

## Original Research Article

# Effects of hydro-alcohol extract of mistletoe leaves on changes in body-weight, uterus-weight, right ovary and liver in female rats

Barinua K. Gbaranor<sup>1\*</sup>, Onisojime M. Alasia<sup>2</sup>, Popnen G. Tee<sup>1</sup>, Tamunobarabiye I. Nonju<sup>3</sup>, Iyingiala Austin-Asomeji<sup>4</sup>, Imaobong I. Nonju<sup>1</sup>, Ihundah Nmehielle<sup>3</sup>, Adetomi Bademosi<sup>4</sup>, Sarah K. Enebeli<sup>3</sup>, Ucheawaji F. Edward<sup>3</sup>, Valente N. Nnoka<sup>3</sup>, Boobondah J. Woha<sup>5</sup>

<sup>1</sup>Department of Human Physiology, <sup>3</sup>Department of Pharmacology and Therapeutics Pharmacology, <sup>4</sup>Department of Community Medicine, <sup>5</sup>Department of Medical Biochemistry, College of Medical Sciences, Rivers State University, Port Harcourt, Nigeria

<sup>2</sup>Department of Pharmacology, College of Medical Sciences, Niger Delta University, Bayelsa, Nigeria, India

**Received:** 10 March 2022

**Revised:** 30 March 2022

**Accepted:** 02 April 2022

### \*Correspondence:

Dr. Barinua K. Gbaranor,

E-mail: [barinua.gbaranor@ust.edu.ng](mailto:barinua.gbaranor@ust.edu.ng)

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Most people across rural areas in Africa depends of phytomedicine for the treatment of various diseases. This study aims to evaluate the impact of hydro-alcohol extract of mistletoe leaves on changes in body-weight, uterus-weight, ovary and liver of female Wistar rats.

**Methods:** Forty-nine female rats were randomly selected into nine groups with five rats per group. Group 1 received 5 ml/kg of water, group 2 received mono sodium glutamate (MSG) 800 mg/kg, group 3 received extract 100 mg/kg, group 4 received extract 200 mg/kg, group 5 received extract 400 mg/kg, group 6 received extract 100 mg/kg and MSG 800 mg/kg, group 7 received extract 200 mg/kg and MSG 800mg/kg, group 8 received extract 400 mg/kg and MSG 800 mg/kg and group 9 received letrozole 0.6 mg/kg and MSG 800 mg/kg. Administration of extract was done for 28 days.

**Results:** Findings from the study revealed significance decreased in the final weight of the animals. When treated groups received extract “100 mg/kg, extract 200 mg/kg, extract 400 mg/kg, and extract 200 mg/kg and MSG 800 mg/kg”, it shows significance decreased in body weight difference. The results also show significance increased in the weight of the right ovary in the treated groups extract 100 mg/kg, extract 100 mg/kg and MSG 800 mg/kg. Extract 100 mg/kg, extract 400 mg/kg and MSG 800 mg/kg and letrozole 0.6 mg/kg and MSG 800 mg/kg, shows significance decreased in the weight of the uterus. MSG 800 mg/kg, “extract 100 mg/kg, extract 200 mg/kg, and extract 400 mg/kg”, it shows significance decreased in the weight of the liver. Statistical analysis was done using statistical package for the social sciences (SPSS) version 23 and  $p < 0.05$  was significant.

**Conclusions:** There was significance decreased in rat’s body weight and significant increase in the right ovary when a lower dose of the extract was given and this increase could be due to MSG. The uterus significantly decreases when low dose of the extract was administered and the liver organ also has significant decreased in all the groups treated with extract alone.

**Keywords:** Changes, Body weight, Right ovary, Uterus, Liver

## INTRODUCTION

Herbs from various plants are important to several ethnic groups across the globe. These herbs usage is on the

increase due to several reasons such as accessibility, affordability and its ability to give results. However, most of these herbs when consumed by the people lacks

scientific documentation and these may result in several complications.

The plant *Englerina drummondii* Balle ex Polhill and *Wiens* is a species of a commonly known plant called mistletoe that belongs to a large family called Loranthaceae.<sup>4</sup> Mistletoe (*Englerina drummondii* Balle ex Polhill and *Wiens*) has a green leaves and fruits and grow on other plants as parasite.<sup>5</sup> It is locally called atabe in OgoniLin Niger Delta, Nigeria.<sup>6</sup> Phytomedicine involves the use of various plant's parts such as leaves, stems, seeds, fruits, barks and roots to treat certain disease at home. Several people have been patronizing herbal medicine to obtain better health care.<sup>4</sup>

Monosodium glutamate (MSG) is a salt of glutamate, synthesized from L-glutamic acid and used as a flavour enhancer in foods.<sup>1</sup> Though MSG improves taste stimulation and enhances appetite, findings revealed that it is toxic to human and experimental animals.<sup>2</sup> MSG has a toxic effect on the testis by causing a significant oligozoospermia and increase abnormal sperm morphology in a dose dependent manner in male Wistar rats.<sup>12</sup> It has been implicated in male infertility by causing testicular hemorrhage, degeneration and alteration of sperm cell population and morphology.<sup>11</sup> Letrozole is a highly potent non-steroidal aromatase inhibitor. It inhibits oestrogen biosynthesis by about 99% at the dose of 2.5 mg/day.<sup>9</sup>

## METHODS

### *Plant collection, identification and preparation of extract*

*Englerina drummondii* Balle ex Polhill and *Wiens* (mistletoe) leaves were obtained from a forest in Khana local government area, Rivers State, Nigeria. The plant was introduced to the researcher by Prof B. A. Ekeke (Professor of Silviculture and Forestry) of the Forestry Department, Faculty of Agriculture, Rivers State University, Port Harcourt, Nigeria, and identified and authenticated in the Department of Plant Science and Biotechnology, Faculty of Science, University of Port Harcourt, Rivers State, Nigeria.

The *Englerina drummondii* Balle ex Polhill and *Wiens* leaves were washed and thereafter completely air dried under normal room temperature. The dried leaves were grounded into powder. 3 kg of the grounded powder was placed in a maceration jar and 6.00 ml of 70% methanol (hydro methanol) was added. The extract was slowly evaporated to dryness in vacuum at 45°C using a rotary evaporator as described by.<sup>3</sup> The LD50 of the *Viscum album* was 0.4 g/kg (400 mg) of body weight as determined by was used.<sup>10</sup>

### *Experimental animals and management*

The animals were obtained from the animal house, Faculty of Basic Medical Sciences, University of Port Harcourt. 45

female rats were used. The animals were placed in cages under natural environmental condition. The animals were weighed before and after the commencement of administration of extract. The experimental animal's weight was between 160-180 g. The animals were allowed free access to clean drinking water and feed.

### *Study design*

A total of 45 animals were selected randomly into 9 groups with five rats per group. Group 1 (control) received 5 ml/kg of distilled water, group 2 received MSG 800 mg/kg, group 3 received extract 100 mg/kg, group 4 received extract 200 mg/kg, group 5 received extract 400 mg/kg, group 6 received extract 100 mg/kg and MSG 800 mg/kg, group 7 received extract 200 mg/kg and MSG 800 mg/kg, group 8 received extract 400 mg/kg and MSG 800 mg/kg, group 9 received letrozole 0.6 mg/kg and MSG 800 mg/kg. All groups received feeds in addition.

The animals were weighed before and after the commencement of the extract.

Administration of extracts was done for 28 days and on 29<sup>th</sup> day, the animals were sacrificed and organs were collected. The LD50 used was 0.4 g/kg (400 mg) of body weight.

## RESULTS

### *Initial body weight*

When normal control group is compared with the following treated groups extract 100 mg/kg, extract 200 mg/kg, extract 400 mg/kg extract 100 mg/kg and MSG 800 mg/kg, extract 200 mg/kg and MSG 800 mg/kg, extract 400 mg/kg and MSG 800 mg/kg and letrozole 0.6 mg/kg and MSG 800 mg/kg, there is a significance increased in the initial body weight and when the MSG 800 mg only group is compared with groups treated with "extract 100 mg/kg, extract 200 mg/kg, extract 400 mg/kg", extract 100 mg/kg and MSG 800 mg/kg, "extract 200 mg/kg and MSG 800 mg/kg, extract 400 mg/kg and MSG 800 mg/kg" and letrozole 0.6 mg/kg and MSG 800 mg/kg, it shows a significance in the initial body weight of rats (Table 1).

### *Final body weight*

When normal control group is compared with extract 100 mg/kg treated group, it shows a significance decreased in final body weight of rats and when the group treated with extract 100 mg/kg and MSG 800 mg/kg, there is a significance increased in final body weight of rats. When MSG 800 mg only group is compared with the treated groups extract "100 mg/kg, extract 200 mg/kg, extract 400 mg/kg, and extract 200 mg/kg" and MSG 800 mg/kg, there is significance decreased in the final body weight of the rats and there is a significance increased in the final body weight of rats when compared with the treated group extract 100 mg/kg and MSG 800 mg/kg (Table 1).

### Body weight difference

When normal control group is compared with the groups treated with extract “100 mg/kg, extract 200 mg/kg, extract 400 mg/kg, and extract 200 mg/kg and MSG 800 mg/kg”, it shows significance decreased in body weight difference and when compare with the treated group letrozole 0.6 mg/kg and MSG 800 mg/kg, it shows notable increased of

the body weight difference. Also, when MSG 800 mg only group is compared with the following treated groups “extract 100 mg/kg, extract 200 mg/kg, extract 400 mg/kg, and extract 200 mg/kg and MSG 800 mg/kg, extract 400 mg/kg and MSG 800 mg/kg” and letrozole 0.6 mg/kg and MSG 800 mg/kg, there is notable decreased in the body weight difference of the rats (Table 1).

**Table 1: Effect of *Englerina drummondii* Balle ex Polhill and Wiens on rat body weight following MSG administrations in female rat.**

Parameters	Initial bwt (g) Mean±SEM	Final bwt (g) Mean±SEM	Bwt difference (g) Mean±SEM
Normal control	163.60±1.47	184.20±6.15	20.60±5.38
MSG 800 mg/kg	168.00±0.63	191.60±3.27	23.60±3.31
Extract 100 mg/kg	<sup>a</sup> 171.80±1.07	<sup>ab</sup> 163.60±0.93	<sup>ab</sup> -8.20±0.97
Extract 200 mg/kg	<sup>ab</sup> 187.40±3.19	<sup>b</sup> 178.40±0.81	<sup>ab</sup> -9.00±2.88
Extract 400 mg/kg”	<sup>ab</sup> 188.20±0.58	<sup>b</sup> 177.60±2.20	<sup>ab</sup> -10.60±2.62
MSG + “extract 100 mg/kg	<sup>ab</sup> 186.40±0.40	<sup>ab</sup> 208.00±5.66	21.60±5.47
MSG + extract 200 mg/kg	<sup>ab</sup> 191.40±1.12	<sup>b</sup> 174.60±2.50	<sup>ab</sup> -16.80±2.52
MSG + extract 400 mg/kg”	<sup>ab</sup> 198.20±1.11	186.80±2.08	<sup>ab</sup> -11.40±1.99
MSG + letrozole	<sup>ab</sup> 210.40±2.86	189.20±7.37	<sup>ab</sup> -21.20±6.19

a=p<0.05 when compared to normal control; b=p<0.05 when compared to MSG (800 mg) only treated group; MSG=mono sodium glutamate; Bwt=body weight; g=grams

### Right ovary

Normal control group when compared with groups treated with MSG 800 mg/kg, “extract 100 mg/kg and extract 100 mg/kg and MSG 800 mg/kg”, it shows significance increased in the weight of the right ovary and when MSG 800mg only group is compared with group 1 shows a significance decreased in the weight of the right ovary and significantly increased in the weight of the right ovary in group treated with extract 100 mg/kg and MSG 800 mg/kg (Table 2).

### Uterus

When normal control group is compared with groups treated with extract 100 mg/kg, extract 400 mg/kg and MSG 800 mg/kg and letrozole 0.6 mg/kg and MSG 800 mg/kg, it shows significance decreased in the weight of the uterus and when MSG 800 mg only group is compared with control, and groups treated with “extract 100 mg/kg, extract 200 mg/kg, extract 400 mg/kg, extract 100 mg/kg

and MSG 800 mg/kg, extract 200 mg/kg and MSG 800 mg/kg, extract 400 mg/kg and MSG 800 mg/kg and letrozole 0.6 mg/kg and MSG 800 mg/kg”, it neither shows any significance increase or decrease in the weight of the uterus (Table 2).

### Liver

When normal control group is compared to groups treated with MSG 800 mg/kg, “extract 100 mg/kg, extract 200 mg/kg, and extract 400 mg/kg”, it shows significance decreased in the weight of the liver and when treated with extract 100 mg/kg and MSG 800 mg/kg, extract 400 mg/kg and MSG 800 mg/kg, and letrozole 0.6 mg/kg and MSG 800 mg/kg, it shows notable (significance) rise in the weight of the liver. Also, when MSG 800 mg only group is compared with control and groups treated with extract 100 mg/kg, extract 400 mg/kg and MSG 800 mg/kg, and letrozole 0.6 mg/kg and MSG 800 mg/kg, it shows notable rise in weight of the liver (Table 2).

**Table 2: Effect of *Englerina drummondii* Balle ex Polhill and Wiens on rat body organs following MSG administration in female rats.**

Parameters	Ovary wt (g)	Uterus (g)	Liver (g)
Normal control	0.03±0.00	0.18±0.05	5.58±0.18
MSG 800 mg/kg	<sup>a</sup> 0.06±0.01	0.15±0.01	<sup>a</sup> 4.49±0.12
Extract 100 mg/kg	<sup>a</sup> 0.05±0.01	<sup>a</sup> 0.08±0.01	<sup>ab</sup> 4.31±0.22
Extract 200 mg/kg	0.04±0.01	0.16±0.03	<sup>a</sup> 4.32±0.16

Continued.

Parameters	Ovary wt (g)	Uterus (g)	Liver (g)
<b>Extract 400 mg/kg</b>	0.05±0.01	0.20±0.08	<sup>a</sup> 4.13±0.19
<b>MSG + extract 100 mg/kg</b>	<sup>ab</sup> 0.09±0.02	0.11±0.02	<sup>a</sup> 7.86±.39
<b>MSG + extract 200 mg/kg</b>	0.05±0.00	0.13±0.01	5.04±0.29
<b>MSG + extract 400 mg/kg</b>	0.05±0.01	<sup>a</sup> 0.09±0.01	<sup>ab</sup> 6.74±0.17
<b>MSG + letrozole</b>	0.05±0.01	<sup>a</sup> 0.05±0.01	<sup>ab</sup> 6.60±0.48

a=p<0.05 when compared to normal control; b=p<0.05 when compared to MSG (800 mg) only treated group; MSG=mono sodium glutamate; Rt ovary wt=right ovary weight; g=grams

## DISCUSSION

The initial weight was weight gotten before the treatment was initiated. However, final weight was meaningfully decrease only in group treated with extract 100 mg/kg when compare to control group. Again, final weight is meaningfully decrease in groups treated with “extract 100 mg/kg, extract 200 mg/kg, 400 mg/kg and extract 200 mg/kg and MSG 800 mg/kg” when compare to MSG 800 mg/kg only group. This suggest that extract could be potent weight reduction substance.

However, the group treated with extract 100 mg/kg and MSG 800 mg/kg was significantly increased when compare to both control group and MSG 800 mg/kg only group. This could be due to decrease in the dosage of extract when combine with the MSG. The MSG may cause increase in weight of this particular group by stimulating appetite centre and this agreed with previous work which shows that “MSG increases the appetite by stimulating the appetite centre in the hypothalamus”.<sup>7,8,13</sup>

The right ovary significantly increases in the following treated groups: MSG 800 mg/kg only group, extract 100 mg/kg and extract 100 mg/kg and MSG 800 mg/kg when compared with the control. This increased could be due to MSG. The uterus significantly decreases in the treated groups: extract 100 mg/kg, extract 400 mg/k and MSG 800 mg/kg and letrozole 0.6 mg/kg and MSG 800 mg/kg when compared with control group. This decreased may suggest increase in oxidative stress. The liver organ also has significance decrease in the groups treated with MSG 800 mg/kg only, “extract 100 mg/kg, extract 200 mg/kg, and extract 400 mg/kg”, and significantly increase in group treated with extract 100 mg/kg and MSG 800 mg/kg when compared with control group. This decrease in the liver organ may be due to the extract. However, the liver organ is significantly increase in the treated groups: extract 400 mg/kg and MSG 800 mg/kg and letrozole 0.6 mg/kg and MSG 800 mg/kg when compared to both control group and MSG 800 mg/kg only group. Again, MSG 800 mg/kg only group is significantly decreased when compare to control group.

### Limitations

Lack of resources and plant’s source were major constraints during the study.

## CONCLUSION

Phytomedicine is an important part of healthcare system and the results from our findings revealed a significance decrease in rat’s body weight and significance increase in the right ovary when a lower dose of the extract was given and this increased could be due to MSG. The uterus significantly decreases when low dose of the extract was administered and the liver organ also has significance decrease in all the groups treated with extract alone.

## ACKNOWLEDGEMENTS

Authors would like to thank Nazor Barinua-Gbaranor, Nuazor V. Barinua-Gbaranor, and Kedumle S. Barinua-Gbaranor for their support, understanding encouragement during this period of research. They would also like to acknowledge Excellent Support Global Foundation for their moral support.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

- Olowofolahan AO, Aina OO, Hassan ET, Olorunsogo OO. Ameliorative Potentials of Methanol Extract and Chloroform Fraction of *Drymaria cordata* on MSG induced Uterine Hyperplasia in Female Wistar Rats. *Eur J Med Plants*, 2017;20(4):1-9.
- Belluardo M, Mudo G, Bindoni M. Effect of early destruction of the mouse arcuate nucleus by MSG on age dependent natural killer activity. *Brain Res*. 1990;534:225-333.
- Eno AE, Owo OI, Itam EH, Konya RS. Contribution of lymphocytes in edema induced by venom from the wasp (*Belonogasterfuscipennis*). *Pharmacol Biol*. 2001;39(4):247-52.
- Gbaranor KB, Ovili-Odili BZ, Okpara EP, Tamuno-Opubo A, Victor PD, Orupabo CD, et al. Effect of Hydroalcohol Extract of *Englerina drummondii* Balle ex Polhill & Wiens (Mistletoe) Leaves on Prolactin and Thyroid Stimulating Hormone (TSH) in Female Wistar Rats. *Greene J Med Sci*. 2021;11(2):109-12.
- Gbaranor KB, Tee PG, Agara HN, Victor PD, Alasia OM, David-Sarogoro N, et al. Phytochemical Analysis Of Leaf Extract Of *Englerina Drummondii*

- Balle Ex Polhill & Wiens. *World J Pharm Res.* 2021;10(11):128-34.
6. Gbaranor KB, Adienbo OM, Alasia OM, Tee PG, Gilbert UD, Nonju TI, et al. Effect of Hydroalcohol Extract of Englerina Drummondii Balle Ex Polhill & Wiens Leaves and MSG on Oestrous Cycle Of Wistar Rats. *World J Innov Res.* 2021;11(4):19-21.
  7. Gobatto CA, Mello MA, Souza CT, Ribeiro IA. The monosodium glutamate (MSG) obese rat as a model for the study of exercise in obesity. *Res Commun Mol Pathol Pharmacol.* 2002;111(1-4):89-101.
  8. Iwase M, Yamamoto M, Iino K, Ichikawa K, Shinohara N, Yoshinari F. Obesity induced by neonatal monosodium glutamate treatment in spontaneously hypertensive rats: an animal model of multiple risk factors. *Hypertens Res.* 1998;21:1-6.
  9. Karaer O, Oruc S, Koyuncu FM. Aromatase inhibitors: possible future applications. *Acta Obstet Gynecol Scand.* 2004;83:699-706.
  10. Matthew O, Earnest O, Erhirhie, Oluwatosin A. Effects of Englerina drummondii Balle ex Polhill & Wiens (mistletoe) from three host plants (cocoa, kola and coffee) on semen quality of wistar albino rats. 2016.
  11. Oforofuo IAO, Onakewhor JUE, Idaewor PE (1997). The effect of chronic admin of MSG on the Histology of the Adult Wistar Rat Testes. *Biosci Res Comm.* 1997;9(2).
  12. Onakewhor JUE, Oforofuo IAO, Singh SP. Chronic administration of Monosodium the histology of the adult wister rat testes. *Biosc Res Comm.* 1998;9(2):6-15.
  13. Rogers PP, Blundell JE. Umani and appetite: Effects of monosodium glutamate on hunger and food intake in human subjects. *Physiol Behav.* 1990;48(6):801-4.

**Cite this article as:** Gbaranor BK, Alasia OM, Tee PG, Nonju TI, Austin-Asomeji I, Nonju II, et al. Effects of hydro-alcohol extract of mistletoe leaves on changes in body-weight, uterus-weight, right ovary and liver in female rats. *Int J Res Med Sci* 2022;10:1421-5.