DOI: 10.36108/ujees/5202.70.0110
UNIOSUN Journal of Engineering and Environmental Sciences. Vol. 7 No. 1. March. 2025

Anthropometric and Biochemical Assessment of Yahauri Spice Meal-Based Diet on Selected Tissues of Female Wistar Rats

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Abstract Feed, anthropometric and biochemical assessment of Yahauri spice meal-based diet on selected tissue of female Wistar rats was evaluated in the present study. Yahauri spices comprises a blend of eleven spices which were dried, pulverized and compounded into animal feeds at inclusion levels of 20%, 40%, 60%, 80% and 100% inclusion levels. Thirty-five rats were grouped into seven and were fed on basal (control) diet, the five inclusion levels of the spice and standard group respectively. The Feed intake {FI}, Feed Conversion Ratio {FCR}, Protein Efficiency Ratio (PER), Body Weight Gain {BWG}, Body Mass Index {BMI}, Liver and kidney function indices and enzymes were estimated using standard methods. Results of FI, FCR, PER, BWG and BMI of rats fed on the spice diet compared favourably ($p > 0.05$) with the control and the standard drug at all inclusion levels. Likewise, the liver and kidney function indices as well as the liver enzymes also had no significant difference ($p > 0.05$) in those fed the diet inclusion when compared with the control. Overall, Yahauri spice might improve the nutritional status at the inclusions levels used and it is relatively safe.

Keywords: Yahauri, Spices, Feed Conversion Index, Inclusion level, kidney function Indices

I. Introduction

Plants are of great importance because of the nutritional and pharmacological roles they possess. For ages, they are known to be priceless sources of natural products for ages which are beneficial in sustaining nutrition, wellness/human health. Their roles as functional foods in the management of most chronic diseases such as diabetes mellitus [1, 2], hypertension [3], cardiovascular disease [4, 5] and in controlling dyslipedemia [6, 7] have drawn attention worldwide [8]. These functional foods from plant origin are either spices or processed foods containing a unique amount of biologically active ingredients which when consumed in the right and carefully defined non-toxic quantities provide clinically established and recognized health benefits for the prevention, management or treatment of chronic diseases [9].

The major functions of spices from time immemorial are their ability to enhance and complement flavors, aroma and organoleptic quality in foods thereby increasing the rate of consumption. However, they are now known to possess various nutritional and healing properties which include antimicrobial [4], antioxidant, anti-convulsant, hepatoprotective, anti-aging [5] and diuretic properties [7]. Although, it is believed that the nutritional content and its usage in small quantity are deemed negligible, research has shown that its

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nutritional value are responsible for its pharmacological activity, thereby regarded now as a functional food [10]. Yahauri spice also known as Arabian spice is a combination of several spices which comprises of ginger, garlic, black pepper, coriander, cinnanamon, Africa nutmeg, cloves, cardamon, cumin and fennel known for their diverse medicinal benefits. Despites the known benefits of this individual spices on health and wellness, there is paucity of information on their combination when blended together. [11] researched on the nutritional/Chemical constituent as well as the free radical scavenging potential of Yahauri spice but the growth performance characteristics, anthropometric data and its impacts on biochemical parameters especially on some tissues and organs has not been documented. Thus, this research was targeted at evaluating the dietary intake, anthropometric and effects on biomarkers of toxicity of Yahauri spice meal-based diet in some selected tissue of wistar rats.

II. Materials and Methods

A. Materials

i. Plant Materials and Authentication

The Eleven spices that made up the Yahauri spices blendes were obtained from Kurmi market, Kano State, Nigeria and were identified at the Herbarium Unit of the Department of Plant Biology, University of Ilorin, Kwara state where voucher numbers were obtained.

ii. Experimental Animals

Thirty-five (35) female Wister Albino rats with average weight of 90.03 ± 5.40g were obtained from the animal Holding Facilities of the Department of Biochemistry, University of Ilorin. They were allowed free access to feed and water.

iii. Feed Components

Yellow corn and Soya beans were obtained from Oja Oba market, Ilorin. Rice husk, Soya oil was obtained from Kawo market, Kaduna. Sucrose is a product of St. Louis Sucre Paris. Pre-mix and D-methionine were obtained from Pipeline Feed Company.

iv. Assay Kits

The assay kits used for the assay of some biochemical parameters such as: Alanine amino transferase, Aspartate aminotransferase, Alkaline phosphatase, were products of Randox Laboratories Ltd., Co-Antrim, UK. All other chemicals used for the study were obtained from Sigma-Aldrich Co. Ltd, Canada and were of analytical grade.

B. Methods

i. Preparation of Yahauri Spice Blend

The methods used by the locals of Yahauri community, a small town in Kano State Nigeria was adopted for the study with slight modification. Briefly the eleven components of the spice were dried, pulverized and mixed in different proportions to make up 4 kg. The spice blend consists of 1.9 kg of ginger, 240g of garlic, 180g of black pepper, 220g of coriander seeds, 270g of African nutmeg, 130g of cloves, 150g of cinnamon, 90g of star anise, 80g of cardamom, 430g of cumin seeds and 300g of fennel seeds in that order.

ii. Composition of Formulated Diets

Composition of the experimental diet was carried out in-line with the methods described by the [12], while 100% tiger curry spice was used as standard (Table 1). All the components of the diet were thoroughly mixed, made into pellets and oven dried at 60^0C. The dried feeds were packed into air-tight polythene bags and stored at 4^0C until when required.

Table 1: Feed composition used for diet formulation

Groups	Corn starch	Yahauri spice	Soy oil	Cellulose	Soy bean	Sucrose	Pre-mix	D -methionine	total
Control	505	-	50	40	250	100	50	5	1000
20% spice	404	101	50	40	250	100	50	5	1000
40% spice	303	202	50	40	250	100	50	5	1000
60% spice	202	303	50	40	250	100	50	5	1000
80% spice	101	404	50	40	250	100	50	5	1000
100% spice	-	505	50	40	250	100	50	5	1000
Standard (100% Tiger curry)	-	505	50	40	250	100	50	5	1000

***** Vitamin/Mineral mix: Vitamin A 4,000,000 i.u; Vitamin D_3, 800,000 i.u.; Tocopherols, 400 i.u; Vitamin K_3 800mg , Folacin, 200mg; Thiamine, 600mg; Riboflavin 1,800mg; Niacin, 6000mg; Calcium pathothenate, 4 mg; Biotin, 8 mg; Manganese, 30,000mg, Zinc, 20,000mg; 8,000mg; Choline chloride 80,000mg; Copper, 2,000mg; Iodine, 480mg; Cobalt, 80 mg; Selenium, 40mg; BHT, 2,500mg. Anticaking agent, 6000mg.
Unit of diet composed – g/ kg.

iii. Animal grouping

Thirty-five (35) female Wister Albino rats were randomized into seven groups (A-G) of five rats in each group and were maintain in their respective diet for a period of eight (8) weeks (Table 2).

Table 2: Animal Grouping and Percentage Yahauri spice added to the formulated diet

S/N	Groups	Feed
1	A (Control)	Control (Basal Diet)
2	B	20% of Yahauri –spice inclusion
3	C	40% of Yahauri-spice inclusion
4	D	60% of Yahauri –spice inclusion
5	E	80% - Yahauri-spice inclusion
6	F	100% - Yahuari spice
7	G (Standard)	100 (Tiger curry)

A- Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

iv. Feed analysis

Feed intake (FI) and body weight gain (BW) was determined weekly and every two weeks respectively. The amount of feed consumed was determine as the difference between the amount of feed offered and refusal while the feed conversion ratio (Kg feed/Kg gain) was evaluated as the ratio between the FI and BW as described by [13]. The method described by [14] was adopted for the protein efficiency ratio (Total weight gain (g)/Dry weight of protein feed (g)) and the procedure as stated by [15] was used to determine the feed conversion ratio (Feed intake(g)/body weight again).

v. Anthropometric determination

Evaluation of the body weight and body length were used to determine the body mass index (Body weight(g)/Length^2 (cm^2) [16].

vi. Isolation and homogenization

At the end of the 8 weeks of the study, the rats were sacrifice and dissected in order to isolate the tissues (Liver, Kidney and Stomach). The isolated tissues were properly cleaned, weight and store in a ice-cold solution of 0.25M sucrose

instantly. 1g of each tissue where subjected to homogenization in 0.25M ice-cold sucrose solution at pH 7.4 in a standard Laboratory mortar and Pestle. The homogenates were centrifuge and the supernatant was examined for some biochemical parameters [17].

vii. Biochemical assays

Alanine aminotransferase (ALT) and Aspartate aminotransferase (AST) were assayed as stated by [18] using Assay kits from Randox laboratories Ltd UK. Gamma glutamyl transferase and acetylcholinesterase activities were assayed by the method of [19] and [20]. Urea and creatinine concentrations were assayed following the methods of [21] and [22] respectively. Albumin and Bilirubin were done following the methods of [23] and [24]. Alkaline Phosphatase was determined in line with the methods of [25] while stomach Pepsin and Iodine was examined in accordance to standard procedure as described by [26].

viii. Statistical analysis

Result of analysis was evaluated using Statistical Package for Social Science (SPSS) package version 21 and graph pad prism version 6 and was expressed using Mean ± Standard Error of Mean (SEM) of six determinations. The values were subjected to analysis of variance (Anova) and Duncan's Multiple Range test, to determine significance at $p<0.05$.

III. Results and Discussion

A. Results

Comparative result of feed intake across the study groups is represented in Table 3. There was a significant difference ($p < 0.05$) observed in the amount of feed consumed in all groups when compared with the control on the after the first week of study. However, it was noticed that as the week advanced, the difference became insignificant while showing up again after the sixth week. The same trend was observed for the feed conversion index (Table 4) which was later reversed at about 4 weeks to eight weeks. In this result, there was a favourably comparism ($p > 0.05$) between the index of the rats fed on Yahauri-spice meal-based diet at all inclusion levels and the control group. For the protein efficiency ratio (Table 5), there was consistency throughout the experiment as all the groups fed on Yahauri-spice meal-based diet at all inclusion levels compared with the control.

The low feed intake recorded among the study groups could be credited to either the palatability or the inability of the blended spices to induced satiety as studies have shown that addition of spices to diet could only have a minimal impact on total energy intake and not on total feed intake (g), water intake, hunger and satiety [27] Similar findings was reported by [28] where rats fed with mixed spices consumed the list amount when compared with their control group, likewise [29] reported similar scenario when they worked with Yaji, Yaji-additives and Yaji spices.

The Feed conversion ratio (FCR) shows a marked difference between the values obtained for the control group and the rest of the groups at the beginning but later formed the same trend with the feed intake. The observed difference and similarity can be attributed to the feed intake level as it is a major determinant of the ratio. The non-significant difference observed in the protein efficiency ratio might be attributed to the similarity in protein content fed on which is a the major determinant of the ratio and can also be attributed to either the body chemistry or biochemical factors of individual rats.

Table 3: Weekly Feed Intake (g) of Rats fed on Yahauri-Spice Meal-based Diet

Weeks	A	B	C	D	E	F	G
1	34.86±8.20^{a}	30.43±2.26^{b}	32.14±3.92^{ab}	31.29±4.02^{ab}	29.86±3.40^{b}	29.29±6.82^{b}	29.71±3.50^{b}
2	45.86±4.72^{a}	46.71±2.17^{a}	43.71±1.61^{a}	45.14±4.64^{a}	44.14±2.62^{a}	45.14±2.73^{a}	43.00±2.35^{a}
3	41.00±2.47^{a}	36.71±2.34^{b}	39.00±1.31^{ab}	41.86±3.56^{a}	41.00±2.86^{c}	41.42±3.12^{a}	46.86±2.14^{c}
4	44.71±2.93^{a}	33.29±2.72^{b}	37.29±1.95^{b}	37.29±3.18^{b}	43.00±2.19^{a}	35.00±2.52^{b}	47.00±1.99^{c}
5	40.57±1.59^{a}	33.71±1.76^{b}	38.00±1.60^{a}	33.71±3.05^{b}	33.57±2.40^{b}	38.71±3.99^{a}	43.43±2.41^{c}
6	40.14±2.28^{a}	31.42±2.13^{b}	35.43±2.59^{b}	38.29±1.89^{a}	38.71±1.27^{a}	34.86±1.83^{b}	45.14±1.34^{c}
7	41.43±1.29^{a}	33.71±1.58^{b}	34.71±1.46^{b}	37.86±2.47$^{a\,b}$	37.29±1.06^{ab}	41.71±1.27^{a}	44.14±1.52^{c}
8	41.29±1.38^{a}	35.57±2.15^{b}	33.42±1.84^{a}	41.14±1.12^{a}	41.57±1.23^{a}	37.43±1.32^{ab}	42.14±1.92^{a}

A -Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

Table 4 :Feed conversion index Rats fed on Yahauri-Spice Meal-based Diet

Weeks	A	B	C	D	E	F	G
2	14.26±0.61^{a}	12.80±0.40^{b}	12.82±0.40^{a}	11.67±-0.38^{bc}	12.53±-0.36^{b}	13.23±0.46^{c}	12.87±0.41^{a}
4	13.68±0.53^{a}	13.10±0.44^{a}	12.97±0.42^{a}	12.25±0.46^{b}	10.60±0.51^{c}	11.09±0.44^{b}	11.73±0.39^{b}
6	11.28±0.47^{a}	13.99±0.43^{b}	13.70±0.39^{b}	12.33±0.48^{ab}	12.32±0.47^{ab}	12.57±0.51^{ab}	11.53±0.36^{a}
8	10.26±0.47^{a}	11.68±0.53^{b}	11.57±0.37^{b}	12.44±0.49^{c}	11.99±0.43^{b}	10.20±0.60^{a}	11.32±0.33^{b}

A- Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

Table 5: Protein Efficiency Ratio of Rats fed on Yahauri-Spice Meal-based Diet

WEEK	A	B	C	D	E	F	G
2	1.05±0.01^{a}	1.1.3±0.00^{b}	1.02±0.00^{a}	1.18± 0.31^{b}	1.21±-0.03^{b}	1.63±-0.09^{c}	1.12±0.02^{b}
4	2.04±0.01^{a}	2.13±0.00^{b}	2.04±0.01^{a}	2.26±-0.04^{c}	2.21±-0.03^{c}	2.15±-0.02^{b}	2.21±0.03^{v}
6	3.05±0.01^{a}	3.06±0.01^{a}	3.03±0.00^{a}	3.10±0.01^{b}	3.04±-0.01^{a}	3.24±-0.03^{c}	3.02±0.00^{a}
8	3.04±0.01^{a}	3.03±0.00^{a}	3.19±0.03^{b}	3.31±0.04^{c}	3.33±0.05^{c}	3.20±0.03^{b}	3.11±0.02^{b}

A- Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

B. Anthropometric Data

Table 6 shows the average weight gain for animals in each for the period of eight weeks. The weight gain for the groups fed on Yahauri-spice compared were of significant difference ($p < 0.05$) in some inclusion levels with the control and the standard group while some compared favourably with each other. The trend was also observed for the body mass index (Table 7). The difference in weight reduction in the studied groups when compared to the standard and control group could be as a result of the pungent compounds in most spices which from research have be reported to accelerate the rate of metabolism and thus causes loss of weight [30, 31]. Also, these pungent properties in most of these spices can possibly result to reduced amount of feed consumed which in-turn result to loss of weigh [32]. Hence it can be deduced from our findings that these blended spices could work synergistically to improve metabolic rate and decrease accumulation of excess weight. This is evident from the reduction in BMI of some of the groups fed on Yahauri- spice meal based diet and was a dose dependent trend.

Table 6: Average Weight Gain of Rats fed on Yahauri-Spice Meal-based Diet

Weeks	A	B	C	D	E	F	G
2	3.40 ± 0.49^{a}	3.20 ± 0.17^{a}	2.80 ± 0.11^{b}	2.80 ± -0.80^{b}	3.20 ± -1.17^{a}	3.60 ± 3.94^{a}	3.20 ± 1.06^{a}
4	4.30 ± 0.33^{a}	4.10 ± 0.17^{a}	4.20 ± 0.31^{a}	3.11 ± 1.59^{b}	3.20 ± 1.17^{b}	3.80 ± -0.97^{ab}	3.20 ± 1.89^{b}
6	5.30 ± 0.33^{a}	4.80 ± 0.34^{b}	5.80 ± 0.26^{a}	4.80 ± 0.69^{b}	5.00 ± -0.29^{ab}	4.50 ± 1.57^{b}	4.90 ± 0.03^{b}
8	5.60 ± 0.29^{a}	5.13 ± 0.20^{b}	5.20 ± 1.66^{b}	5.20 ± 2.14^{b}	5.45 ± 2.26^{ab}	5.40 ± 1.43^{ab}	$5.30\pm P.87^{ab}$

Values are means of 5 replicates ± SEM. Values with different superscript across the same column are significantly different from the control for each parameter ($p < 0.05$)

A -Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

Table 7: Body Mass Index (BMI) of Rats fed on Yahauri-Spice Meal-based Diet

GROUP	BMI (Kg/m^2)
A	0.90 ± 0.06^{a}
B	0.90 ± 0.09^{a}
C	0.85 ± 0.11^{b}
D	0.86 ± 0.08^{b}
E	0.85 ± 0.09^{b}
F	0.82 ± 0.07^{b}
G	0.87 ± 0.07^{ab}

Values are means of 5 replicates ± SEM. Values with different superscript across the same column are significantly different from the control for each parameter ($p < 0.05$)

A -Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

C. Biochemical Indices (Kidney and Liver function biomarkers)

There is no significant difference in the Urea and Creatinine value (Kidney parameters) between the control group and other studied groups has showed (Table 8). Likewise, the same trend was observed for the albumin and bilirubin concentrations (Table 9). Similar trends was also observed in the five liver enzymes which were assayed for although a slight increase ($p < 0.05$) was observed in the gamma glutamyl transferase activity of two of the groups fed on the diet when compared with the control

The result of kidney function biomarkers shows no significant difference between the values of the control group and the values obtained for other groups for both Urea and Creatinine. These two parameters are products of protein breakdown and metabolism in the body [33] and important indicators of kidney functions in human and other animals [34] also reported similar findings in their studies for three different blended spices. Hence it can be asserted that the formulated Yahauri spice may not pose a threat to the kidney if consumed as part of a diet or if used as feed for animals.

Albumin is a protein made by the liver which helps keep fluid in the bloodstream not to leak into other tissue. It also carries various substances throughout the body including hormones, vitamins and enzymes [35]. The result of albumin and Bilirubin shows no significant difference between the control group and other studied groups. This finding indicates that formulated Yahauri spice meal base-diet can be seen as a diet that can maintain or regulates the albumin and bilirubin content of the body.

The studied parameters, Alanine transaminase (ALT), Aspartate transaminase (AST), Gamma-glutamyltransferase (GGT), Alkaline phosphatase (ALP) all varies distinctly across the groups. Lack of increase in ALT value across the groups compared to the control group shows that the formulated Yahauri spice has no adverse effects on the liver. In the same vain similar experience were obtained for AST parameter and other two parameters (ALP and GGT) analyzed. The results obtained for these liver parameters is an indication that the formulated spice may not be toxic or cause damages to the liver if consumed as a diet or part of diet, similar result were obtained when three different spices where mix together to evaluates the biochemical parameters and body weight gain in obese rats [34].

Table 8: Effect of Yahauri Spice Meal-based Diet on the Kidney Function Indices of Female Wistar Rats

Groups	Urea (mmol/L)	Creatinine (µmol/L)
A	8.86 ± 0.97^{a}	1.55 ± 0.14^{a}
B	8.44 ± 1.00^{a}	1.14 ± 0.00^{a}
C	$9.21 + 1.73^{ab}$	1.35 ± 0.34^{a}
D	9.58 ± 1.71^{ab}	1.23 ± 0.55^{a}
E	8.01 ± 0.34^{a}	1.09 ± 0.27^{a}
F	8.11 ± 1.77^{a}	1.48 ± 0.07^{a}
G	8.31 ± 0.08^{a}	1.37 ± 0.68^{a}

Values are means of 5 replicates ± SEM. Values with different superscript across the same column are significantly different from the control for each parameter ($p < 0.05$)

A -Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

Table 9: Effect of Yahauri Spice Meal-based Diet on the Liver Function Indices of Female Wistar Rats

Groups	Albumin(g/dL)	Total Bilirubin (g/Dl)	Direct Bilirubin(µmol/L)
A	3.36 ± 0.52^{a}	3.42 ± 0.16^{a}	1.56 ± 0.07^{a}
B	3.91 ± 0.39^{a}	3.26 ± 0.12^{a}	1.49 ± 0.05^{a}
C	3.36 ± 0.26^{a}	3.29 ± 0.03^{a}	1.50 ± 0.12^{a}
D	3.19 ± 0.60^{a}	4.33 ± 0.11^{a}	1.52 ± 0.05^{a}
E	3.37 ± 0.32^{a}	3.07 ± 0.07^{a}	1.40 ± 0.03^{a}
F	2.57 ± 0.42^{b}	4.28 ± 0.03^{b}	1.96 ± 0.01^{b}
G	3.82 ± 0.32^{a}	3.24 ± 0.22^{a}	1.48 ± 0.10^{a}

Values are means of 5 replicates ± SEM. Values with different superscript across the same column are significantly different from the control for each parameter ($p < 0.05$)

A -Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

Table 10 : Effect of Yahauri Spice Meal-based Diet on the Activities of Some Liver Enzymes of Female Wistar Rats

Treatment Groups	GGT(U/L)	ACHE(µg/ml)	AST(U/L)	ALT(U/L)	ALP(U/I)
A	18.79 ± 1.04^{a}	5.71 ± 1.39^{a}	87.90 ± 0.70^{a}	75.00 ± 2.50^{a}	131.79 ± 24.15^{a}
B	17.55 ± 1.25^{a}	5.79 ± 1.60^{a}	89.80 ± 1.20^{a}	73.75 ± 4.25^{a}	141.08 ± 31.74^{ab}
C	18.33 ± 0.40^{a}	5.16 ± 0.96^{a}	89.00 ± 3.80^{ab}	77.75 ± 3.75^{a}	132.50 ± 4.14^{a}
D	19.43 ± 1.39^{b}	5.25 ± 0.13^{a}	91.40 ± 2.80^{b}	75.25 ± 6.75^{a}	139.41 ± 28.29^{ab}
E	19.51 ± 2.62^{b}	6.00 ± 0.53^{ab}	83.70 ± 9.30^{a}	72.00 ± 1.00^{a}	135.92 ± 18.48^{ab}
F	18.91 ± 0.72^{ab}	6.01 ± 1.27^{ab}	89.60 ± 3.00^{a}	73.75 ± 0.25^{a}	140.30 ± 23.85^{ab}
G	19.44 ± 0.40^{b}	6.53 ± 0.41^{b}	90.70 ± 0.10^{a}	73.25 ± 3.75^{a}	184.89 ± 15.90^{b}

Values are means of 5 replicates ± SEM. Values with different superscript across the same column are significantly different from the control for each parameter ($p < 0.05$)

A -Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

D. Iodine and Stomach Pepsin Value

Tables 11 represent the results of serum iodine and pepsin across the studied groups. From the data obtained, there was a significant increase ($p < 0.05$) in the concentration of these two parameters in the group fed on diet at all inclusions when compared with the control.

Pepsin is a potent enzyme in gastric juice that proteins such as those in meat, eggs, seeds, and dairy products [36] whereas iodine is an essential component of the thyroid hormones thyroxine (T4) and triiodothyronine (T3). Thyroid hormones regulate many important biochemical reactions, including protein synthesis and enzymatic activity, and are critical determinants of metabolic activity [37]. They are also required for proper skeletal and central nervous system development in fetuses and infants [38]. The

results obtained here reveals that the formulated Yahauri spice administered was able to improve the concentration of the two biomarkers thereby enhancing their nutritional status.

Table 11: Effect of Yahauri Spice Meal-based Diet on Serum Iodine and Pepsin Concentrations of Female Wistar Rats

Groups	Iodine (mg/dl)	Pepsin (µmol/tyrosine/ml)
A	0.15 ± 0.07^{a}	12.42 ± 0.34^{a}
B	0.11 ± 0.00^{b}	12.04 ± 0.14^{b}
C	0.13 ± 0.05^{ab}	12.51 ± 0.16^{a}
D	0.13 ± 0.03^{ab}	12.74 ± 0.11^{c}
E	0.16 ± 0.03^{a}	12.85 ± 0.41^{cd}
F	0.16 ± 0.03^{a}	12.97 ± 0.14^{e}
G	0.16 ± 0.02^{a}	12.85 ± 0.32^{d}

Values are means of 5 replicates ± SEM. Values with different superscript across the same column are significantly different from the control for each parameter ($p < 0.05$)

A -Control diet, B –F : fed on 20%, 40%, 60%, 80%, 100% - Yahauri spice inclusion , G – Standard diet

IV. Conclusion

Yahauri spice meal based-diet has a good impact on the nutritional status of rats and might not be toxic to the body system. Due to its effect on nutritional status, it might likely possess the ability to reduce body weight which confirmed the claim by the Yahauri community as functional foods in the management of weight gain and other metabolic diseases.

V. Acknowledgement

The authors are indebted to the Biochemistry Department of the Faculty of Life Science, University of Ilorin, Ilorin Nigeria for making available their laboratory space for the conduct of this research work.

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