Phytochemical screening , Anti-obesity and Hepatoprotective activities of ethanol leaf extract of *Jatrophatanjorensis* in Wistar rats.

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Abstract

Aim: The objective of this study is to assess Jatrophatanjorensis'sphytochemical components, anti-obesity and hepatoprotective properties.

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Methods: 35 albino Wistar rats were placed into five groups of seven rats each. Each group received the following treatment: Group A served as the control group, and extract doses of 100 mg/kg and 150 mg/kg were given to groups B and C, respectively. Doses of 200 mg/kg and 250 mg/kg of *Jatrophatanjorensis* extract were given to groups D and E. Using accepted methods, the phytochemical components, anti-obesity, and hepatoprotective properties of *Jatrophatanjorensis*were identified.

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Results:*Jatrophatanjorensis* was found to include biochemical building blocks like alkaloids, flavonoids, tannins, cardiac glycosides, anthraquinones, and saponins after undergoing a qualitative phytochemical screening. With the exception of group C, the results showed a substantial (P< 0.05) drop in cholesterol levels when compared to the control group. Group A's HDL concentration levels increased significantly (P< 0.05) when compared to the other groups.In treated group D (8.70±6.54) after extract administrations, ALP levels were significantly (p 0.05) lower than in the normal control group (15.00±8.00). Although there was a considerable decline in other groups, the ALT activity was found to be significantly lower in treatment group E (5.33±1.33). Treatment groups B (14.003.61) and E (14.003.61) saw a minor but significant decline in AST activity, but treatment groups C (24.33±3.53) and D (36.67±17.34) saw a more significant increase.

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Conclusion: The study concludes that plant extracts may be used to treat metabolic disorders like obesity and cardiovascular diseases because they have the potential to lower cholesterol and have hepatoprotective effects. Additionally, phytochemicals may be used as drug precursors, templates for synthetic modification, and pharmacological probes.

Key words: cholesterol, obesity, cardiovascular disease, liver enzymes, and plant extract.

Introduction

Man has reaped enormous benefits from employing medicinal plants to manage disease since they are generally safer, more cost-effective, and occasionally have superior therapeutic value than manufactured pharmaceuticals. As more medicinal plants are discovered, there is an increased need for scientific investigation of their bioactivity in order to provide information that will enable doctors and patients to make informed decisions before employing them. The oldest and possibly most diverse treatment approach is African traditional medicine. Africa is regarded as the origin of humanity and has a diverse biological and cultural heritage that is reflected in regional variations in medical practices [1]. Plants with therapeutic qualities are always being discovered in new species. There isn't much information or research on these plants to support their potential. *Jatrophatanjorensis* is one of these plants. About 170 species of the genus Jatropha, which is a member of the Joannesieae tribe and the Euphorbiaceae family, are now recognized. The word "Jatropha" is derived from the Greek words "jatros," which means "doctor," and "trophe," which means "food," indicating that it has medicinal properties [2]. Field crops frequently *have Jatrophatanjorensis*Ellis &Saroja as a weed. A widespread vegetable in many regions of southern Nigeria is the leaf. It is also known as "catholic vegetable," "hospital too far," "Iyana-Ipaja," or "lapalapa." In this area, it is also well-liked as a natural diabetic treatment. In addition to being used as a leafy vegetable and medicine in Nigeria, *Jatrophatanjorensis* (L) (Family: Euphorbiaceae) has demonstrated hematological, antimalarial, antibacterial, hypoglycemic, hypolipidemic, and antihypertensive effects. This review focuses on important information on *Jatophatanjorensis's* traditional usage, phytochemistry, and pharmacological effects against a few tropical diseases in order to emphasize its therapeutic potential and incorporate it into standard medical practice. The plant has been linked to several kinds of phytochemical substances, including polyphenols, saponins, tannins, and alkaloids.

Additionally, it has been demonstrated to have a broad range of biological properties, including antiplasmodial (antimalarial), antibacterial, antiparasitic, antioxidant, anti-diabetic, antihypertensive, and antihyperlipidemic properties, as well as the ability to treat anemia. [3].

Methodology

Sample Collection And Extraction of ethanol leaf extract of *Jatrophatanjorensis*

In Abuja, Nigeria, local gardeners picked fresh *Jatrophatanjorensis* leaves. The Department of Biology at Veritas University in Abuja recognized and verified the plant specimens. After a thorough washing, the leaves were allowed to air dry at room temperature. *Jatrophatanjorensis* homogenized leaves weighing 100 g were macerated with 100 ml of ethanol and left to stand for 48 hours. After standing for 48 hours, each preparation was given a shake every 30 minutes for 6 hours. With No. 1 Wattman filter paper, each preparation was filtered. To obtain the dried extract, they were each put into a separate beaker and submerged in water for 48 hours at 37 °C.

Laboratory animals

The investigation used twenty-five (35) mature male Wistar rats, which were acquired from Kaduna State in Nigeria. The animals underwent a week of acclimatization. The animals were kept in the animal house of the Department of Biochemistry, Veritas University, Abuja, under laboratory conditions of humidity, temperature (23 to 25 °C), and a 12-hour light-dark cycle. They were also given free access to regular growers' mash and water as needed.

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Table 1: Experimental Design

Groups	Dosage of extract administered	
A	Control group	
B	250mg/kg of *Jatrophatanjorensis extract*	
C	350mg/kg of *Jatrophatanjorensis extract*	
D	450mg/kg of *Jatrophatanjorensis extract*	
E	550mg/kg of *Jatrophatanjorensis extract*	

The Wistar rats were weighed using a weighing balance and put to sleep using chloroform at the conclusion of the dosing. The abdominal region was opened using the linear Alba, and the organs were exposed by dissecting the tissue with a surgical blade. Using a sterile needle, a heart puncture was used to obtain a blood sample. The blood was drawn with a syringe and placed in simple sample bottles with appropriate labels. For ten minutes, it was centrifuged at 3000 rpm. The serum was transferred from the clot of blood into a serum container using a sterile Pasteur pipette.

Phytochemical qualitative property screening

Saponins Test

10 ml of distilled water was added to 2 ml of extracts in a test tube.There was a frantic shaking of the mixture. It was checked for persistent foaming that persisted even after heating, which is a sign of saponins.

Anthroquinone Test

5m1 of 10% ammonia was added to the extracts, which were each around 2m1, and forcefully mixed. It was checked for a color change, which indicates a successful test (the color change is from its original color to another color). A negative test is indicated by no color change.

Phenol Test

In a test tube, 10 ml of each extract was combined with 8 ml of distilled water. 6 mL of ferric chloride solution was added to the mixture.It was observed whether the hue changed to light brown, indicating a successful test [1].

Tannins test

Each of the extracts received 1 ml of 1% ferric chloride addition. It was examined for a color shift that would signal a successful test.

Phylobatanning Test

Aqueous hydrochloric acid (1% concentration) was added to 2 mL of each extract and heated. It was noticed that there was white precipitate, which is a sign of a successful test.

Examine your alkaloids. Three drops of Dragendoff's reagent were added to each 0.5 g of extract to dissolve it. An alkaloid is present when an orange precipitate forms.

Flavonoids test

Two milliliters of sodium hydroxide solution were used to dissolve each 0.2-gram extract. When a yellow solution develops and vanishes when HCl acid is added, flavonoids are present (Unegbu et al., 2019).

Glycosides Test
The legal test

Sodium nitropruside in pyridine and sodium hydroxide were added to a small fraction of the extracts, and the results were evaluated. Utilizing kits, the anti-obesity program was executed.

Analytical Statistics

The mean and standard error of the mean were used to record the data. A one-way ANOVA with SPSS 16.0 was used to examine the statistical difference between the means. $P < 0.05$ was considered the significant level for any difference in means that was deemed significant.

Results

Table 2: Phytochemical composition of *Jatrophatanjorensis*.

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Phytochemical Components	(leaf)
Flavonoids	+
Saponins	-
Anthraquinone	-
Phenol	+
Phylobataning	-
Alkaloids	-
Tannins	-
Glycosides	+

+ = positive

- = negative

The phytochemical components of Jatrophatanjorensis are displayed in Table 2 (Hospital too far). Alkaloids, saponins, anthraquinones, phylobataning, and tannins are not present in the ethanol extracts of the leaf, which instead contain flavonoids, phenols, and glycosides.

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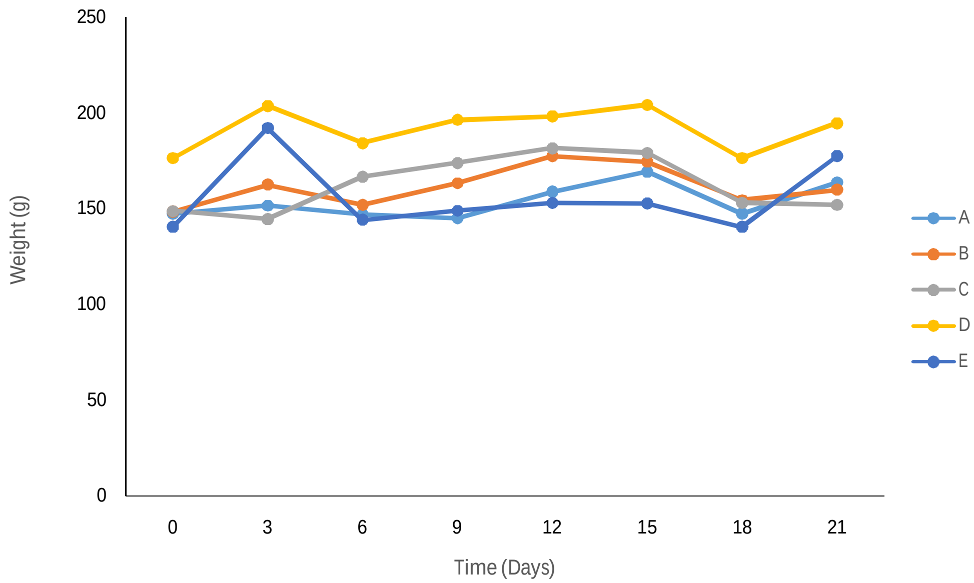

Figure 1: Effect of Jatropha leaves Extract on the Weight of wistar rats

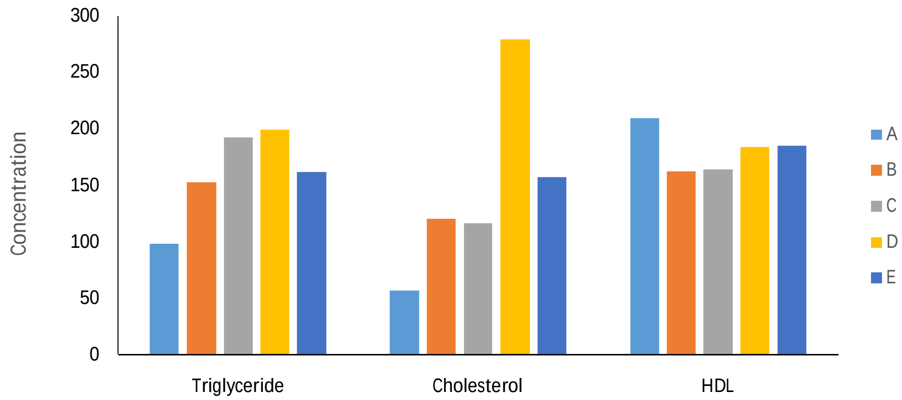

Figure 2:Effect of ethanol *Jatrophatanjorensis*leaf extractonsome anti-obesity parameters in Wistar Rats

Table 3: Effect of Ethanol Leaves Extract of *Jatrophatanjorensis* on Liver Function of Wistar Rats

GROUPS	**Concentration mg/kg of body weight**	**AST (µ/l)**	**ALT (µ/l)**	**ALP (µ/l)**
A	Control	15.00±8.01[a]	22.67±14.84	15.00±8.00
B	250mg/kg	14.00±3.61[a]	8.33±4.33	25.18±1.65
C	350mg/kg	24.33±3.53[a]	11.00±3.79	25.36±12.51
D	450mg/kg	36.67±17.34[a]	17.00±11.06	8.70±6.54
E	550mg/kg	14.00±3.61[a]	5.33±1.33	41.55±7.68

Values are represented as Mean±SEM of triplicate determinations. Values with different alphabetic superscript are significantly different along the column at p<0.05

Discussion

Figure 1 below depicts a graph of how *Jatropha* leaf extract affected rats' weight over the course of 21 days at 3-day intervals. The rats in group D weighed more than the animals in the other groups did over the course of the therapy . Rats in groups B, C, D, and E showed a gradual rise in weight from days 6 to 12, but group A showed a progressive increase from days 9 through 15 of therapy. All of the groups' rat weights decreased on day 18 before increasing on day 21, with the exception of group C (152.0±04.99 g), which decreased. Throughout the entire treatment period, there was no significant (P< 0.05) weight difference among the rats in groups A, B, and C. Furthermore, throughout the entire trial period, the weight of the rat in group D was considerably (P< 0.05) higher than that of the rat in group A.

Fats, waxes, sterols, fat-soluble vitamins, monoglycerides, diglycerides, triglycerides, phospholipids, and other naturally occurring molecules are included in the category of molecules known as lipids. Lipids' primary biological roles include energy storage, signaling, and serving as a structural component of cell membranes. Small molecules that are hydrophobic or amphiphilic can be roughly referred to as "lipids." While lipids are broken down and synthesized through a variety of biosynthetic routes in mammals, including humans, some important lipids cannot be produced in this way and must be received through diet. Lipid profile testing is carried out [4] to make sure that the body's lipid concentration is normal. Numerous studies on both men and women have found that high density lipoprotein levels in the blood are inversely related to the risk of atherosclerosis [5].

A comprehensive lipid profile test measures the body's levels of high-density lipoprotein, low-density lipoprotein, and triglycerides. Obesity has a significant negative impact on cardiovascular disease, which is predominantly caused by atherosclerosis and is the world's leading cause of mortality [6].

Many people in recent years have been uninformed of the advantages of being conscious of one's profile. A battery of blood tests known as a lipid profile is used as a preliminary screening method for lipid disorders such as high cholesterol and triglyceride levels. People frequently have two worries about the fats in their diet. One is their excessive calorie intake, which could lead to unintended weight gain. The second is that they have been linked to elevated cholesterol, which is a risk factor for cardiovascular disorders. Wistar rats' total cholesterol, triglycerides, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and very low-density lipoprotein cholesterol levels were examined in relation to the effects of ethanol extracts of the Jatrophatanjorensis plant. Up to 1800 mg/kg-1 b.wt (maximum dose), the ethanol extracts of Jatrophatanjorensis leaves were not poisonous, indicating the extracts are acceptable for use as food additives and by humans and animals alike. However, ethanol extracts of Jatrophatanjorensis leaves with concentrations of up to 2900 mg/kg-1 wt were found to be non-toxic.

Because of its amphipathic character, cholesterol is the major sterol that all mammals synthesize and is mostly found in cell membranes. Its synthesis starts with the mevalonate or HMG-CoA reductase pathway, the target of statin medications, which includes the first 18 steps. Then, after 19 more steps, either the Bloch pathway, the Kandutsch-Russell pathway, or both are used to convert the resulting lanosterol into cholesterol. According to reports, it is a significant contributor to cardiovascular disorders such as atherosclerosis, myocardial infarction, and coronary heart disease. In this study, the plant extracts resulted in a decrease in serum cholesterol, which may have been caused by the presence of saponins, a phytochemical that inhibits the absorption of cholesterol or its precursor, bile salts, by binding with bile acid in the intestine and increasing bile acid secretion. As a result, plant extracts may have anticholesterolaemic properties [7].

The most prevalent kind of lipid in the body is a triglyceride, an ester created from glycerol and three fatty acids. The primary components of body fat in humans, other vertebrates, and vegetable fat are triglycerides. They are a significant part of human skin oils and are also present in the blood to allow the bidirectional transference of adipose fat and blood glucose from the liver [8]. Although it is not cholesterol, it is measured because excessive levels may lead to atherosclerosis and coronary heart disease if high-density lipoprotein cholesterol (HDL-c) levels are low. Cardiovascular disease may develop from hypertriglyceridemia, which is a high level of triglycerides in the blood. In this investigation, it was found that plant extracts raised triglyceride levels in all test groups [9].

LDL-c, or low-density lipoprotein cholesterol, transfers cholesterol from the liver to the precise location where it will be used. Excess LDL cholesterol has the potential to initiate the atherosclerosis process.It carries 60–70% of the total amount of cholesterol. As a result, an increase in TC level will also result in an increase in LDL-c. The blood LDL-c level of the plant extracts that were given in high dosages appeared to have dropped, indicating a lack of propensity to atherosclerosis and other cardiovascular-related disorders. The diameter of the blood vessels is reduced by atherosclerosis. This lowers the blood supply and creates the ideal environment for clot formation. A high level of LDL cholesterol increases the risk of developing a wide range of conditions, including hypercholesterolemia, angina, coronary heart disease, heart attacks, and. coronary artery disease.

As seen in the group that received a high dose of *Jatrophatanjorensis* alone, high-density lipoprotein cholesterol (HDL-c) is an anti-atherogenic lipoprotein that carries cholesterol from peripheral tissues back to the liver, where it is broken down into bile acids. LDL-c is decreased while HDL-c is simultaneously increased by inhibiting HMG-CoA reductase, a microsomal enzyme that catalyzes the rate-limiting step in the cholesterol production pathway. Increased levels of HDL cholesterol are linked to heart health, which lowers the chance of developing cardiovascular diseases and their associated complications like stroke, myocardial infarction, and mortality. Additionally, the increased activity of the enzyme lecithin-cholesterol acyl transferase (LCAT), which converts free cholesterol into HDL-c and promotes reverse cholesterol transport by competitively inhibiting the uptake of LDL-c by endothelial cells and preventing the production of oxidized LDL-c, may be the cause of this. According to previous research, cardiovascular disease accounts for one in three fatalities, and the main risk factors include high levels of blood total cholesterol (TC), low density lipoprotein cholesterol (LDL-c), triglycerides (TG), and low levels of high density lipoprotein cholesterol (HDL-c). These The investigation did not find any predisposing variables for cardiovascular disease. Regarding Jatrophatanjorensis, the effect was dose-dependent.
With no discernible difference in the levels of serum triglycerides and HDL cholesterol between rats in the test groups and the controls, the leaf extract of Jatrophatanjorensis has been demonstrated to have significant hypolipidemic effects on serum total lipids, total cholesterol, and LDL cholesterol. The fact that the extract was seen to significantly lower serum total lipids, total cholesterol, and LDL cholesterol suggests that it can be used to avoid cardiovascular issues

brought on by hyperlipidemia. This may explain why the leaf extract has traditionally been used in the West Africa sub-region as a natural treatment for cardiac ailments. High levels of LDL cholesterol, which are frequently referred to as "bad cholesterol," in contrast to HDL particles, which are referred to as "good cholesterol" or "healthy cholesterol," increase health issues and cardiovascular disease. According to studies, those with higher amounts of HDL cholesterol appear to experience fewer issues with cardiovascular diseases, whereas people with lower levels of HDL cholesterol are more likely to develop heart disease. The findings of these studies suggest that the therapeutic benefits [10] [11] attributed to *Jatrophatanjorensis* as a useful herb in the treatment of heart ailments may be based on how the plant's phytoconstituents affect the serum lipid profiles of albino rats.

Conclusion: The study concludes that plant extracts may be used to treat metabolic disorders like obesity and cardiovascular diseases because they have the potential to lower cholesterol and have hepatoprotective effects. Additionally, phytochemicals may be used as drug precursors, templates for synthetic modification, and pharmacological probes.

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