Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Effect of Euphorbia Hirta on Certain Metabolic and Cardiovascular Diseases

Yayé Yapi Guillaume[1,3], Adon Mousan Arsène[2], Okou Obou Constantin[1,3], Djè Koffi[1,2], Konan Kouassi Martin[2], Ackah Jacques Auguste Alfred Bognan[1,3], Djaman Allico Joseph[3,4]

[1]Biology-Health stream, Department of Biochemistry-Microbiology, Agroforestry UFR, University of Jean Lorougnon Guédé, Daloa, Côte D'Ivoire.

[2]Researcher, Department of Cellular Biology, Institut Pasteur, Abidjan, Côte d'Ivoire.

[3]Health Biology laboratory, Biosciences UFR, University of Félix Houphouët-Boigny, Abidjan, Cote d'Ivoire.

[4]Professor, Department of Medical and Fundamental Biochemistry, Institut Pasteur of Côte d'Ivoire, Abidjan, Côte d'Ivoire.

Received: March 2020
Accepted: March 2020

ABSTRACT

Background: The species Euphorbia hirta is a plant used in traditional medicine in the treatment of many pathologies such as metabolic and cardiovascular diseases. **Methods:** The evaluation of the potential effect of the aqueous extract on certain metabolic and cardiovascular diseases was performed with wistar rats by gavage of 500 µL/day of the aqueous extract of Euphorbia hirta at a dose of 200 mg/mL for 21 days. At the same time, a weight gain is carried out every 3 days until the 21st day. **Results:** The results reveal that the aqueous extract of the plant improves the lipid profile with a significant decrease in Total Cholesterol, LDL-c and Triglycerides, and an increase in HDL-c levels. The Cholesterol/HDL ratio is 0.76. This extract also has no negative effect on blood sugar levels. It facilitates weight gain in rats by increasing muscle mass while limiting excess fat. It also increases kidney activity by decreasing serum Creatinine and Urea levels. In addition, the study of absolute and relative liver and kidney weights of rats treated showed no evidence of cytotoxicity, suggesting that consumption of the plant would have no adverse effect on the body's functioning and would be safe for health. **Conclusion:** These results confirm the use of the plant in traditional medicine in the treatment of certain metabolic diseases.

Keywords: Euphorbia hirta, Effect, Metabolic, Cardiovascular.

INTRODUCTION

Medicinal plants are an important source for the treatment of many conditions. Thus, according to ethnopharmacological studies several plants are used in traditional medicine, for their biological activities in the treatment of pathologies.[1] Indeed, medicinal plants contain bioactive molecules representing multiple interests and which are put to use in different areas. Among these compounds are secondary metabolites being most prominent in the therapeutic field.[2] Furthermore, the finding of recent decades reveal that research in herbal medecines has become a scientific concern. It was possible to identify more and more plant substances, explain their structure and prove their effects in a scientific manner especially since most of the population is interested in the virtues of medicinal plants in the treatment of many pathologies.[3] Thus, in some traditional societies such as in China, most African and Latin American countries, drug management of chronic diseases (cancer, diabetes, kidney failure, atherosclerosis, hypertension, etc.) is largely assured by the use of medicinal and food plants.[4]

It is therefore important to lay the scientific basis for the use of these medicinal plants in view of the problems of quantitative, qualitative and economic inaccessibility faced by our populations and especially the low interest of pharmaceutical firms to affect the economically weak countries. This is the case of the species Euphorbia hirta used to treat several pathologies including microbial infections, hepatic, renal, respiratory and other pathologies such as diabetes, hypertension. It is also sedative and febrifuge.[5-8] The purpose of this report was undertaken to assess its potential effect against certain metabolic diseases by using wistar rats.

Name & Address of Corresponding Author
Dr. Yayé Yapi Guillaume,
Biology Health, Department of Biochemistry-Microbiology,
Agroforestry UFR,
University of Jean Lorougnon Guédé, Daloa,
Côte d'Ivoire.

MATERIALS AND METHODS

The biological material consists of a part of a vegetable substance (powder obtained from the whole plant of Euphorbia hirta). And on the other hand, rats of wistar strain (Rattus norvegicus). As for the technical equipment, it is common laboratory equipment for biology.

Preparation of the aqueous extract:

After identification of the species, a treatment was followed that allowed the dried whole plant to be sprayed. The powder obtained was used to prepare the aqueous extract.

Indeed, 1.5 L of distilled water was added to 150 g of the powder. This set was homogenized and

macerated in a blender for 5 min and then filtered. The mac was subsequently taken up in 1 L of distilled water, macerated and filtered again. This process was repeated 3 times and the resulting final filtrate was oven dried at 50 °C for 5 days. The resulting dry aqueous extract was preserved for the various tests.

Breeding conditions:

Up on receipt of rats (28) of the species Rattus norvegicus aged 12-14 weeks, they were weighed and then batching of two (14 rats/batch), taking into account their weight on arrival, in appropriate cages whose sawdust is renewed every 3 days.

These rats were acclimatized between 22-24 °C with stable hydrometry and a system that regulates periods of darkness and light (alternating 12 hours). During the acclimatization period (2 weeks), each rat identified at the ear had free access to food and water.

Treatment of animals:

After the acclimation period, the rats were treated for 21 days as follows:

- The control group was given only distilled water;
- And each rat in the experimental group in addition to water received by feeding 500 µL/day of extract solution at the concentration of 200 mg/mL. The feeding occurred at a specific time of day. Simultaneously during this treatment period and at specified times the animals are weighed every 3 days.

After the treatment period (21 days), and according to the recommendations of the Federal office for food Safety and Veterinary affairs,[9] the animals were sacrificed and blood samples (2-2.5 mL) were taken immediately and collected in labelled tubes (dry tubes and tubes containing EDTA).

These tubes were centrifuged at 3000 rpm for 15 minutes and biochemical parameters (Total Cholesterol, HDL-c, LDL-c, Total Glucose, Triglycerides, Creatinine and Urea) were determined using a multiparametric automaton (COBAS C311). Subsequently after dissection the liver, spleen and kidneys of each rat were collected and weighed.

The statistical data were processed using the Graph Pad Prism 7 software. The comparison between control and treated was made by the t-tests and by the ANOVA variant analysis method with a difference of significance of $P \leq 0.05$.

RESULTS

The body weight gain results are presented in [Figure 1]. These results show regular body weight gain in control rats from 243.75 g to 254.25 g (approximately 11 g). While in experimental rats, there was a slight increase in body weight from 260.42 to 266.95 g (about a 6 g difference).

In terms of the absolute weights of the different organs collected, there is no significant difference between the two batches of rats [Figure 2]. The same applies to the relative weights except for the spleen, with a significant difference (P = 0.04) [Figure 3].

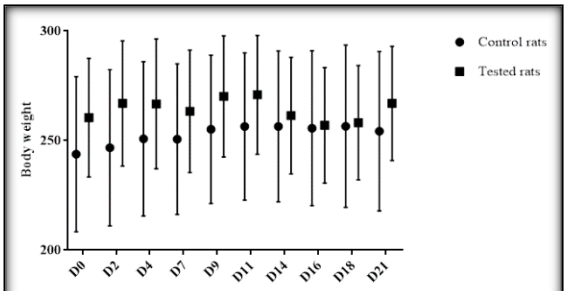

Fig. 1: Change in rat body weight (Day 1-21)

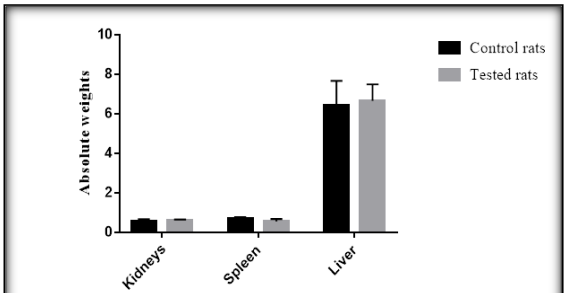

Fig. 2: Comparison of absolute organ weights (Kidneys, Spleen, Liver)

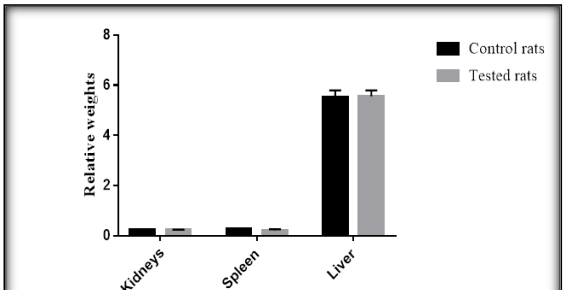

Fig. 3: Comparison of relative organ weights (Kidneys, Spleen, Liver)

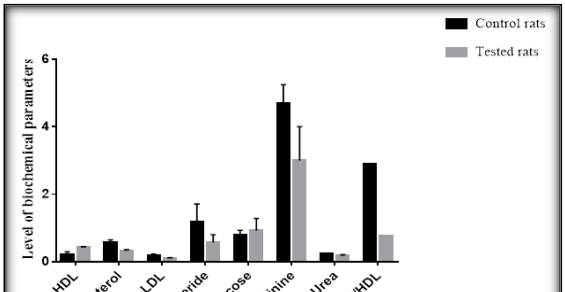

Fig. 4: Biochemical profiles studied

Moreover, the results of lipid profile variation show significant decrease in cholesterol and LDL levels in animals that received the aqueous extract of Euphorbia hirta (P = 0.03). This difference is still very pronounced for LDL (P = 0.02). On the other hand, at the triglycerides level, there is no significant difference. It is the same for serum glucose and the two renal biochemical parameters (creatinine and urea) of these rats fed on this aqueous extract of E.

hirta. In addition, the cholesterol/HDL ratio is 0.76 for tested rats while it is 2.89 for controls rats. [Figure 4].

DISCUSSION

In this study, rats fed with 500 µL of aqueous extract of Euphorbia hirta gained body weight compared to control rats. This would be due to the beneficial effect of this plant against obesity and overweight.[10] In fact, the aqueous extract of E. hirta facilitates weight gain by increasing muscle mass without however increasing fat mass. These results are contistent to those of Harchane et al., 2012,[11] which worked on extracts of grains of Trigonella foenum graecum.

Furthermore, the non-significant difference in absolute and relative kidney and liver weights in rats (treated and untreated) could be an indication of the absence of adverse effects on these organs at the dose levels used for these tests (200 mg/mL).[12] In addition, Lanhers et al.,1988,[13] confirmed that the acute oral LD50 of the aqueous extract of Euphorbia hirta is about 9 g/kg (9000 mg/kg), well above the 200 mg/mL. On the other hand, the significant decrease in spleen weight in treated rats could reveal a side effect of the extract on this organ.

In addition, plasma creatinine and urea levels in treated rats show that absorption of the aqueous extract of E. hirta increases their elimination. This would indicated a good diuretic activity of this plant. These results were revealed by the Tabuti, 2008.[6] Indeed the aqueous extract of Euphorbia hirta increases diuresis. These results confirm its traditional use as a diuretic agent.

Although there is no significant difference, the mean blood glucose level of treated rats (0.92 g/L) is within the mean range (0.8-1.2 g/L) while that of control rats is just below the lower limit (0.79 g/L). This would indicate that the extract better regulates the glycemia and therefore would have an effect on hyperglycemia.

Decreased plasma levels of cholesterol, triglyceride and LDL-c and the high levels of HDL seen in treated rats could be explained by the presence of saponins in the aqueous ex3tract of the plant revealed by Lanhers et al., 1987.[14] According to some authors, saponins have anti-hyperlipidemia and anti-hypercholesterolemia properties,[15-17] hypotensive and cardiodepressive properties.[18] Other studies have also found that saponins have anti-obesity properties.[8] The comparison of these lipid levels and cholesterol/HDL ratio to the reference values reveals that Euphorbia hirta can be used to effectively fight against certain metabolic and cardiovascular diseases.[19,20]

In addition, according to Bonnefont-Rousselot, 2016,[19] a lipid profile is described as better when the cholesterol/HDL ratio is less than two (2). In rats tested this ratio is 0.76. This could mean that the aqueous extract of E. hirta would be the source of a good lipid profile. The antioxidant activity of this plant comparable to that of green and black teas was reported by Sharma et al., in 2008,[21] and would also be the basis of its antihypertensive, antihypotensive and antidiabetic activity. These results justify the use of the plant in the treatment of metabolic diseases such as cardiovascular risks and diabetes.[8,22,23]

CONCLUSION

At 200 mg/mL, the results obtained showed that the aqueous extract has a beneficial effect against obesity and does not show any signs of cytotoxicity at this concentration.

The values of the biochemical parameters found show that this aqueous extract improves blood sugar levels and lipid profile, thereby improving diabetes and cardiovascular risks. It also has good diuretic activity, reducing the risk of kidney failure.

More in-depth studies can be carried out to integrate it into the diet. This could contribute to the prevention of these pathologies. At this point it would be interesting to situate the effect of the plant on the spleen. This work could be improved by optimizing activity and identifying the plant's bioactive compounds responsible for these effects.

Acknowledgement

We would like to express their deepest gratitude to the entire staff for the Clinical and Fundamental Biochemistry Department and the Department of Cell Biology of Institut Pasteur.

REFERENCES

1. Bisht VK, Negi JS, Bhandari AK, Sundriyal RC. Amomum subulatum Roxb: Traditional, phytochemical and biological activities-An overview. Afri J Agric Re. 2010 ; 6(24) :5386-5390.
2. Anderson OM, Markham KR. Flavonoids : Chemistry, Biochemistry and Applications. CRC Press, Taylor & Francis Group. 2006 ;1(32) :397- 425.
3. Njike NG, Watcho P, Nguelefack TB, Kamanyi A. Hypoglycaemic activity of the leaves of Bersama engleriana in rats. Afr J Trad. 2005 ; 2(3) : 215-221.
4. Zhou J, Zhou S, Tang J, Zhang K, Guang L, Huang Y, et al. Protective effect of berberine on beta cells in streptozotocin and high-carbohydrate/high-fat diet-induced diabetic rats. Eur J Pharmacol. 2009 ; 606 (1-3) : 262-268.
5. Djoko E, Chougouo RD, Ngondji TC, Wouessidjewe D. Formulation d'un médicament traditionnel amélioré à visée antiamibienne à base de Euphorbia hirta Linn. Int J Biol Chem Sci. 2018 ;12(2) :659-667.
6. Tabuti JRS. Euphorbia hirta L. In : Plant Resources of Tropical Africa 11(1)/ Medicinal plant 1. Schmelzer G.H. & Gurib-Fakim (Editors), Backhuys Publishers, Leiden, CTA, Wageningen, Pays-Bas ; 2008. p.298-303.
7. Lanhers MC, Nicolas JP, Fleurentin J, Weniger B. Euphorbia hirta dans Monographie de plantes. Ethnopharmacologia, 2005 ; 36 : 9-23.
8. Linfang H, Shilin C, Meihua Y. Euphorbia hirta (Feiyangcao) : A review on its ethnopharmacology, phytochemistry and pharmacology. J Med Plant Res. 2012 ; 6(39) : 5176-5185.

9. Office fédéral de la sécurité alimentaire et des affaires vétérinaires (OSAV) : Protection des animaux (Directives 1.04 et 3.02). Cited 2020 January 05. Available from : http://www.blv.adm.ch
10. Abbas K et Djermoun M. Étude de l'effet de l'extrait aqueux de Portulaca oleracea sur l'obésité chez les rats Wistar. 2015. Mémoire de fin d'étude en Sciences Biologiques : Biochimie Appliquée. 85pp. Cited 2019 Decembre 2019. Available from : http://www.dspace-univ-eloued.dz/handle/123456789/135.
11. Harchane H, El Addas H, Amsaguine S, El Amrani N, Radallah D. Effets de l'extrait aqueux des graines du fenugrec (Trigonella foenum graecum) sur l'amélioration du profil lipidique et la prise de poids chez le rat. Phytothérapie, 2012 ; 10(6) : 357–362.
12. Berroukche A, Slimani M, Kahloula K, Kafi H, Cheikh A. Evaluation de l'activité du cadmium, en présence du zinc, sur les structures des tissus régulateurs du métabolisme chez le rat Wistar. Int J Biol Chem Sci. 2014 ;8(4) : 1796-1807.
13. Lanhers MC, Fleurentin J, Mortier F, Pousset JL, Pelt JM. Nouvelle utilisation d'Euphorbia hirta L. en thérapeutique. Cited 2020 January 05. Avaible from : http://www.patentimages.storage.googleapis.com/FR2639229 A1.pdf.
14. Lanhers MC, Fleurentin J, Mortier F, Pousset JL, Pelt JM. Composition chimique de Euphorbia hirta. Al Biruniya, 1987 ; 3 (2) : 121-136.
15. Elekofehinti OO, Adanlawo IG, Saliu JA, Sodehinde SA. Saponins from Solanum anguivi fruits exhibit hypolipidemic potential in Rattus novergicus. Pharm Lett. 2012 ; 4 (3) :811-814.
16. Kumar S, Malhotra R, Kumar D. Euphorbia hirta: Its chemistry, traditional and medicinal uses, and pharmacological activities. Pharmacogn Rev. 2010 ; 4(7) : 58-61.
17. Güçlü-Ustündağ O, Mazza G. Saponins : Properties, Applications and Processing. Crit Rev Food Sci Nutr. 2007 ; 47 (3): 231–258.
18. Price KR, Eagles J, Fenwick GR. Saponin composition of 13 varieties of legume seed using fast atom bombardment mass spectrometry. J Sci Food Agric. 1988 ; 42 :183-193.
19. Bonnefont-Rousselot D. Bilan lipidique en 2016. Feuillets de Biologie, 2016 ; 330 : 39-52.
20. Gotto AM, Grundy SM. Lowering LDL Cholesterol questions from recent meta-analyses and subset analyses of clinical trial data issues from the interdisciplinary council on reducing the risk for coronary heart disease, Ninth Council Meeting. Circ. 1999 ; 99 : E1- E7.
21. Sharma NK, Dey S, Prasad R. In vitro antioxidant potential evaluation of Euphorbia hirta L. Pharmacologyonline. 2007 ; 1 : 91-98.
22. Maurya AK, Tripathi S, Ahmed Z, Sahu RK. Antidiabetic and antihyperlipidemic effect of Euphorbia hirta in streptozotocin induced diabetic rats. Pharm Lett. 2012 ; 4 (2) : 703-707.
23. Widharna RM, Soemardji AA, Wirasutisna KR, Kardono LBS. Anti diabetes mellitus activity in vivo of ethanolic extract and ethyl acetate fraction of Euphorbia hirta L. Herb. Int J Pharmacol. 2010 ; 6 (3) : 231-240.

How to cite this article: Guillaume YY, Arsène AM, Constantin OO, Koffi D, Martin KK, Bognan AJAA, Joseph DA. Effect of Euphorbia Hirta on Certain Metabolic and Cardiovascular Diseases. Ann. Int. Med. Den. Res. 2020; 6(3):BC01-BC04.

Source of Support: Nil, **Conflict of Interest:** None declared