

Effect of Ethanol Extract of *Cajanus cajan* Leaf on Plasma Lipid Level in Albino rats

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KEYWORDS

Lipid profile,
Cajanus cajan,
Albino rats,
Weight reduction
and Ethanol extract

A B S T R A C T

The study was designed to evaluate the effect of ethanol extract of *Cajanus cajan* leaves on Plasma lipid levels in albino rats with total number of sixteen albino rats. The plasma lipid levels were determined by spectrophotometric method. The rats were randomly assigned to four experimental groups A, B, C and D. Group A with four rats received only water and feed and served as control while B, C and D received ethanol extract of *Cajanus cajan* leaves at 200, 400 and 800mg/kg body weight once daily for seven days. In the acute toxicity study *Cajanus cajan* leaf extract caused no death in rats even at 16000 mg/kg dose. The result of the study showed that there was significant ($P < 0.05$) reduction in the mean body weight of the rats in administered group. The result also revealed that there were no significant ($P > 0.05$) difference in total cholesterol (TC), high density lipoprotein - cholesterol(HDL - C) and low density lipoprotein - cholesterol (LDL - C) levels in rats administered ethanol extract of *Cajanus cajan* leaves. There was significant ($P < 0.05$) reduction in triacylglyceride level in rats administered ethanol extract of *Cajanus cajan* leaf. This reveals that *Cajanus cajan* leaves can be used in the reduction of weight and management of cardiovascular diseases.

Introduction

Cardiovascular disease and other related disorders are the major cause of mortality or death in the populace all over the world-both in developed and developing countries. In the ethnology of cardiovascular disease, high level of total cholesterol (TC), and low density lipoprotein-cholesterol (LDL-C) in the serum have been implicated and seen as primary risk factor (Edijala *et al.*, 2005).

A number of epidemiological investigations have shown a clear association between dietary saturated fat, atherosclerosis, and coronary heart disease (CHD) (Edijala *et al.*, 2005).

The composition of human diet plays an essential role in the management of lipid and lipoproteins concentration in the blood

(Nazin *et al.*, 2008). However, disturbances in serum lipoprotein and abnormal lipid metabolism characterized by hyperlipoproteinemia or hyperlipidaemia have also been seen as an implicative risk factor in coronary heart disease (CHD) development (Nazin *et al.*, 2008).

The use of herb in medicine has played an important role in nearly every culture on earth, including Asia, Africa, Europe, and America. Medicinal plants have been based on fact that plant contains natural substances that can promote health and alleviate illness (Aattar, 2006). Several herbs can help to reduce high blood cholesterol concentrations (Aattar, 2006). Various organic compounds are derived from plants which are important in alleviating different diseases that humans are constantly exposed to, phytochemicals constituents of the plants and their usage immensely help in treatment of diseases both in the medical and pharmaceutical fields (Enwuru, 2008). Ghasi *et al.* (2000), Adebayo *et al.*, (2006), and Nazin *et al.*, (2008) have reported that some commonly consumed traditional plants or herbs promote reduction in serum lipid.

Cajanus cajan locally known as pigeon pea is a perennial member of the family of fabaceae, a tropical grain legume growing mainly in India. Today *cajanus cajan* are widely grown in all tropical and semi-tropical regions of both the old and new world, including Nigeria, Mexico, south America, sub-Saharan Africa, west and eastern Africa (Brenan,1996). *Cajanus cajan* (pigeon pea) has its English names as Congo pea, pigeon pea, no-eye pea, red gram and Angolan pea (Orwa *et al.*, 2009).

The local names in Nigeria includes Fiofio (Igbo), Aduwa (Hausa), Otili (Yoruba), Olele (Edo), Shingwazo (Gwari), agadagbulu (Igala) and alev (Tiv). Though it is largely considered as orphan crop, it has

untapped potential for improvement both in quantity and quality of production more than any other legume adopted to various regions (Sheel *et al.*, 2011). Beside its nutritional values, the leaves, seeds and the roots of the plant also possesses various medicinal properties due to the presence of a number of phytochemicals. Thus, it is an integral part of traditional folk medicine in India, China, Nigeria, Angola, and some other nations (Saxena *et al.*, 2010). The aim of this research work is to investigate the effect of ethanol extract of *Cajanus cajan* leaves on lipid profile in Albino rats.

Materials and Methods

Collection and preparation of *Cajanus cajan* leaves

The leaves of *Cajanus cajan* were collected from a residential farm yard in Aghara-osa in Iboko of Izzi Local government area in Ebonyi State, Nigeria and was classified by a taxonomist in the Department of Applied Biology, Ebonyi State University, Abakaliki, Nigeria. A part of the plant was also deposited in the herbarium for reference purposes. The leaves *Cajanus cajan* were washed thoroughly under running tap water, shade dried and pulverized, using a grinding machine. Exactly 100g of powdered seeds were soaked in 500 ml of ethanol for 24 hours. The mixture was sieved and the solvent was allowed to evaporate to obtain the crude extracts.

Experimental design

Acute toxicity

Acute toxicity of *Cajanus cajan* leaves ethanol extracts was carried out with total of Albino 20 rats according to the method of Sawadogo *et al.*, (2006) and as was described by Adedapo *et al.*, 2009.

Sub-acute toxicity

A total of 16 albino rats weighing (120-240 g) were used for the study. They were purchased from the Pharmacy Department University of Nigeria, Nsukka, Nigeria and acclimatized (for 7 days) and maintained at normal room temperature in the Experimental Animal House of the Faculty of Biological Sciences, Ebonyi State University, Abakaliki, Nigeria. They were housed in stainless rat's cages and allowed access to water and food *ad-libitum*. At the start of the experiment, all the animals were weighed and subsequently at week intervals. The rats were randomly assigned to three experimental groups marked as groups A, B, C and D. Group A with four rats received only water and food and served as control while B, C and D received ethanol extract of *Cajanus cajan* leaves at the graded doses of 200, 400 and 800 mg/kg body weight to the rats respectively for 7 days. The administration was done through the mouth with diabetic syringe.

Group A: Received no extract. Group B: Albino rats received ethanol extract of *Cajanus cajan* leaves at 200mg/kg body weight twice daily for 7 days. Group C: Albino rats received ethanol extract of *Cajanus cajan* leaves of 400mg/kg body weight daily for 7 days. Group D: Albino rats received ethanol extract of *Cajanus cajan* leaves of 800mg/kg weight daily for 7 days. After the treatment period (7days), the animals of all the groups were sacrificed. The rats were dissected and 5 ml of whole blood drawn through cardiac puncture. The blood was dispensed into centrifuge tubes and centrifuged at 5000 rpm for 10 minutes. After centrifugation, the plasma was then separated from the blood cells and used for assay of total cholesterol (T-C), triacylglycerides (TG), low density lipoprotein cholesterol (LDL-C) and high

density lipoprotein cholesterol (HDL-C) levels were determined using the methods described by Quinica (1978) and Burstein *et al.* (1970). Statistical analysis: Data obtained were subjected to a one way analysis of variance ANOVA using the General Linear Model procedure of SAS (version 6.04). Comparison of significant treatment means was by least significance differences (LSD) as outlined by Obi (2002).

Result and Discussion

Percentage Yield of *Cajanus cajan* leaves Extract

Ethanol extract of *Cajanus cajan* leaves (200g) gave 8.5% crude extract as the percentage yield as shown in table 5 below. This then indicates that *Cajanus cajan* leaves are sparingly soluble in ethanol.

Result of Acute Toxicity Study in Albino Rats after 72 hours of Administration of Ethanol Extracts of *Cajanus cajan* Leaves

Acute toxicity studies in rats after 72 hours of administration of ethanol extracts of *Cajanus cajan* leaves showed that no mortality was recorded in any of the groups even at 1600 mg/kg dose. The behavioral change noted in these rats following extracts administration were slight dullness at the onset of extracts administration. The rats later become active after some hours of extracts administration (Table 2).

Weight of Albino Rats Administered Ethanol Extract of *Cajanus cajan* Leaves

The result revealed that there was significant ($P < 0.05$) decrease in mean body weights of rats administered ethanol leaf extract of *Cajanus cajan* as shown in figure 1 below.

Table.1 Percentage Yield of Ethanolic Leaves Extract of *Cajanus cajan*

Solvent used	Plant part	Mass of leaves before extraction (g)	Volume of solvent added (ml)	Mass of leaves after extraction (g)	Mass of crude extract (g)	% yield
Ethanol	Leaves	200	1600	183	17	8.5

Table.2 Acute toxicity study in Albino rats after 72 h of administration of ethanol extract of *Cajanus cajan* leaves (n=4)

Group	Dose mg/kg	T/D	Period of Observation(h)	Signs of Toxicity Observed
A	Distillate water	4/0	72	No toxic changes observed
B ₁	200	4/0	72	No toxic changes observed
B ₂	400	4/0	72	No toxic changes observed
B ₃	800	4/0	72	No toxic changes observed
B ₄	1600	4/0	72	Slight dullness was observed in the rats within first eight hours of extract administration but after this period they became normal

T/D = number of rats administered/number of deaths.

Figure.1 Weight of Albino Rats Administered Ethanol Extract of *Cajanus cajan* Leaves for Seven Days

Data are shown as mean \pm S.D (n = 4) and significant difference at $P < 0.05$ in comparison with the control

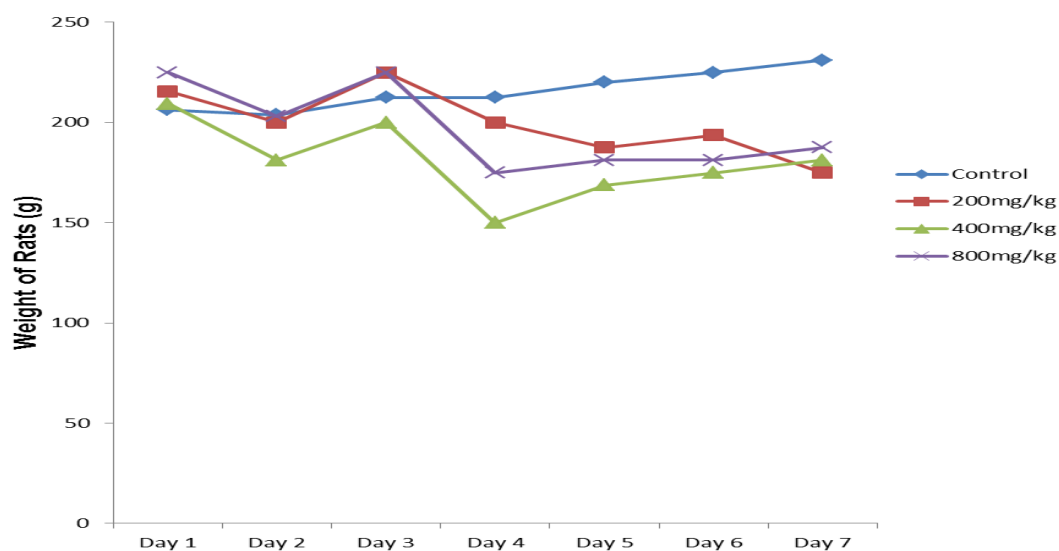
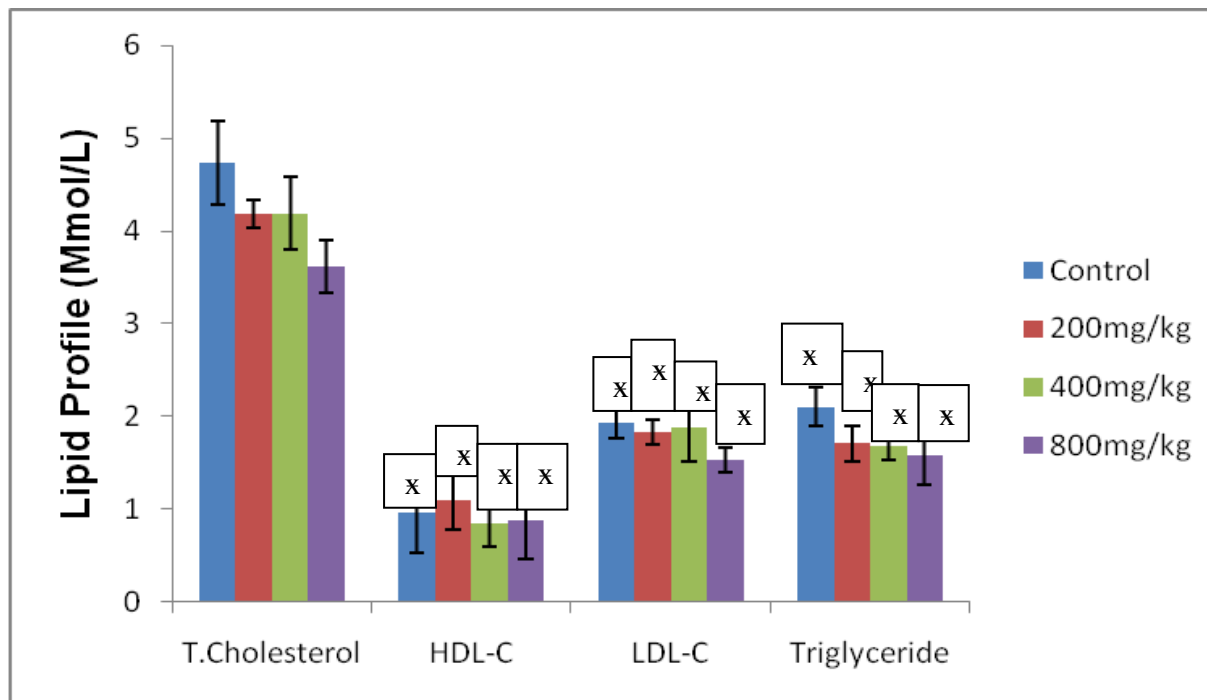


Figure.2 Levels of Plasma Lipids in Albino Rats Administered Ethanol Extract of *Cajanus cajan* Leaves. Data are shown as mean \pm S.D (n=4). Means values in bars with (x) have significance differences at (P<0.05) in comparison with control



Acute toxicity study in rats administered ethanol extracts of *Cajanus cajan* leaves showed that no mortality was recorded in any of the groups even at 1600 mg/kg dose. This was in correlation with the report of Adedapo *et al.* (2009) which revealed that *Moringa oleifera* leaves was not toxic at the same dose. Abnormal lipid metabolism characterized by hyperlipidemia and other related disorders are widely recognized as a major risk for coronary heart disease (CHD) and other abnormal risk factors (Edijala *et al.*, 2005, and Nazin *et al.*, 2008). Cardiac dystrophy is the reduced blood (oxygen) transport to the heart muscle due to the narrowing of (stenosis) of the blood vessels of the arteries of the heart (Nazin *et al.*, 2008). Natural compounds have been used in the treatment of various chronic human pathological conditions and also used to reduce subsequent CHD-associated morbidity and mortality (Zahid *et al.*, 2011).

Thus, the therapeutic benefits of plant extracts without side effect have been the focus of many extensive studies (Enwuru, 2008 and Nazin *et al.*, 2008). Nikkon *et al.* (2003) and Nazin *et al.* (2008) had earlier reported anti – cholesterolemic effect of some medicinal plants in rats.

According to Luo *et al.* (2008); Mayilvaganan *et al.* (2004) and Ogbunugafor *et al.* (2013) reported that various doses of ethanol extract of *Cajanus cajan* revealed a significant ($p<0.05$) increase in the level of high density lipoprotein cholesterol (HDL – C), and significant ($p<0.05$) decrease in total cholesterol (TC), low density lipoprotein cholesterol (LDL – C) and triacylglyceride after four weeks of treatment in albino rats. The result obtained in this study agrees with the report that *Cajanus cajan* produces a favourable relationship with the atherogenic

risk predisposing index, because of the ability of the leaf extract to maintain the level of HDL – C, LDL – C and TC at no significant ($P > 0.05$) increase or decrease. This might be due to the period of administration, part of the plant used as extract, solvent used for extraction and sex of the experimental animals (Nwagwu *et al.*, 2009; Luo *et al.*, 2008 and Dolui and Rupa, 2012). The results which correspond to the reports of Luo *et al.* (2008); Mayilvaganan *et al.* (2004) and Ogbunugafor *et al.* (2013) also revealed the significant ($P < 0.05$) decrease in the level of triglyceride and thus infer the importance of the extract in weight and cardiovascular risk management.

Conclusion

The leaf of *cajanus cajan* may be used as a medicinal friendly plant and in weight and cardiovascular managements.

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