

Original Research Article

Evaluation of the effects of *Corchorus olitorius* L. and *Carapa procera* in the treatment of obesity

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ABSTRACT

Background: The obesity remains a pathology today which expands. It leads in its wake much pathology with very serious consequences. It is therefore necessary to take steps to curb this nutritional pathology. Thus, two plant species including *Carapa procera* and *Corchorus olitorius* have been tested to assess their effect on this pathology.

Methods: Aqueous extracts of *Carapa procera* bark and *Corchorus olitorius* roots were tested on rats and biochemical parameters were evaluated. Besides, a chemical characterization was led.

Results: These plant extracts contain bioactive molecules that have a regressive activity on the plasma levels of cholesterol, triglyceride and LDL-cholesterol. These bioactive molecules increase the level of HDL-cholesterol. These 2 species are non-toxic on renal, hepatic and pancreatic functions in view of the values of urea, creatinine and blood glucose.

Conclusions: Of these 2 extracts, the aqueous extract of *Corchorus olitorius* is more active.

Keywords: Biochemical parameters, *Carapa procera*, *Corchorus olitorius*, Obesity

INTRODUCTION

In recent decades, the incidence of obesity has grown to such an extent that it has become a global epidemic.^{1,2} Obesity has become the first non-infectious disease in history. This is a real epidemic affecting both industrialized and developing countries. The World Health Organization is currently prioritizing its prevention and management as a priority in the area of nutritional pathology. It is due to a state of dysregulation of energy reserves.³ Its development is favored by a diet rich in fat.⁴ And leads to other pathologies such as high blood pressure, diabetes, cardiovascular, joint and

respiratory complications, vesicular lithiasis, increased risk of certain cancers, acid reflux, depression, infertility and disturbances of menstruations etc.⁵ Its prevention is a public health problem. It can have a significant impact on the health of the individual. This chronic metabolic disorder leads to increasing morbidity and mortality.⁶⁻⁸ It is therefore necessary to find a solution to this thorny problem.

Thus, one of the alternatives available to us to solve this public health problem is research from medicinal plants which becomes more and more reassuring despite progress in modern medicine.⁹ Medicinal plants

according to ethno pharmacological studies are used in our societies for the medical management of so-called chronic pathologies and are the most reassuring way.¹⁰ In general, medicinal plants contain bioactive molecules that are secondary metabolites with high therapeutic activity.¹¹ They have proven their effectiveness in this area.

For this purpose, the species *Corchorus olitorius* and *Carapa procera* used in traditional environment in Côte d'Ivoire and in the West African subregion for the treatment of certain physiological pathologies such as diabetes, high blood pressure motivated this work whose general objective is to evaluate their effect on obesity in view of the close link between this anomaly and these physiological pathologies. Thus, the total aqueous extracts from the roots of *Corchorus olitorius* and the bark of *Carapa procera* administered to the rats allowed on the one hand to verify the biochemical parameters related to obesity and on the other hand a phytochemical screening of these aqueous extracts gives us an idea of the chemical nature of the active principle (s).

METHODS

The vegetable substances used for this study are powders obtained respectively from the roots of *Corchorus olitorius*, and the bark of *Carapa procera*. Female Wistar rats were used as animal models.

After spraying dried roots and bark, the aqueous extracts were prepared by infusion by dissolving 30g of each powder in 100ml of boiling distilled water. In each case, the assembly was allowed to stand for 10 minutes and then filtered successively on hydrophilic cotton and on wattman paper. The filtrates obtained at a concentration of 300mg/kg of body weight (bw) were administered by gavage to the animals. Here Ext1 stands for extracts from bark of *Carapa procera* and Ext2 for extracts from roots of *Corchorus olitorius*.

Nine young females of an average weight of 192g were obtained from the Ecole Normale Supérieure of Abidjan (Côte d'Ivoire) animal facility. These animals were housed at the Pasteur Institute animal care facility in plastic cages and a cycle of day/night was maintained (approximately 12hours of light and 12hours of darkness) in a ventilated animal room. The rats were acclimated for two weeks to their new environment before the treatment and had free access to sterile distilled water and sterilized standard food. All the animals were handled in accordance with the guidelines and protocols approved by the Care and Use of Animals Committee of Côte d'Ivoire.

Besides, the animals were divided into 3 groups (the control, Ext1-treated and Ext2-treated groups) and each group is made 3 rats. The control rats received 10ml/kg bw of distilled water, the Ext1-treated and the Ext2-treated groups received respectively 300mg/kg bw of

aqueous extracts from bark of *Carapa procera* and 300mg/kg bw of the aqueous extract from roots of *Corchorus olitorius*. The treatment was done two times a day (early in the morning and late in the afternoon) and the body weight was recorded every three days. The experiment was conducted for eighteen days.

Twenty-four hours after the last gavage, the rats were subjected to fourteen hours of fasting. The animals were then sacrificed, and their blood collected. The blood samples were centrifuged at 3000rpm for 5min and the serum samples collected and then sent for biochemical analysis at the clinical biochemistry laboratory of the Pasteur Institute of Côte d'Ivoire respectively for the determination of glucose and the lipid profile according to their laboratory protocols

The phytochemical tests were carried out on these aqueous extracts by the technique of qualitative coloration characterization. The major four chemical groups, saponosides, sterols and terpenes, alkaloids and phenolic compounds were searched.

The statistical analyses were carried out by using the software Graph Pad Prism 5 Demo. The results are presented in the form of average \pm SEM. The test of Student and the test of ANOVA were used for the comparison of the averages. A value of $p < 0.05$ was regarded as significant. The significant statistical differences are announced in the table II by a star (*), the very significant statistical differences by two stars (**), and the highly significant statistical differences by three stars (***)

RESULTS

The average of weight gain or lost is shown in Table 1. Statistical analyses of these values indicate that the rats treated with Ext1 and Ext2 showed no significant difference on their average body weight when compared to the control rats ($p > 0.05$).

The results of the biochemical parameters are represented in Table 2. In this table the levels of blood glucose (GLU), LDL and alkaline phosphatase (ALP) show no significant difference between the Ext1- and Ext2-treated rats when compared to the control non-treated rats. However, the Ext1- and Ext2-treated rats show a significant reduction in the levels of total cholesterol (CHO), triglyceride (TRIG), HDL, total protein (Pro T) and urea when compared to the control non-treated rats.

For the levels of creatinine (CREAT), no significant difference is observed between the two groups of the treated rats with *Carapa procera* extract (Ext1). Besides it shows significant difference between *Corchorus olitorius* extract (Ext2) and the control non-treated rats. The results of the phytochemical screening revealed the presence of low number sterols and terpenes, an average

number of alkaloids and a strong number of phenolic compounds and saponosides.

Table 1: Variation of the body weight of the control, ext1 and ext2-treated rats.

| Times (days) BW (g) | 3 | 6 | 9 | 12 | 15 | 18 |
|---------------------|-------|-------|-------|-------|-------|-------|
| Ctrl | +1.16 | +0.46 | +0.45 | +0.19 | -0.03 | +0.48 |
| Ext ₁ | +1.54 | -2.41 | -0.92 | -5.50 | +0.07 | +0.11 |
| Ext ₂ | +1.11 | -0.59 | -1.16 | +2.08 | +0.11 | +0.46 |

(-): Weight loss; (+): Weight gain

Table 2: Assay of the biochemical parameters of control, ext1 and ext2-treated rats in G/L.

| | Biochemical Parameters | | | | | | | | |
|------------------|------------------------|--------|---------|------|----------|--------|-----|-------|---------|
| | GLU | CHO | TRIG | LDL | HDL | Pro T | ALP | CREAT | UREA |
| Ctrl | 0.43 | 0.68 | 0.86 | 0.18 | 0.398 | 84.6 | 135 | 0.71 | 0.28 |
| Ext ₁ | 0.44 | 0.54** | 0.84* | 0.18 | 0.322** | 77** | 138 | 0.63 | 0.44*** |
| Ext ₂ | 0.46 | 0.50** | 0.56*** | 0.12 | 0.266*** | 78.9** | 137 | 0.57 | 0.40*** |

DISCUSSION

Plant-based natural medicine is now the most widely used way around the world. The use of plant for treatments and research for new bioactive substances are of great interest for scientists. The body weight analysis of the rats after oral administration of the extracts showed a slight increase in body weight in the treated rats with no significant difference when compared to the control rats. This increase in weight is due to the normal growth of the rats. Regarding biochemical parameters, the results showed a significant decrease in plasma levels of cholesterol, triglyceride and LDL and a significant increase in HDL levels in the rats treated with both aqueous extracts when compared to the control rats. This work is in accordance with the results of Allain, 2000.¹²

Moreover, the significant decrease of triglyceride and the increase of the HDL level in the treated rats is explained by the presence of saponins in the aqueous extracts of the bark of *Carapa procera* and the roots of *Corchorus olitorius*. Indeed, these saponins have an anti-hyperlipidemia, anti-hypercholesterolemia, hypotensive and cardiodepressive properties according to the work of Price et al, in 1987 and those of Özlem and Giuseppe, 2007.^{13,14} In addition, studies have also shown that saponins have an anti-obesity property.¹⁵

The presence of alkaloids could also lower the plasma cholesterol and triglyceride levels by increasing the hepatic LDL low density lipoprotein receptor expression and also by inhibiting lipid synthesis in human hepatocytes.¹⁶

Other studies, including those by Heidarzadeh et al, in 2013, have shown that the phenolic, steroidal, terpenic and glycoprotein compounds present in medicinal plants have good fat and sugar reducing properties.¹⁷ With

respect to the plasma levels of urea and creatinine, the analysis of the results shows no significant difference between the treated and the control rats. This confirms the non-toxicity of both extracts and also that the kidney functions are intact since these two biochemical parameters are good markers of this function.¹⁸

The blood glucose level obtained in all the treated and untreated rats indicates that the aqueous extracts of these two plants have no harmful effect on the pancreas. In addition, the plasma levels of alkaline phosphatase, triglycerides and total proteins are significantly decreased in rats treated with both aqueous extracts when compared to the control non-treated rats. This can be explained by the presence of phenolics, terpenoids, saponins and alkaloids in these two extracts. These bioactive substances are known for their hepatoprotective and antioxidant activities.¹⁹⁻²¹

CONCLUSION

This study is part of one of the main lines of research of the laboratory of natural substances which makes it possible to value not only the therapeutic virtues of the medicinal plants but also to look for new molecules with pronounced activity starting from extract of plants which could be new drugs in several therapeutic areas, including the field of metabolic diseases. In addition to the confirmation of the well-founded use of these plants in traditional environment in the treatment of certain physiological pathologies and nutritional anomaly such as obesity, one can retain the existence in these plant extracts of bioactive molecules which have a regressive activity on the plasma levels of cholesterol, triglyceride and LDL-cholesterol. These bioactive molecules increase the level of HDL-cholesterol. In addition, the aqueous extract of the bark of *Carapa procera* and the roots of *Corchorus olitorius* are non-toxic effect on the kidney,

liver and pancreas functions. In addition, more in-depth studies will be needed to better understand the mechanisms involved in the different effects observed.

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