

THE EFFECT OF *MOMORDICA CHARANTIA* LEAF EXTRACT ON WHITE BLOOD CELL COUNT IN ALBINO RATS

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ABSTRACT

Momordica Charantia is among the most bitter of all fruits. Several studies revealed that this plant has anti-ulcer, anti-diabetic, antifungal, anti-leukemic, anti-protozoal, antibacterial, anti-fertility, antiviral, and hypoglycemic effects. We aim to study the effect of MC on the immune system. The study involved 25 rats and they were divided into 5 groups each comprising of 5 rats. The aqueous extract of *Momordica Charantia* was administered orally with syringes and cannula to 4 groups (A, B, C, D) at different doses (50mg/kg, 100mg/kg, 120mg/kg and 140mg/kg body weights per day respectively) to investigate its effect on white blood cells count and the last group served as the control and they were given drug vehicle (normal saline) only. The results showed a significant decrease ($P < 0.05$) in mean white blood cells count of all experimental animals when compared to the control group at the end of the administration which lasted for two weeks. The decrease in white blood cells count was most significant at the highest dose administered (140mg/kg body weight). There was a significant increase ($P < 0.05$) in mean neutrophils count of two groups (A and C) when compared to the control group while the remaining two groups showed no significant change ($P > 0.05$). The study showed that *M. charantia* caused significant changes in white blood cell counts when administered orally and that this effect was probably dose dependent.

Keywords: *Momordica charantia*, Extract, Orally, White Blood Cell Count.

INTRODUCTION

Finding healing powers in plants is an ancient idea. People on all continents have long applied poultices and imbued infusions of hundreds, if not thousands, of indigenous plants, dating back to prehistory (Stockwell et al. 1998).

It is estimated that there are 250,000 to 500,000 species of plants on Earth (Borris et al. 1996). A relatively small percentage (1 to 10%) of these are used as foods by both humans and other animal species. It is possible that even more are used for medicinal purposes (Moerman, 1996). *Momordica charantia* (MC), a member of the Cucurbitaceae family, is known as bitter melon, bitter gourd, balsam pear, karela, and pare. It grows in tropical areas of the Amazon, East Africa, Asia, India, South America, and the Caribbean and is used traditionally as both food and medicine.

Several studies revealed that this plant has anti-ulcer (Yesilada et al. 1999), anti-diabetic, antifungal, anti-leukemic, anti-protozoal, antibacterial, anti-fertility (Girini et al. 2005), antiviral, and hypoglycemic effects (Mitra et al. 2001).

So far, only a few, nonrandomized clinical studies have investigated the effects of MC in humans (Leatherdale et al., 1981; Welihinda et al., 1986; Srivastava et al., 1993; Basch et al., 2003). It is therefore crucial to conduct more studies which will shed more light on its other physiological effects. This study therefore seeks to study the effect of MC on the white blood cells.

METHODS AND MATERIALS

Animals: The rats weighing between 120-150g were obtained from the animal house of the department of Biological Science, Kwara State College of Education, Ilorin, Kwara State, Nigeria. The animals were maintained under standard conditions for temperature, relative humidity and light / day cycle.

Experimental design: 25 rats were randomly divided into 5 groups A, B, C, D and E, of 5 rats each. The groups are as follows:

- Group A received a dose of 80mg/kg body weight
- Group B received a dose of 100mg/kg body weight
- Group C received a dose of 120mg/kg body weight
- Group D received a dose of 140mg/kg body weight
- Group E was given normal saline and it served as the control group.

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Plant materials: *Momordica charantia* leaves were collected fresh from the biological garden of University of Ilorin, Kwara State Nigeria.

Collection and preparation of extracts: The leaves of *Momordica charantia* were aired and dried and milled into powder. 1.5 kg of the sample was percolated in 13 litres of water for about 48 hours, after which it was filtered and evaporated using water bath to give about 220g of a dark solid extract which was stored at 4°C temperature before physiological studies were made before oral administration. After two weeks of administration, the 25 rats were sacrificed by cervical dislocation (Akanji and Yakubu, 2009) after being anesthetized with chloroform. Blood samples were obtained through cardiac puncture.

Statistical analysis: The data were expressed as mean $\pm$ standard error of mean (SEM) and analyzed using analysis of variance (ANOVA) and Bonferroni. The significance value was taken at $P < 0.05$.

DISCUSSION

In our study, the extract of *Momordica Charantia*, when administered orally at doses employed, caused a significant decrease ($p < 0.05$) in total white blood cell count in rats. White blood cells are cells of the immune system involved in defending the body against both infectious disease and foreign materials. Five different and diverse types of leucocytes exist, but they are all produced from a multipotent cell in the bone marrow.

A previous study (Abalaka et al.; 2009) in which the acute toxicity of MC was used to determine the safety levels and usefulness of plants in Ethnochemotherapy, showed no significant changes in hematologic parameters between experimental and control rats. There was also no dose related changes in hematological and biochemical parameters except that there was a slight increase in mean counts of white blood cells.

Another study (Pongnikorn et al; 2003) in which the effect of MC on the level and function of NK cells in cervical cancer patients with radiotherapy indicated that MC extracts modified the immune response via reduced lymphocyte number and increased T helper and natural killer cell populations.

Other studies (Carl et al., 2001 and Roopshree et al., 2009) in which the acute oral toxicity studies of antispasmodic herbal mixture comprising of aqueous extracts of MC and other plant extracts indicated that MC had no significant effects on WBC and differential count.

Our study, showed a significant increase in neutrophil count and a significant decrease in total white blood cell count. Neutrophil counts were seen to have significantly ($P < 0.05$) increased in two groups (groups A and C; administered with 80mg/kg and 120mg/kg of MC extract, respectively) when compared to the control groups, while a significant decrease ($P < 0.05$) in total white blood cells was seen in all the experimental groups.

Analysis of haematological profile is an important parameter that can be useful in the detection of infections which may be due to various reasons. Factors that may reduce white blood cell counts in healthy adults include chemotherapy, radiation therapy, leukemia, myelofibrosis and aplastic anemia. Increase in neutrophil counts is seen in conditions such as acute inflammation, infarct or burns, and in some malignancies. Similar and contrasting results seen in neutrophil counts and total white blood cell counts, respectively, in our findings and previous findings, show the need for more detailed studies on the effects of MC, as well as other herbal preparations, and the mechanisms by which MC exerts its clinical and medicinal effects.

CONCLUSION

In conclusion, it can be inferred from our results that effects of MC on WBC is probably dose dependent. Investigations should be done regarding the white blood cell modulating activity of this plant used in folk medicine in Nigeria and in many other countries.

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RESULTS

Effects of *Momordica charantia* on total white blood cell count.

The mean white blood cell count of the control rats (normal saline) and those of the experimental rats (group B-80mg/kg, group B-100mg/kg, group C-120mg/kg and group D-140mg/kg) are shown in table 1 and figure 1.

The mean white blood cells count in control group was $(13.18 \times 10^3 \pm 0.473)$ as against group A $(10.04 \times 10^3 \pm 0.150)$, group B $(9.66 \times 10^3 \pm 0.268)$, group C $(9.65 \times 10^3 \pm 0.139)$ and group D $(7.10 \times 10^3 \pm 0.255)$. Values of the experimental groups showed a statistical significance of $P < 0.05$ when compared to the control group.

Effects of *Momordica charantia* on differential white blood cell counts.

Neutrophils

The mean neutrophil count of the control group (normal saline) and the test groups A, B, C and D are shown in table 2 and fig 2.

The mean neutrophil count in the control group was (9.00 ± 0.632) as against group A (12.60 ± 0.100) , B (8.20 ± 0.809) , C (14.00 ± 1.095) and D (9.00 ± 0.632) .

Values of experimental groups A and C showed a significant difference ($P < 0.05$), while those of groups B and D showed no significant difference ($P > 0.05$).

Basophils

The mean basophil count of the control group and those of the test groups are shown in table 3 and figure 3. The mean basophil count of the control group was (1.00 ± 0.00) and was the same for groups A, B, and C, while that of group D was (0.00 ± 0.000) .

Values of the experimental groups were not statistically significant ($P > 0.05$) when compared to the control group.

Eosinophils

The mean eosinophil count of the control rats and those of the experimental rats are shown in table 4 and figure 4.

The mean eosinophil count in the control group was (6.00 ± 1.265) as against group A (6.80 ± 0.533) , B (3.80 ± 0.0583) , C (3.60 ± 0.748) and D (6.80 ± 0.374) .

Values of the experimental groups showed no statistical significance ($P > 0.05$) when compared to the control group.

Monocytes

The mean monocyte count of the control rats and those of the experimental rats are shown in table 5 and figure 5.

The mean monocyte count in the control group was (1.40 ± 0.245) as against group A (0.20 ± 0.200) , B (1.20 ± 0.200) , C (1.80 ± 0.374) and D (0.80 ± 0.374) .

Values of the experimental groups showed no statistically significant difference ($P > 0.05$) when compared to the control group.

Lymphocytes

The mean lymphocyte count of the control rats and the experimental rats are shown in table 6 and figure 6.

The mean lymphocyte count in the control group was (83.80 ± 1.685) as against group A (80.20 ± 0.200) , B (86.20 ± 1.068) , C (80.0 ± 0.000) and D (84.20 ± 1.049) .

Values of the experimental groups showed no statistical difference ($P > 0.05$) when compared to the control group.

Table 1: Total

Group
Control
A
B
C
D

Table

Group
Cont
A
B
C
D

Table 1: Total White blood cell count in control and experimental rats

Groups	Mean ($\times 10^3/\text{mm}^3$)	S.E.M.	P value
Control	13.18	0.473	
A	10.04	0.150	<0.05
B	9.66	0.268	<0.05
C	9.68	0.139	<0.05
D	7.10	0.255	<0.05

Table 2: Neutrophil count in control and experimental rats

Groups	Mean (%)	S.E.M.	P value
Control	9.00	0.632	
A	12.60	0.400	<0.05
B	8.20	0.800	>0.05
C	14.00	1.095	<0.05
D	10.60	0.872	>0.05

Table 3: Basophil count in control and experimental rats

Groups	Mean (%)	S.E.M.	P value
Control	1.00	0.000	
A	1.00	0.000	-
B	1.00	0.000	-
C	1.00	1.000	-
D	0.00	0.000	-

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Table 4: Eosinophil count in control and experimental rats

Groups	Mean (%)	S.E.M.	P value
Control	6.00	1.265	
A	6.80	0.583	>0.05
B	3.80	0.583	>0.05
C	3.60	0.748	>0.05
D	6.80	0.374	>0.05

Table 5: Monocyte count in control and experimental rats

Groups	Mean (%)	S.E.M.	P value
Control	1.40	0.245	
A	0.20	0.200	>0.05
B	1.20	0.200	>0.05
C	1.80	0.374	>0.05
D	0.80	0.374	>0.05

Table 6: Lymphocyte count in control and experimental rats

Groups	Mean (%)	S.E.M.	P value
Control	83.80	1.685	
A	80.20	0.200	>0.05
B	86.20	1.068	>0.05
C	80.00	0.000	>0.05
D	84.00	1.049	>0.05

WBC count in control and experimental rats

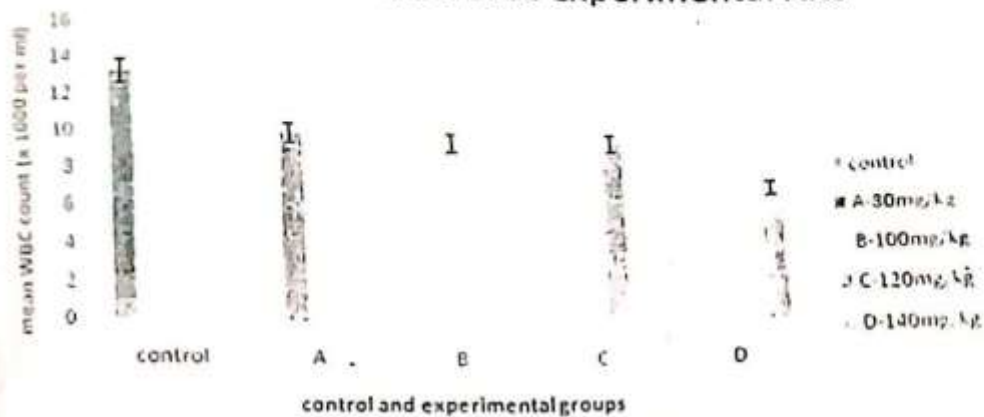


fig 1: $P < 0.05$ in all groups compared with control.

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Neutrophil count in control and experimental rats

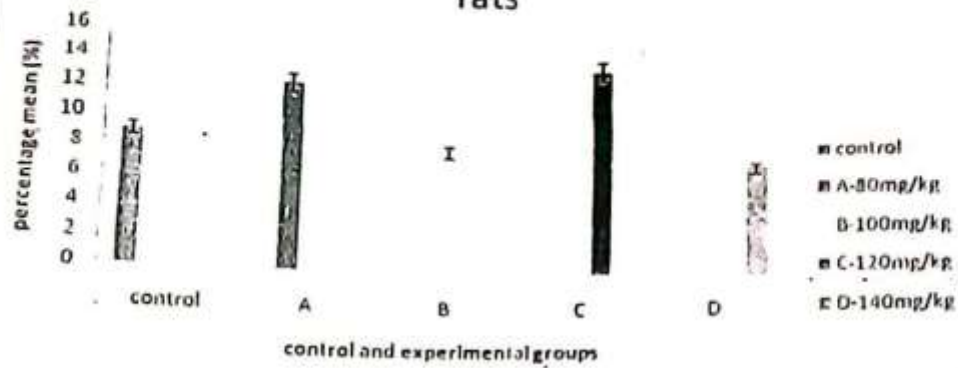


fig 2: $P < 0.05$ in groups A and C compared with control.

Basophil count in control and experimental rats

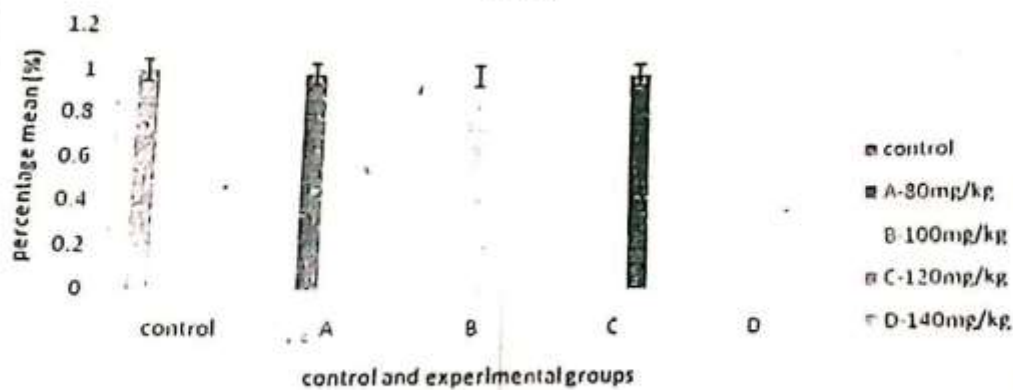


fig 3: no P values in all experimental groups

Eosinophil count in control and experimental rats

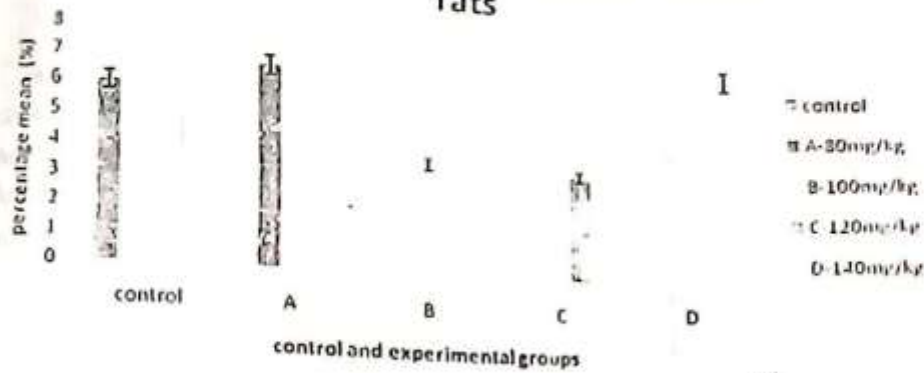


fig 4: $P > 0.05$ in all groups compared with control.

Monocyte count in control and experimental rats

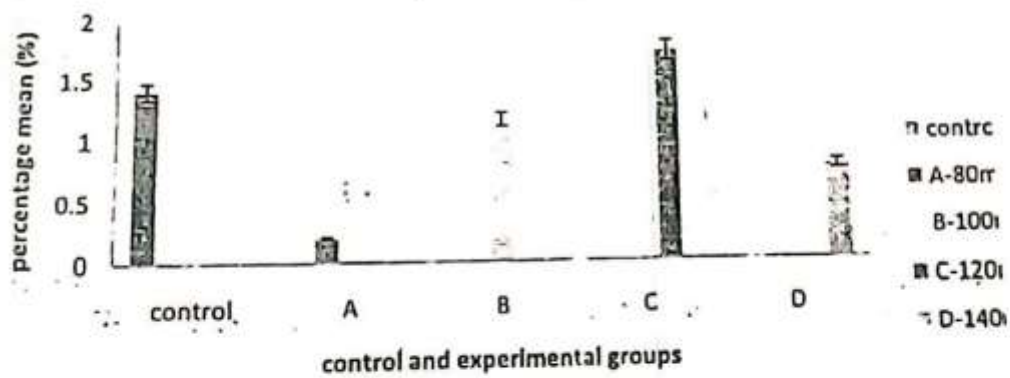


fig 5: $P > 0.05$ in all groups compared with control

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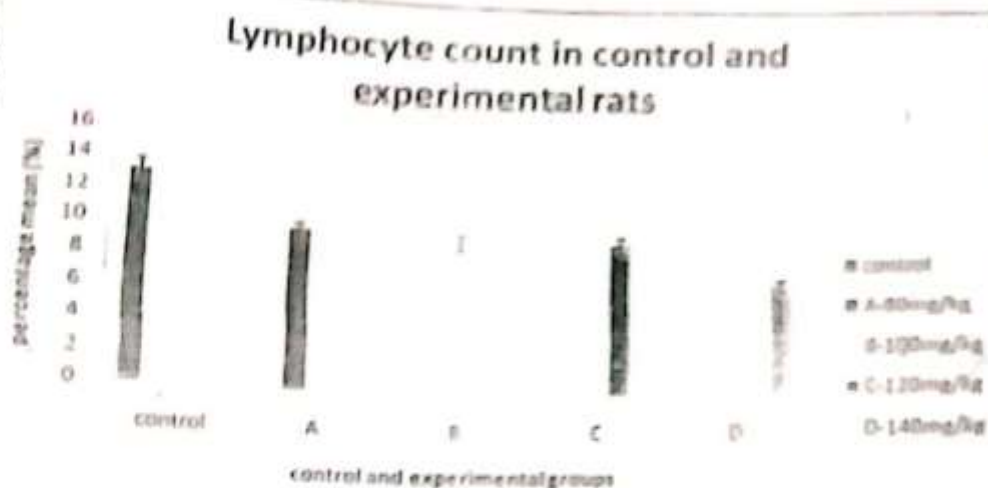


fig 6: $P > 0.05$ in all groups compared with control.