Effects of *Momordica charantia* on the serum chemistry and some reproductive parameters in the Female Wistar Rats

Oyeyemi M.O[1], Esan O.O[2], Esan O.O[2], Oyerinde C.M[1], Uwalaka E.C[3]

[1.] Department of Veterinary Surgery and Reproduction, University of Ibadan
[2] Department of Veterinary Medicine, University of Ibadan
[3] Department of Veterinary Microbiology and Parasitology, University of Ibadan
oiuseunsol@yahoo.co.uk

Abstract: *Momordica charantia* (Bitter melon) has been used in African and Asian herbal medicine for a long time. This work is however designed to investigate the effect of *Momordica charantia* leaf extract on the reproductive parameters of the female Wistar Rats. The fifteen female wistar rats used in this study were divided into 3 groups of five rats each. The rats in groups A and B were treated with a daily dose of 300mg and 600mg per-os of the leaf extract for seven (7) days respectively while control group C received distilled water. There was a significant difference ($P \leq 0.05$) between the mean packed cell volume, White blood cell Values, Mean corpuscular volume, Mean heamatocrit concentration and Mean corpuscular heamatocrit concentration of the different groups. There was a significant difference ($P \leq 0.05$) in the valves of Protein, Albumin, Globulin, Sodium, Blood urea nitrogen and AST between the groups. The reproductive indices, showed a significant difference ($P \leq 0.05$) in the mean value of the length of the uterine horn and diameter of the right ovary whereas; there is no significant difference ($P \geq 0.05$) in the mean length values for the other parts of the reproductive tract across the groups. There was a significant difference ($P \leq 0.05$) in the mean values of the weight of the left ovary across the groups but between the groups in the right ovary. However, there was no significant difference ($P \geq 0.05$) in the mean values of the weight of the left and right kidneys, spleen and the weight of reproductive tract. It is concluded that the leaf extract of *Momordica charantia* probably induce follicular growth which may be responsible for the heavier ovaries in the test groups.
[Oyeyemi M.O, Esan O.O, Esan O.O, Oyerinde C.M, Uwalaka E.C. **Effects of *Momordica charantia* on the serum chemistry and some reproductive parameters in the Female Wistar Rats.** *Nat Sci* 2015;13(4):119-123]. (ISSN: 1545-0740). http://www.sciencepub.net/nature. 18

Keywords: *Momordica charantia,* Female Wistar Rat, Reproductive parameters, Serum Chemisty, Ovary.

1. Introduction

Mormodica charantia (Bitter melon) belongs to the family *cucurbitaceae* plant. It is commonly known as bitter melon, bitter gourd, balsam apple. It grows in tropical areas such as part of the Amazon, East Africa, Asia and the Caribbean and also cultivated as food and medicine plant in South America. Bitter melon has been used in various Asian and African herbal medicine systems for a long time. (Ananya and Raychaudhuri., 2010; Beloin *et al*.,2005). In Turkey, it has been used as a folk remedy for a variety of ailments, particularly stomach complaints (Semiz and Sen, 2007). The fruit is broken up and soaked in either olive oil or honey.

Bitter melon has been used in various Asian traditional medicine systems for long life (Grover and Yadav, 2004).

The plant contains several biologically active compounds, chiefly momordicin I and momordicin II, and cucurbitacin B. (Fatope *et al.,* 1990). The plants contains also several bioactive glycosides including momordin, charantin, charantosides, goyaglycosides, momordicosides and other terpenoid compounds including momordicin-28, momordicinin, momordicilin, momordenol, and momordol (Begum, *et al.,* 1997, Kimura, *et al.,* 2005). It also contains cytotoxic (ribosome-inactivating) proteins such as momorcharin and momordin. Ortigao and Better (1992) and Waako *et al* (2005) reported that various species of bitter melon have anti-malaria activities through human studies have not been published.

Laboratory tests also suggest that some compounds in bitter melon might be effective for treating Human immunodeficiency virus HIV infection (Jiratchariyakul *et al*, 2001). It is used topically for sores, wounds, infections, internally and externally for worms and parasites (Leslie Taylor, 2005).

Several in-vivo studies have demonstrated the anti-tumourous activity of the entire plant of bitter melon. A study showed that a water extract of bitter melon blocks the growth of rat prostate carcinoma; while another study reported that a hot water extract of the entire plant inhibited the development of mammary tumors in mice.

Other in-vitro studies have also demonstrated the anti-cancerous and anti-leukemia activity of bitter melon against numerous cell lines including liver cancer, human leukemia, melanoma and solid sarcomas (Leslie Taylor, 2005).

In addition to these properties, leaf extracts of bitter melon have demonstrated broad spectrum antimicrobial activity. Various extracts of the leaves have demonstrated in-vitro antibacterial activities against E coli, staphylococcus, pseudomonas, Salmonella, Streptobacillus and streptococcus. The entire plant was also shown to have antiprotozoal activity against *Entamoeba histolytica* (Leslie Taylor, 2005).

Many in-vivo clinical studies have demonstrated the relatively low toxicity of all parts of bitter melon plant where ingested orally. However, toxicity and even death in laboratory animals has been reported when extract are injected intravenously. Other studies shows that fruit and leaf extracts ingested orally is safe during pregnancy while the seed has however demonstrated the ability to induce abortions in rats and mice (Bakare *et al.,* 2010). Although the antiplasmodial and antibacterial activities have been documented, there is a dearth of information in the literature on the reproductive activity of *Momordica.*

2. Material and Methods

Experimental Animals.

Fifteen sexually matured healthy female wistar rats between 110 and 150g were obtained from the Laboratory Animal Experimental Unit, University of Ibadan, Ibadan was used for this experiments. They were acclimated to laboratory conditions, housed five per cage and fed pelleted feed and water was provided *ad libitum.*

Plant Material and extract.

Freshly harvested leaves of *Momordica charantia* were obtained from within the campus of University of Ibadan. Two different concentrations of 300mg and 600mg were prepared by pulverizing fresh washed 0.3g and 0.6g of leaves respectively into paste with a laboratory mortals and pestle. Each was thoroughly mixed with 10mls of distilled water to produce 300mg and 600mg respectively of the leaf extract.

Experimental design

A total of fifteen (15) sexually matured female wistar rats divided into three groups of five (5) rats each. Group C rats served as the control and received 2mls of distilled waster only while groups A and B were administered a daily dose of 2mls of the 300mg and 600mg of *Momordica charantia* respectively for seven (7) consecutive days. Stomach canula was used to carefully administer the dose to each rat. At the end of the treatment, the rats were bled through the orbital sinus using a capillary tube. Blood was collected into bottles containing EDTA for haematological studies while plain bottles were used to collect blood for serum chemistry.

Each rat was sacrificed by cervical dislocation, the rats were dissected and the entire reproductive tract was removed from each rat and weighed before separating into its various parts; the left and right ovaries, the uterine body, the left and the right uterine horns and the cervix. Individual weight and or length of these parts were obtained. Other samples collected were; the left and right kidneys, spleen and the liver. The weight of these organs were obtained and recorded.

Data analysis

The organosomatic indices were obtained by dividing the weight of individual organ by the body weight of the particular rat. Data were analysed using ANOVA test of statistics and the SPSS data analysis package.

3. Results

Effects of *Mormodica charantia* on haematological parameters:

There was no significant difference ($P \geq 0.05$) in the value of Red Blood Cells (RBC), Mean corpuscular Haemoglobin (MCH), Mean corpuscular Haemoglobin Concentration (MCHC) and Platelet between the control (Group C) and the test groups A and B respectively (Table 1). There was a significant difference ($P \leq 0.05$) between the mean PCV and Neutrophil of the Control group and the test groups (Table 1).

There is a significant difference ($P \leq 0.05$) in the value of the WBC between the control (group C) and test (group A) but there is no significant difference ($P \geq 0.05$) between the control and the test (group B). There was a lower significant difference between the MCV ($P \geq 0.05$) of the (Control group C) and the test (group B) whereas there is no significant difference ($P \geq 0.05$) between Control and group A (Table 1).

Table 1: Haematological parameters for the three groups.

	Mean ± Standard Deviation		
	Group A (300mg)	Group B (600mg)	Group C (Control)
PCV	33.6 ± 2.1 [b]	40.0 ± 3.8[a]	38.0 ± 1.4[a]
HB	11.1± 0.8 [b]	13.3 ± 1.3[a]	12.6 ± 0.6 [a]
RBC	10.2 ± 2.0	10.6 ± 1.5	11.3 ± 3.7
WBC	15.2 ± 3.0[a]	8.52 ± 0.9[b]	8.8 ± 2.2[b]
Platelet	11.0 ± 3.3	13.4 ± 4.2	10.4 ± 0.9
MCV	34.8 ± 5.4[a]	19.0 ± 14.4[b]	35.8 ± 11.3[a]
MCH	11.0 ± 2.0	13.6 ± 3.4	11.6 ± 3.6
MCHC	33.0 ± 0.0[a]	33.0 ± 0.0[a]	32.4 ± 0.6[b]
Lymphocyte	70.8 ± 4.2[a]	62.2 ± 6.4[b]	63.6 ± 2.1[b]
Neutrophils	29.2 ± 4.2 [b]	37.4 ± 6.7[a]	35.4 ± 2.3[ab]

Legend: PCV- Packed cell volume, **HB- Haemoglobin**, **RBC-** Red Blood Cells, **WBC**- White Blood Cells, **MCH**- Mean corpuscular Haemoglobin, **MCHC**- Mean corpuscular Haemoglobin Concentration, **MCV**- Mean corpuscular Volume.

Serum Chemistry:

There was no significant difference (P≥0.05) in the value of Potassium, Creatine, ALT, AST between and across the groups (Table 2).

There is a significant difference (P≤0.05) in protein and globulin Values of the test group B and that of group A and group C (control) respectively (Table 2). There is no significant difference (P≥0.05) in the Values of Sodium and BUN between the Group C (Control) and the test group A but, the value of the test group B was significantly higher (P≤0.05) to the value of group C (Control) and test group A respectively. (Table 2).

There is no significant difference (P≥0.05) in the value of ZST of groups A and B respectively, while that of the group C (control) is significantly lower (P≥0.05) than that of groups A and B. Also, the value of albumin did not significantly differ (P≥0.05) between the Group C (control) and Group B but that of group A has higher significant value from both of them (P≤0.05).

Table 2: Serum chemistry for the three groups

	Mean ± Standard Deviation		
	Group A (300mg)	Group B (600mg)	Group C (control)
Protein	4.8 ± 0.5[b]	5.5 ± 0.2[a]	4.4 ± 0.6[b]
Albumin	2.0± 0.2[a]	1.1 ± 0.1[b]	1.1 ± 0.1[b]
Globulin	2.8 ± 0.5[b]	4.4 ± 0.3[a]	3.3 ± 0.6[b]
Potassium	75.6 ± 7.8	78.0 ± 7.8	62.4 ±18.2
Sodium	91.8 ± 9.0[ab]	96.6 ± 13.0[a]	75.6±19.6[b]
Creatinine	1.2 ± 0.1	1.2 ± 0.1	1.5 ± 0.6
ALT	32.4 ±10.8	40.8 ± 8.3	40.0 ± 3.8
AST	63.0 ± 13.6	65.6 ± 13.7	72.8 ± 7.6
BUN	1.9 ± 0.5[ab]	2.1 ±0.7[a]	1.2 ± 0.4[b]

Legend: ALT- Alanine aminotransferase, AST- Aspartate aminotransferase, BUN- Blood urea nitrogen.

Reproductive Organ Morphometrics:

There is a significant difference (P≤0.05) between the value of Length of Right Uterine horn (LLUH) in the control and that of groups A and B respectively (Table 3).

The value of Diameter of Right Ovary (DRO) of the group C (control) is not significantly different (P≥0.05) from that of the group B but was significantly deference (P≤0.05) to that of Group A (Table 3). There are no significant differences (P≥0.05) in the mean values of all the other parts of the reproductive tract across the three groups.

Table 3: Reproductive Organ Morphometrics

	Mean ± Standard Deviation		
	Group A (300mg)	Group B (600mg)	Group C (control)
Length of right uterine Horn	3.1 ± 0.4	3.9 ± 0.5	3.4 ± 0.9
Length of Left uterine Horn	3.1 ± 0.4[ab]	3.0 ± 0.6[b]	4.0 ± 0.9[a]
Diameter of right uterine Horn	2.2 ± 0.1	2.3 ± 0.1	2.4 ± 0.1
Diameter of left uterine Horn	0.2 ± 0.1	0.2 ± 0.1	0.2 ± 0.1
Length of uterine body	0.5 ± 0.1	0.5 ± 0.1	0.4 ± 0.1
Diameter of uterine body	0.4 ± 0.1	0.4 ± 0.1	0.5 ± 0.1
Length of right ovary	0.5 ± 0.6	0.4 ± 0.1	0.4 ± 0.1
Length of left ovary	0.5 ± 0.1	0.5 ± 0.1	0.4 ± 0.1
Diameter of right ovary	0.3 ± 0.1[b]	0.4 ± 0.0[a]	0.4 ± 0.1[a]
Diameter of left ovary	0.4 ± 0.1	0.4 ± 0.02	0.4 ± 0.1
Length of cervix	0.4 ± 0.04	0.4 ± 0.1	0.4 ± 0.1
Diameter of cervix	0.5 ± 0.1	0.4 ± 0.1	0.5 ± 0.1

Organosomatic indices:

Table 4: Organosomatic indices

	Mean ± Standard Deviation		
	Group A (300mg)	Group B (600mg)	Group C (control)
Weight of reproductive tract	0.4 ± 0.1	0.5 ± 0.1	0.3 ± 0.1
Weight of left ovary	0.03 ± 0.01[b]	0.05 ± 0.02[a]	0.03 ± 0.004[b]
Weight of right ovary	0.03 ± 0.01[b]	0.05 ± 0.02[a]	0.03 ± 0.01[b]
Weight of left kidney	0.3 ± 0.04	0.3 ± 0.1	0.3 ± 0.04
Weight of right kidney	0.4 ± 0.3	0.3 ± 0.1	0.3 ± 0.1
Weight of spleen	0.3 ± 0.04[b]	0.4 ± 0.04[a]	0.4 ± 0.1[a]
Weight of liver	3.5 ± 0.6	3.5 ± 0.6	3.8 ± 0.6

There is no significant difference (P≥0.05) in the value of Weight of reproductive tract (WRT), Weight of left kidney (WLK), Weight of right kidney (WRK), and Weight of Liver (WL) across the 3 groups (Table 4).

There is a significant difference (P≤0.05) in the value of Weight of left ovary (WLO) and Weight of right ovary (WRO) of the group B to the values of groups A and C (control) respectively.

There is also a significant difference (P≤0.05) in the value of Weight of spleen (WS) of group A to that of Group B and C (control) respectively (Table 4).

4. Discussions

The haematology result showed that wistar rats were able to survive irrespective of the dose of *Mormordica charantia* although at 300mg concentration of the extract induced sight anemia and lower haemoglobin value.

Also, increased protein and albumin concentration was observed at the dose of 600mg and 300mg respectively which may be due to the effect of the chemical composition of the plant extract which has been reported to contain considerable amount of carbohydrate, protein, Vitamins A, E, C, K and folic acid. (Bakare *et al.,* 2010).

Moderate azotaemia was observed in the test groups which may be as a result of moderate renal toxicity of the plant extract.

Shortening of uterine horn length was observed in both test groups as oppose to the control group. This is in contrast to the increased uterine weight and micrometric measurements as reported by Sharanabasapp *et al.,* 2002 following a thirty days (30) administration of seed extract of *Mormordica charantia*.

An increase ovarian weight was observed in the test groups, which showed that the extract probably induces follicular growth which might be responsible for the heavier ovaries in the test groups.

This is equally in contrast to the report by Sharanabasapp *et al.,* 2002 that a reduced ovarian weight was observed at autopsy following a thirty (30) days administration of seed extract of *Mormordica charantia*.

Corresponding Author:
Dr. Esan Oluwaseun O
Department of Veterinary Medicine,
University of Ibadan, Nigeria.
E-mail: oiuseunsol@yahoo.co.uk

References

1. Akihisa, Toshihiro; Higo, Naoki; Tokuda, Harukuni; Ukiya, Motohiko; Akazawa, Hiroyuki; Tochigi, Yuichi; Kimura, Yumiko; Suzuki, Takashi et al. (2007). "Cucurbitane-type triterpenoids from the fruits of *Momordica charantia* and their cancer chemopreventive effects". *Journal of Natural Products*70: 1233–1239. DOI:10.1021/np068075p. PMID 17685651.
2. Ananya Paul and Sarmistha Sen Raychaudhuri (2010), Medicinal uses and molecular identification of two Momordica charantia varieties – a review. Electronic Journal of Biology, volume 6, issue 2, pages 43-51.
3. Bakare R. I.,Magbagbeola O. A.,Akinwande A. I and Okunowo O. W. (2010).Nutritional and chemical evaluation of *Momordica charantia.* Journal of Medicinal Plants Research Vol. 4(21), pp. 2189-2193, 4 November, 2010. Available online at http://www.academicjournals.org/JMPR.
4. Begum, Sabira; Ahmed, Mansour; Siddiqui, Bina S.; Khan, Abdullah; Saify, Zafar S.; Arif, Mohammed (1997). "Triterpenes, a sterol, and a monocyclic alcohol from *Momordica charantia*". *Phytochemistry* 44 (7): 1313–1320.
5. Beloin, N.; Gbeassor, M.; Akpagana, K.; Hudson, J.; De Soussa, K.; Koumaglo, K.; Arnason, J. T. (2005). "Ethnomedicinal uses of Momordica charantia (Cucurbitaceae) in Togo and relation to its phytochemistry and biological activity". *Journal of Ethnopharmacology* 96 (1–2): 49–55. DOI:10.1016/j.jep.2004.08.009. PMID 15588650.edit.
6. Chang, Chi-I; Chen, Chiy-Rong; Liao, Yun-Wen; Cheng, Hsueh-Ling; Chen, Yo-Chia; Chou, Chang-Hung (2008). "Cucurbitane-type triterpenoids from the stems of *Momordica charantia*". *Journal of Natural Products* 71 (8): 1327–1330. DOI:10.1021/np070532u.
7. Fatope, Majekodunmi; Takeda, Yoshio; Yamashita, Hiroyasu; Okabe, Hikaru; Yamauchi, Tatsuo (1990). "New cucurbitane triterpenoids from *Momordica charantia*". Journal of Natural Products 53 (6): 1491–1497.
8. Grover, J. K.; Yadav, S. P. (2004). "Pharmacological actions and potential uses of Momordica charantia: A review". *Journal of Ethnopharmacology* 93 (1): 123–132. DOI:10.1016/j.jep.2004.03.035. PMID 15182917.edit.
9. Kimura, Yumiko; Akihisa, Toshihiro; Yuasa, Noriko; Ukiya, Motohiko; Suzuki, Takashi; Toriyama, Masaharu; Motohashi, Shigeyasu; Tokuda, Harukuni (2005). "Cucurbitane-type triterpenoids from the fruit of Momordica charantia". Journal of Natural Products 68 (5): 807–809. DOI:10.1021/np040218p. http://pubs.acs.org/doi/pdf/10.1021/np040218p.
10. Kudret Narı Faydaları". Beslenme Desteği. http://www.beslenmedestegi.com/bitkisel-ilaclar/kudret-nari-faydalari.Retrieved 2011-10-03.
11. Taylor L (2005). Bitter melon: Herbal properties and actions. In: The healing power of rainforest herbs. Raintree Nutrition Inc. Square one Publ. Inc. New York, pp. 1-5.
12. Okabe, H.; Miyahara, Y.; Yamauci, T. (1982). "Studies on the constituents of *Momordica charantia* L.". *Chemical Pharmacology Bulletin* 30 (12): 4334–4340.
13. Ortigao, Marcelo; Better, Marc (1992). "Momordin II, a ribosome inactivating protein from *Momordica balsamina*, is homologous to other plant proteins". *Nucleic Acids Research* 20 (17): 4662. http://nar.oxfordjournals.org/cgi/reprint/20/17/4662.pdf.
14. Semiz, A, Sen A. (February 2007). "Antioxidant and chemoprotective properties of Momordica charantia L. (bitter melon) fruit extract". *African Journal of Biotechnology* 6 (3): 273–277.

4/6/2015