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Original Research Article

Antilipidemic Activity and Phytochemical Properties of Methanol Extract and Fractions of *Sphenostylis stenocarpa* Seeds

Chinasa M. Ugwu[1,2], Ndidiamaka H. Okorie[1]*, Ibeabuchi J. Ali[1], Gerald W. Ugodi[1], Anthony A. Attama[1,3]

[1]*Department of Pharmaceutical and Medicinal Chemistry, Faculty of Pharmaceutical Sciences, Enugu State University of Science and Technology, Agbani, Enugu State*
[2]*Department of Applied Science, Federal University of Allied Health Sciences, Enugu*
[3]*Department of Pharmaceutics, University of Nigeria, Nsukka, Nigeria*

ABSRTACT

Sphenostylis stenocarpa, also known as African yam bean (AYB), has reportedly been used in traditional medicine to manage and control hyperlipidemia, among other health benefits. The aim of this work was to investigate the antilipidemic potentials of methanol crude extract and fractions of *Sphenostylis stenocarpa* seeds. In this work, pulverized AYB was macerated in absolute methanol for 72 h, filtered, and air-dried to obtain the crude extract. The crude extract was partitioned using *n*-hexane, ethyl acetate, *n*-butanol, and distilled water. The *n*-butanol and aqueous fractions were further fractionated using a vacuum liquid chromatographic technique. The acute toxicity test was conducted using eighteen Wistar rats in a two-phase test, with doses of 10-1000 mg/kg and 1600-5000 mg/kg body weight, respectively. The antilipidemic activity was investigated in Triton-induced adult Wistar rats of either sex for 28 days using L-Livoline and Tween-80 as positive and negative controls, respectively. The phytochemical screening revealed that the methanol extract, aqueous fraction, and the ethyl acetate fraction contained terpenoids and saponins, while the *n*-butanol fraction contained only terpenoids. The methanol extract, ethyl acetate-, *n*-butanol-, and aqueous fractions, and the *n*-butanol- and aqueous sub-fractions showed antilipidemic activity in the rat model, with the aqueous sub-fraction showing better antilipidemic activity (27.21 ± 1.43 mg/dL) in the low-density lipoprotein assay when compared with the standard livoline (33.24 ± 3.43 mg/dL). There was a significant difference in the antilipidemic activity as measured by total cholesterol, low-density lipoprotein, and phospholipid levels ($p < 0.05$).

Keywords: African yam bean, Lipidemia, Heart diseases, Natural product

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Introduction

As the incidence of lipid-related diseases increases as the global population grows, the search for underutilized food crops, many of which are potentially medicinal in humans and animals, has been intensified to maintain a balance between population growth and overall global health. The World Health Organization reported that raised cholesterol levels increase the risk of heart disease and stroke, and that a third of ischaemic heart disease is attributed to high cholesterol.[1] They estimated that raised cholesterol is responsible for 2.6 million deaths, representing 4.5% of total deaths per annum.[2] Raised cholesterol is attributed to be the major cause of disease burden in both the developed and developing world.[3]

*Corresponding author. mail: Hannah.okorie@esut.edu.ng
Tel: +2348037777736

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According to the Centers for Disease Control (CDC), a high cholesterol level (hyperlipidaemia) implies having a total cholesterol level above 200 mg/dL. The threshold for optimal cholesterol levels is: total cholesterol (150 mg/dL), LDL (100 mg/dL), triglycerides (< 150 mg/dL), and HDL (at least 40 mg/dL in men or 50 mg/dL in women).[4] According to the CDC, about 86 million US adults aged 20 or above have total cholesterol levels above 200 mg/dL, and nearly 25 million of these have cholesterol levels above 240 mg/dL.[5] The National Cholesterol Education Program (NCEP) of the USA states that total cholesterol (TC) concentration below 200 mg/dL is within a desirable range and considered optimal, while a concentration greater than 240 mg/dL is referred to as hyperlipidemia. For children and adolescents, it should be less than 180 mg/dL.[6,7]

Statins, fibrates, bile acid sequestrants, and niacin are the current pharmaceutical agents for the treatment of hyperlipidemia.[8-10] However, these classes of medicine have been reported to have various limitations including the risks of liver damage associated with statins,[11] the gallstones linked to the fibrates,[12] gastrointestinal problems of bile acid sequestrants,[13] and the itching and liver damage associated with niacin.[14]

Several medicinal plants have been specifically used for the treatment of hyperlipidemia for example *Anethum graveolens*, *Berberis sp*, and *Carum carvi* have been shown to possess antilipidemic activity.[15-18] In addition, *Cassia angustifolia*, *Cichorium intybus*, *Citrus aurantium*,

Descurainia Sophia, Zingiber officinale, and many other plants have been reported to show antilipidemic activity.[19-24] Among the legumes, only *Piliostigma thonningii* has been directly reported to possess antilipidemic activity,[25,26] while others like dried beans,[27] lentils,[28] chickpeas,[29] and peas[30] derive their antilipidemic activity from their high fiber content and antioxidant potentials.

African yam beans, an underutilized food widely available in West African countries, have been reportedly used as weaning food,[31] treatment for stomach ache and acute drunkenness,[32] antioxidant agent,[33] antidiabetic agent,[34] amongst other uses. Inspired by the reported antilipidemic activity of a diet formulated with *Sphenostylis stenocarpa*,[35] we report herein the antilipidemic activity of the methanol extract, fractions, and subfractions of *Sphenostylis stenocarpa*.

Materials and Methods

Plant Material

White seed variety of *Sphenostylis stenocarpa* was collected from Nsukka, Enugu State (geographical coordinates: 6.9269 ˚N, 7.4547 ˚E) in November 2024 and authenticated by Dr Patrick Obi of Department of Pharmacognosy and Environmental Medicine, Faculty of Pharmaceutical Sciences, Enugu State University of Science and Technology Enugu and deposited in the herbarium of the same institution with a voucher number ESUT/PCG/25041.

Extraction and fractionation

The extraction, fractionation, and VLC purification steps are summarized in Figure 1. The extraction was done using a modification of the method reported by Girija and Lakshman.[36] A 1 kg and 500 mg sample of pulverized *Sphenostylis stenocarpa* seed was separately cold macerated in 5 L of methanol for 72 h with intermittent agitation every 12 h. The mixture was filtered through a fine silk cloth, and the filtrate was further re-filtered using Whatman No. 1 filter paper to provide the clear filtrate. The clear filtrate was concentrated under reduced pressure at 40 ˚C using a rotary evaporator (Stuart RE 400DB, China), and the percentage yield was calculated. The crude extract was further subjected to liquid-liquid partition using the order of polarity: hexane, ethyl acetate, butanol, and water. Fifteen (15) grams of crude extract was weighed and dispersed in 10% aqueous methanol (100 mL), 100 mL of n-hexane was added to the dispersed sample and partitioned using a separating funnel. Next was the use of ethyl acetate (100 mL x 2), which gave ethyl acetate fractions. After the separation of the ethyl acetate fraction, the next solvent used was butanol (100 mL x 5). The fractions were recovered and kept for further evaluation (purification, biological assays, and phytochemical analysis).

VLC fractionation

The butanol and aqueous fractions were further fractionated using vacuum liquid chromatography. The butanol fraction (4 g) was dissolved in DCM (10 mL), and a slurry was made with silica gel and packed in a vacuum liquid chromatography column. The column was eluted with 100 mL of solvent mixtures in increasing polarity: dichloromethane: methanol (100:0, 90:10, 70:30, 30:70, 10:90, 0:100), yielding six fractions respectively. These fractions were analyzed using TLC on silica gel 60 F254 plates using dichloromethane: methanol (9:1) as the mobile phase, visualized using an iodine chamber. Fractions 1 and 2 showing similar TLC spots were pooled as BF1, while fractions 3 to 6 were labelled BF2-5, respectively. The aqueous fraction (4 g) was dissolved in water, and a slurry was made with C18-reverse phase silica gel and packed in a vacuum liquid chromatography column. The column was eluted with 100 mL of solvent mixtures in increasing polarity: methanol: water (100:0, 80:20, 60:40, 20:80, 0:100), yielding five fractions AF1-5, respectively. These fractions were analyzed using TLC on silica gel 60 F254 plates using dichloromethane: methanol (9:1) as the mobile phase, visualized using an iodine chamber.

Phytochemical Screening

Qualitative phytochemical analysis of the extract and fractions of *Sphenostylis stenocarpa* seed was carried out according to the standard method.[37,38] The detailed method for each phytochemical is provided in the supporting information.

Ethical Approval

All procedures for animal experiment were approved by ESUT animal ethics committee (approval number: ESUT/AEC/2025/0561/AP503) and conducted in compliance with the National Institutes of Health guide for care and use of laboratory animals (NIH publication No. 8023, revised 2011).

Experimental Animals

Eighty-eight adult Wister rats of either sex weighing between 180 and 200 g were obtained from the Department of Pharmacology, Enugu State University of Science and Technology. The rats were housed in a standard aluminium cage maintained at a temperature of 24.5 ±1.5 ˚C, relative humidity of 25 ± 1%, and fed *ad libitum*. The rats were acclimatized for two weeks prior to experimentation.

Acute toxicity test

The acute toxicity test was conducted using adopted Lorke's method.[39] In this investigation, eighteen (18) albino rats were used. There were two phases of the test. The animals were divided into three (3) distinct groups of three rats each in stage one. The animals were given 10, 100, and 1000 mg/kg body weight of the extract, respectively, and in the second stage, 1600, 2900, and 5000 mg/kg body weight. The extract was administered by oral means, and the animals were observed for tremor, salivation, spasmodic movement, or death for 14 days.

In vivo anti-lipidemic activity

The Wistar rats were divided into fourteen groups of five rats each. The positive control (group 1) was given livoline (100 mg/kg), negative control (group 2) received tween-80 (vehicle) (5%), ethyl acetate fraction (group 3 and 4) received (200 mg and 400 mg/kg) doses, n-butanol fraction (group 5 and 6) received (200 mg and 400 mg/kg) doses, aqueous fraction (group 7 and 8) received (200 mg & 400 mg/kg), aqueous subfraction (group 9 and 10) received (200 mg and 400 mg/kg) doses, n-butanol subfraction (group 11 and 12) received (200 mg and 400 mg/kg) while the crude methanol extract (group 13 and 14) received (200 mg and 400 mg/kg) doses respectively.

Blood collection

At the end of the treatment period, all the rats were anesthetized, and their blood samples were collected into EDTA-sample containers using retro-orbital sinus puncture. The samples were centrifuged for 10 minutes, and the serum was collected for the lipidemic activity analysis.

In vivo total cholesterol

The *in vivo* total cholesterol concentration was assayed according to the methods reported by Costabile et al.[40] In brief, distilled water (10

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µL) was added to a test tube for the water blank, 10 µL of the standard reagent was added to another test tube, and 10 µL of the sample was added to another test tube. Then, 1000 µL of reagent R1 was added to each test tube and mixed. Then, incubated for 10 min at 37 ˚C. The absorbance of all the cuvettes was read and recorded at 546 nm.

$$\text{CHOL}\left(\frac{\text{mg}}{\text{dL}}\right) = \text{change in Abs of}\frac{\text{sample}}{\text{standard}}\ \text{concentration of standard}$$

*Determination of serum triglycerides (TAG***)**

The *in vivo* serum triglyceride concentration was assayed according to the methods reported by Hauser *et al*.[41] The 5 µL of distilled water was added to the test tube blank, 5 µL of the standard reagent was added to another test tube, and 5 µL of the sample was added to another test tube. Then, 500 µL reagent (R1) was added to each test tube and mixed. This was incubated for 5 minutes at 37 ˚C. The absorbance of all the cuvettes was read and recorded at 546 nm.

$$\text{TAG}\left(\frac{\text{mg}}{\text{dL}}\right) = \text{change in Abs of}\frac{\text{sample}}{\text{standard}}\ \text{concentration of standard}$$

Determination of the serum high-density lipoproteins (HDL)

The *in vivo* high-density lipoprotein concentration was assayed according to the methods reported by Hafiane et al using the Randox kit.[42] High-density lipoproteins (HDL) were determined using a commercial biosystem kit method, which was based on the principle that very low-density lipoprotein (VLDL) and low-density lipoprotein (LDL) in the sample precipitated with phosphotungstate and magnesium ions. The supernatant contains high-density lipoproteins (HDL). The high-density lipoproteins (HDL) were spectrophotometrically measured. The 100 µL of the serum and standard was pipetted into the centrifuge tube, which was immediately accompanied by the addition of 500 µL of the diluted precipitation reagent (R1) to the centrifuge tube. The content was mixed and allowed to stand for 10 minutes at 25 ˚C, then centrifuged for 15 minutes at 3500 rpm. The cholesterol concentration of the supernatant was determined after centrifugation. Into three test tubes labelled test, sample supernatant, standard, and blank were added 50 µl of sample supernatant, 50 µL of standard, and 50 µL of distilled water, respectively. Then, 500 µL each CHOL reagent solution was added to the test tubes and mixed, and then incubated for 10 min at 25 ˚C. The absorbance was read at 500 nm after 60 minutes.

$$\text{HDL}\left(\frac{\text{mg}}{\text{dL}}\right) = \text{change in Abs of}\frac{\text{sample}}{\text{standard}}\ \text{concentration of standard}$$

Determination of the serum low-density lipoproteins (LDL)

LDL-Cholesterol was determined as the difference between total cholesterol and the cholesterol content of the supernatant after precipitation of the LDL fraction by polyvinyl sulphate (PVS) in the presence of polyethylene glycol monomethyl ether.[43]

$$\text{LDL}\left(\frac{\text{mg}}{\text{dL}}\right) = \text{total cholesterol} - \text{HDL} - \left(\frac{\text{TAG}}{5}\right)$$

Determination of the serum very low-density lipoproteins (VLDL)

The very-low-density lipoprotein cholesterol concentration was determined using the method reported by Lee *et al*.[43]

$$VLDL\left(\frac{mg}{dL}\right) = \frac{TAG}{5}$$

In vivo phospholipids

The *in vivo* phospholipid concentration was determined using ammonium ferro thiocyanate.[44] In summary, plasma samples were extracted with chloroform and methanol. On separating, 1.0 mL of each chloroform extract was removed with a syringe and concentrated to dryness in a stream of air at 50 ˚C. The dried extract of phospholipids was then dissolved in 2.0 mL of chloroform and added to 2.0 mL of ammonium ferrocyanide in a total mixer. Following phase separation, the lower chloroform phase was removed with a Pasteur pipette, and the optical density was measured at 448 nm in a 10 x 75 mm cuvette, and a standard curve was plotted. The concentration of each sample was extrapolated from the standard curve.

Statistical analysis

The data collected was tallied and coded at the end of the collection exercise, and SPSS version 23 was used to analyse the coded data. The results were expressed as mean ± standard error of the mean. One-way analysis of variance (ANOVA) with Dunnett test for multiple comparisons was used to compare means across the groups. Mean values with $p < 0.05$ were considered statistically significant among the groups.

Results and Discussion

Extraction/Fractionation

The result of the extraction and fractionation (Table 1) showed that only an average of 2.98 % yield of the crude extract was obtained. The yields of the various fractionations showed that the aqueous fraction with 27.84% gave the highest yield, while the ethyl acetate fraction with an average yield of 2.55% was the least. It was observed that, comparatively, extraction with 500 g gave a better yield (3.40%) than the extraction with 1000 g (2.55%). The yields of the fractions were calculated with respect to the quantity of the crude extract used for fractionation. Among the fractions, the aqueous fraction had the highest yield, while the ethyl acetate fraction had the lowest yield, indicating that the constituents are largely polar compounds. The summary of the extraction, fractionation, and VLC steps is presented in Figure 1.

The percentage yield of the crude was calculated with respect to the pulverized sample, while the yields of the various fractions were calculated with respect to the weight of crude used for fractionation.

Table 1: Yield of extraction and fractionation (%)

Extract/fraction	Yield (%) for 1000 g	Yield (%) for 500 g	Average (%)
Methanol (crude)	2.55	3.40	2.98
n-hexane fraction	0.00	0.00	0.00
Ethyl acetate fraction	2.75	2.35	2.55
butanol fraction	9.61	8.82	9.22
Aqueous fraction	26.27	29.41	27.84

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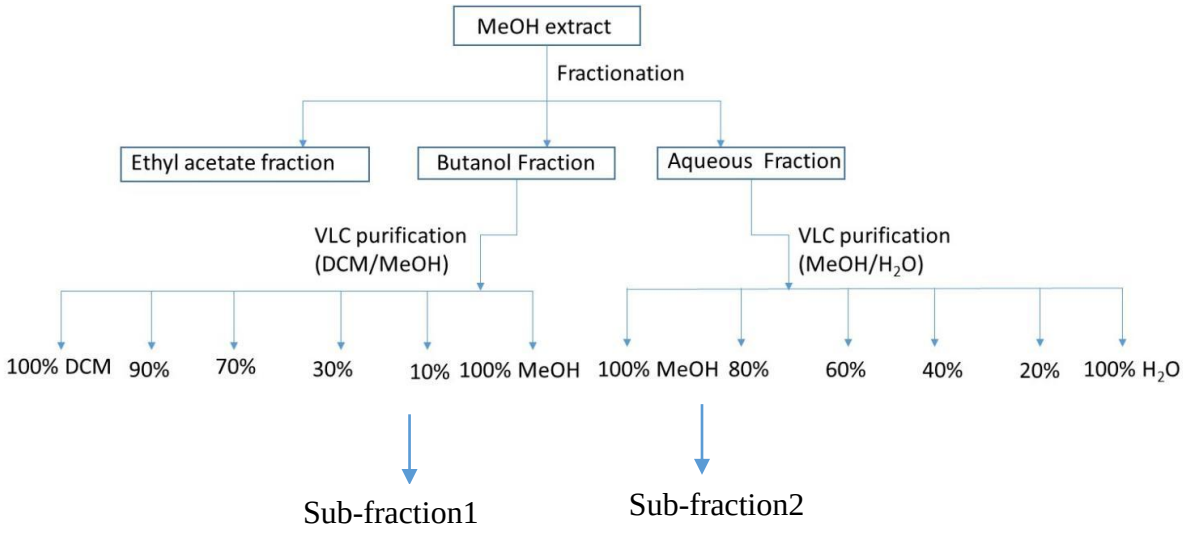

Figure 1: Representation of the steps for extraction, fractionation, and VLC purification

Acute toxicity of methanol extract

The acute toxicity study of the methanol extract of *Sphenostylis stenocarpa* showed that there was no death at a 5000 mg/kg dose, which indicated that the methanol extract of *Sphenostylis stenocarpa* was non-toxic. Hodge and Sterner scale rating of toxicity affirms that compounds whose LD_{50} is greater than 5000 mg/kg are non-toxic. The crude methanolic extract is adjudged to be non-toxic in line with Hodge and Sterner scale rating of toxicity. The result is in agreement with the earlier report of Christopher *et al*. where the methanol extract of *Sphenostylis stenocarpa* administered up to 5000 mg/kg did not cause any death in albino mice.[45] The reported acute toxicity profile of the methanol extract is also in agreement with the traditional usage of *Sphenostylis stenocarpa* seeds as a wholemeal without stringent processing.[32,38]

The acute toxicity test of the seeds of *S. stenocarpa* showed no death up to 5000 mg/kg body weight. The LD50 was found to be above 5000 mg/kg body weight (Table 2).

Phytochemical screening

The result of the phytochemical screening (Table 3) showed that the crude methanol extract and the aqueous fraction contained terpenoid, saponin, glycoside, and alkaloid, while the butanol and ethyl acetate fractions only contained terpenoid and glycoside. The presence of some phytochemicals like terpenoids and saponins in the crude methanol extract indicates that the AYB phytochemicals could be a rich source of materials for drug production in treating diseases. Terpenoids are a varied class of plant-derived secondary metabolites that have received great interest for their potential as anti-hyperlipidemic and cardioprotective medicines, providing natural alternatives or adjuncts to cholesterol and triglyceride management. They work primarily by regulating key enzymes and genes involved in lipid metabolism, lowering hepatic lipid buildup and increasing fatty acid oxidation.[46] Antioxidant-rich foods, including terpenoids, have been reported to inhibit LDL oxidation and thus prevent the formation of cell-to-cell adhesion factors, which are implicated in the damage to the arterial endothelium and in the formation of blood clots.[47] Saponins have been reported to exhibit antioxidant activities.[48,49] The medicinal properties of plants' secondary metabolites are very numerous and have been well documented.[50,51] The antilipidemic activities of *Sphenostylis stenocarpa* seeds could be linked to the abundance of terpenoids and saponins in the crude methanolic extract and various fractions. Further work is still needed to isolate the constituent responsible for the antilipidemic properties.

Table 2: LD_{50} of methanol extract (crude)

Parameter	Dosage (mg/kg) body weight	Mortality
Phase I		
Group 1	10	0/3
Group 2	100	0/3
Group 3	1000	0/3
Phase II		
Group 1	1600	0/3
Group 2	2900	0/3
Group 3	5000	0/3

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Table 3: Results of phytochemical screening

Parameters	Crude extract	Aqueous fraction	Butanol fraction	Ethyl acetate fraction
Terpenoid	+	+	+	+
Flavonoids	-	-	-	-
Saponin	+	+	-	+
Tannins	-	-	-	-
Phenolic	-	-	-	-
Glycoside	+	+	+	+
Alkaloids	+	+	-	-
Steroids	-	-	-	-

+ means positive, while - means negative

In vivo antilipidemic activity

In the *in vivo* antilipidemic activity assay (Table 4), the methanol extract, ethyl acetate, *n*-butanol, and aqueous fractions, and the *n*-butanol and aqueous subfractions displayed good antilipidemic activity using total cholesterol, high-density lipoprotein, triglyceride, low-density lipoprotein, very low-density lipoprotein, and phospholipid assays. Only the total cholesterol, low-density lipoprotein, and phospholipid assays showed statistically significant differences in antilipidemic activity among the various groups. The crude extract was the most active in reducing total cholesterol, high-density lipoprotein, triglyceride, and very low-density lipoprotein concentrations from 159.77 ± 1.34 to 130.97 ± 1.90; 74.09 ± 2.82 to 64.92 ± 2.59; 204.24 ± 2.73 to 168.15 ± 4.18; and 40.85 ± 0.55 to 33.63 ± 0.83 mg/dL respectively while the aqueous subfraction was the most active in reducing low-density lipoprotein and phospholipids from 44.82 ± 4.01 to 27.21 ± 1.43, and 104.36 ± 5.36 to 102.09 ± 4.25 mg/dL respectively. Among the fractions, the aqueous fraction was the most active antilipidemic agent in the total cholesterol, high-density lipoprotein, triglyceride, low-density lipoprotein, and very low-density lipoprotein assays, while the ethyl acetate fraction displayed the best activity in the phospholipid assay. The most active subfractions in the total cholesterol, low-density lipoprotein, and phospholipid assay were the aqueous subfraction, while the *n*-butanol subfraction was the most active in the high-density lipoprotein, triglyceride, and very low-density lipoprotein assay. We observed a dose-dependent antilipidemic activity among the fractions and subfractions. Only the aqueous subfraction (27.21 ± 1.43 mg/dL) displayed an activity better than livoline (33.24 ± 3.43 mg/dL) in the low-density lipoprotein assay, while all the fractions expressed a better activity (102.09 – 110.83 mg/dL) in the phospholipid assay than livoline (112.79 ± 3.40 mg/dL). The statistical analysis of the antilipidemic activity results showed that the total cholesterol, low-density lipoprotein, and phospholipid assays had a significant difference among the groups ($p < 0.05$), while the high-density lipoprotein, triglycerides, and very-low density lipoprotein assays had no significant difference among the groups ($p > 0.05$). None of the samples (extract, fractions, and subfractions) had activity better than livoline in the total cholesterol, high-density lipoprotein, triglyceride, and very low-density lipoprotein. The observed activity could be linked to the widespread presence of saponins and terpenoids in the extract, fractions, and subfractions. Saponins have been widely reported to express antilipidemic activity.[52,53] The acute toxicity study indicates that the extract was safe for consumption even at 5000 mg/kg, which is in agreement with the widespread local use of *Sphenostylis stenocarpa*.

Table 4: Antilipidemic activity of Extract and fractions of *S. stenocarpa*

Group	TC (mg/dL)	HDL (mg/dL)	TAG (mg/dL)	LDL (mg/dL)	VLDL (mg/dL)	Phospholipid (mg/dL)
1	123.43±1.79^{a}	59.10±2.71^{a}	155.41±3.73^{a}	33.24±3.43^{a}	31.08±0.75^{a}	112.79±3.40^{b}
2	159.77±1.34^{b}	74.09±2.82^{a}	204.24±2.73^{a}	44.82±4.01^{b}	40.85±0.55^{a}	104.36±5.36^{a}
3	145.72±3.37^{b}	70.92±2.12^{a}	182.99±4.76^{a}	38.20±5.55^{b}	36.60±2.29^{a}	105.48±3.22^{a}
4	146.54±6.81^{b}	71.27±0.59^{a}	184.11±1.99^{a}	38.44±7.05^{b}	36.82±0.40^{a}	102.35±3.83^{a}
5	155.75±1.67^{b}	72.69±1.88^{a}	189.70±4.22^{a}	45.13±3.37^{b}	37.94±0.84^{a}	102.87±3.22^{a}
6	151.39±2.90^{b}	73.56±2.82^{a}	189.33±2.73^{a}	39.96±2.48^{b}	37.87±0.55^{a}	105.75±3.92^{a}
7	142.35±3.57^{b}	66.51±2.71^{a}	179.64±5.71^{a}	39.91±1.64^{b}	35.93±1.14^{a}	109.53±4.09^{b}
8	136.66±4.02^{a}	68.63±2.70^{a}	178.52±3.98^{a}	32.33±5.15^{a}	35.70±0.80^{a}	108.49±3.13^{b}
9	139.50±2.57^{b}	69.15±0.82^{a}	184.86±5.72^{a}	33.37±4.54^{a}	36.97±1.14^{a}	102.09±4.25^{a}
10	135.32±1.45^{a}	72.33±1.53^{a}	178.89±0.16^{a}	27.21±1.43^{a}	35.78±0.30^{a}	105.22±2.44^{a}
11	146.03±4.24^{b}	67.92±1.29^{a}	182.25±2.28^{a}	41.66±3.75^{b}	36.45±1.79^{a}	103.66±2.52^{a}
12	140.51±4.91^{b}	66.69±0.71^{a}	176.66±3.72^{a}	38.49±4.57^{b}	35.33±1.79^{a}	110.05±2.35^{b}
13	132.30±1.45^{a}	64.92±2.59^{a}	184.11±0.97^{a}	30.56±2.38^{a}	36.82±0.99^{a}	107.18±6.09^{b}
14	130.97±1.90^{a}	67.22±1.76^{a}	168.15±4.18^{a}	30.12±3.67^{a}	33.63±0.83^{a}	110.83±5.74^{b}

Mean values with different letters as superscripts are considered significant ($p< 0.05$), while mean values with the same letters as superscripts are considered non-significant ($p> 0.05$) within the group

Conclusion

The extraction, fractionation, VLC-purification, and antilipidemic activity evaluation of *Sphenostylis stenocarpa* seeds are reported in this work. The phytochemical analysis of the methanolic extract and fractions revealed the presence of terpenoids, saponins, and alkaloids. The findings indicated that all the fractions and the methanolic extract of *Sphenostylis stenocarpa* seeds had an antilipidemic effect on the Triton-induced lipidemic rat model. The aqueous sub-fraction displayed an antilipidemic effect (27.21 ± 1.43 mg/dL) better than livoline (33.24 ± 3.43 mg/dL), in the low-density lipoprotein cholesterol assay. The acute toxicity study demonstrated that the methanol extract of *Sphenostylis stenocarpa* was not toxic up to 5000 mg/kg body weight in the rat model. We recommend further purification of the aqueous sub-fraction to achieve isolation of the antilipidemic component.

Conflict of Interest

The authors declare that there is no conflict of interest regarding this publication.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by us.

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