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Effects of Some Selected Spices on Some Biochemical Profile of Wister Albino Rats

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Abstract The influences on the biochemical profiles by three medicinal plant parts used by pregnant women in the southern part of Nigeria, *Tetrapleura tetraptera*, *Piper guineense*, and *Xylopia aethiopica* were evaluated through a feeding study using Albino Whistar rats. The study revealed that extracts decreased the plasma cholesterol and triglyceride levels in treated rats and is attributable to the presence of hypolipidemic agent in the extracts. This shows that the extracts could reduce cardiovascular risk factor. Also, plasma levels of Potassium statistically decreased in the rats treated with *T. tetraptera, P. guineense*, and *X. Aethiopica*. This finding is suggestive of a hypokalaemic effect. Two major liver enzymes, ALT and AST plasma levels significantly decreased in the order *X. Aethiopica* > *T. Tetraptera* > *P. Guineense and P. Guineense* > *X. Aethiopica* > *T. Tetraptera* for ALT and AST respectively. These findings suggest effective potential to lower hepatotoxic effects by the spices.

Keywords Spices, Hepatoxicity, X. Aethiopica, P. Guineense, T. Tetraptera, Whister Albino Rats

1. Introduction

The tropical vegetation of Southern Nigeria provides among others the *Tetrapleura tetraptera, Xylopia aethiopica*, and *Piper guineense*. The seeds of these plants are widely used as spices in Nigeria.

The people of Akwa Ibom State of Nigeria in their diverse culture and heritage are known for their traditional expertise in cooking food (National dishes). These do not without these three major spices.

X. aethiopica

The plant (*X. aethiopica*) contains anonaceine, an alkaloid, and rutin, volatile aromatic oil and a fixed oil. The plant contains also high amounts of copper, manganese, and zinc. Key constituents are diterpenic and xylopic acid. The essential oil has been well characterized with linalool, beta-trans-ocimene, alpha- farnesene, alpha-pinene, beta-pinen, myrtenol, beta- phallandrene and 3-ethylphenol as the major volatile constituents (Tairu et al., 1999). In 1993, Iwu also identified vitamins A, B, C, D, and E, proteins and minerals (Nwachukwu, 2000). Biochemically, the essential oils of *X. aethiopica* plants possess antioxidant activity found significant in scavenging superoxide anion radical (Karioti et al., 2004). Nnodim et al. (2010) reported that the extracts of *X. aethiopica* decreased the plasma levels of glucose in treated rats. They reported also that the application of *X. aethiopica* extract in the treatment of platelets disorder and cardiovascular diseases may have significant effects in moderating such condition. Nwozo et al. (2011) reported that intake of *X. aethiopica* reduced the composition of lipids and produced a favorable lipid profile in the serum and PMF (post Mitochondrial Fractions) of visceral organs in experimental hypercholesterolemia. *X. aethiopica* when used in combination with other nutritious regimen like fruits, fish and legumes, may be a promising option for the effective management of sickle cell disease (Uwakwe et al., 2008). Achinewu et al. (1995) reported that these spices are particularly very important in the diets of post partum women as an aid to the contraction of the uterus.

Piper guineense

P.guineense has been demonstrated to possess significant antioxidant and anti atherogenic effect against atherogenic diet intoxication (Agbora et al., 2010). It also possesses anti convulsant property (Abila et al., 1993). Oji et al. (1990) and Asawalam (2006) reported that the potential of controlling *S. zeamais* in stored maize seeds. However to achieved better result, concentration of the treatment needs to be increased (Onuh et al., 2008).

Tetrapleura tetraptera

The dry fruit of *T.* tetraptera contains saponin glycoside with oleanolic acid aglycone, a monodesmosidic hyroxyolean -12(13)-en-28-ioc acid, and echninocystic acid -3-0-sodium sulfate from the stembark, umbeliferone and ferulic acid from the leaves and branches respectively. Also isolated from the fruits were aridanin and three of its olean -12-en-28-oic acid derivatives (Adetunji, 2007). The docu-

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mented biological and –or pharmacological activities are found to be molluscicidal, cardio-vascular, neuromuscular, hypotensive, anticonvlsant, molluscidical, trypanocidal, hirudinicidal, schistosomiasis control, antiulcerative, cytotoxic, anti-inflammatory, hypoglycaemic, anti-microbial, emulsifying, important at birth control, of food value and the control of intestinal parasites (Adetunji, 2007). Elizzi et al. (1990) reported that the stem bark of *T. tetraptera* execrated an inhibitory effect on leuteinizing hormone released by pituitary cells. *T. tetrapleura* has been shown to cause elevation in serum AST and alteration of various metabolites and did not induce any marked pathological lesson in the liver Odesanmi et al. (2009). The sedative, anticonvulsant and analgesic effect of aridanin in mice have been reported (Aderibigbe et al., 2007). The aqueous extract of *T. tetraptera* fruit have been shown to possess anti inflammatory and hypoglycaemic properties (Ojewole and Adewunmi, 2004). One of the active constituents isolated from T. tetraptera fruit, mono-N-acetylglycoside of oleanoic acid (3 beta- hydroxyolean-12-en-28-ioc) called Aridanin (Adesina and Reish, 1985), induced anxiolytic effect in mice (Aderibigbe et al., 2010). The fruit is used to prepare soup for mothers from the day of birth to prevent post partum contraction (Nwawu and Akah, 1986). The fruit is also used as a dietary supplement rich in vitamins in Southern and Eastern Nigeria (Okwu, 2003; Essien et al., 1994). The allelopathic potential of *T. tetraptera* has led to its integration into agro forestry system (Amoo et al., 2008).

2. Objectives of the Study

This study seeks to evaluate the effects of *X. aethiopica*, *P. guineense* and *T. tetraptera* administration on the body and organ weight of Albino Wister rats and the medicinal implication on mammals.

3. Materials and Methods

Animals: Wister Albino rats weighing between (100-150g) were obtained from the animal house of the University of Port Harcourt, Port Harcourt. The animals were divided into five rats in each cage and the cages were four. The animals were fed under standard laboratory conditions. The animals were allowed to feed *ad libitum*. All experiment was carried out in compliance with the University of Port Harcourt Ethics Committee on research in animals and in accordance with NIH guide for care and use of laboratory animals.

Plant material: Dried fruits of *X. aethiopica, P. guineense,* and *T. tetraptera* were bought from a Local Market Akwa Ibom/Nigeria and were identified by the Department of Plant science and Biotechnology.

Preparation of extract

Two grams of each of the dried fruits was weighed, pounded with mortar and pestle and then placed in test tubes and then heated in a water bath for one hour. The heated spice was then poured into 750ml clean water making a concentration of 0.26% w/v.

Experimental design

Twenty male rats were divided into four groups, namely, Group A, Group B, Group C, and Control. The control group was given normal feed and water. Groups A, B, C rats were administered *T. tetraptera, P. guineense*, and *X. aethiopica* respectively. Five milliliters of the aqueous extracts was administered orally for 28 days. Blood samples were collected for some biochemical analysis.

Biochemical assays

Serum biochemistry was carried out on each sample. The biochemical parameters selected are electrolytes (potassium and sodium), lipids (cholesterol and triglycerides) and liver enzymes (ALT and AST). The tests were carried out using Teco diagnostics USA potassium and sodium kits, and Randox laboratories LTD UK cholesterol, triglyceride, ALT and AST kits.

4. Results

Weight (g) of Wister Albino rats before acclimatization in experimental and control groups

The measured weights for the animals used are as given in table 1.0. Observed weights ranged between 100-125, 125-150, 125-125, 100-100 for groups control, A, B, C respectively.

Table 1.0. Weights (g) of Animals before acclimatization.

	Control	Group A	Group B	Group C
1	125	125	125	100
2	100	125	125	100
3	100	150	125	100
4	125	150	125	100
5	100	150	125	100
Mean ± S.E	110±5.45	140±5.48	125±0.00	100±0.00

Group A = *T.tetraptera*; Group B = *P. guineense*;
Group C = *X. aethiopica*

Weights (g) of Wister Albino rats after acclimatization in experimental and control groups

The measured weights for the animals are as given in table 1.1 observed weights ranged between 100-125, 125-175, 125-150, 125-150 for groups control, A, B, C respectively

Table 1.1. Weights (g) of Animals after acclimatization.

	Control	Group A	Group B	Group C
1	125	125	150	125
2	125	125	150	150
3	125	150	150	150
4	125	175	150	150
5	100	175	125	125
Mean ±S.E	120±4.47	150±10.0	145±4.47	140±5.46

Weight (g) of Wister Albino rats after experimental and Control groups

The measured weights are as given in table 1.2. Observed weights ranged between 175-200, 175-225, 200-225, and 175-225 for control and group A, B, C respectively.

Table 1.2. Weights (g) of Animals after experiment.

	Control	Group A	Group B	Group C
1	200	225	200	175
2	200	225	225	225
3	200	175	200	200
4	200	DIED	200	200
5	175	DIED	200	175
Mean± S.E	195±4.47	208.2±13.8	205±4.47	195±8.36

Mean weight (g) of organs in experimental and control groups

5. Discussion

Body weight of test animals

The body weight of test animals after acclimatization in experimental and control groups as shown in table 1.1 showed relatively no significant difference. The weight of test animals of test animals after administration as shown in table 1.2 also showed no significant difference between the mean of the experimental and control groups although two of the animals fed *T tetraptera* diet were lost in the third week which could be attributable to possible hypernatremia evident in sodium observed levels for the group.

Organ weight of test animals

The weights of the organs measured at the end of the finding study showed that there is no statistically significant difference ($P < 0.5$) between the experimental groups and control group, see table 1.3. This may indicate that these spices do not induce a significant hepatotoxic, cardiotoxic, nephrotoxic or spleeentoxic effects in the organs of Wister Albino rats within the administered dose.

Table 1.3. Observed organ weight at the end of the experiment.

	Heart	Liver	Spleen	Kidneys
Control	0.494a	6.393a	1.053a	0.906a
(N=5)	±0.018	±0.075	±0.086	±0.057
Group A	0.546b	6.628a	1.441b	1.016a
(N=3)	±0.014	±0.535	±0.294	±0.019
Group B	0.672b	6.950ab	1.210b	1.073a
(N=5)	±0.105	±0.437	±0.176	±0.039
Group C	0.471c	6.393ab	0.993c	1.079a
(N=5)	±0.017	±0.075	±0.856	±0.059

Values are mean± S.E at 5% confidence level values in the same column with same alphabets are not significant. For N = 3, death of 2 of 5 were recorded.

Observed Biochemical profile in rats

The present study has shown that extracts of the seed of *X. aethiopica, P. guineense* and the tuber of *T.tetraptera* have varying influences on some selected biochemical profile. The study revealed that the extracts decreased markedly the plasma cholesterol and triglyceride levels in treated rats compared with the control as shown in table 1.4 above. This could be probably due to the presence of hypolipidemic agent or component in the extracts. The levels of plasma lipids are usually elevated in cardiovascular diseases; such an elevation represents a risk factor for coronary heart disease. Therefore, the administration of X. aethiopica, P. guineense, T.tetraptera when compared with the control caused significant decrease in lipid profile. This showed that the extracts had some beneficial effects of reducing cardiovascular risk factor that are not genetic.

Table 1.4. Assayed Biochemical profile at the end of the experiment.

Parameters	Control (N=5)	Group A (N=3)	Group B (N=5)	Group C (N=5)
Cholesterol (mmol/l)	4.65a ± 0.098	1.84b ± 0.057	2.44b ±0.100	1.78b ±0.074
Triglyceride (mmol/l)	2.16c ± 0.085	0.8d ± 20.070	1.70e ±0.065	1.76e ±0.068
Sodium (mEq/L)	235.6a ± 5.23	335.2b ± 7.71	80.4c ±8.33	82.8d ±7.23
Potassium (mEq/L)	18.5d ± 0.386	6.50e ± 0.131	5.99e ±0.036	6.75e ±0.044
ALT(IU)	95.2a ± 0.716	40.0b ± 0.816	47.4b ±0.358	38.2b ±0.335
AST(IU)	175.2f ± 1.213	102.6g ± 2.204	80.8h ±0.438	95.2g ±0.438

Values are mean± S.E at 95% confidence level values in the same row with same alphabets are not significant

Also, it was observed that plasma levels of potassium significantly decreased in the rats treated with *X. aethiopica, P. guineense,* and *T. tetraptera* when compared with the control. This finding is suggestive of a hypokalaemic effect. It was also observed that plasma levels of sodium in *X. aethiopica* and *P. guineense* were reduced while a hyperkalaemic effect was evident in rats treated with T. tetraptera.

At 95% confidence level, the observations made on two major liver enzymes, Alanine amino transferase, ALT and Aspartate amino transferase, AST revealed that there were significant decreases in the plasma ALT and AST when compared to the control groups as shown in table 1.4. Hence, no marked hepatotoxic effects were observed. Highest percentage (60%) ALT activity reduction was found in *X. aethiopica* fed animals

6. Conclusions

Researches in herbal medicine have attained an incredible global level in the recent past. The application of some plants constituents in pharmaceutical industries has gone a long way in the elevation of the status of the traditional herbal medicine in Africa and in Nigeria in particular. Hence herbal medicines have received greater attention as an alternative to clinical therapy leading to increasing demand. The use of herbal drugs by elites and non-elites for the treatment and prevention of disease in Akwa Ibom State Nigeria is very common particularly in rural areas. The results obtained from analysis of some biochemical profile (sodium, potassium, cholesterol, triglyceride, AST and ALT activity) on *X.*

aethiopica, P. guineense, T. tetraptera treated rats have shown that these spices have hypolipidemic and hypokalaemic effect. The spices may possess hypolipidemic bioactive component(s). *X. aethiopica, P. guineense,* and *T. tetraptera* possess no or low hepatotoxic activity.

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