Effect of the aqueous extract of *Corchorus olitorius* L. on the lipid parameters of rats subjected to a hyperlipidic diet

ABSTRACT

Background: Progresses in physiological data, clinical research and medical-economic findings have led to the recognition of obesity as a pathogenic situation, or even a real disease. Measures should be taken to stop the spread of this disease associated with glucose anomalies and lipid metabolism. Thus, a plant species was tested to evaluate its effect on lipid parameters.

Method: The aqueous extract of the plant *Corchorus olitorius L.* was tested on rats subjected to a hyperlipidic diet and biochemical parameters were evaluated. In addition, a phytochemical characterization was conducted.

Results: The hyperlipidic diet led to hyperphagia and increased weight. The aqueous extract of *Corchorus olitorius L.* contains bioactive molecules that have promoted the decrease in plasma and tissue cholesterol, triglycerides, LDL and an increase in HDL levels in rats subjected to the hyperlipidic diet.

Conclusion: The aqueous extract of *Corchorus olitorius L.* has beneficial effects on lipid disorders.

Keywords: hyperlipidic diet, lipid parameters, Corchorus olitorius L.

UNDER REVIEW

1. INTRODUCTION

Obesity has become a pandemic, affecting adults and children around the world [1]. It is usually the result of an imbalance between calories consumed and calories burned [2]. It is the result of a failure of the system of regulation of energy reserves by external factors (sedentary lifestyle, environment) and characterized by a diffusion in almost all countries. Obesity can no longer be considered only a North American phenomenon [6]. It affects all social classes and all countries of the world.

According to the latest WHO estimates, the global prevalence of obesity has almost tripled since 1975. The prevalence of overweight and obesity among children and adolescents aged 5 to 19 has increased dramatically from just 4% in 1975 to just over 18% in 2016 [7]. Côte d'Ivoire is not spared by this scourge of modern times. In 2019, abdominal obesity was very common in the population of central Côte d'Ivoire precisely in the city of Bouaké [8]. Current research in the treatment of obesity highlights the areas of dietetics and lifestyle [9]. However, the WHO internal factors (neuro-hormonal, psychological, biological and genetic) [3]. Obesity is largely due to the westernization of diet [4,5]. This westernization is accompanied by an important lipid intake. The epidemiology of obesity is

encourages more research into solutions that turn towards traditional herbal treatments [10]. In recent years, herbal medicine, which is the treatment of plants, has grown in importance and has become so popular among scientists [11]. Medicinal plants contain bioactive molecules that are secondary metabolites with high therapeutic activity [12]. Thus, the plant species *Corchorus Olitorius L.* used in traditional environment in Côte d'Ivoire for the treatment of certain metabolic diseases such as hypertension, stroke, heart failure, motivated this work, the general objective of which is to evaluate the effect of the aqueous extract of *Corchorus Olitorius L.* on the lipid parameters of rats on a high-calorie diet.

2. MATERIALS AND METHODS

Plant Extraction

The plant substance used in this study is a powder obtained from the dried plant of *Corchorus olitorius L.* The plant was cleaned, sorted, washed, then dried out of the sun for several days then ground into powder. The extract was prepared by infusion according to the following protocol: 30 g of plant powder was dissolved in 100ml of boiling distilled water. The set was left to rest for 10 minutes and then filtered successively on hydrophilic cotton and wattman paper. The filtrate obtained from a concentration of 300mg/kg body weight was administered by gavage to the animals.

Animals grouping

The animals used were female albino rats of the Wistar strain (Rattus norvegicus). A total of 12 rats divided into 3 groups of 4 rats each:

Group1: animals subjected to the normal diet receiving distilled water 10mL/kg.

Group2: animals subjected to the hyperlipidic diet (HD) receiving distilled water 10mL/kg.

Group3: animals subjected to the hyperlipidic diet (HD) treated with the aqueous extract of *Corchorus olitorius L* the dose of 300mg/kg.

Experimental design

The extract was administered by gavage twice a day: in the morning and in the evening for three weeks. The weight of the rats was measured every three days during the period of the experiment.

Twenty-four hours after the last gavage the rats were subjected to 14 hours of fasting. The animals were then sacrificed and the blood collected. The blood samples were centrifuged at 3000 rpm for 5 minutes. The serum collected was aliquoted and then sent for the determination of biochemical parameters to the clinical biochemistry laboratory of the "Institut Pasteur in Cote d'Ivoire".

The phytochemical tests of the aqueous extract were carried out by the technique of qualitative characterization of the staining. The four main chemical groups saponosides, sterols and terpenes, alkaloids and phenolic compounds were investigated.

Statistical Analysis

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The statistical analyses were carried out using the Graph Pad Pism 5 Demo software. The results are presented as an average ( ). The Student test and the ANOVA test were used to compare averages. A value of $p<0.05$ was considered significant. Significant statistical differences are reported in Table II by a star (*), very significant statistical differences by two stars (**) and very very significant statistical differences by three stars (***).

3. RESULTS

The results summarized in Table 1 show weight gain or loss. Body weight shows significant variations between batches of rats. In fact, rats consuming the hyperlipidic diet (RL) have a significantly higher weight than those of the control rats. Statistical analyses of these values indicate that rats treated with the extract on the hyperlipid diet showed no significant body weight values compared to controls.
The results of the lipid parameters are summarized in Table 2. In this table the different values of blood glucose (GLU), total cholesterol (CHO), triglycerides (TRIG), and LDL in untreated hyperlipid rats are significantly higher ($p < 0.05$) than controls while HDL decreases.

Table 1: Change in body weight of control rats and extracts

	Day 3	Day 6	Day 9	Day 12	Day 15	Day 18	Day 21
Witness	+ 1,16	+ 0,46	+ 0,45	+0,19	-0,03	+0,48	+0,45
HD	+ 1,60	+ 1,40	+ 1,80	+ 2,2	+2,4	+2,9	+3,4
HD + Extract	+ 1,11	- 0,59	- 1,16	+ 0,08	+0,11	+0,46	+0,35

(-): weight loss (+) weight gain

Table 2: Determination of lipid parameters in control and extract-treated rats

	GLU	CHO	TRIG	LDL	HDL
TESTIMONIES	0,73	0,68	0,86	0,18	0,398
HD	0,98**	1***	1,2***	0,22*	0,15***
HD + EXTRACT	0,76	0,50**	0,56***	0,12	0,266***

4. DISCUSSION

The link between health and food is more relevant than ever. In recent decades, major socio-economic changes in most countries have undeniably affected people's eating patterns and levels of physical activity. Experimental and epidemiological data suggest that a diet rich in fat promotes the development of obesity and that there is a direct correlation between the lipid ration and the degree of obesity [13].
Analysis of the body weight of rats subjected to the hyperlipidic diet without treatment leads to a progressive increase in body weight. This shows that such a diet could cause overweight. In our work a significant increase in values of lipid parameters such as cholesterol, triglycerides and LDL has been found. In fact, the adoption of a hyperlipidic diet is essentially responsible for overweight. In both humans and animals, studies show a relationship between an excess of calories (most often brought by an excess of fat) and an increase in fat mass. Excess fat tissue can alter lipid metabolism by altering plasma levels of lipid parameters leading to very important health consequences [14; 15]. After oral administration of the extract, there was a slight increase in body weight in treated rats compared to controls. This weight increase without any significant difference is due to normal growth of female rats.

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The aqueous extract of *Corchorus olitorius L.* causes a significant decrease in serum cholesterol and triglyceride levels in treated rats, showing a hypolipidemic effect of the extract. Phytochemical tests revealed the presence of saponosides, sterols and terpenes, alkaloids and phenolic compounds in Corchorus olitorius extract. Some studies have shown that alkaloid may decrease cholesterol and triglyceride levels by increasing liver receptor expression of low-density lipoproteins and inhibited lipid synthesis in human hepatocytes by activation of the AMPK [16].

5. CONCLUSION

This work consisted in the study of the effect of the aqueous extract of *Corchorus olitorius L.* on the lipid parameters of rats subjected to a hyperlipidic diet. This allowed us to show that the hyperlipidic diet leads to weight gain as well as a significant increase in lipid parameters such as triglycerides, total cholesterol and LDL. The aqueous extract of the plant *Corchorus olitorius L*. induces hypolipidemia by lowering these parameters for doses equal to 600 mg/kg body weight. Alkaloids could be the basis of the anti hyperlipidemic activity of our plant.

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CONSENT

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee

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