ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 4, Issue 4, pp: (50-54), Month: October - December 2016, Available at: www.researchpublish.com

The Hypolipidemic Effect of *Citrullus Colocynthis* Diet on the Lipid Profile of *Wistar* Rats

[1]Akinleye, Waheed A., [2]Ilesanmi, Ayodele O., [3]Oni, Odunayo

Department of Medical Laboratory Science, Babcock University, Ilishan-Remo. Nigeria

Abstract: **Most southern Nigerian diets are laced with fat, spurring anxiety of diet-induced hyperlipidaemia. Recently, there have been a number of studies involving commonly consumed oily products, to determine the cause and effect of hyperlipidaemia on the population. In the current study, we examined the effect of *egusi* melon consumption on the serum lipid profile of *Wistar* rats, comparing results obtained with those of rats fed on normal mouse feed pellets. The dehulled seeds of *Citrullus colocynthis* L. obtained from the local market were ground into powder form and mixed with the normal commercial feed ration for subsequent administration to ten rats for four weeks. Another group of ten rats, serving as control were administered with the commercial feed ration only. Results show significantly lowered values of Total Cholesterol, Triglyceride, HDL-Chol and LDL-Chol for rats fed with the extract of *C. colocynthis*. The mean TC, TG, HDL and LDL values [113.0 ± 1.4 mg/dl, 74.7 ± 2.1 mg/dl, 49.4 ± 1.1 mg/dl and 48.7 ± 2.9 mg/dl] were obtained respectively for rats fed with the melon and normal ration admixture, compared to animals fed on normal commercial feed pellet only (140.4 ±0.88 mg/dl; 85.64 ± 0.94 mg/dl; 69.56 ± 1.31 mg/dl; 53.71 ± 0.91mg/dl respectively). This study confirms recent findings that show that melon diet induces a hypolipidaemic effect.**

Keywords: **diet, melon, lipids, heart, rats, serum.**

1. INTRODUCTION

Citrullus colocynthis L., known locally as *egusi* across most parts of Nigeria is a species belonging to the genus *Citrullus* of the Cucurbitaceae family; which usually consists of a large number of varieties with great genetic diversity (Abbah *et al*., 2015) and are also generally known as melons. *Egusi* (*Citrullus colocynthis L.*) as it is called locally, is among the 300 species of melon found in tropical Africa and it is cultivated for its seeds, which have been reported to be rich in oil and protein (Giwa *et al.*, 2010). The greyish white seeds grow in gourds that emanate from the creeping herbaceous plants, cultivated annually in the tropics mainly because of the seeds. The tropical species may have as much as 28% protein and 35% fat. Various studies have reported predominantly high linoleic fatty acid content in these melon seed oils. Due to the very high unsaturated fatty acid composition of its oil (Abbah *et al*., 2015), it has been reported to have similarities to safflower (Yaniv *et al*., 1999), corn, cotton-seed, sunflower, soybean and sesame oil (Oluba *et al*., 2008). Other members of the Cucurbitae family with similar characteristics include *Cucumis melo* (cantaloupe) and *Momordica charantia* (bitter gourd). In recent times, more of its phyto-medicinal properties are being discovered.

Being a very common condiment of soups made by a large number of Nigerian families, concern for its effect on the lipid profile of persons consuming it has been heightened in recent times following increased mortalities caused by cardiovascular diseases among several prominent Nigerians. There is a school of thought linking the increased mortality due to cardiovascular diseases on the local diet pattern which essentially is made up of starchy staples and oily soups. This study was therefore initiated to investigate *egusi*'s effect on the serum lipid profile, with rats serving as animal models.

ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 4, Issue 4, pp: (50-54), Month: October - December 2016, Available at: www.researchpublish.com

2. MATERIALS AND METHODS

The dehulled seeds of *Colocynthis citrullus* L. as confirmed by a taxonomist at the OOU, Ago-Iwoye were obtained from a local market in Sagamu, in the dried state and ground into powder for subsequent administration to a select group of *Wistar* rats. There was no need to process the seeds to the liquid oil phase since it is the ground form of the seed that is generally taken in diet, albeit after it has been cooked.

Twenty male and female adult albino (*Wistar*) rats (4 weeks old) weighing between170g and 210g were obtained from the breed of the animal house of the Physiology department, Babcock University, Ilishan. They were kept in individual cages under standard environmental conditions and fed with feed pellets obtained from Babcock Feeds Ltd. and with tap water. They were acclimatized for 3 weeks on normal diet of pelletized mouse dice and water, at ambient room temperature and with a 12-hr light and dark cycle before the commencement of the experiment.

The animals were distributed by weight into 2 groups (A and B) with a population of ten rats in each group. Group A represents the group of rats eating the normal commercial ration with ground melon added. Group B represents the group of rats feeding on the normal commercial ration alone. The admixture of the rations for the former group was as follows: melon and commercial feed formula (pellets) - 1: 2 proportions by weight respectively.

Twenty-four hours prior to the commencement of the experiment, the animals were deprived of food but only provided with tap water. Thereafter, the first group of animals were administered with the ground melon seed/feed admixture while the others were fed with only the normal ration of animal pellets. The experimental diets were given for four weeks before sample collection and analysis.

Sample collection:

The rats were sacrificed by cervical dislocation and the blood sample was collected via cardiac puncture. 5mls of blood was collected into plain tubes for each of the animal; allowed to clot for serum extraction before analysis was carried out. Spectrophotorimetric analysis proceeded immediately after sera were separated from blood samples.

Analytical Methods:

Lipid profile estimation was carried out using the techniques of Friedewald *et al*., (1972), with the modifications given by Bachorik *et al*., (1996) and Rifai *et al*., (2000). Briefly, serum was separated from whole blood. Thereafter, the serum Triglyceride, HDL fractions and the Total Cholesterol were analyzed spectrophotometrically after appropriate incubation with test reagents. Values were obtained by calculation, using absorbance readings of test compared to that obtained with the standard. LDL values were then calculated from the aforementioned parameters.

3. RESULTS

The number of subject samples analysed was 20. The summary after analysing with the SPSS (statistical package) 2.0 version was represented using tables and graphs. The paired *t* test was employed in comparing the mean of the two groups. A *p* -value of less than or equal to 0.05 was considered statistically significant. The result as displayed in Figure 1 reveals the general effect of the melon diet on the different serum lipid fractions, showing first the effect of the melon on the serum total cholesterol of the rats.

Table1 shows the effect of the melon diet on the total serum cholesterol of the rats. The result displayed a significant difference in which the mean total serum cholesterol of group B rats i.e. rats fed with ordinary ration (140.40 ± 0.88 mg/dl), was significantly higher than that of group A rats i.e. rats fed with melon and feed pellets (113.00 ± 1.00), [t =113.00, p < 0.05 (0.006)].

Table 1. Effect of melon diet on the lipid profile of *wistar* rats

Lipid profile	Group of rats	N	Mean ± SEM	t-value,	p-value
Total cholesterol	A	10	113.00 ± 1.00	t = 113.00,	p < 0.05 (0.006)
	B	10	140.40 ± 0.88		
Triglyceride	A	10	74.7±1.45	t = 51.48,	p < 0.05 (0.012)
	B	10	85.64±0.94		
HDL	A	10	49.35±0.75	t = 65.80,	p < 0.05 (0.010)
	B	10	69.56±1.31		
LDL	A	10	48.72±2.04	t = 23.88,	p < 0.05 (0.027)
	B	10	53.71±0.91		

ISSN 2348-313X (Print)
International Journal of Life Sciences Research ISSN 2348-3148 (online)
Vol. 4, Issue 4, pp: (50-54), Month: October - December 2016, Available at: www.researchpublish.com

Keys:

A. Rats placed on normal diet and melon

B. Rats placed on normal diet only

The total serum triglyceride results, in similar manner, showed a significant difference in which the mean total serum triglyceride of group B rats i.e. rats fed with ordinary ration (85.64 ± 0.94 mg/dl), was significantly higher than that of group A rats i.e. rats fed with melon (74.65 ± 1.45), [t =51.48, p < 0.05 (0.012)]. Next is the effect of the melon on the total serum high density lipoprotein (HDL) of the rats. The results here show significant difference in the mean total serum HDL of group B rats i.e. rats fed with ordinary ration (69.56 ± 1.31 mg/dl), as compared to that of group A rats i.e. rats fed with melon (49.35 ± 0.75), [t =65.80, p < 0.05 (0.010)].

There was also a significant difference between the mean total serum low density lipoprotein (LDL) of group B rats i.e. rats fed with ordinary ration (53.71 ± 0.91 mg/dl), and that of group A rats i.e. rats fed with melon (48.72 ± 2.04), [t = 23.88, p < 0.05 (0.027)].

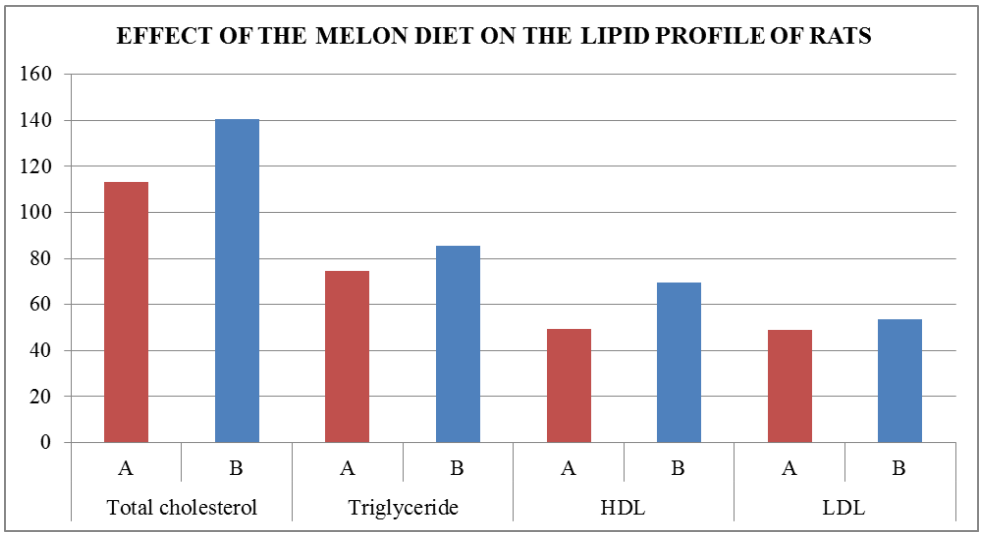

Fig. 1 Effect of melon diet on the lipid profile of rats

KEYS:

A. Rats placed on normal diet and melon

B. Rats placed on normal diet

4. DISCUSSION

Egusi, the seed product of the plant, *Citrullus colocynthis* is a soup ingredient widely consumed in southern Nigeria and other parts of West Africa. Being an oily-rich, plant-based product, there is a general concern that its consumption could lead to raised levels of cholesterol and its fractions in the serum. To allay this fear, empirical data was required. This study was carried out to assess the lipid profile of rats fed with melon seed, *Citrullus colocynthis*, locally known as *egusi*. The tests that make up the lipid profile for which assays were carried out in this study include: Total cholesterol (TC), Triglyceride (TG), High Density Lipoprotein (HDL) and Low Density Lipoprotein (LDL). The mean TC, TG, HDL and LDL values [113.0 ± 1.4 mg/dl, 74.7 ± 2.1 mg/dl, 49.4 ± 1.1 mg/dl and 48.7 ± 2.9 mg/dl] of the control rats (i.e. rats placed on normal diet alone) respectively were above the reference range [TC: 113.9 ±2.18, TG: 76.13±2.38, HDL: 49.14±1.05, LDL: 49.64±1.82] reported by Ihedioha *et al.*, (2011).

There was a general decrease in the mean values in the lipid profile of rats fed on the melon ration as compared to those fed on normal (ordinary) ration. According to Giwa *et al.*, (2010), melon is believed to be rich in oil, although Ajibola *et al.*, (1990) suggested that the oil present in melon is high in unsaturated fatty acid and linoleic acid. Girgis and Said (1968) had suggested a possible hypocholesteronic effect. Oluba *et al.*, (2011) also found *egusi* to have hypolipidemic effect on experimental animals. The results from this study show a decrease in the level of lipid profile (serum total cholesterol, triglyceride, HDL and LDL) of rats fed with melon ($p < 0.05$) when compared with the rats fed with the

normal diet. These results thereby agree with the suggestions made by Ajibola *et al.*, (1990) and Oluba *et al*., (2011) that melon is possibly hypocholesteronic. It is pertinent to mention that in our own study, we did not extract the oil as Oluba *et al*., (2011) did. This deliberate action was intended to mimic the real situation since the whole seed is usually consumed after grinding and cooking in most homes.

Hypercholesterolaemia is a public health concern all over the world, as it is one of the risk factors for heart diseases. Cardiovascular diseases which hitherto were of low incidence in developing countries of sub-Saharan Africa have recently become more established causes of death and disability. It is estimated that CVDs account for a third of all deaths worldwide (Nascimento *et al*., 2014). Heart diseases include heart failure, high blood pressure, stroke and coronary heart disease. Therapeutic strategies to control hyperlipidaemia have hitherto focused on regulating the amount of dietary fat intake since this is the most effective strategy to reduce cardiovascular risks to date.

Results from this study show decrease in serum lipid levels across board for rats fed on *egusi* diet. That *egusi* has a hypolipidaemic effect is to be expected, being constituted majorly of unsaturated fatty acids. *Egusi* melon is known to contain a rich amount of linoleic acid (Ajibola *et al.*, 1990), an unsaturated acid found to have a protective effect against coronary heart disease (CHD) (Abbah *et al*., 2015). Unsaturated fatty acids have the tendency to significantly reduce total cholesterol levels in the body. Delvin (2006) had even suggested that to decrease cholesterol levels, a higher ratio of polyunsaturated fatty acids to saturated fatty acids in the diet must be targeted. In this regard, the consumption of *egusi* melon in the diet is a step in the right direction. The British Heart Foundation states that consumption of plant sterols and stanols is capable of helping to lower LDL cholesterol by as much as 15% when 2g of same is taken as part of a healthy balanced diet. *Egusi* is a plant-based soup condiment that is often consumed together with vegetables, a rich combination that is capable of warding off reactive oxygen species (ROS). *Egusi* melon has been shown to have anti-oxidant properties by conferring protection against lipid peroxides (Oluba *et al*., 2011). In addition, it also has inhibitory activity against lecithin: cholesterol acyltransferase activity (Ojieh *et al*., 2010) and this has been said to account for its hypolipidaemic effect.

The reason for the contrasting observations in previous studies may be as a result of genetic variation among the wide varieties of melons, since there are about 300 species of melon found in tropical Africa (Giwa *et al.*, 2010). There is therefore a need to identify those species, if any, which may have a hyperlipidemic effect on mammals.

5. CONCLUSION

We have found that *Citrullus colocynthis* seeds taken in diet have the propensity to lower the body lipid level in animals and hereby suggest human studies involving a large population be further undertaken so as to validate the findings in this study.

ACKNOWLEDGEMENT

We want to sincerely thank the staff of the Animal House, Babcock University, Ilishan-Remo for their co-operation throughout the period of this study.

REFERENCES

[1] Abbah OC, Musa AD, Ejembi D, Omale J, Sanni M, Olajide JE and Ojogbane BE. (2015) Medicinal uses of Egusi melon (*Citrullus colocynthis*) *Int J Curr Res Biosc Plant Biol* 2(7): 185-191

[2] Ajibola OO, Eniyemo SE, Fasina OO, Adeeko KA (1990). Mechanical expression of oil from melon seeds. *J Agric Engr Res* 45: 45-53.

[3] Bachorik PS, Rifkind BM, Kwiterovich PO (1996). Lipids and dyslipoproteinaemia. In: Henry JB *ed.* Clinical Diagnosis and Management by Laboratory Methods Vol. 19th ed., Philadelphia: WB Saunders pp 208-236

[4] www.bhf.org.uk/.../risk-factors. Accessed 10th July, 2016

[5] Deacon AC and Dawson PJ (1979). Enzymatic assay of Total Cholesterol involving chemical or enzymatic hydrolysis – a comparison of methods. *Clin Chem;* 25: 976-984

[6] Delvin T (2006) Textbook of Biochemistry with Clinical correlation 6th ed, Wiley-Liss, Hoboken.

[7] Friedewald WT, Levy RI and Fredrickson DS (1972). Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge *J Clin Chem* 18: 499-502

[8] Girgis P and Said F (1968). Lesser known Nigerian edible oils and fats: characteristics of melon seed oil. *J Sci Food Agric*; 19: 615-616.

[9] Giwa S, Abdullah LC and Adam NM (2010). Investigating "Egusi" (*Citrullus* colocynthis) seed oil as potential biodiesel feedstock. *Energies;* 3: 607–618

[10] Ihedioha JI, Noel-Uneke OA and Ihedioha TE (2011). Reference values for the serum lipid profile of albino rats (*Rattus norvegicus*) of varied ages and sexes; *Comp Clin Path.* 22: 93-99

[11] Nascimento BR, Brant LCC, Moraes DN and Ribeiro ALP (2014) Global health and cardiovascular disease. *Heart* 100: 1743-1749; doi: 10.1136/heartjnl-2014-306026.

[12] Ojieh, GC, Eidangbe GO, Oluba OM (2010) Effect of Egusi melon oil on lecithin: cholesterol acyltransferase activity in rats fed a cholesterol diet. *Afr J Biochem Res* 4(1): 1-5

[13] Oluba, OM, Adeyemi O., Ojieh G.C., Adebisi KE., Isiosio IO., and Aboluwoye CO (2008). Fatty acid composition of *Citrullus lanatus* and its effect on serum lipid. *International Journal of Cardiovascular Research*. 5:2.

[14] Oluba OM, Eidangbe GO, Ojieh GC, Idonije BO (2011) Palm and Egusi melon oils lower serum and liver lipid profile and improve anti-oxidant activity in rats fed a high fat diet. *Int J Med Sci* 3(2):47-51

[15] Rifai N, Dominiczak M, Warnick GR *eds.* (2000) Handbook of lipoprotein testing 2nd ed. AACC Press, Washington.

[16] Yaniv Z, Shabelsky E, and Schafferman D. (1999) Colocynth: Potential arid land oilseed from an ancient cucurbit; In *Perspectives on New Crops and New Uses*, 1st Edition; ASHS Press, Alexandria, USA; pp 257-261