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SERUM BIOCHEMICAL CHARACTERISTICS OF NILE RATS (*ARVICANTHIS NILOTICUS*) FED FIVE DIFFERENT SOURCES OF FEED

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ABSTRACT: *Serum biochemical analysis were conducted to determine the effects of cassava tubers, growers mash, guinea grass; sorghum seeds and yam peels on the liver condition of Nile rats. Three hundred rats were divided into five groups of sixty rats each in three replicates. They were fed with different rations for twenty-four weeks (168 days) along with water ad libitum. Serum biochemistry, liver marker enzymes and lipid profile were evaluated following standard methods. Results showed that rats fed with sorghum seeds had highest serum levels of glucose and globulin while serum protein level was highest in male rats fed with guinea grass and female rats fed with growers' mash. Level of urea was lowest in those fed with sorghum seeds while creatinine was lowest in rats fed with cassava tuber. In the male Nile rats, lowest levels of liver marker enzymes Alanine Aminotransferase (ALT) and Alkaline Phosphatase (ALP) evaluated were lowest in the baseline than those fed with the different feed regime. Also, levels of Alanine Aminotransferase (ALT) and L-aspartate Aminotransferase (AST) were higher in the male rats fed with cassava tuber. Male rats fed with yam peel had the highest level of Alkaline Phosphatase (ALP). Generally, the feed type showed significant effect on serum lipid profile, higher serum glucose level in the Nile rats fed with sorghum seed in captivity could also suggest an onset of diabetics. This study concluded that Nile rat can be reared in captivity, having preference for sorghum seeds and growers mash feeds respectively.*

KEYWORDS: Serum biochemical, Nile rats, sorghum seeds, and growers mash

INTRODUCTION

One more major challenge of domestication is the ability to mimic perfectly the conditions in the wild so as to maximise the growth and reproductive potentials of the Nile rat. In Nigeria, the demand for animal protein intake is felt more by a large proportion of the population especially in the rural areas (Ayodele, 2010; Oleforuh-Okoleh *et al.*, 2015). Bush meat like the Nile rat is a good source of wild animal protein. Increase in the habitat destruction and that of improper domestication ethics are among the constraints in Nile rat production. Knowledge of the earth's species and the ways in which they are related in an ecological process is important, if we are able to manage the ecosystems and if we are able to predict the consequences of our action.

Research in medicine frequently depends on the availability of wild animal species. According to Ayodele and Lameed (1999) wild animals have made unparallel contribution in the field of medical research. In 1996, U.S.A. alone utilized 62,783 primates (consisting of new and old-world species) and half a million rhesuses during the 6 peak years of polio vaccine production a decade earlier (IUCN. 1970). Also, in the year 1977 alone, 18 million individuals of wild rats and mice were used for research in pharmacology and physiology in the U.S.A. (Zeng, 1985).

Herbal plant and agricultural products which are nutritionally adequate and locally available in the study area were harnessed. Information from hematological parameters are important as it serves as an important index of physiological, nutritional and pathological station of an animal species and incorporated into breeding programme (Elagib and Ahmed, 2011). The present study was carried out to evaluate the serum biochemical characteristic of Nile rats fed at five different sources of feed.

MATERIALS AND METHODS

Experimental site and *Arvicanthis niloticus Collection*

The experiment was set up in the Animal House of the Department of Wildlife and Range Management, University of Agriculture, Makurdi, Benue State, Nigeria.

The Nile rats (*Arvicanthis niloticus*) were collected from the wild at Makurdi (derived Savannah), Gwer-west (Woodland), Guma (woodland and Savannah) and Kwande (Woodland), all in Benue state Nigeria in November and December 2016. Local hunters in these areas were recruited for the rat collection using various local devised traps. A total of four hundred (400) rats were collected during this period. However, rats with similar size and an average weight of 75.47±8.86 g (total of 300 rats) were selected and used for this study.

Experimental Rat Acclimatization

Collected rats were transferred to the Animal House of the Department of Wildlife and Range Management, University of Agriculture, Makurdi, Benue State, Nigeria and allowed to acclimatize for four weeks to enhance good health as specified by Suleiman and Shumake (1984). The rats were fed regularly and water provided *ad libitum*.

Serum Biochemical Composition Determination

The serum biochemical composition of the experimental rats was determined according to the methods described by Adeyi *et al*. (2012). Flame photometry method was used to determine the concentration of sodium and potassium in the plasma of each rat while colorimeter method was used to determine the concentration of calcium in the blood of the animals. Phosphorus and chloride were determined by the method described in the Association of Official Analytical Chemists (AOAC) publication (2005).

Blood glucose was determined using the strip of digital ACCU-CHEK advantage glucose meter (Roche diagnostic, Mannheim Germany). A drop of blood was obtained from tip of conscious rats and placed on the strip. The reading on the meter was noted and recorded as the blood glucose concentration.

Determination Protein Concentration

This was determined by using burette method.

Procedure: Serial dilutions of stock BAS solutions made by using varying concentrations. Biuret reagent was added to each diluted protein standard solution (stock BSA) and the mixture was allowed to stand at room temperature for 30 minutes before reading. The absorbance of the solutions was then read at 540 nm and a graph of absorbance against BSA Concentration (mg/ml) was then plotted.

Estimation of Protein Content

Suitable dilutions of the blood samples were made with distilled water. This was done to reduce the level of protein in the post mitochondria fraction (PMF) to the sensitivity range of the Burette method. 1ml of diluted samples was taken and the process for protein determination as described above was repeated. The absorbance was read at 540 nm against blank containing 1 ml of distilled water and 4 ml of Burette reagent. The protein content of samples was extrapolated from the protein standard curve to get actual amount of protein in the sample.

The Bromo Cresol Green (BCG) method described by Doumas *et al*. (1972) was used to determine the serum albumin concentration. The absorbance of the sample and the standard were taken against a blank at 620 nm wavelength. Serum globulin was calculated as

$$\text{Serum globulin} = \text{Total serum protein} - \text{Serum albumin}$$

Determination of Albumin

Albumin was determined by the method of Doumas *et al.* (1972).

Principle: The method is based on the specific binding of Bromo Cresol Green (BCG), an anionic dye, and the protein at acid pH produce a colour change of the indicator from yellow –green to green –blue with the resulting shift in the absorption wavelength of the complex. The intensity of the color formed is proportional to the concentration of albumin in the sample.

BCG + Albumin $\xrightarrow{\textbf{pH 4.3}}$ BCG-albumin complete

Assay Procedure

To 5µl of the blood sample was added to 1.0ml of the reagent (Bromocresol green PH 4.2 (0.12mmol/L)). The blank (distilled water) and the standard albumin (5g/dl) were treated similarly. The tests, blank and standard were incubated for 10mins at 25^0c and absorbance was read at 630nm. The concentration of the albumin was calculated using the equation

$$Albumin\ concentration = Absorbance\ of\ sample\ x\ \frac{Concentration\ of\ standard}{Absorbance\ of\ standard}$$

Liver Marker Enzymes

Blood samples were collected from saphenous vein as recommended by (Hoff, 2000) into plain sample tubes. These were allowed to clot and centrifuged at 3000 rpm for 15 min using electric centrifuge (Shimadzu Scientific Corporation Tokyo, Japan) within 1 hr after collection. The sera aspirated, stored at -20^{0}C and used for evaluation of biochemical parameters which include aspartate aminotransferases (AST), alanine aminotransferases (ALT), alkaline phosphatases (ALP), creatinine, and urea using the commercial kits manufactured by RANDOX Laboratory Ltd., Crumlin, United Kingdom.

Estimation of Lipid Profile

Total Cholesterol Concentration

Total cholesterol estimation was carried out using RANDOX Diagnostic kit. Cholesterol concentration is determined after enzymatic hydrolysis and oxidation. The indicator quinoneimine is formed from hydrogen peroxidase and 4-aminoantipyrine in the presence of phenol and peroxidase.

Cholesterol ester + H_2O $\xrightarrow{\text{cholesterol esterase}}$ Cholesterol + Fatty acids

Cholesterol + O_2 $\xrightarrow{\textbf{\textit{cholesterol oxidase}}}$ Cholestene-3-one + one + H_20_2

H_2O_2 + Phenol + 4-Aminoantipyrine $\xrightarrow{\text{Peroxidase}}$ Quinoneimine + 4 H_2O

Assay Procedure

To 10µl of samples homogenate, 1.0ml of R1 was added (R1 - Reagent 1 which contained 0.3 mM 4-Aminoantipyrine, 6 mM phenol, ≥0.5 U/ml peroxidase, ≥ 0.5 U/ml cholesterol esterase, 0.1 U/ml cholesterol oxidase, 80 mM pipes buffer, pH 6.8). The blank (distilled water) and the standard cholesterol (195mg/dl) were treated similarly. The tests, blank and standard were incubated for 5 min at 25^{0}C and absorbance was read at 500 nm within 1hr against the blank.

The concentrations of total cholesterol were calculated using the equation:

$$\text{Cholesterol concentration(mg/dL)} = \frac{\Delta\text{Asample}}{\Delta\text{Astandard}} \text{ x concentration of standard}$$

Where $\Delta\,\text{Asample} = \text{A sample} - \text{A blank}$

And $\Delta\,\text{Astandard} = \text{A standard} - \text{A blank}$

Estimation of Total Triglycerides Concentration

The estimation of triglycerides was carried out according to the method described by Tietz, (1990) using Randox Diagnostic kit. Triacylglycerol's are determined after enzymatic hydrolysis with lipases. The indicator is a quinoneimine formed from hydrogen peroxide, 4-aminophenazone and 4-chlorophenol under the catalytic influence of peroxidase.

Triglycerides + H_2O ***Lipases*** → Glycerol + Fatty acids

Glycerol + ATP ***GlycerolKinase*** → Glycerol -3-phosphate + ADP

Glycerol-3-phosphate + O_2 **Glycerol-3-*phosphate oxidase*** → Dihydroxyacetone + Pi+ H_2O_2

H_2O_2 +4- aminophenazone+ 4-chlorophenol ***Peroxidase*** → Quinoneimine + HCI + 4 H_2O

Assay Procedure

To 10µl of homogenate was added 1.0ml of reagent 1 (one vial of Rlb{0.5 mM 4-aminophenazone, 1.0 mM ATP, ≥ 150 U/ml Lipases, ≥ 0.4 U/ml Glycerol kinase, ≥ 1.5 U/ml Glycerol-3-phosphate oxidase, ≥0.5 U/ml peroxidase) constituted with 15ml of Rla (40 mM Pipes buffer, Ph 7.6, 55 mM 4-chlorophenol, 17.5 mM Magnesium ions). The blank (distilled water) and the standard cholesterol (196 mg/dL) were treated similarly. The test, blank and standard was incubated for 5 min, at 25^0C. Absorbance was read at 546 nm within 1hr against blank. The concentration of triacylglycerol in the homogenate was calculated using the equation below:

$$\text{Triglycerides concentration(mg/dL)} = \frac{\Delta\text{Asample}}{\Delta\text{Astandard}} \text{ x concentration of standard}$$

Where $\Delta\,\text{Asample} = \text{A sample} - \text{A blank}$

And $\Delta\,\text{Astandard} = \text{A standard} - \text{A blank}$

High-Density Lipoprotein Cholesterol (HDL) Concentrations

The estimation of HDL-c was carried out according to the method described by Tietz, (1990) using Randox Diagnostic kit. To 0.5 ml of homogenate were added 1 ml of R1 (Reagent 1 which contained 25 mM Magnesium Chloride and 0.55 mM phosphotungstic acid). The suspension was incubated for 10 min at room temperature. The suspension was centrifuged for 10 min. at 4,000 rpm on Bench Centrifuge Model 90-2, Microfield Instrument, Essex, England. To 100µ of the supernatant was added cholesterol reagent (R1a and Rib which contained 0.5 mM 4-aminophenazone, 1.0 mM ATP, ≥ 150 U/ml Lipases, ≥ 0.4 U/ml Glycerol Kinase, ≥ 1.5 U/ml Glycerol-3-phosphate oxidase, ≥ 0.5 U/ml peroxidase, 40 mM Pipes buffer, pH 7.6, 5.5 mM 4- chlorophenol and 17.5mM Magnesium ions) 0.5 ml of blank (distilled water) and the standard cholesterol (180 mg/dL) were treated. Absorbance was read at 546 nm within 1hr. against blank.

The concentration of HDL was calculated using the equation below:

$$\text{HDL concentration(mg/dL)} = \frac{\Delta\text{Asample}}{\Delta\text{Astandard}} \text{ x concentration of standard}$$

Where $\Delta\,\text{Asample} = \text{A sample} - \text{A blank}$

And $\Delta\,\text{Astandard} = \text{A standard} - \text{A blank}$

Low-Density Lipoprotein Cholesterol Concentration (LDL-c)

The concentration of LDL-c in the homogenate was calculated using the formula below

$$\text{LDL concentration(mg/dL)} = \frac{\text{Total Cholesterol}}{5} - \text{Triacylglycerol} - \text{HDL} - \text{c}$$

RESULTS

Serum Biochemical Composition of the Nile Rats

There was no significant difference recorded in the serum level of albumin in both the male and female Nile rats between the baseline and those fed with growers' mash, sorghum seed, yam peel, cassava tuber and guinea grass respectively in captivity (Table 1). Serum levels of total protein, globulin and glucose of both male and female Nile rats were lower at the baseline than those fed with the different feed regime. However, rats (male and female) fed with sorghum seeds had the highest serum levels of glucose and globulin. On the other hand, total serum protein level was highest in the male rats fed with guinea grass and female rats fed with growers' mash. The levels of total protein and serum glucose were significantly different between the male and female rats. Levels of serum albumin and globulin were however not significantly different between the male and female rats.

Table 1: Serum Biochemical Composition (g/dL) of Nile Rats fed Different Diets in Captivity

		T. Protein	Albumin	Globulin	Glucose
Male	Baseline	3.60 ± 0.14^{d}	2.60 ± 0.14^{a}	0.95 ± 0.07^{c}	52.70 ± 1.56^{e}
	Cassava tuber	11.05 ± 2.47^{b}	3.55 ± 0.21^{a}	7.75 ± 2.62^{c}	94.80 ± 6.36^{c}
	Growers mash	6.95 ± 3.61^{c}	3.25 ± 0.21^{a}	3.70 ± 3.82^{d}	132.00 ± 1.84^{b}
	Sorghum seed	3.90 ± 0.42^{d}	2.70 ± 0.85^{a}	12.00 ± 4.24^{a}	146.00 ± 5.66^{a}
	Yam peel	8.90 ± 6.22^{c}	2.55 ± 0.21^{a}	6.35 ± 6.01^{c}	92.20 ± 4.95^{c}
	Guinea grass	13.65 ± 0.21^{a}	2.75 ± 0.07^{a}	10.90 ± 0.28^{b}	65.50 ± 1.13^{d}
Female	Baseline	3.50 ± 0.14^{d}	2.80 ± 0.28^{a}	0.55 ± 0.07^{d}	61.85 ± 2.33^{e}
	Cassava tuber	5.85 ± 1.34^{c}	3.25 ± 0.21^{a}	2.60 ± 1.56^{c}	102.80 ± 19.09^{b}
	Growers mash	12.05 ± 3.32^{a}	4.30 ± 1.84^{a}	7.75 ± 5.16^{b}	79.65 ± 22.13^{d}
	Sorghum seed	4.30 ± 0.57^{c}	2.95 ± 0.92^{a}	13.50 ± 3.54^{a}	161.00 ± 8.49^{a}
	Yam peel	10.75 ± 5.73^{b}	2.90 ± 0.28^{a}	7.85 ± 5.44^{b}	96.20 ± 7.78^{c}
	Guinea grass	4.50 ± 0.00^{c}	2.65 ± 0.21^{a}	1.85 ± 0.21^{c}	89.00 ± 5.23^{c}
Gender comparison	F-value	0.969	0.785	0.776	0.095
	P-value	0.04*	0.39	0.40	0.02*

*^{abcd}Mean (±Standard deviation) in the same column for male and female Nile rats respectively having similar superscripts are not significantly different α0.05 *Parameter significant different between the male and female rats α0.05 T.Protein = Total protein*

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Serum Liver Marker Enzymes of the Nile Rats

In the male Nile rats, lowest levels of liver marker enzymes (Alanine Aminotransferase, L-aspartate Aminotransferase and Alkaline Phosphatase) evaluated were lowest in the baseline than those fed with the different feed regime (Table 2). Also, levels of Alanine Aminotransferase (ALT) and L-aspartate Aminotransferase (AST) were higher in the male rats fed with cassava tuber. Male rats fed with yam peel had the highest level of Alkaline Phosphatase (ALP).

In the female rats however, levels of all the liver marker enzymes (ALT, AST and ALP) evaluated were lowest in those fed with sorghum seeds. Level of AST was significantly higher in the female rats fed with growers' mash while those fed with yam peel had the highest ALP level. On the other hand, except for those fed with sorghum seeds, ALT level was not significantly different between the baseline and the other experimental groups.

Statistical analysis showed no significant difference in the serum levels of liver marker enzymes (Alanine Aminotransferase, L-aspartate Aminotransferase and Alkaline Phosphatase) between the male and female Nile rats.

Table 2: Levels of Liver Marker Enzymes (U/L) of Nile Rats fed Different Diets in Captivity

		ALT	AST	ALP
Male	Baseline	25.25 ± 1.34^{c}	19.25 ± 2.33^{e}	12.50 ± 1.84^{d}
	Cassava tuber	38.40 ± 7.35^{a}	61.05 ± 2.47^{a}	23.45 ± 1.43^{c}
	Growers mash	31.40 ± 12.30^{b}	30.55 ± 1.20^{c}	30.75 ± 0.49^{b}
	Sorghum seed	14.00 ± 4.24^{d}	24.50 ± 3.54^{d}	21.05 ± 3.89^{c}
	Yam peel	29.60 ± 9.90^{b}	37.55 ± 6.15^{b}	41.40 ± 15.56^{a}
	Guinea grass	31.40 ± 12.30^{b}	30.55 ± 11.10^{c}	30.35 ± 11.67^{b}
Female	Baseline	30.25 ± 1.63^{a}	32.65 ± 3.18^{c}	28.70 ± 2.26^{c}
	Cassava tuber	34.90 ± 2.40^{a}	33.15 ± 9.83^{c}	41.40 ± 0.00^{b}
	Growers mash	32.25 ± 11.10^{a}	41.05 ± 11.10^{a}	31.75 ± 13.65^{b}
	Sorghum seed	11.00 ± 1.41^{b}	19.00 ± 2.83^{d}	18.55 ± 1.63^{d}
	Yam peel	38.35 ± 2.47^{a}	40.15 ± 19.73^{a}	53.75 ± 5.73^{a}
	Guinea grass	34.90 ± 2.40^{a}	20.95 ± 2.47^{d}	38.60 ± 19.52^{b}
Gender comparison	F-value	0.434	0.664	3.875
	P-value	0.52	0.43	0.07

^{abcd}Mean (±Standard deviation) in the same column for male and female Nile rats respectively having similar superscripts are not significantly different α0.05 AST = L-aspartate Aminotransferase, ALT = Alanine Aminotransferase, ALP = Alkaline Phosphatase

Serum Levels of Urea and Creatinine of the Nile Rats

Results showed reduced serum level of urea in Nile rats (male and female) fed with growers' mash, sorghum seed, yam peel, and cassava tuber and guinea grass respectively in captivity than the baseline (Figure 1). Level of urea was lowest in those fed with sorghum seeds. The

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serum urea levels recorded in the rats fed with growers' mash, yam peel, and cassava tuber and guinea grass respectively in captivity were not significantly different. On the other hand, Nile rats (male and female) fed with sorghum seeds had the highest level of serum creatinine (Figure 2). However, creatinine level was lower in the rats fed with growers' mash, yam peel, cassava tuber and guinea grass respectively than those of the baselines.

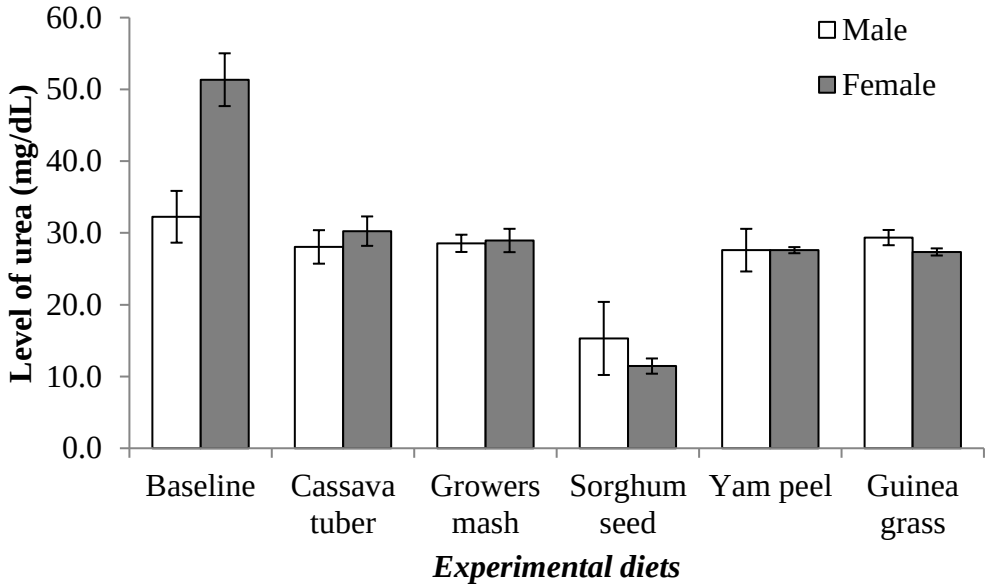

Figure 1: Level of Urea (mg/dL) in the Blood of Nile Rats fed with Different Diets in Captivity (α0.05)

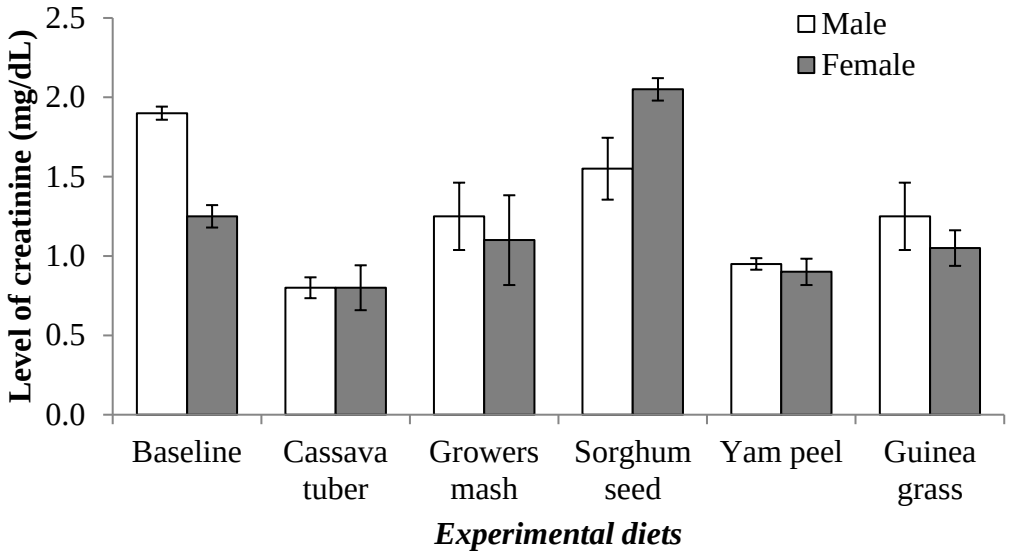

Figure 2: Level of Creatinine (mg/dL) in the Blood of Nile Rats fed with Different Diets in Captivity (α0.05)

Serum Lipid Profile of the Nile Rats

The levels of cholesterol, triglycerides, HDL and LDL in the Nile rats fed with growers' mash, sorghum seed, yam peel, cassava tuber and guinea grass respectively in captivity does not follow similar trend in the male and female rats (Table 3). In the male rats, those fed with guinea grass had significantly higher serum cholesterol level. There was no significant difference in the level of HDL recorded in the male rats fed with growers' mash and guinea grass diets. These were however significantly higher than those of the other experimental groups. Level of LDL was significantly higher in the male rats fed with cassava tuber. On the other hand, serum triglycerides level was significantly higher in the baseline than those fed with the different feed regimes. Similarly, in the female Nile rats, levels of triglycerides and HDL were higher in the baseline than those fed with the different feed regimes. Female rats fed with growers' mash had the highest serum cholesterol level while those fed with yam peel had the highest LDL level. Statistical analysis revealed significant difference in the serum levels of cholesterol and HDL between the male and female rats. However, there was no significant difference in the levels of triglycerides and LDL between the male and female Nile rats.

Table 3: Lipid Profile (mg/dL) of the Blood of Nile Rats fed with Different Diets in Captivity

		Cholesterol	Triglycerides	HDL	LDL
Male	Baseline	88.85±2.90^{e}	142.10±3.11^{a}	11.46±2.34^{c}	47.30±2.26^{c}
	Cassava tuber	150.30±29.98^{b}	89.75±8.41^{e}	19.50±5.52^{b}	62.95±7.71^{a}
	Growers mash	94.65±14.78^{e}	64.95±30.19^{f}	25.45±7.00^{a}	55.25±5.73^{b}
	Sorghum seed	137.00±7.07^{c}	137.65±4.88^{b}	12.71±1.97^{c}	44.75±3.46^{c}
	Yam peel	113.65±91.71^{d}	63.35±54.24^{d}	17.35±2.05^{b}	55.80±10.32^{b}
	Guinea grass	213.25±64.42^{a}	131.20±55.01^{c}	25.45±4.31^{a}	58.30±5.52^{b}
Female	Baseline	92.20±5.52^{c}	148.30±2.40^{a}	43.10±4.53^{a}	44.35±2.76^{c}
	Cassava tuber	44.90±2.69^{d}	33.50±2.12^{d}	20.85±9.40^{c}	57.40±10.75^{a}
	Growers mash	161.70±15.70^{a}	99.55±13.93^{b}	19.65±4.03^{c}	51.75±11.81^{b}
	Sorghum seed	109.50±10.61^{b}	147.35±5.16^{a}	36.71±13.57^{b}	43.95±1.77^{c}
	Yam peel	145.90±105.22^{b}	98.30±84.57^{b}	21.15±8.98^{c}	59.10±9.48^{a}
	Guinea grass	100.95±78.28^{b}	61.10±48.93^{c}	18.55±2.62^{d}	50.10±1.70^{b}
Gender comparison	F-value	1.297	0.200	9.098	1.036
	P-value	0.02*	0.06	0.01*	0.33

*^{abcd}Mean (±Standard deviation) in the same column for male and female Nile rats respectively having similar superscripts are not significantly different at α0.05 *Parameter significant different between the male and female rats α0.05 HDL = High density lipoprotein cholesterol; LDL= Low density lipoprotein cholesterol.*

DISCUSSION

This study recorded significantly higher serum glucose level in both the male and female Nile rats fed with sorghum seeds. Early-onset diabetes in the Nile rats has been linked to greater food intake and greater adiposity (Chaabo *et al*., 2010). It is generally accepted that

carbohydrate (CHO), as the dietary glycemic load, is the prime dietary contributor to the increase in blood glucose and eventual diabetes (Reaven, 2004; Kwon *et al*., 2017). Sorghum is a major cereal crop that is rich in carbohydrate. Similarly, the sorghum seed was the most preferred food of the Nile rats in captivity as observed in this study. Also, Chaabo *et al*. (2010) affirmed that increased consumption in Nile rats could lead to adipose accumulation and diabetes. Unlike the wild environment of the Nile rat where the rats feed on different varieties of feed, the sorghum seed used in this study was administered to the rats without the addition of other feed type. Also, unlike the wild where the rats are free to move about to burn excess fats and energy in their body system, the rats were restricted to the limited cage space during captivity. This restriction as obtainable in captivity could have resulted in the elevated serum glucose level in both the male and female Nile rats fed with the sorghum seeds. Although, this study did not test the feeding preference of the Nile rats with respect to onset of diabetics, higher serum glucose level in the Nile rats fed with sorghum seed in captivity could also suggest an onset of diabetics. Previous reports have shown that the Nile rats have the tendency of developing diabetes in captivity and have been used in as models in the study of diabetes (Bolsinger *et al*., 2014; Chaabo *et al*., 2010; Subramaniam *et al*., 2018). It is therefore advisable that the Nile rats should be fed with composite feed in captivity.

The enzymatic activity of alanine (ALT) and aspartate (AST) aminotransterases and alkaline phosphatase were studied to evaluate liver malfunctions. Liver enzymes levels are usually raised in acute hepatoxicity, but tend to decrease with prolonged intoxication due to damage to the liver. (Imafidon and Okunrobo, 2012). All liver marker enzymes levels increased in those rats fed with the different feed regime, however, levels of the entire liver marker enzymes (ALT, AST and ALP) evaluated were lowest in those fed with sorghum seeds. Level of AST was significantly higher in the female rats fed with growers' mash while those fed with yam peel had the highest ALP level. This result is at variance with that of (Imafidon & Okunrobo, 2012), that was conducted to determine the effects of palm oil, groundnut oil and coconut oil on the liver condition of albino rats.

In this study, creatinine level was lower in the rats fed with growers' mash, yam peel, cassava tuber and guinea grass respectively than those of the baselines (from the wild). This is agreement with the findings of (Tizhe, *et al.,* 2014) that reported a relatively high creatinine concentration in Glyphosphate with Zinc administered groups, respectively, showing that wild animals can be exposed to contaminants.

CONCLUSION AND RECOMMENDATIONS

This study has shown that wild Nile rat, *Arvicanthis niloticus* can be domesticated and reared in captivity. Nile rat preferred food was observed in this study to be sorghum seeds and growers mash respectively. The five different feed types were observed to produce different serum biochemical characteristics on Nile rats in captivity. Although, this study did not test the feeding preference of the Nile rats with respect to onset of diabetics, higher serum glucose level in the Nile rats fed with sorghum seed in captivity could also suggest an onset of diabetics. It is therefore highly recommended that dietary supplements be given to the Nile rats when feeding them with plant materials during domestication. Also, further research should be carried out on the reproductive success of this Nile rats in captivity.

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