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# EFFECT OF LEAVES OF *IPOMOEA BATATAS*, (L) LAM, *TELFAIRIA OCCIDENTALIS*, HOOK .F. AND *JATROPHA TANJORENSIS*, L. ON PLASMA AND TISSUES LIPID PROFILE OF WEANLING ALBINO RATS

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## ABSTRACT

The effect of feeding rats for four weeks on diet supplemented with fresh leaves of *Ipomoea batatas*, *Telfairia occidentalis* and *Jatropha tanjorensis* on body weight, blood and tissue lipid profile has been examined. Lipid analysis were carried out by kits supplied by Randox Laboratories. Phytochemical analysis were carried out on these vegetables. Significant ($p< 0.05$) weight gain were observed in both control rats (51.2 ± 9.2g) and test rats (47.7 ± 5.3g, 42.8 ± 5.4g and 30.5 ± 6.2g for rats fed *I. batatas, T. occidentalis and J. tanjorensis* respectively). Plasma cholesterol level of control rats was 137.7 ± 5.90mg / dl as against 111.0 ± 9.18mg/ dl (*T. occidentalis* group), 94.33 ± 0.88mg / dl (*J. tanjorensis* group) and 78.33 ± 4.73mg/dl (*I batatas* group). For kidney cholesterol level, control rats was, 68.67 ± 2.17mg/dl as against 49.00 ± 4.27mg/dl, 41.67 ± 3.17mg/dl an 37.00 ± 2.43mg/dl in rats fed *T. occidentalis, J. tanjorensis* and *I. batatas* supplemented diet respectively. Liver cholesterol, 83.80 ± 4.75mg/d (control rats) as against 63.00 ± 3.40mg/dl (*T. occidentalis group*), 52.67 ± 1.59 (*J. tanjorensis* group) and 67.33 ± 3.90mg/dl (*I. batatas* group). Heart cholesterol level, 69.30 ± 0.76mg/dl (control rats) as against 45.33 ± 3.91 mg/dl (*T occidentalis group*). 42.67 ± 2.65mg/dl (*J tanjorensis* group), 48.00 ± 3.68mg/dl (*I batatas* group). Plasma LDL –Cholesterol levels of control rats was 101.93 ± 4. 19mg/ dl as against 72.87 ± 7.52mg/ dl, 48.53 ± 1.00mg/dl, 36.00 ± 1.06mg/dl, in rats fed *T. occidentalis, J. tanjorensis and I. batatas* supplemented diet respectively. These results indicates a significantly ($p< 0.05$) reduced level of tissue and plasma total cholesterol and LDL –cholesterol levels. Plasma HDL –cholesterol of test rats were significantly higher than those of control rats (31.67 ± 1.76mg/dl as against 34.67 ± 1.19mg /dl, 41.67 ± 1.20mg/dl, 38.67 ± 3.34mg/dl in rats fed *T. occidentalis, tanjorensis and I. batatas* respectively. These results indicate that these vegetables are hypocholesterolemic and so does not increase the risk of cardiovascular disease incidence.


**KEYWORDS:** Cholesterol, Plasma, Liver, Heart, Kidney.

## INTRODUCTION

Dietary components have been shown to have measurable effects on blood components [Eggum 1970, Ker et al., 1982, Babatunde et al., 1987, Iyayi and Tewe, 1998] Church et al, [1984] also reported the importance of blood chemistry profiles in relation to nutrient uptake.

Emenalom et al, 2004. Observed an elevated serum cholesterol level on feeding pigs with *Mucuna pruriens* seed diets, however, Omoregie (2005) reported a reduced plasma lipid profile in normal rats fed *T. occidentialis* and *J. tanjorensis* supplemented diet. Emenalom et al, (2004), also studied internal organ characteristics of pigs fed on raw and cooked mucuna seeds and reported tissue damage among pigs receiving higher levels of preheated seeds.

*Ipomoea batatas* (sweet potatoes) belong to the family, convolvulaceae. It is common to the American tropics and has been introduced and cultivated in many tropical and subtropical countries (Hug et al, 1983).

Fluted pumpkin (*Telfairia occidentalis*). Is a vein crop of West Africa belonging to the family curcurbitaceae. It is mainly cultivated for its leaves and seeds (Baker and Baker, 1973).

*Jatropha tanjorensis* (Hospital-too-far) belong to the family, Euphorbiaceae. It is commonly found in West Africa and some parts of Europe. (Odebiyi, 1980). *Telfairia occidentalis, Ipomoea batatas* and *Jatropha Tanjorensis* are common vegetables with medicinal and nutritive values.

This study is aimed at determining the effect of these vegetable supplements on blood and tissues lipid profile in rats.

## MATERIALS AND METHODS

### EXPERIMENTAL ANIMALS AND MATERIALS

Twelve weanling albino rats (Wistar Strain), aged between 5 and 6 weeks old were purchased from the animal unit of the department of Microbiology, University of Benin.

They were acclimatized for 1 week on growers mash (Bendel feed and flour mills, Ewu, Nigeria) and water, *ad libitum.* Growers mash consists of crude protein, 14.5%, crude fat, 4.8%, crude fibre 7.2%, crude ash 8%, calcium 0.8%, phosphorus 0.62%, lysine 0.6%, methionine 0. 29%, vitamin E 15mg vitamin B2, 4mg, vitamin C, 50mg, manganese, 30mg, zinc 30mg and sodium, 0.15%.

### PREPARATION OF LEAF SUPPLEMENTS

Fresh leaves of *Telfaira occidentals, Ipomoea batatas* and *Jatropha tanjorensis* were collected from a farm located at Technical Road, Benin City. The leaves were sliced fresh and throughly mixed with growers mash.

### FEEDING TREATMENT OF ANIMALS AND COLLECTION OF SAMPLES.

The rats were divided into four experimental groups of 3 rats each. Group 1 was fed the control diet (growers mash only), group 2 was maintained on growers mash and fresh sliced leaves of *T. occidentalis,* group 3 on growers mash and *J. tanjorensis* while group 4 was maintained on grower mash and *I. batatas* leaves in a 9: 1 ratio accordingly. The rats were maintained on the respective diet and water ad libitum for 4 weeks. They were weighed weekly, and sacrificed after 4 weeks and fasting blood samples collected from the animal heart and blood vessels with or without anticoagulnt.

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The heart, kidney and liver of the sacrificed experimental rats were isolated and weighed, 1g of tissue sample was homogenise at room temperature using chloroform/methanol mixture (2: 1v/v). The organic phase was collected and evaporated to dryness in a steam bath, after which they were stored.

**PHYTOCHEMICAL ANALYSIS**

Simple chemical tests were performed on dried powder leaves of *I. batatas, T. occidentalis* and *J. tanjorensis* to detect the presence of alkaloids, and saponins using the method of Harbourne, (1973) while the method of Evans (1989) was used for tannins and flavonoids analysis. Preparation of plant extract for phytochemical analysis was done by the method of Sofowora (1993).

**BIOCHEMICAL ASSAY PLASMA LIPIDS AND TISSUE LIPIDS**

Serum triacylglycerol, total cholesterol and HDL-cholesterol levels were determined by an enzymatic method using kit supplied by Randox Laboratories Limited, Crumlin, Co, Anthrix, U.K. VLDL- cholesterol was estimated using the Friedewald equation (Friedewald et al, 1972)and LDL was determined using the formula.

HDL-cholesterol = Total cholesterol – (VLDL + LDL- chol).

**STATISTICAL ANALYSIS**

Mean levels and standard deviations of all the parameters were calculated and the data was expressed as mean ± S.D. Data was analysed by means of the one-way analysis of variance and least significant differences tests were used to check the significant differences between various parameters of experimental designs.

**RESULTS**

**Table I:** Weight gain of rats fed for 4 weeks on supplemented and control diets

| GROUP | WEIGHT GAIN (g) |
|---|---|
| 1. Control | 51.2 ± 9.2 |
| 2. *Ipomoea batatas* | 47.7 ± 5.3 |
| 3. *Telfairia occidentalis* | 42.8 ± 5.4 |
| 4. *Jatropha tanjorensis* | 30.5 ± 6.2* |

Values are means ± S.D of 3 samples, asterisks indicate significance at p <0.05 when compared with control rats.

**Table II**: phytochemical analysis on leaf samples of *Ipomoea batatas, T. occidentalis & J. tanjorensis.*

| SAMPLE | TEST CONSTITUENTS | OBSERVATION | INFERENCE |
|---|---|---|---|
| 1. *Ipomoea batatas* | Alkaloids | No precipitate | Absent |
| | Flavonoids | Brown precipitate | Present |
| | Saponins | Persistent foaming | Present |
| | Tannins | Blue green precipitate | Present |
| 2. *Telferia occidentalis* | Alkaloids | Turbid Precipitate | Pressent |
| | Flavonoids | Brown precipitate | Present |
| | Saponins | Persistent precipitate | Present |
| | Tannins | Blue green precipitate | Present |
| 3. *Jatropha tanjorensis* | Alkaloids | Turbid precipitate | Present |
| | Flavonoids | Brown precipitate | Present |
| | Saponins | Persistent foaming | Present |
| | Tannins | Blue green precipitate | Present |

**Table III**: plasma lipid profile (mg/ dl) of rats fed supplemented and control diet

| | Control Diet | T. *occidentalis* (Supplemented Diet) | *J. Tanjorensis (Supplemented Diet)* | *I. batatas (Supplemented Diet)* |
|---|---|---|---|---|
| Cholesterol (mg/ dl) | 137. 7± 5.90 | 111.0 ± 9.18* | 94.33± 0.88* | 78.33± 4.73* |
| Triglyceride (mg/ dl) | 20.33 ± 5.72 | 17.33± 1.35 | 20.67 ± 3.85 | 18.33± 5.72 |
| HDL-Cholesterol (mg/dl) | 31.67 ± 1.76 | 34.67 ± 1.19* | 41.67 ± 1.20* | 38.67 ± 3.34* |
| LDL- Cholesterol (mg/dl) | 101.93 ± 4.19 | 72.82 ± 7.52* | 48.53 ± 1.00* | 36.00 ± 1.06* |

Values are mean ± S.D of samples, asterisks indicate significance at p<0.05 when compared with control rats.

**Table IVa**: Kidney lipid profile (mg/g) of rats fed supplemented and control diet

| | Control Diet | T. *occidentalis* (Supplemented Diet) | *J. Tanjorensis (Supplemented Diet)* | *I. batatas (Supplemented Diet)* |
|---|---|---|---|---|
| Cholesterol (mg/ g tissue) | 68.67 ± 2.17 | 49.00 ± 4.27* | 41.67± 3.17* | 37.00± 2.47* |
| Triglyceride (mg/ g tissue) | 123.00± 2.51 | 101.67± 6.76* | 194.00 ± 8.67* | 132.33± 4.42* |
| HDL-Cholesterol | 19.67 ± 1.07 | 14.33± 1.24* | 12.67 ± 2.46* | 19.33± 1.25 |
| LDL- Cholesterol (mg/g) | 45.00± 2.89 | 29.77 ± 3.06* | 20.20 ± 4.09* | 16.40 ± 3.58* |

Values are means ± S.D of 3 samples, asterisks indicate significance at p<0.05 when compared with control rats.

**Table IVb:**. LIVER LIPID PROFILE (mg/g)

| | Control Diet | T. *occidentalis* | *J. Tanjorensis* | *I. batatas* |
|---|---|---|---|---|
| Cholesterol (mg/ g ) | 83.80 ± 4.75 | 63.00 ± 3.40* | 52.67± 1.59* | 67.33± 3.90* |
| Triglyceride (mg/ g ) | 252.00± 10.68 | 156.33± 7.72* | 174.00± 7.30 | 216.00± 7.70* |
| HDL-Cholesterol (mg/g) | 20.67± 1.24 | 12.33. ± 3.00 | 17.00 ± 1.32 | 12.33± 2.47 |
| LDL- Cholesterol (mg/g) | 56.07± 3.86 | 44.07 ± 5.59 | 24.93± 3.29 | 50.47± 3.22 |

Values are means ± S.D of 3 samples, asterisks indicate significance at p<0.05 when compared with control rats

Table IVc: HEART LIPID PROFILE (mg/g)

| | Control | T. *occidentalis* | *J. Tanjorensis* | *I. batatas* |
|---|---|---|---|---|
| Cholesterol (mg/ g ) | 69.3 ± 0.76 | 45.33 ± 3.91* | 42.67 ± 2.65* | 48.00 ± 3.68* |
| Triglyceride (mg/ g ) | 133.33 ± 11.98 | 125.33 ± 2.65* | 232.33 ± 21.80* | 146.33 ± 6.22* |
| HDL-Cholesterol | 16.33 ± 0.95 | 9.50 ± 2.41 | 6.33 ± 2.04 | 10.76 ± 1.87 |
| LDL- Cholesterol | 50.00 ± 2.89 | 30.77 ± 4.72 | 30.20 ± 4.09 | 29.40 ± 3.58 |

Values are means ± S.D of 3 samples, asterisks indicate significance at p<0.05 when compared with control rats.

## RESULTS

The result of the effect of *I. batatas, T. occidentalis* and *J. tanjorensis* supplemented diet on plasma and tissue lipid profile of experimental rats are presented in this study.

Table 1 shows the weight gain of rats fed for 4 weeks on supplemented and control diet. There was significant (p<0.05) difference between the weight gain of rats fed on *J. tanjorensis* supplemented diet and those of the control rats. Some studies by Nausa *et al,* 1982, have indicated increase in weight with consumption of vegetables. However, the work of Ijieh, et al, 2006, showed a loss in weight of rabbits given extracts of *Hyptis suaveolens.*

Table 11 shows the result of phytochemical analysis of leaf samples of these plants. The results show the presence of flavonoids, tannins, saponins in all three vegetables, while alkaloids were presents in leaves of *T. occidentalis* and *J. tanjorensis,* they were however absent in *I. batatas.*

Table 111 shows plasma lipid profile of rats fed supplemented and control diets. The leaves of the three plants significantly (p<0.05) reduced plasma cholestrol levels of the rats. Emenalom *et al* (2004) reported an elevated serum cholesterol on feeding pigs with mucuna seeds.

While plasma triglyceride level of rats fed supplemented diets did not differ significantly (p<0.05) from the control, their plasma HDL levels were slightly higher while their plasma LDL concentrations were significantly lower than those of control rats. This reduced lipid profile is consistent with the findings of Omoregie (2005).

Tissue lipid profiles of these experimental rats are shown in table IV. The cholesterol levels of the heart liver and kidney of rats fed supplemented diet were significantly lower than those of rats fed control diet (table IVa). The triglyceride level of heart, kidney and liver of rats fed diet supplemented with leaves of *T. occidentalis* were significantly lower than that of control rats (table IVb), while the triglyceride level of the liver of rats fed *J. tanjorensis* and *I. batatas* supplemented diet were lower than that of control rats, the triglyceride level of the heart and kidney of rats fed diet supplemented with these vegetables were higher than those of the control rats.

The kidney, heart and liver HDL and LDL levels of test rats were lower than those of the control rats, (table IV).

These results therefore, show that these vegetables are hypocholesterolemic.

## DISCUSSION

After a four week period of feeding experimental rats with *J. tanjorensis, I. batatas* and *T. occidentalis* supplemented diet, a significant (p<0.05) decrease in plasma cholesterol and LDL-Cholesterol levels were observed, HDL – Cholesterol level were significantly (p<0.05) increased in all test rats, while plasma triglyceride level of rats differ insignificantly (p< 0.05) when compared with that of control rats.

This result is consistent with the report of Oke (1968) and Omoregie (2005), and it may be suggestive of a hypolipidaemic effect of the leaves biogenic components. Accordingly, saponins and dietary fibres have been found to lower blood cholesterol level, thereby reducing incidence of coronary heart disease (Trease and Evans, 1996, Kromhout. 2001).

Weight gain observed in these experimental rats shows that they were healthy and they accepted the diet regimen. It also shows that these vegetables support growth (Ijeh *et al,* 2006). The results on tissue lipid also indicate the hypocholesterolemic nature of these vegetable. While the triglyceride level of the liver of rats fed the different diet supplements were low, however, the triglyceride level of the heart and kidney of rats fed *J. tanjorensis* and *I. batatas* supplemented diet were higher than those of the control rats.

The low levels of triacylglycerol in the liver could be as a result of enhanced rate of fat transportation out of the liver. The cardioprotective nature of leaves supplement has been reported, Valdes and Rose (1994), reported that some plants biogenic agents, particularly cardiac glycosides have been found to have cardiotonic effect on the heart muscles. However, the high triglyceride level in the heart and kidney of these rats could suggest some degree of tissue damage.

## SUMMARY AND CONCLUSION

The result of this study therefore suggests that leaves of important medicinal plants such as *I. batatas, J. tanjorensis* and *T. occidentalis* possess cholesterol-lowering effect. The decrease in total cholesterol of rats fed supplemented diet could be as a result of the hypocholesterolemic effect of saponins. This result correlates with the results of Oke (1968), who suggested saponin antagonism with diet induced hypercholesterolemia. Flavonoids prevent oxidative damage to LDL-cholesterol, thus facilitating intake of cholesterol into tissues. This feature is very important in the prevention of atherosclerosis, coronary heart disease (CHD) and cardiovascular disease (CVD) (Kromhout, 2001).

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