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# Effect of Consumption of *Irvigna gabonesis* and *Citrullus colocynthis* Seeds on the Lipid Profile and Liver Enzymes of Albino Rats

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**Abstract:** The effects of *Citrullus colocynthis* and *Irvigna gabonesis* seeds on the lipid profile and liver enzymes activities on Wister albino rats were carried out. The seeds were processed, dried and ground to reduce particle size. The flour was used to compound feed for the rats in different ratios. The investigation of the effect of these seeds on the lipid profile showed a decrease in triacylglycerol concentration in rats fed with various ratios of *Irvigna gabonesis.* There was an insignificant increase ($p>0.05$) in HDL-C with increase in the amount of seed flour. The total cholesterol and LDL-C increased significantly ($p<0.05$) in the groups fed with the seed flour of *Citrullus colocynthis.* The activity of transaminases (AST and ALT) increased significantly ($p<0.05$) in the groups fed with *Irvigna gabonesis* while there was a significant increase ($p<0.05$) only in the ALT of group fed with *Citrullus colocynthis.* The activity of AST did not show any significant difference ($p>0.05$). The activities of the liver enzymes indicated that the seeds were not hepatotoxic while the lipid profile suggests possible protective potentials against atherosclerosis and cardiovascular diseases.

**Key words:** Soup · Thickeners · Characterization · Fatty Acids · Vitamins · Phytochemicals · Enzymes · Lipids

## INTRODUCTION

Food is any substance, which contains nutrients, substances that promote growth, maintain and repair tissues, generate energy and regulate body processes when ingested, digested, absorbed and metabolized [1]. Eating is a mandatory pastime for humans and other animals since they require food to stay alive and to perform various body functions. Food materials are the products of agriculture and sources include mostly plant parts such as those derived from plant flowers (Seeds and fruits), cuttings, tubers, roots, shoots, stems and vegetables [2].

In the nutritional consideration of food and food substances, only a diet adequate in energy and nutritionally complete can form a secure basis for health necessary for the intellectual, cultural and ethical development in man. The seeds used as soup thickeners/condiments, which are popular, especially in the urban areas in the South-eastern parts of Nigeria are *Citrullus colocynthis* (Melon) and *Irvingia gabonnesis* (Bush mango). The soups are sometimes eaten in combination.

*Citrullus colocynthis* (English: melon; Igbo: egusi) is a creeping annual, belonging to the gourd family Ucurbtaceae [3]. It is a seed crop and popularly used to make soup in West Africa, both as condiment and as thickener. *Irvigna gabonesis* (English – bush mango; Igbo - ogbono) is a seed crop whose seeds have the ability to form gels even at lower concentration than many oil seed flours and this is why they are applied in food industry that require a thickening agent [4].

The essence of nutrition is to furnish the body with nutrients which it uses to build up complex molecules of life. The quality of biomolecules of life and the metabolic state of an organism depends on the quality of the material that provides the precursors of complex molecules. Thus it becomes very useful to assess the metabolic response of an individual after consumption. Metabolic responses and possible effects may be evaluated by assaying for parameters that are affected or whose concentrations or activities vary in response to exogenous materials fed into the systems. Such biochemical parameters include the electrolyte and lipid profiles and the activity of liver enzymes such as liver transaminases and alkaline phosphatase. The lipid profile

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is a group of tests that are often ordered together to determine risk of coronary heart disease. They are tests that have been shown to be good indicators of whether someone is likely to have a heart attack or stroke caused by blockage of blood vessels or hardening of the arteries (Atherosclerosis). The lipid profile typically includes total cholesterol, high density lipoprotein cholesterol (HDL-C) often called good cholesterol, low density lipoprotein (LDL-C) often called bad cholesterol and triglycerides (Tg) [5].

## MATERIAL AND METHODS

The samples used were fresh local indigenous seeds picked from Okposi autonomous community in Ohaozara Local Government Area, Ebonyi State, Nigeria. They were dried in an oven at $60^0$C for 48 hours and later milled with blender to reduce the particle size and increase the surface area. The test animals were male Wister albino rats that were at least eight (8) weeks old, which were arranged into three groups of four rats each. The first group served as the control, which were given only growers mash and allowed free access to water *ad libitum*. The remaining groups A and B were given formulated feed (Growers mash mixed with seed flour) in the ratios of 2:1 and 1:1 respectively.

**Lipid Profile:** Cholesterol was determined using Trinder [6] triglyceride was determined using Tietz [7] HDL-Cholesterol and low density lipoprotein were determined using Lopes–virella *et al.* [8].

**Liver Enzymes Activities:** Investigation of the activities of liver enzymes (The transaminases) and alkaline phosphatase were evaluated as indirect probe of the effects on the integrity of the liver using Reitman and Frankel Method Reitman and Frankel [9] by monitoring the concentration of pyruvate hydrazone formed with 2, 4-dinitrophenyl hydrazine. The aspartate transaminase activity was also determined using Reitman and Frankel Method (1957), by monitoring the concentration of oxaloacetate hydrazone formed with 2,4 dinitrophenyl hydrazine. The alkaline phosphatase activities were determined using an optimized standard method of Dentsche Gesellschaft fiir klinische chemie (1972).

## RESULTS AND DISCUSSION

The investigation of the effect of these seeds on the lipid profile showed a decrease in triacylglycerol concentration in rats fed with various ratios of *Irvigna gabonesis* when compared with the control as shown in table 1. The decrease is very important in control and management of cardiovascular diseases, high blood pressure, amnesia and stroke. However there was an increase in the triacylglycerol of rats fed with *Citrullus colocynthis*. There was an increase in the HDL and in the LDL-Cholesterol. The increase in the group fed with *Irvigna gabonesis* did not show any significant difference ($p$>0.05) in the levels of HDL, LDL and Triacyglycerol when compared with the control. High level of triacylglycerol and LDL indicates implies elevated amount of cholesterol in excess of the quantity needed for

Table 1: Lipid Profile of Rats Fed With Seed Flour of *Irvigna gabonesis* and *Citrullus colocynthis* Seeds

| | | Concentration (mg/dl) | |
|---|---|---|---|
| Parameters | Groups | Irvigna gabonesis | *Citrullus colocynthis* |
| Triglyceride | Control | 175.90±6.54 | 175.90±6.54 |
| | Feed:flour (Ratio 2:1) | 138.30±8.67 | 561.73±0.86 |
| | Feed:flour (ratio 1:1) | 140.95±6.94 | 325.70±8.53 |
| HDL-C | Control | 40.33±3.48 | 40.33±3.48 |
| | Feed:flour (Ratio 2:1) | 44.68±3.63 | 46.28±2.12 |
| | Feed:flour (ratio 1:1) | 49.28±3.21 | 52.20±5.83 |
| Total Cholesterol | Control | 236.78±8.42 | 236.78±4.71 |
| | Feed:flour (Ratio 2:1) | 260.58±8.77 | 514.45±5.26 |
| | Feed:flour (ratio 1:1) | 267.63±4.36 | 388.93±6.19 |
| LDL-C | Control | 196.45±4.12 | 196.45±4.12 |
| | Feed:flour (Ratio 2:1) | 215.90±5.43 | 468.17±4.62 |
| | Feed:flour (ratio 1:1) | 218.35±3.18 | 336.73±2.56 |

Table 2: Liver Enzyme Assay of Rats Fed With Seed Flour of *Irvigna Gabonesis* and *Citrullus Colocynthis* Seeds

| | Concentration in iU/L | | |
|---|---|---|---|
| Parameters | Groups | *Irvigna gabonesis* | *Citrullus colocynthis* |
| ALT (SGPT) | Control | 26.25±3.59 | 26.25±3.59 |
| | Group A | 55.50±3.50 | 85.38±2.56 |
| | Group B | 48.50±4.36 | 46.13±4.61 |
| AST(SGOT) | Control | 35.55±3.21 | 35.55±3.21 |
| | Group A | 65.50±2.85 | 21.25±2.40 |
| | Group B | 81.13±5.90 | 41.50±3.69 |
| ALP | Control | 934.26±8.67 | 934.26±8.67 |
| | Group A | 575.46±22.76 | 550.45±32.20 |
| | Group B | 163.53±10.55 | 325.08±13.82 |

the synthesis of membranes, bile salts and steroids and may lead to pathological accumulation and deposit of cholesterol in blood vessels (Atherosclerotic plagues) which results in obstruction of blood vessels. This is one of the major causes of high blood pressure, stroke and death [10].

Table 2 showed there was a significant increase ($p<0.05$) in the activity of transaminases (AST and ALT) in the groups fed with *Irvigna gabonesis* whereas there was a significant increase ($p<0.05$) only in the ALT of group fed with *Citrullus colocynthis* while the AST did not show any significant difference ($p>0.05$). Generally, there was a significant decrease in the activity of alkaline phosphates (ALP) in all the groups when compared with the control.

ALT is usually present in high concentrations in the liver and to a less extent, in skeletal muscles, kidney and heart. Causes of increased levels include circulatory failure with shock and hypoxia, cirrhosis, liver congestion, cholestatic jaundice and surgery or extensive trauma and skeletal muscle disease [11, 12].

AST is present in high concentration in the cells of cardiac and skeletal muscles, liver, kidney and erythrocytes. Damage to any of these tissues may increase plasma AST levels. Causes of increased level or activity include release from erythrocytes in hemolysis, myocardial infarction, acute viral or toxic hepatitis, cirrhosis, cholestatic jaundice, malignant infiltration of the kidney and skeletal muscle disease [13-16].

ALP functions by splitting off phosphoric acid from organic compounds at high pH. The primary importance of measuring ALP is to check the possibility of bone, heart and liver damage. The mucosal cells that line up the bile system of the liver are the sources of ALP. The free flow of bile through the liver and down to the biliary tract and gall bladder are responsible for maintaining proper level of this enzyme in the blood. When the liver, bile duct or gall bladder systems are not functioning properly or are blocked, this enzyme is not excreted through the bile and ALP is released into the blood. Thus, assay of the serum or tissue ALP activity is a measure of the integrity of the hepatobiliary system and the flow of bile into small intestine. Causes of increased activity are: bone disease such as rickets, liver disease and malignancy - of bone or liver involvement or direct tumor production Burtis and [6, 13, 16].

## CONCLUSION

The activities of the liver enzymes indicated that the seeds were not hepatotoxic. The activity of alkaline phosphate decreased significantly ($p>0.05$) in all the groups, which was an indication that there was free flow of bile through the liver, bile duct and gall bladder systems. Increased level is normally due to the blockage or non-functional state in these systems and diseases such as rickets, liver disease and malignancy of bone or liver involvement or direct tumor production.

There was a general significant increase in the level of LDL and triacyglycerol in the groups fed with *Citrullus colocynthis.* Elevated levels of plasma triacylglycerol and reduced concentration of HDL cholesterol have been strongly associated with the appearance of small dense LDL particles. This may not be recommended to be taken frequently due to predisposition to atherosclerosis and cardiovascular diseases.

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