ISSN 2347-6893

Effect of Ground Seeds of Picralima Nitida Incorporated Diets on Serum Lipid Profile of Albino Rats

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ABSTRACT

The effect of ground seeds of *Picralima nitida* incorporated diets on serum lipid profile of albino rats was studied. Twenty five albino rats randomly distributed into five groups of five rats were fed with 5%, 10%, 20% and 30% w/w concentrations of ground seeds of *Picralima nitida* incorporated diets for 28 days. The concentrations of serum triacylglycerols (TGs), total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), positive atherogenic index (HDL-C/TC) and negative atherogenic index (LDL-C/HDL-C) of the serum of albino rats fed with these percentage concentrations of ground seeds of *Picralima nitida* incorporated diets were determined using standard methods. Albino rats fed with guinea feed without ground seeds of *Picralima nitida* served as the control. Results obtained show that there was a significant ($p<0.05$) decrease in the concentrations of triacylglyceroles, low-density lipoprotein as the concentrations of ground seeds of *Picralima nitida* increased in contrast to a gradual significant ($p>0.05$) increase in the concentrations of serum cholesterol at 10% and a significant ($p<0.05$) reduction in the concentrations of high-density lipoprotein cholesterol (LDH-C) at high concentration of 30% of the ground seeds of *P. nitida* incorporated diets, when compared to those of the control. Positive atherogenic index (HDL-C/TC) showed a significant ($p<0.05$) reduction at 30% while negative atherogenic index (LDL-C/HDL-C) was significantly ($p<0.05$) lower from 10% when compared to those of the control. These observed changes, as a result of administration of ground seeds of *P. nitida* incorporated diets indicate that these plant seeds have hypolipidaemic potential on the serum of experimental albino rats.

Indexing terms/Keywords

Picralima nitida seed; Diet, Lipid profile, Atherogenic index, Albino Rats;

Academic Discipline and Sub-Disciplines

Biochemistry

SUBJECT CLASSIFICATION

Pharmacological Biochemistry and Toxicology

Council for Innovative Research

Peer Review Research Publishing System

Journal of Advances in Biology

Vol. 7, No. 2

www.cirjab.com

editorsjab@gmail.com , editor@cirjab.com

ISSN 2347-6893

INTRODUCTION

All plants produce chemical compounds as part of their normal metabolic activities. The medicinal importance of *P. nitida* is based on its phytochemicals components. The plant is known to contain several phytochemical components such as alkaloids, saponins, tannins, polyphenols and steriods noted for their medicinal importance (Afolabi et al., 2007).

Chemical compounds in plants mediate their effects on the animals through processes identical to those already well known in conventional drugs; thus herbal medicines do not differ greatly from conventional drugs in terms of how they work. The major difference is their recommended doses (Tapsell *et al.,* 2006; Lai and Roy, 2004).

Picralima nitida is the only species of the genus Picralima and it is related to Hunteria and Pleiocarpa. It belongs to the hunterieae tribe of the Apocynaceae family. It is commonly called Osi-Igwe in Ibo, Abere in Yoruba. In other parts of West Africa, the plant is called Gbe-Fon dangne in Benin Republic, Adangme in Ghana, Abureebissi in Ivory Coast and Susu balunyi in Sierra Leone (Burkill, 1985).

It is widely distributed in high deciduous forest of West-Central Africa, from Ivory Coast to West Cameroons, and extending across the Congo basin and Uganda (Saxton, 1960; Burkill, 1985; Ajanohoun *et al.,* 1996; NNMDA, 2008).

Picralima nitida is an under storey tree which reaches up to 4-35 meters in height, crown dense, its trunk is about 5-60 meters in diameter and its cylindrical in shape. The wood is pale yellow, hard, elastic, fine-grained and taking a high polish. *P. nitida* bears white flowers (about 3 cm long) with ovoid fruits, which at maturity are yellowish in colour. The leaves are broad (3-10 cm) and oblong (6-20 cm long) with tough tiny lateral nerves of about 14 to 24 pairs (Burkill, 1985). *P. nitida* has widely varied applications in West African folk medicine. Various parts of the plant; the leaves, seeds, stem bark and roots are used by herbalists for the treatment of various ailments including fever, hypertension, jaundice, gastro-intestinal disorders and malaria (Etukudo, 2003; Kouitcheu *et al.,* 2008).

Preparations from different parts of this plant are employed as herbal extract as remedy for various kinds of human diseases. The seeds are widely used in West Africa especially in Nigeria, Cote d'ivoire and Ghana as antipyretic, aphrodisiac, for the treatment of malaria, pneumonia and chest pain (Kapadia *et al.,* 1993; Kouitcheu *et al.,* 2008; Nkere and Iroegbu, 2005). In Gabon, the seeds are applied externally for the treatment of abscesses. The fruits are used in West Africa for the treatment of gastro-intestinal disorder and dysmenorrhoea (Ajanohoun, 1996; Ansa-Asamoah and Ampofo, 1986). The leaves are used as a vermifuge and the leaf-sap is dropped into the ears for otitis (Iwu, 1993). The bark is used as laxatives and purgative, anthelmintic and in the treatment of venereal diseases, as febrifuges and also to treat hernia (Raponda-Walker and Sillans, 1961). In Ivory Coast, a decoction of the stem bark is drunk in draught for jaundice and yellow fever (Kerharo and Bouquet, 1950). The root is used as vermifuge, aphrodisiac, for fevers, malaria, pneumonia and gastro-intestinal disorder (Kouitcheu *et al.,* 2008; Ainslie, 1937; Oliver, 1960).

Despite the widespread abundance and numerous traditional uses of *Picralima nitida* plants and their seeds in the treatment of various diseases, no study has been done on the effect of this plant seeds on lipid profile to the best of our knowledge. Therefore, the aim of this study was to investigate the effect of ground seeds of *Picralima nitida* incorporated diets on serum lipid profile of albino rats.

2. MATERIALS AND METHODS

2.1 Plant material collection and preparation

The pods of *Picralima nitida* were bought from Ekeonuwa market, Owerri, Imo State, Nigeria and were identified by a plant taxonomist at the Department of Forestry and Wildlife, School of Agriculture, Federal University of Technology, Owerri. The seeds were removed from the pods, air-dried for two weeks and ground into a fine powder using a grinding machine.

2.2 Experimental Animals

Twenty five (25) male albino rats of the Wistar strain weighing between 156 to 186 grams were purchased from the animal house of the Department of Zoology, University of Nigeria, Nsukka, Nigeria. The rats were transported to the animal house of the Department of Biochemistry, Federal University of Technology, Owerri, Nigeria. The rats were housed in partitioned wire-meshed cages under standard laboratory condition of humidity, temperature (25± 2^0C) and light (12 hr light/dark cycles). They were treated humanely as encapsulated in National Institutes of Health (NIH, 1995) guidelines. The research was approved by the Departmental Ethical Committee on the use of animals for the research, Department of Biochemistry, Federal University of Technology, Owerri, Nigeria. They were fed *ad libitum* with water and growers' mash (Guinea Feed, Nigeria).

The rats were divided into five groups of five (5) rats in each cage according to their relative body weights. The animals were allowed to acclimatize to the environment for one (1) week on a regular water and feed. After acclimatization, each group was fed with the growers' feed formulated with 5%, 10%, 20% and 30% w/w of ground seeds of *P. nitida*, except the control group which received 100% feed. During this period, observations were made on the animals' appetite and general wellbeing.

2.3 Animal Grouping and Feed Administration

The five (5) different experimental groups received designated concentrations of the feed incorporated with ground seeds of *P. nitida* thus: Group 1 received 100% growers feed only (Control), Group 2 received 95% feed with 5% ground seeds

of *P. nitida*, Group 3 received 90% feed with 10% ground seeds of *P. nitida*, Group 4 received 80% feed with 20% ground seeds of *P. nitida* while Group 5 received 70% feed with 30% w/w ground seeds of *P. nitida* respectively.

2.4 Collection of Blood Samples

The rats were anesthetized by exposure to dichloromethane vapor in covered transparent plastic container. Incisions were then made into their thoracic regions and were terminally bled by cardiac puncture using 5mL hypodermic syringes and needles. The blood sample was collected and introduced into sterile sample bottles using 5mL hypodermic syringes and needles. The blood samples were allowed to clot and centrifuged at 3000 rpm for 10 mins. The serum was separated using micropipettes and used for the determination of the various serum lipid profile parameters.

2.5 Lipid Analysis

Serum total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C) and triacylglycerols (TGs) were determined by enzymatic methods as described by Stein (1987) and Walmsley and White (1994). Low-density lipoprotein cholesterol (LDL-C) was calculated using the Friedewald et al (2007) formula, while positive and negative atherogenic indices (AI) were determined as described by Igwe et al (2007).

2.6 Statistical Analysis

Each reading was taken in triplicate. All data were expressed as mean ± standard deviation and analyzed for statistical significance by using one way Analysis of Variance (ANOVA). Values were considered significant at $p \leq 0.05$.

3. RESULTS

The administration of ground seeds of *P. nitida* incorporated diets caused an alteration in the serum lipid profile concentrations of the rats. There was a significant ($p>0.05$) increase in serum total cholesterol (TC), which was more pronounced with administration of ground seeds of *P. nitida* incorporated diets from 10% concentrations when compared to those of the control (Figure 1). There was a significant ($p<0.05$) decrease in the concentrations of triacylglycerols when compared to those of the control (Figure 2). The same trend as for triacylglycerol was observed for low-density lipoprotein cholesterol (Figure 3), in contrast to high-density lipoprotein whose decrease was slightly significant ($p<0.05$) with administration of ground seeds of *P. nitida* at 30% concentration when compared to those of the control (Figure 4). Positive atherogenic index (HDL-C/TC) showed a significant ($p<0.05$) reduction at 30% (Figure 5), while negative atherogenic index (LDL-C/HDL-C) was significantly ($p<0.05$) lower from 10% when compared to those of the control Figure6).

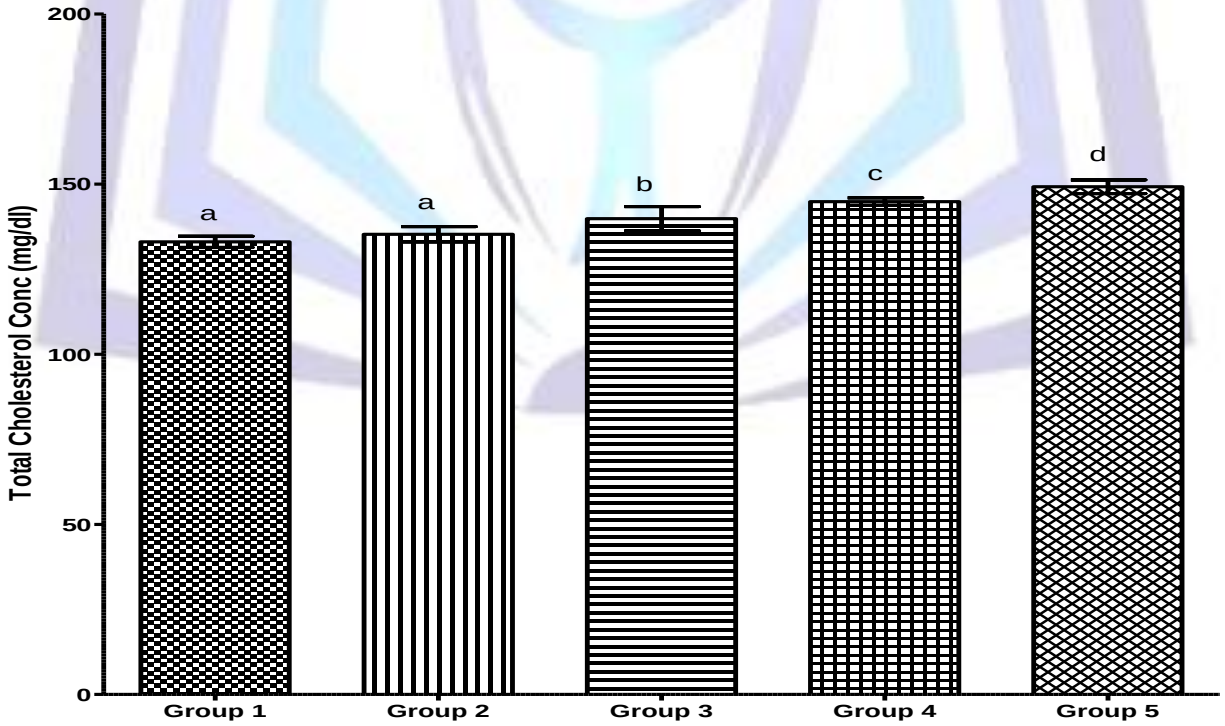

Fig. 1: Serum total cholesterol concentrations from albino rats fed incorporated diets with different percentage concentrations of ground seeds of *P. nitida*.

Bars (mean ± standard deviation) with different superscript letter(s) are statistically significant ($p>0.05$).

ISSN 2347-6893

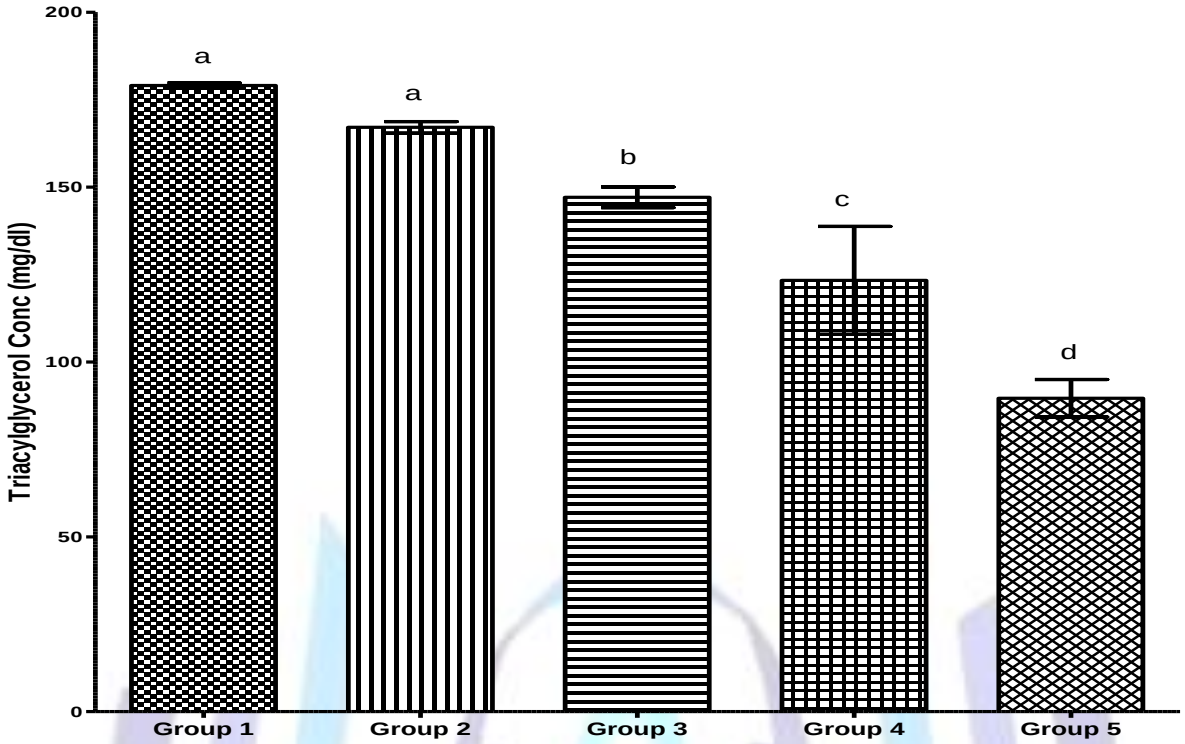

Fig. 2: Serum triacylglycerol concentrations from albino rats fed incorporated diets with different percentage concentrations of ground seeds of *P. nitida*.

Bars mean ± standard deviation) with different superscript letter(s) are statistically significant ($p<0.05$).

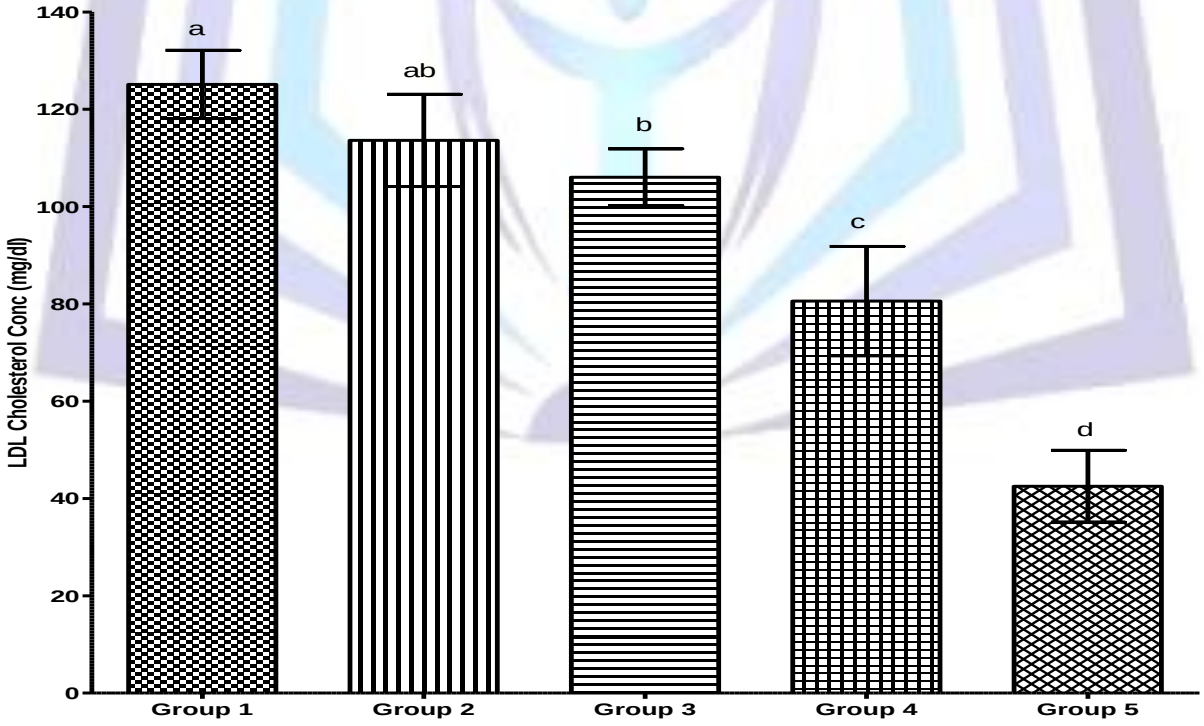

Fig. 3: Serum low density lipoproteins cholesterol concentrations from albino rats fed incorporated diets with different percentage concentrations of ground seeds of *P. nitida*.

Bars (mean ± standard deviation) with different superscript letter(s) are statistically significant ($p<0.05$).

ISSN 2347-6893

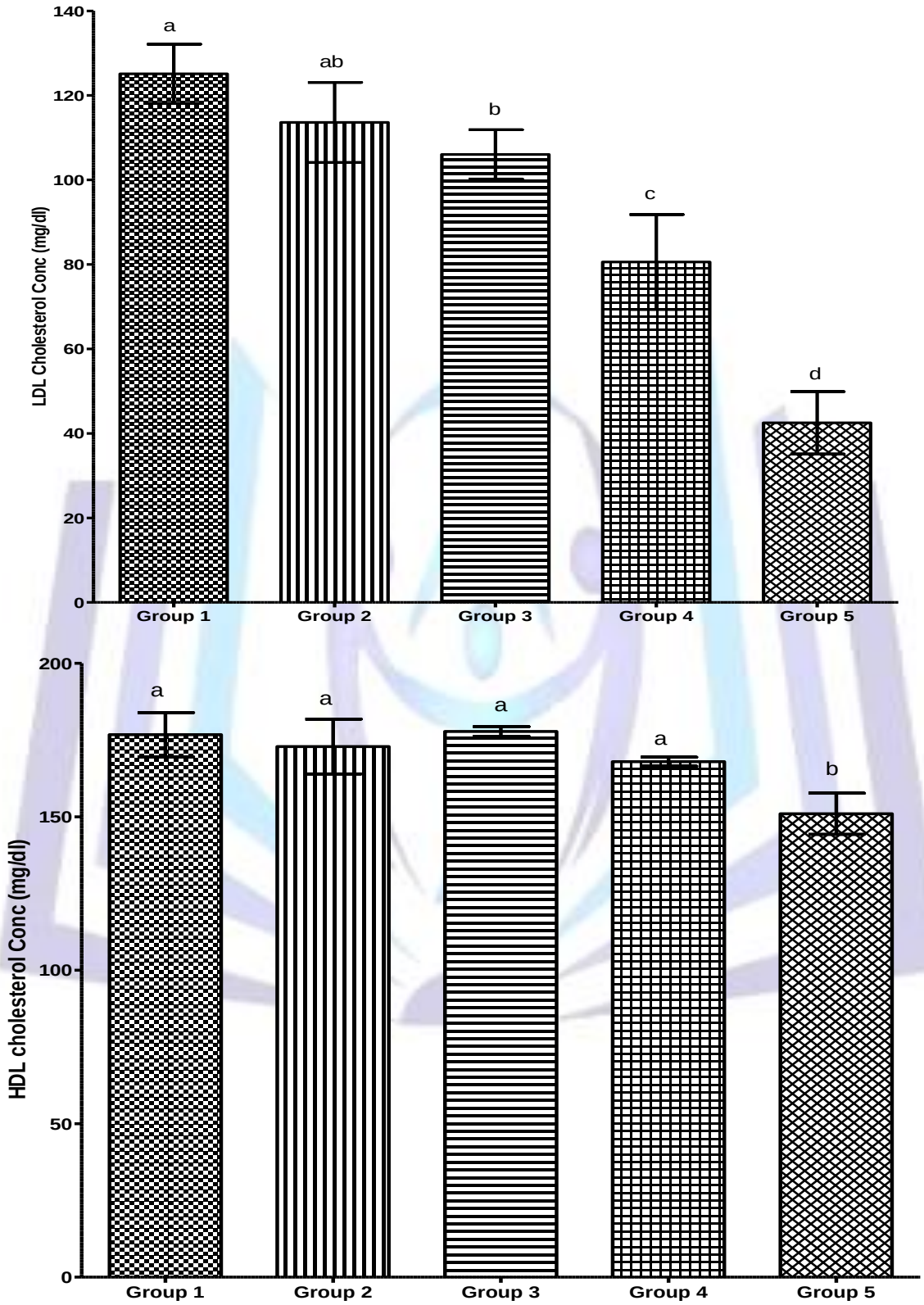

Fig. 4: Serum high density lipoproteins cholesterol concentrations from albino rats fed incorporated diets with different percentage concentrations of ground seeds of *P. nitida*.

Bars (mean ± standard deviation) with different superscript letter(s) are statistically significant ($p<0.05$).

ISSN 2347-6893

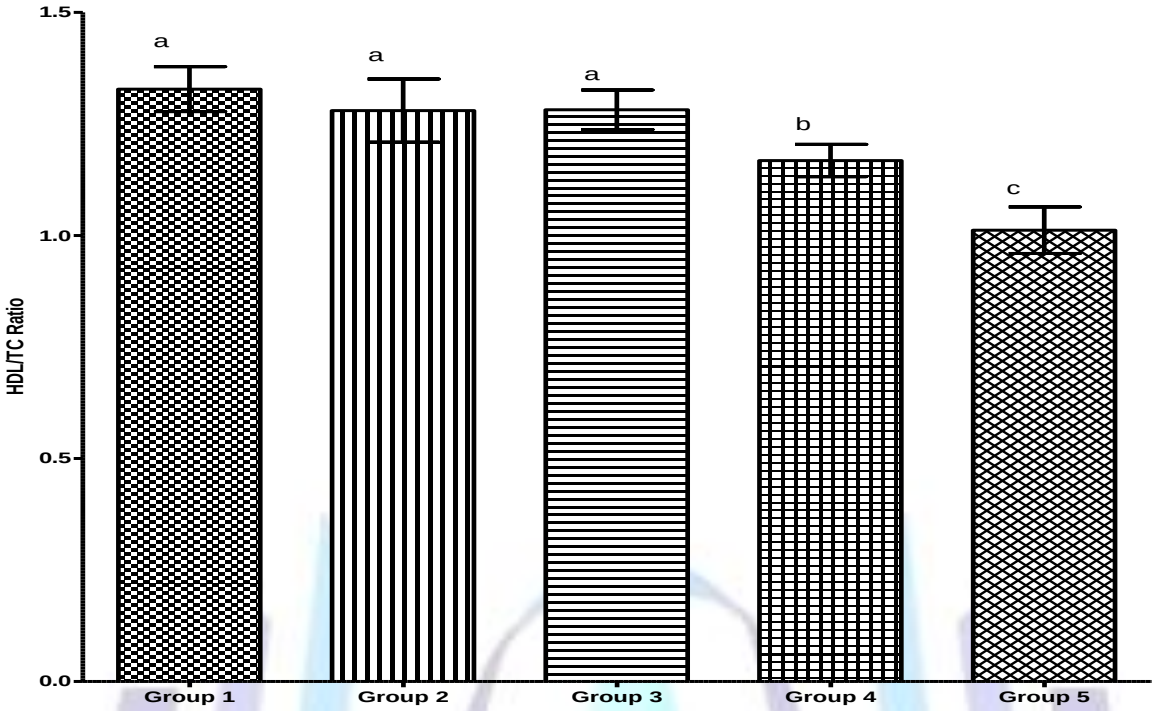

Fig. 5: Positive atherogenic index from albino rats fed incorporated diets with different percentage concentrations of ground seeds of *P. nitida*.

Bars (mean ± standard deviation) with different superscript letter(s) are statistically significant ($p<0.05$).

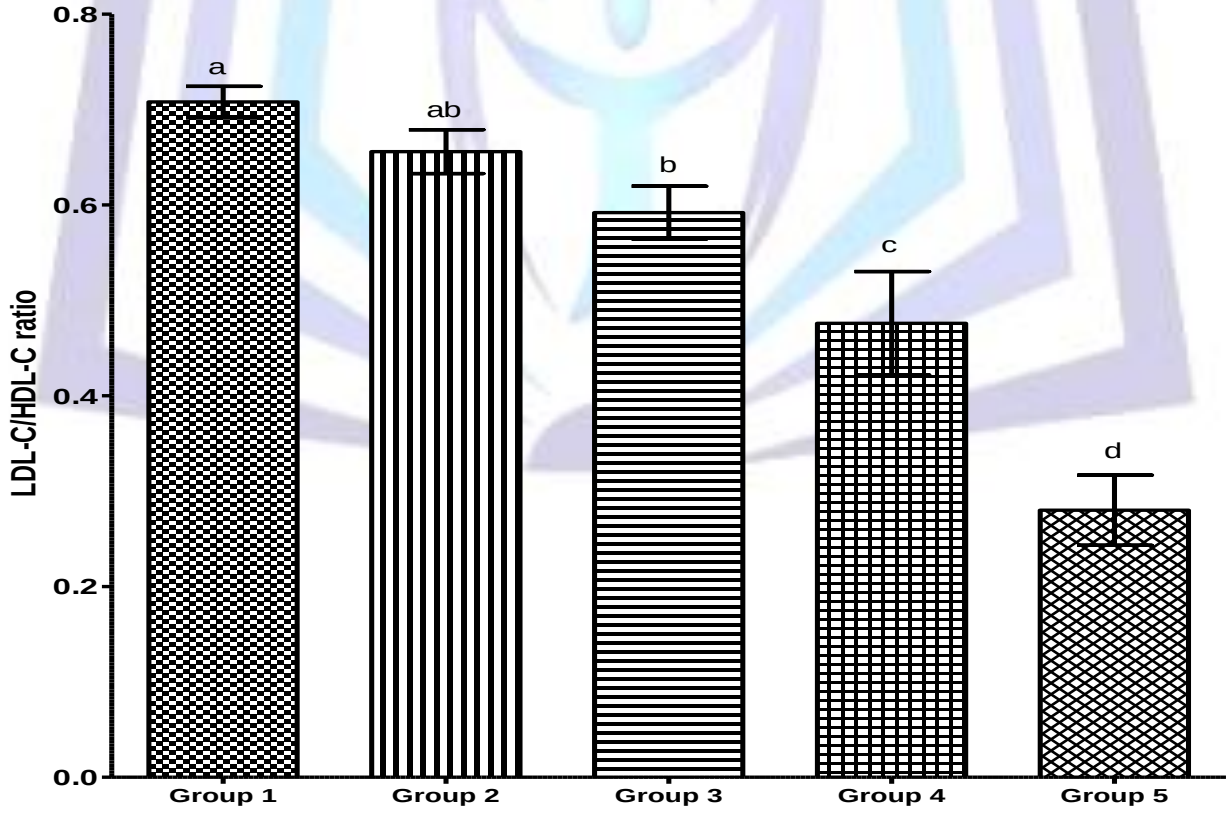

Fig. 6: Negative atherogenic index from albino rats fed incorporated diets with different percentage concentrations of ground seeds of *P. nitida*.

Bars (mean ± standard deviation) with different superscript letter(s) are statistically significant ($p<0.05$).

ISSN 2347-6893

4 DISCUSSION

The results obtained from this study showed that administration of ground seeds of *P. nitida* has serum lipid changing effects on the levels of triacylglycerols, total cholesterol, low-density lipoprotein and atherogenic indices. The observed significant ($p<0.05$) increase in serum total cholesterol (TC), which was pronounced with administration of ground seeds of *P. nitida* incorporated diets from 10% concentrations when compared to those of 5% and control and duration of administration. This may be attributed to the gut intra-lumenal interaction effect of important phytochemical components of the plant seed saponins (Osayemwenre et al., 2014). The increased total cholesterol levels may have contributed to the observed significant low serum high density lipoprotein cholesterol in the rats fed with ground seeds of *P. nitida* incorporated diets at 30%. About 30% of blood cholesterol is carried in the form of high-density lipoprotein. It has been said that that HDL can remove cholesterol from atheroma within arteries and transport it back to the liver for excretion or re-utilization. Thus, HDL-C being good cholesterol can protect against cardiovascular disease (Kwiterovich, 2000). The observed non-significant change in HDL-C concentration after administration of the ground seeds incorporated diets from (5% - 20%) concentrations indicate that, although the ground seeds do not have HDL-C boosting effect, they do not have significant lowering effect on HDL-C level, even at high percentage concentration (20%). The observed slight decrease in HDL-C may be due to the effect of over-dose at 30%.

On the other hand, the ground seeds at the lowest concentration (5%) significantly reduced triglycerides and low-density lipoprotein cholesterol. Low-density lipoprotein transports cholesterol to the arteries where they can be retained by arterial proteoglycans, starting the formation of plaques. LDL-C poses a risk for cardiovascular diseases (atherosclerosis, heart attack, coronary heart disease and stroke) when they invade the endothelium and become oxidized, since the oxidized form is more retained by the proteoglycans (Cromwell and Otvos, 2004).

The positive atherogenic index HDL-C/TC ratio was found to be significantly ($p<0.05$) reduced only at over dose (30%). On the other hand, the results reviewed that there was a significant ($p<0.05$) reduction in the negative atherogenic index from 10% concentrations of the ground seeds when compared to those of the control. This indicates that the seeds can help to prevent cardiovascular diseases (Ibegbulem and Chikezie, 2012).

The significant reduction in the levels of triacylglycerols, low-density lipoprotein cholesterol and the atherogenic indices by this plant seeds points to the potential of the seed to reduce cardiovascular disease risks. The significant ($p<0.05$) increase of cholesterol concentration at high percentages (20% and 30%) needs further investigation. It is well known that these indices are all independent and significant risk factors of cardiovascular diseases (Wilson et al., 1998).

In conclusion, ground seeds of *P. nitida* incorporated diets are suggested to possess a potential to reduce some lipid profiles which include triacylglycerol, low-density lipoprotein cholesterol, positive and negative atherogenic indices which in turn can reduce cardiovascular risks, in addition to their other numerous medicinal properties. Considering the availability of this plant and its seeds, its use is highly encouraged.

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