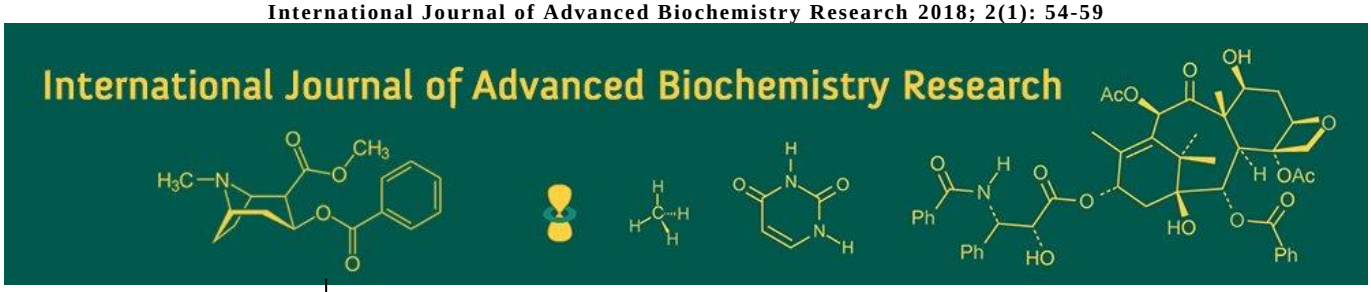

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Biochemical and physicochemical properties of *Persea americana* fruits replacement for margarine on wheat-avocado cakes production on wistar rats

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Abstract
This research assessed the biochemical and physicochemical effect of *Persea Americana* fruits cake (PAFC) which served as a close substitute for margarine in Wistar rats. The animals were grouped into six of 5 rats each. Group A= received 100% Margarine and served normal as control, Group B= 20% Margarine+ 80% Avocado, Group C= 30% Margarine+ 70% Avocado, Group D= 40% Margarine+ 60% Avocado, Group E= 50% Margarine+ 50% Avocado, Group F= 100% Avocado only and all had access to clean drinking water *ad libitum.* The animals received these varieties of *Persea Americana* cakes for twenty one days. The results of the proximate composition of wheat-avocado cake showed that avocado cake contains higher carbohydrate, protein and fats. The carbohydrate content was highest in group F followed by group D It is also high in protein composition compared to group E D, B, and C. In spite that group F contain the highest amount of fiber followed by group D, C and E. More so, the moisture contents were higher in groups B and A respectively. The ash content were higher in group E and group A while the fat contents of group F has the least amount compared to groups E, C and A respectively. There were significant differences ($P<0.05$) between group A compared to other groups ranging from their percentage moisture composition to their percentage carbohydrate compositions. After the analysis, it was observed that the total cholesterol levels (TC-L) increased in all the test groups with group A recording the highest concentration. It was observed that the cakes have concentration of iron and sodium followed by calcium and magnesium. F (65.0±1.9)Mg/dl respectively. In the low density lipoprotein cholesterol (LDL-C) there was a decrease in the initial values obtained before treatment of the animals with the cake. Groups A, B, C, D and F decreased with the exception of group E. The order of decreased in their LDL-C are Groups D>F>B>C>A, while A increased. The (HDL-C) was also analyzed and it was discovered that their values increased significantly. Group B increased more than group C, F, A, D and E the one-way ANOVA shows no significance difference ($P>0.05$) within and among groups in the TC- level. In overall, the biochemical and the physico-chemical properties of wheat avocado study shows that wheat avocado cake is strongly important in the management of hyperlipidemia and could be used or substituted essentially for margarine or butter in the production/baking of cakes though the texture and the aroma were not as pleasant as the 100% margarine cake.

Keywords: Margarine, butter, cake, avocado seed

Introduction
Plants in general and fruits have several compounds with antioxidant properties which include ascorbic acid, carotenoids and polyphenols, increased consumption of fruits and vegetables in association with lowered risk of cardiovascular diseases and even cancer (Riboli and Norat *et al*., 2003. Studies in experimental animals indicate that the addition of different dietary fibers may have different effects on cholesterol metabolism (Ghada *et al*., 2012). Cake is a form of sweet dessert that is typically baked. In its oldest form, cakes are modification of breads but now cover a wide range of preparation that can be simple or elaborate. Typical cake ingredients are flour, sugar, eggs and butter or margarine with some recipes requiring additional liquid such milk or water and leavening agents such as baking powder to give cake a delicate light consistency while also giving it a rich flavor and tender crumb (Cary 2014). Margarine or butter which is the main sources of lipid in the diets and is commonly used in baked foods.

It contain high level of saturated fatty acids and cholesterol. It is also documented that butter contain some harmful dietary fats like saturated fatty acids and trans fats.

Saturated fats is a type of fats that comes mainly from animals sources of food, such as red meats, poultry and full fat dairy products. Trans fats is also a type of fats that occurs naturally in some foods in small amounts. But Trans fats are made from oil through a food processing method called partial hydrogenation. Research studies show that saturated fats raises total blood cholesterol level and low density lipoprotein cholesterol levels which increase the risk of cardiovascular diseases and may increase the risk of type 2 diabetes. It has also been proven that partial hydrogenated Trans fats can increase unhealthy LDL-C levels and lower HDL-C levels, therefore increase cardiovascular diseases (www.mayoclinic.org/in-depth/fats. It is also proven that mega doses of vitamin A, D, E and K which are contained in margarine can be toxic and lead to health problems (Hanna *et al*., 2019) [9]

Therefore, this study investigated the effect of substituting fruits or vegetables for animals or dairy products in our baked foods and avocado pear *(Persea Americana*) fruits were considered since it is also widely consumed within our locality and due to the paucity of information on the biochemical effect of *Persea Americana o*n Wistar rats necessitated this study.

Materials and Methods

Plant collection and identification

Fresh avocado fruits and other ingredients were purchased from Ogbete Main Market, South eastern Nigeria. Riped *Persea Americana* fruits were identified by a Taxonomist at the Department of Crop Science, Enugu State University of Science & Technology, Agbani with a sample of the dried fruits kept in their herbarium unit with voucher number ESUT H123.

Sample Preparation

The riped avocado fruits were purchased from purchased from Ogbete Main Market, South eastern Nigeria and were thoroughly sorted out, washed and drained to avoid microbial contamination. They were peeled and the creamy mesocarp were homogenized using an electric Binatone 7 Grinder- BLG-402 to obtain a smooth puree or paste. The puree was used in the preparation of wheat-avocado cake with different proportions of avocado and margarine as stated in the experimental design.

Experimental animals

Thirty (30) Wistar rats of three to four months of age weighing between 100- 180g were used for the research. The animals were purchased from the Animal House Unit of the Department of Pharmacology & Therapeutics, College of Medicine, Enugu St State University of Science and Technology, Enugu and were kept in a well aerated laboratory cage in a room with 12 hrs dark/light cycle with a free access to feed (standardized and pelletinized growers feed from UAC- feed, Jos (Plateau state) with clean drinking *water ad libitium.* The animals were treated according to the International guidelines for the care and maintenance of laboratory animals and were allowed for acclimatization to the environment for seven (7) days before commencement of the experiment.

Experimental design

The thirty wistar rats of mixed sexes after acclimatization for seven (7) days were divided into six (6) groups of five rats each with their basal parameters determined and recorded before commencement of the treatment. The designs were as stated;

Group A= 100% Margarine with drinking water and served normal as control
Group B= 20% Margarine+ 80% Avocado
Group C= 30% Margarine+ 70% Avocado
Group D= 40% Margarine+ 60% Avocado
Group E= 50% Margarine+ 50% Avocado
Group F= 100% Avocado

Sensory evaluation/food intake

The animals food intake were also determined on daily basis for 21 days using a digital top loading weighing balance and the quantity of the feed consumed daily were recorded by subtracting the remnant from the total amount given in a day and were recorded in grams

Determination of the lipid profile

This was analyzed according to the methods of Ani *et al*., 2017 [1]. The lipid profiles (total cholesterol, triglycerides, high density lipoprotein and low density lipoprotein cholesterol) were determined prior to the commencement of the experiment using the hand-held cardiocheck self test meter (lipidocare) which has already been calibrated by the manufacturer (Polymer Technology System (PTS) USA). The samples of blood were collected directly from the tail region of each rat and the equipment was switched ON and allowed for about two minutes for normal booting followed by the insertion of the Memo clip into the lipidocare. Then two drops of blood of about 30 uL obtained directly from the tail of the animals were placed on a test strip inserted into the machine and allowed to acclimatize for 30 seconds followed by display of pink coloration which showed that it has been ready for result display and immediately, the results were displayed on the LCD screen of the equipment. The 'NEXT' buttons were pressed and the results of the lipid panel (Total Cholesterol, High density Lipoprotein cholesterol and Triglycerides etc were displayed one after the other and recorded in milligram/deciliter (mg/dl) while The serum level of LDL-C was measured according to the protocol of Friedewald *et al*. (1972) using the equation below: LDL-C = TC - (HDL-C - TGL/2.2). The values obtained were expressed in mg/dL.

Measurement of the body weights

The body weights of all the experimental animals were determined weekly throughout the experimental periods for four (4) weeks using the digital top loading weighing balance by Havard Apparatus Ltd. USA. Meanwhile, a cylindrical and transparent glass rat's restrainer was weighed and the weight tarred to zero before the introduction of the animals individually and their weights recorded in gram.

Statistical analysis

Data were analyzed using ANOVA followed by Tukey Post -hoc test to show multiple comparisons versus control group. Data analysis was evaluated using SPSS version 21 software Values of $P \leq 0.05$ were considered as significant.

Results

Table 1: Result of the Proximate Composition

Groups	Moisture (%)	ASH (%)	Protein (%)	Fiber (%)	Fat (%)	Carbohydrate
A	11.12±0.045	1.95±0.04	11.47± 0.003	1.34+0.001	24.68±0.0004	49.43± 0.027
B	11.65±0.0036	1.42±0.006	11.55±0.004	1.56±0.003	18.69±0.002	55.11±0.004
C	6.98±0.0026	2.23±0.002	11.48±0007	1.83±0.006	27.44±0.004	50.29±0.413
D	6.48±0.0035	1.75±0.005	11.91±0.00.5	1.85±0.05	22.24±0.004	55.78±0.014
E	10.36±0.0042	2.22±0.007	12.26±0.003	1.76±0.002	25.38±0.006	48.03±0.021
F	8.16±0.0036	1.26±0.004	14.57±0.001	1.85±0.006	8.26±0.007	62.25±25+5.78

Values were expressed as Mean ± Standard Deviation (n-5) A = 100% Margarine; B = 80% Margarine + 20% Avocado; C = 70%Margarine + 30% Avocado, D = 60% Margarine = 40% Avocado; E = 50% Margarine + 50% Avocado and F = 100% Avocado.

The results of the mean and standard deviation of the proximate composition of wheat-avocado cake are presented in table 1. The avocado cake contains higher carbohydrate content and protein with fat content. The carbohydrate content was (62.25±5.78) in group F (100% Avocado) followed by group D (60% margarine 40% Avocado). The 100% Avocado also serves as a good source of carbohydrate/energy. It is also high in protein composition (14.57±0.001) compared to group E (12.26±0.003), D(11.91±0.005), B(11.55±0.004), C(11.48±0.007) with group A(11.47±0.003). In spite that group F(100% Avocado) contain the highest amount of fiber (1.85+0.006) followed by group D(1.85±005), C(1.83±0.006), E(1.76±0.002), B(1.56±0.003) with group A(100% Margarine) with a value of 1.34±0.0001. More so, the moisture content were higher in group B and A (11.65±0.0036 and 11.12±0.045) respectively. The ash content were higher in group E(2.22±0.007) and group A(1.95±0.004). The fat content of group F(8.26±0.007) has the least amount compared to groups E(25.38±0.006), group C(27.44±0.004), A (24.68±0.004) respectively.

The results of the proximate composition of the different groups of the wheat-avocado cake were compared with group A (100% Margarine) and discovered that there were significant differences (P<0.05) between group A compared to other groups ranging from their percentage moisture composition to their percentage carbohydrate composition as illustrated in table 1.Hence the cakes are good source of energy since they have high oil content, however, the energy content is limited by high fibre content.The result of the moisture contents was relatively higher than the moisture content (5.3±0.2%) reported in (Jibran *et al*., 2020) [11]

Table 2: Result of the Mineral Element Present in the Sample (mg/100g)

Groups	Calcium	Magnesium	Iron	Sodium	Potassium
A	0.36±0.004	0.24±0.004	2.30±0.06	0.48 ±0.004	0.24±0.004
B	0.42±0.005	0.14±0.003	2.26±0.004	0.43±0.005	0.23±0.03
C	0.36±0.02	0.16±0.003	2.52±0.007	0.52±0.008	0.24±0.004
D	0.33±0.004	0.21±0.007	2.59±0.005	0.53±0.003	0.26±0.006
E	0.42±0.005	0.22±0.003	2.72±0.006	0.53±0.006	026±0.006
F	0.33±0.003	0.24±0.003	2.68±0.004	0.49±0.004	0.26±0.006

Values are express as mean± standard deviation, n=5, *P < 0.05 compared with A, $^{\beta}$P < 0.05 compared with B and $^{\gamma}$P < 0.05 compared with D.

Table 2 illustrated the result of the mineral elements present in the respective cake blends. It was observed that the cakes have concentration of iron and sodium followed by calcium and magnesium. Among all the groups analyzed, group E (50:50) has the highest concentration of iron followed by groups F, D, C, A and B respectively. The calcium concentration was higher in groups B and E followed by groups A, C, D and F respectively. The cakes have the lowest concentration of magnesium with group B with the least value compared to other groups respectively. The potassium concentration of the cakes were also very minute. Though groups D, E and F have a higher concentration compared to groups A and C, with group B with the least concentration. Groups D, E and F have equal concentration respectively. And group A and C and group B with the least concentration

Table 3: Result of the Mean ± SD of the Pre/Post Treatment of the Lipid Profile (Mg/dl**)**

Group	TC		TG		LDL-C		HDL-C	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
A	86.47±4.4	157.25±28.9	69.02±11.5	168.0±44	60.9±6.4	40.18±8.4γ	7.18±2.0	63.9±40.1
B	94.1±4.4	149.25±27.5	72.56±20	239±10.6	73.34±6.	30.4±2.8*γ£	5.42±1.8	71.05±27.2
C	79.52±7.9	130.75±26.7	81.41±20	192±38.2	51.72±7.5	27.7±4.1*γ	6.95±2.1	65.37±27.2
D	91.88±7.4	118.5±21.11	90.23±29	233±22.0	71.79±4.4	20.3±3.3*γ	5.09±1.6	51.6±18.8
E	85.58±5.6	134.0±4.4	83.53±20.3	207±20.5	50.95±15.1	61.8±8.3*βC	8.34±0.44	30.7±7.5
F	84.9±9.5	104.9±9.3	107.9±52.9	172±51.0	66.39±7.1	16.87±2.6*	8.64±0.8	66.2±27.9

*P < 0.05 compared with A, βP < 0.05 compared with B, CP < 0.05 Compared C, dP < 0.05 compared with D, £P < 0.05 compared with E and γP < 0.05 compared with F.

Table 3 shows the means standard deviation of lipid profile of the rats fed the cake blends. After the analysis, it was observed that the total cholesterol levels (TC-L) increased in all the test groups with group A recording the highest

concentration of the total cholesterol followed by groups B>C>E>D>F with values of 157.25±28.9, 149.25±27.5, 134.0±4.4, 188.5±21.11 and 104.9±9.3mg/dl respectively. Groups A increased by A(70.78±24.5), B(55.13±23.1), C(51.23±18.8), D(26.62±0.72), E(48.42±1.2) and F(20.0±0.2)mg/dl respectively. Moreover, the triglyceride (TG) level also increased significantly with groups B having the highest values of 239±10.6 followed by group D(233±22.0), E(207±20.5), C(192±38.2), A(168.0±44.2) and F(172±51.6)Mg/dl respectively. The increased in their triglyceride levels are as follow: groups B>D>E>C>A>F with values of 166.44±9.6, D(192.72±29.6), E(123.47±0.2), C(110.59±18.0), A(98.98±32.7) and F(65.0±1.9)Mg/dl respectively.

In the low density lipoprotein cholesterol, there was a decreased in the initial values obtained before treatment of the animals with the cake. Groups A, B, C, D and F decreased with the exception of group E. The post treatment value of the LDL-C were as stated, groups A(40.18±8.4), B(30.4±2.8), C(27.7±4.1), D(20.3±3.3), E(61.8±8.3) and F(16.87±2.6)mg/dl. The order of decreased in their LDL-C are Groups D>F>B>C>A, while A increased. Groups D decreased by 59.2±1.1, F(49.52±4.5), B (42.9±3.3) C(24.0±3.4) and A(20.27±2.0) respectively.

The High Density Lipoprotein Cholesterol (HDL-C) was also analyzed and it was discovered that their values increased significantly. Group B(71.05±27.2) increased more than group C(65.37±27.2), F(66.2±27.9), A(63.4±40.4), D(51.6±18.8) and E(30.7±7.5)mg/dl with differences in the pre-treatment and post-treatment results as stated: A(56.72±38.4), B(65.63±23.1), C(58.42±25.1), D(46.51±17.2), E(22.36±7.06) and F(57.56±27.1). They were all analyzed statistically with one-way ANOVA, followed Tukey Post-hoc test for multiple comparism. The one-way ANOVA shows no significance difference (P>0.05) within and among groups in the Total Cholesterol Level. The triglyceride recorded some increase in their levels but the statistical analysis shows that there was no significance difference (P>0.05) among and within the groups using the Tukey Post-hoc test for multiple comparison. Their LDL-C were also analyzed and discovered that there were significance differences (P<0.05) in some of the groups. Group A was compared with all the groups and found that there were significance difference (P<0.05) between group A compared with all the groups. Group B shows a significance difference (P<0.05) with groups E and F. There was also a significance difference (P<0.05) between groups C and E. Group D is also significantly different (P<0.05) with group E. There was also a significant difference (P<0.05) between groups F and groups A, B, C, D and E respectively. In the HDL-C, there were no significant difference (P>0.05) among and within all the groups compared with one-way ANOVA and multiple comparism using the Tukey Post-hoc test.

Table 4: Mean weekly food intake/percentage changes

Groups	Week 1	Week2	Week 3	Change in food intake (%)(WK3-WK 1)
A	43.14±18.00	40.64±4.30	43.72±4.90	0.58 g (1.34%)
B	50.00±0.00	49.48±1.09	46.36±4.31	-3.64 (7.28%)
C	34.33±15.18	35.01±8.91	40.71±8.09	6.38 (18.58%)
D	41.43±15.90	35.39±13.46	35.47±19.66	-5.96(14.38%)
E	29.49±10.45	32.23±17.05$^{\beta}$	25.14±12.67 $^{*\beta}$	-4.35 (14.75%)
F	32.56±9.67	30.23±12.14 $^{\beta}$	38.31±3.51	5.75(17.66%)

Values are presented as Mean $^{\pm}$ standard deviation with negative sign indicating a decrease in food intake. Also values with asterisk (*) and beta (β))symbols showed that there were significant differences)P<0.05) compared with groups A and B respectively.

Table 4 and shows the mean weekly food intake by the animals in each group for a total period of three weeks. The groups were provided with approximately fifty (50) grams of the cake blends daily for twenty one (21) days. There were increase in food intake in groups A, C and F but the increase was more significant in group C, followed by group F and group A respectively while groups B, D and E had a significant (P<0.05) decrease in food intake. It was observed that the decrease in food intake was more pronounced in group D.

Table 5 also shows the Mean ± SD of the bi-weekly body weights of all the experimental groups. From the table, it was observed that there were some significant increase and decreased among the groups. Group A at the end of the experiment decreased slightly on the week 1 (day 2) to week 2 day 2 but had little increase on week 3 day 1 and finally decreased by 0.66± 10.4g on the week 3 day 2. Group B with an initial body weight of 137.94± 14.04 increased to 149.68± 16.4 with a difference of 11.74±5.36g. Group A was compared with B, C, D, E and F weekly throughout the experimental period and it was discovered that there were significant differences (P<0.05) between group A and all the groups on the week 1 day 2 of the experiment. But on the week 2 day 1, group A was found to be significantly different (P<0.05) with groups B, D, E and F but not with group C (P>0.05). In the week 2 day 2 and week 3 day 1, there was no significant difference (P>0.05) between and within the groups using the one-way ANOVA and Tukey post-hoc test for multiple comparison. Group B and D were significantly difference (P<0.05) with group E on the final week (week 3 day 2) of the treatment. Meanwhile, on the final week of the treatment, group C and F had a significant decrease in their body weight with values of 5.52±14. 3g and 21.24± 15.43g respectively. Group F had a significant decreased in body weight from the week 1 day 2 to week 3 day 1 of the experiment and gained slightly on the initial body weight with a negligible decrease of 0.05±5.00g. But group D increased throughout the experimental period from an initial body weight of 141.65±12.23 to 156.25±14.83g leaving a difference of 14.6±2.6g. Despite the increase/decrease in the body weight, there was no significant difference (P>0.05) on the final week of the treatment

Table 5: Result of the Means ± SD of the Weekly(WK0 Body Weight (g)

Groups	WK1		WK2		WK3	

	D1	D2	D1	D2	D1	D2
A	125.18±7.5	114.5±7.23	118.02±13.76	118.86±17.87	125.76±15.58	124.52±17.79
B	137.94±14.04	144.1±12.65*	148.7±14.21*	145.28±13.63	134.6±25.0	149.68±16.4
C	135.54±6.65	138.6±10.42*	132.62±9.23	121.58±17.42	126.42±18.2	130.02±20.95
D	141.65± 12.23	149.35±16.39*	150.72±17.68*	148.62±17.59	155.62±16.8	156.25±14.83
E	144.18±6.69	144.6±6.94*	144.28±5.51*	147.55±8.09	126.8±25.0	122.94±22.12$^{\beta\gamma}$
F	153.3±3.58	147.47±11.65*	142.45±10.25*	149.75±5.4	150.5±7.12	153.25±8.58

Values are expressed as means ± standard deviation, n=5, *P<0.05 compared with A, $^{\beta}$P<0.05 compared with group B and $^{\gamma}$P<0.05 compared with group D

Discussion, conclusion and recommendation

The result of this study titled the Biochemical and physicochemical properties of *Persea Americana* fruits replacement for margarine on wheat avocado cake blends fed Wistar rats blends indicates that 100% avocado could be used in the lieu of 100% margarine often used in the preparation of cake. This attributes could be attached to the physicochemical properties of wheat avocado cake and its effects on lipid profile test (TC, HDL –C, LDL -C, and TG) including the animal's body weight. It was observed that the group treated with 100% wheat avocado cake had the 2nd best result in the assessment of it high density lipoprotein cholesterol after group B (80% margarine + 20% avocado) with group E (50% margarine + 50% avocado) with the least concentration of HDL –C. Group F (100% Avocado) had the least concentration of LDL-C compared to other groups. This reduction in the LDL-C exhibited by group F (100% Avocado) could be attributed to higher carbohydrate value recorded by the group. The higher carbohydrates value also affected the fibre content of the plant. The fibre content found in group F (1.55 ± 0.00) recorded the highest among all the experimental groups. In the group treated with 100% margarine, there was a significant increase in the total cholesterol more than other groups, though the TC level still falls within recommended level. It has a high concentration of triglycerides. Margarine reduced its values but the reduction is not comparable to that observed in group F. The mechanism that result in the increase in serum Ldl could be as a result of the decrease in body weight and possible antioxidant effect of avocado fruit. An argumentation of dietary fiber intake may increase the triglyceride due to the increase of the lever lipogenase enzymes activities as postulated by Barson *et al*., 2012 [2]. It has been documented that high fat diet (generally <25g/day) for women are recommended because of many associated health benefits (Due *et al*., 2004) [5]. In particular, evidence from randomized controlled trials observational studies, and animal models demonstrates that dietary fiber lowers level of low density cholesterol (Due *et al*., 2004) [5]. Which are common risk factors for cardiovascular disease (Hajar, 2017) [10] and increased the HDL- C. In overall, the serum TC-level in all the group did not decrease compared to the pre-treatment result but this could be that dietary fibre may alter serum sex hormone concentration which could affect lipid metabolism. (Barson 2012.) [2] The triglycerides level in all the experimental groups increased significantly above the normal range of triglyceride of 0-150 mg/dl, with group F (100% avocado) recording the least value among all the experimental groups. It was also documented that dietary carbohydrates can raise your tissues and blood cholesterol levels especially if your diet contains more calories than you expend on a daily basis. All digestible carbohydrates are broken into simple sugar, mainly glucose and fructose prior to their absorption from your small intestine. From the results, it was observed that the wheat avocado cake contains the highest concentration of dietary carbohydrate compared to other nutrients. The percentage unsaturated fat inhibited carbohydrate was highest in the group F (100% Avocado) Compared to other group, while the fat content of group A was higher than all other groups except groups C (70% margarine + 30% Avocado and D (60% margarine + 40% avocado). It was documented that margarines elevates the level total cholesterol, high density lipoproteins and triglyceride (Tanko *et al* 2016) [16]. In the proximate analysis, the moisture, ash, protein, fiber and carbohydrate contents were significantly different with P= 0.0001. This result seems to be in agreement with the result of the research carried out by Wekwete *et al*, 2008 [17] in which they performed a study that substituted margarine in oatmeal cookies with avocado and the moisture content of the avocado cookies were significantly difference from the controlled margarine cookies (Wekwete *et al*, 2008) [17]. In the sensory evaluation, it was made known that the respondents prefer cake with 100% margarine to 100% avocado, and this could be affiliated to the fact that they are used to such cakes in Nigeria and will likely take a wide time to adapt to the new wheat-avocado cake. In the food intake assessment from the experimental feeding, the group that were fed cake with 80% margarine 20% avocado consumed more of the diet followed by the group that received 100% margarine feed only. The least consumed is the group fed 100% avocado and this may be affiliated with the texture of the wheat avocado cake. Also sensory evolution of the cake by humans showed the highest likeness in 100% margarine cake followed by 80% margarinee+20% avocado. So in this research, it was observed that more of the diet that contains more proportion of margarine was consumed more compared to other groups. But looking into the health beneficial effect of avocado and margarine, it was documented that margarine contain high level of saturated fatty acids and cholesterol (Wardlaw and Hampl, 2004) than avocado. Also it contains some harmful dietary fats like saturated fats and trans fat which are atherogenics to both humans and animals. More so, margarine is hydrogenated in nature which causes rise in total cholesterol levels and low density lipoprotein cholesterols (LDL - C) and can cause greater risk of cancer as well coronary artery disease than from saturated fats (Lumor, 2010) [13].

Conclusion

In overall, the biochemical and the physic- chemical of wheat avocado study shows that wheat avocado cake is strongly important in the management of hyperlipidemia and could be used or substituted essentially for margarine or butter in the production/baking of cakes though the texture and the aroma were not as pleasant as the 100% margarine cake.

This study strongly recommended that avocado fruits should be substantiated for margarine or butter in the production of

cakes or other bather food likely because of the antioxidant proportion of the avocado including the high carbohydrate content of wheat avocado -cake. The study also suggests or recommends that subsequent researches be carried out on this plant using human models since the wheat avocado cake is mainly consumed by man.

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Conflict of Interest
None to declare

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