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Antiobesity properties of methanolic extract of *Alchornea cordifolia* in vitro

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Abstract

Obesity is a medical condition that results in over accumulation of fat or triacylglycerol leading to other complications. *Alchornea cordifolia* is a plant found in Africa with many acclaimed medicinal properties. Leaves of *Alchornea cordifolia* were harvested, dried and extracted with methanol. The extract was further subjected to standard phytochemical and anti-obesity studies. Results of the study

revealed phytochemicals like alkaloids, flavonoids, steroids, triterpenoids, saponins, and phenols in greater quantity. Also, *Alchornea cordifolia* shows antilipase activity at a concentration of 1 mg/ml *Alchornea cordifolia* methanolic extract showed 77.07 % inhibition of pancreatic lipase. Therefore, *Alchornea cordifolia* can act as a drug for the management of obesity.

Keywords: Antiobesity, *Alchornea cordifolia*, in vitro, Body Mass Index

1. Introduction

Obesity is a medical disorder which results from abnormal or excessive fat or triacylglycerol accumulation which is dangerous to health, (Nelson and Cox, 2000; Fox, 2011) ^[1, 2]. It often results when the amount of daily calories intake is more than the amount burned by exercise and normal daily activities, (Fox, 2011) ^[2]. Body Mass Index (BMI) is used to determine if someone is obese. The BMI is defined as a person's weight (in kg) divided by the square of their height (in m²). According to the center of disease control and prevention (CDC), in adults, obesity is defined as having a BMI of 30 or more, (WHO, 2000; Fox, 2011) ^[11, 2].

Pancreatic lipases are water-soluble enzymes that act by catalyzing the hydrolysis of lipids (Devlin, 2001) ^[3]. Through hydrolysis, the lipase can degrade lipids into glycerol and three free fatty acids. In animals, lipases are produced to aid in the digestion of lipid-containing diet (Voet and Voet, 2001; Garrett and Grisham, 1999) ^[5, 4].

Inhibition of pancreatic lipase retards or slows the absorption of fatty acid, which reduces obesity. This is the most widely studied mechanisms for the evaluation of natural products as anti-obesity agents (Foster-Schubert and Cummings, 2006; Yun, 2011) ^[10, 9].

Alchornea cordifolia is shrub or small tree distributed throughout tropical Africa, it can grow up to 8 meters tall. The plant is used in traditional African medicine, (Mavar-Manga *et al.*, 2008) ^[8]. The common name is the "Christmas bush". The phytochemical screening of the leaves, root, and stem bark contains triterpenoids, steroids, tannins, saponin, flavonoids, phenol and alkaloids. *Alchornea cordifolia* has been used in treatment of diseases, such as diarrhea, wound infection and dental caries (Mavar-Manga *et al.*, 2008) ^[8].

2. Materials and method

Chemicals

Alcoholic ferric chloride (FeCl₃), ammonia solution, Mayer's reagent, acetic anhydride, sulfuric acid (H₂SO₄), chloroform, sucrose solution, ammonium sulfate, olive oil, acetone ethanol, oxalate, phenolphthalein, sodium hydroxide is all of analytical grade.

Methods

Plant collection and identification

The plant *Alchornea cordifolia* (fresh leaves) was collected from Otuaba community, Ogbia L.G.A. Bayelsa State. The plant was identified and documented in the Department of Botany Niger Delta University, Bayelsa State. April 2021.

Preparation of the methanol extracts

Harvested leaves of *Alchornea cordifolia* were washed with distilled water and kept to dry at room temperature for three weeks. The dried leaves were grounded into fine powder using mortar and pestle and weighed. A total of 150g of the powdered leaves were soaked in 1.5L of methanol.

Extraction of *Alchornea cordifolia*

The filtered extract was concentrated to dryness in a rotary evaporator, until the extracts become a dark solid paste. The extract was stored at 4°C for further use.

Determination of phytochemical content of *Alchornea cordifolia*

Qualitative tests were carried out on *Alchornea cordifolia* to determine the presence of phytochemicals according to standard methods described by Boxi *et al.*, 2010^[13] and Adegoke *et al.*, 2010^[12]

Anti-lipase activity of *Alchornea cordifolia*

Extraction of lipase from chicken (*Gallus domesticus*) pancreas and Determination of pancreatic lipase activity was according to standard methods described by Sahani *et al.*, 1976^[6] and Zheng *et al.*, 2010^[7].

3. Results

Percentage yield = 20.59%

Table1: Phytochemical Screening of *Alchornea Cordifolia* Leaves

S. No	Test	Observation	Inference
1	Tannin	Greenish to back colouration	+++
2	Flavonoid	Yellow colouration	++
3	Saponin	Persistent frothing	+++
4	Alkaloid	Creamish precipitate	+++
5	Phenolic	Reddish brown colouration	+++
6	Triterpenoids	Reddish – violent colouration	++
7	Steroids	Blue, green colouration	+++

Key = +++ = Highly Positive ++ = Moderately Positive += Sparingly Positive - = Negative

Table 2: Percentage inhibitory effect of *Alchornea cordifolia* on lipase activity

Concentration (mg/ml)	Leaves
0.2	24.88 ± 0.76
0.4	43.98 ± 0.26
0.6	52.50 ± 1.67
0.8	65.50 ± 1.25
1.0	77.07 ± 1.80

*Values are in mean ± standard deviation, n = 3

4. Discussion

The results showed that *alchornea cordifolia* extract inhibited *Gallus domesticus* pancreatic lipase as shown in table 2. At a concentration of 0.2 mg/ml the % lipase inhibited was 24.88 ± 0.76. *Alchornea cordifolia* has showed a marked inhibition of 77.07 % at a concentration of 1 mg/ml. The least concentration of 0.2 mg/ml also had a greater inhibition of pancreatic lipase at 24.88 %. From this study *Alchornea cordifolia* inhibits the activity of pancreatic lipase which indicates its protective role in treating obesity. The anti-obesity activities of *Alchornea cordifolia* extract might be due to the action of bioactive presents in them. In fact, the anti-obesity activity may be attributed to the

synergy of a variety of bio active compounds in the extract. In this study, bioactive screening indicates presence of alkaloids, flavonoids, steroids, triterpenoids, saponins, and phenols. Conclusively, this research demonstrates that *Alchornea cordifolia* have anti-lipase activity and reveal the presence of vital extractives. The anti-obesity activity of the studied plant may have resulted from its extractive constituents.

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