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Effect of Ethanol Leaf-Extract of *Psidium guajava* on Lipid Profile

[1]C.E. Offor, [1]J.A. Okoro, [1]U.A. Ibiam and [2]S.C.O. Nwangwu

[1]Department of Biochemistry, Ebonyi State University, Abakaliki, Nigeria
[2]Department of Biochemistry, School of Basic Medical Sciences,
Igbinedion University, Okada, Edo State, Nigeria

Abstract: The effect of ethanol extract of *Psidium guajava* leaves on lipid profile was investigated in albino rats using spectrophotometric methods. Twenty albino rats were grouped into four (A, B, C and D) containing five rats each. The animals in groups A, B, C and D were administered the leaf-extract through oral intubation for two weeks at the doses (mg/kg) of 200, 400, 600 and 0 respectively. Blood samples were collected on the 15th day following the last day of administration. The Total cholesterol concentrations (TC) recorded 222.50 ±0.65, 218.50 ± 0.56, 200.75 ± 0.48 and 238.25 ± 0.73 for the animals in groups A, B, C and D respectively with corresponding concentrations of Triacylglycerol as 182.50 ± 0.65, 175.00 ± 0.41, 170.00 ± 0.41 and 188.33 ± 0.69. The High Density Lipoprotein (HDL) concentrations recorded 50.00 ± 0.44, 51.75 ± 0.33, 53.00 ± 0.34 and 42.50 ± 0.29 with corresponding concentrations of Low Density Lipoprotein (LDL) as 118.00 ± 0.57, 115.75 ± 0.43, 113.00 ± 0.38 and 131.75 ± 0.75. The investigation revealed that the extract significantly ($P<0.05$) and dose-dependently decreased serum Total Cholesterol (TC), Triacylglycerol (TAG) and Low Density Lipoprotein (LDL) concentrations, while it significantly ($P<0.05$) increased the High Density Lipoprotein (HDL) concentrations.

Key words: Leaf-extract · *Psidium guajava* and lipid profile

INTRODUCTION

Studies have demonstrated that the consumption of a diet rich in fruits, vegetables, seeds and whole foods contributes to diminish the risk factors associated with chronic disorders such as insulin resistance, high blood pressure and dyslipidemia [1-6]. Vegetables not only provide important components such as ascorbic acid, β-carotene and folic acid that play basic roles in the organism, but are also sources of bioactive compounds that are directly associated with the prevention of disorders such as diabetes and cardiovascular diseases [7-8].

Psidium guajava, popularly known as guava, belongs to the family *myrtaceae* and has been used traditionally as a medicinal plant. Its leaves are used routinely in many countries to treat respiratory and gastro-intestinal disorders and as an antispasmodic and anti-inflammatory remedy [9-13].

The lipid profile is a group of tests to determine risk of coronary heart diseases. The tests that make up lipid profile 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 (hardening of the arteries). The lipid profile includes Total cholesterol, triacylglycerols, High Density Lipoprotein cholesterol (often called good cholesterol) and Low Density Lipoprotein cholesterol (often called bad cholesterol) [7-8]. Eating food rich in saturated fats increases LDL levels, but vegetables and fruits lower the risk of heart diseases [14-18].

Cholesterol is an important component in the membrane and a constituent of bile acids, which are essential for the utilization and absorption of the fat-soluble vitamins (A, D, E and K). Insufficient cholesterol from diet is made by its synthesis in the liver and cells of small intestine [16]. Most of the cholesterols in the blood are present as esters while most of them in the cells and tissues are in free form. Fat deposits containing mostly cholesterol in the course of transportation accumulates leading to a disease known as arteriosclerosis [2]. The deposits harden and enlarge to

Corresponding Author: C.E. Offor, Department of Biochemistry, Ebonyi State University, Abakaliki, Nigeria.

form plaques, gradually narrowing the artery and restricting blood flow and as such cause formation of blood clot in the arteries, then starving the heart of oxygen which will cause heart attack, while starving the brain of oxygen will cause stroke [19-20].

Triacylglycerols are the chemical form in which most fats exist in food as well as in the body. They are also present in the blood plasma and in association with cholesterol, form the plasma lipids. Triacylglycerols in plasma are derived from other energy sources like carbohydrate whereas calories injected in a meal and not used immediately by tissues are converted to triacylglycerols and transported to fat cells to be stored. Hormones also regulate the release of triacylglycerols from fat tissues so they meet the body's needs for energy. Triacylglycerols provide stored energy for cellular functions [12].

High Density Lipoprotein (HDL) collects cholesterol from the tissues and brings it back to the liver. It is sometimes referred to as the "good cholesterol" lipoprotein. High-density lipoprotein cholesterol is good cholesterol because high levels of HDL seem to protect against heart attack. Low levels of HDL (less than 40mg/dl) also increase the risk of heart attack. Medical experts think that HDL tends to carry cholesterol away from the arteries and back to the liver, thus slowing its building in the arteries [16].

Low Density Lipoprotein (LDL) carries cholesterol from the liver to cells of the body. It is sometimes referred to as the "bad cholesterol" lipoprotein [5]. Very Low Density Lipoprotein (VLDL) carries newly synthesized triacylglycerol from the liver to adipose tissue. VLDL is a lipoprotein subclass. It is assembled in the liver from cholesterol and apolipoproteins. It is converted in the blood stream to Low Density Lipoprotein (LDL). VLDL particles have a diameter of 30-33nm. VLDL transports endogenous products [9].

One of the main risk factors for non-transmissible chronic diseases is a diet of inadequate composition, allied to the lack of physical activity and other life style related factors such as the case of tobacco and alcohol. The incidence of chronic disorders such as obesity, diabetes, cardiovascular disease and metabolic syndrome has increased visibly, impairing the quality of life and increasing spending on medications and other public health interventions [10]. This research was aimed at investigating the effect of ethanol extract of *Psidium guajava* leaves on the lipid profile of albino rats.

MATERIALS AND METHODS

Materials: Twenty albino rats were obtained from University of Nigeria Nsukka (UNN). Fresh leaves of *Psidium guajava* were obtained from Abakaliki, Ebonyi State, Nigeria.

Methods

Extraction of Plant Material: 500g of dry and ground *Psidium guajava* leaves was soaked in 1000mls of ethanol in a container such that the ethanol would cover the sample. It was left standing for about 24 h. The solution was squeezed and filtered with a muslin cloth and the filtrate was poured into an evaporation dish. It was then exposed to air and mild heat of the sun until a semi-solid extract was gotten.

Administration of Plant Extract to Animals: The albino rats in groups A, B, C and D (containing five rats in each group) were administered with the extract by oral intubation at the doses of 200mg/kg, 400mg/kg, 600mg/kg and 0mg/kg (Control) of body weights respectively twice daily for fourteen days.

Collection of Blood Sample for Analysis: The blood samples were collected through heart puncture into labelled tubes.

Determination of Lipid Profile: The spectrophotometric methods of Allain and Roschlaw (1979), Quinica (1978) and Brusten *et al.*, (1980) were used for the quantitative determinations of serum total cholesterol, triacylglycerol and HDL cholesterol levels respectively. LDL Cholesterol levels were determined by the method of Friedewald *et al.,* (1972).

Data Analysis: All the tested parameters were subjected to statistical analysis using T-test. Differences between means were regarded significant at $P<0.05$ (Oyeka, 1996).

RESULTS AND DISCUSSION

The ethanol extract of *Psidium guajava* leaves significantly ($p<0.05$) decreased the Total cholesterol and triacylglycerol concentrations as shown in Figs. 1 & 2. Siegel *et al.*, (2010) [19] reported that disorders indicate that excessive consumption of foods high in fat including liquid and sterols increase the risk of developing arterial diseases.

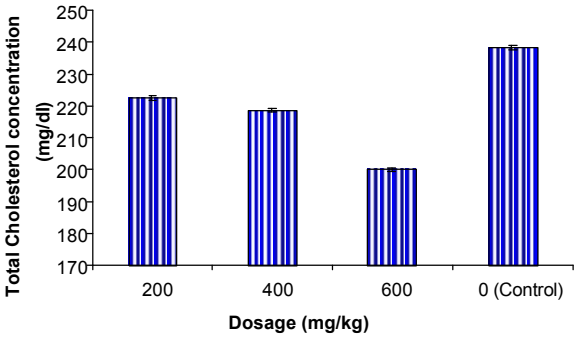

Fig. 1: Serum Total cholesterol (TC) concentration (mg/dl)

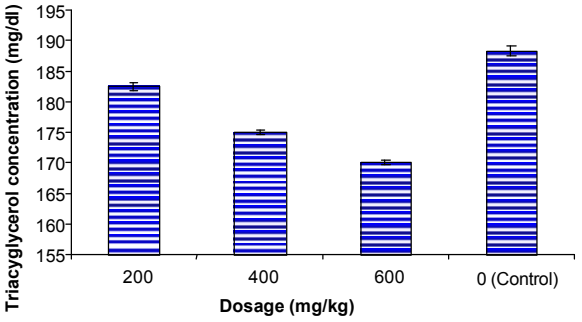

Fig. 2: Serum Triacylglycerol concentration (mg/dl)

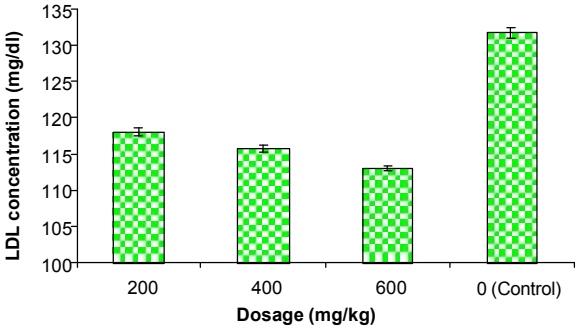

Fig. 3: Serum LDL concentration (mg/dl)

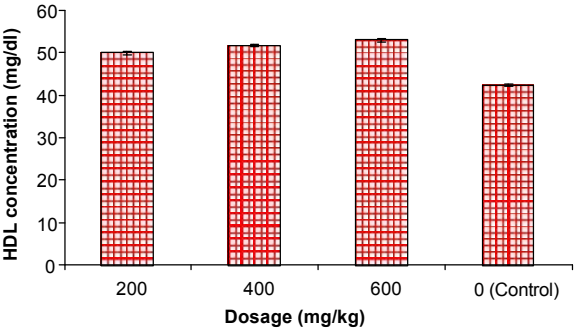

Fig. 4: Serum HDL concentration (mg/dl)

There were also significant ($p<0.05$) dose-dependent elevations in the concentrations of High Density Lipoprotein (HDL) (Fig. 3). Robert (2010) [17] reported a significant increase in the level of High Density Lipoprotein (HDL) in the presence of ethanol extract of guava leaves and is good cholesterol because it seems to protect against heart attack. Charles *et al*., (2011) [4] reported that when the level of Low Density Lipoprotein is high in relation to the High Density Lipoprotein, there is a high risk of coronary diseases.

The Low Density Lipoprotein (LDL) concentrations decreased significantly ($p<0.05$) and also dose-dependently in the groups administered with the ethanol leaf-extract of *Psidium guajava* (Fig. 4). Smart and Wolfaine (2010) [20] reported that LDL has an increased risk for heart disease or stroke when it is high.

In conclusion, the administration of *Psidium guajava* ethanol leaf- extract affected the lipids by decreasing the concentrations of triacylglycerols, Total cholesterol (TC) and Low Density Lipoprotein (LDL) and increasing the concentration of High Density Lipoprotein (HDL). These results, therefore strongly, suggest that *Psidium guajava* ethanol leaf- extract could be cardio-protective.

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