is in agreement with the reported findings in another study [23] which showed that, *Momordica charantia* did not significantly affect red blood cell count, even though, both studies employed slightly different methods in extraction of plant materials. *Momordica charantia* was reported to contain some amounts of iron, riboflavin, folate and nicotinic acid [17], which is factors necessary for haemoglobin formation [24], however, the extract of *Momordica charantia* did not cause any significant alteration in the concentration of haemoglobin in this study. The packed cell volume was not significantly altered as well. The packed cell volume is the proportion of blood occupied by red blood cells, expressed in percentage while the haemoglobin is the iron-containing coloring matter of red blood cells which is responsible for carrying respiratory gases [25]. It has been reported that a direct relationship exist between red blood cell, packed cell volume and haemoglobin concentration [26], hence, any change occurring in one

parameter, affects the other. The finding concerning the packed cell volume and haemoglobin concentration in this study may be because of the non-significant effect of *Momordica charantia* on red blood cell count, because the relationship existing between these parameters is built around the red blood cells. This finding disagrees with the report in a similar study which stated that a significant reduction occurred in RBC count, PCV and Hb concentration [27]. The differences in findings may be due to the different methods employed in extraction of plant material. The level of white blood cells was significantly increased by the lower dose (200mg/kg) of *Momordica charantia*. The concentration of white blood cells can be significantly increased by some substances that possess the ability to boost the immune system [28]. In these situations, the increase in WBC may be reactive in conditions such as, infection, inflammation, stress, allergy, trauma or some disease conditions affecting an organ or tissue or the whole organism [29]. The extract of *Momordica charantia* at 200mg/kg dose may have caused some effects in the body of treated rats leading to elevation of WBC count. However, the higher dose inexplicably had no significant effect on the WBC. The WBC searches the blood for foreign bodies which invade the system and destroy it before it causes any problem to the body. The platelet count was also increased after administration of extracts of *Momordica charantia*. The increase may lead to enhanced blood clotting and hemostasis.

## CONCLUSION

*Momordica charantia* reportedly contains substances such as iron and vitamins which are necessary for formation of the red blood cells series, however, the extract of *Momordica charantia* did not significantly alter the RBC, PCV and Hb, but significantly increased WBC and platelet counts of wistar rats in this study.

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