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Growth performance and Carcass Characteristics of broiler Chickens fed Graded levels of differently processed Rubber Seed Meal based Diets

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Abstract*— *High cost of conventional feed ingredients has force many poultry farms to ford-up therefore call more researches in the use alternative feedstuffs which rubber seed meal is one. This experiment was therefore carried out to evaluate the growth performance and carcass characteristics of broiler chickens fed processed rubber seed meal (RSM) based diets in a six weeks straight feeding trial in completely randomized design with two by four factorial arrangement i.e. two processing methods (roasted rubber seed meal and` Hot water soaked sample and four equi-protein replacement of soybean meal levels (0, 15, 25 and 35% levels). The results revealed that the final weight (2150.00-2243.07g), weight gained (2106.00-2213.60g), daily weight gained (50.14-52.01g) average feed intake (101.89 -108.46), average feed consumed (4177.67- 4447.00g) and feed conversion ratio (1.91-2.10) were not significantly ($p \geq 0.05$) affected by dietary treatments. The dressed and eviscerated weights of broilers fed HRSM based treatment were significantly ($p \leq 0.05$) higher than those that fed RRSM based treatment. Level interaction, treatment contrast and treatment and level interactions did not showed any significant ($p \geq 0.05$) variation in all parameters measured suggesting rubber seed meal as suitable replacement of soybean meal in broilers chickens ration.

Keywords*— *rubber seed meal (RSM); hot water rubber seed meal (HWRSM); roasted rubber seed meal (RRSM); soybean meal (SBM).

I. INTRODUCTION

Poultry products mostly meat, is a one meal size which did not require storage, it requires small space to rear, has short gestation period, can reach slaughter age within a short period. Thus, developing the poultry industry appears to be the fastest means of bridging the protein deficiency gap presently prevailing in Nigeria (Akinsanmi *et al*., 2017). Nigeria's feed production seem to be expanding rapidly in consistent with growth in the poultry industry. The business of raising poultry is cost-sensitive. Poultry feed accounts for higher percentage of the total feed produced in Nigeria (Agbede, 2019). The demand for poultry products has increased markedly over the past few years, due to the rapid growth specifically in the number of fast food restaurants featuring chicken menu in major urban areas (Akinnusotu *et al*., 2018). Profit of poultry farming mainly depends upon the economics of feeding the birds. Nigeria poultry industry is facing the problem of limited availability and high cost of conventional feed ingredients (Agbede, 2019). Therefore, search for alternative feedstuffs that can reduce cost of feed becomes a necessity. The use of unconventional feed sources like crop residues and agro-industrial by-products has been suggested to be the solutions to the problem of feed crisis in

poultry production (Agbede, 2019; Igbasan, 2019). In fact, partial or complete replacement of the expensive conventional feed ingredients with cheaper non-conventional one has been suggested (Akinsanmi *et al*., 2020; Ijaiya *et al*., 2011). Over the years, different researches have been carried out on the use of unconventional feed ingredients in which rubber seed meal was one. Rubber seed is cheaper than full fat soya beans, it is not normally used as food by man and is a good source of protein and energy (Akinsanmi *et al*., 2017; Ijaiya *et al*., 2011). The rubber tree plantation in Nigeria was estimated to cover 200,000 hectares of land producing about 20,000 tons of seeds per year and seed yield of 214.9kg/hectare of which only about 20% were used as seedlings and the remaining were fed on by rodents or wasted (Noordin *et al*., 2012). Research has shown that the nutrient composition of rubber seed meal (RSM) were; metabolizable energy (1828.65- 2675.61kcal/kg), crude protein (22.16- 40.36 %,); ether extract (12.41 to 55.67%); crude fibre (2.65 - 3.62 %,); ash (2.20%- 6.57%) and carbohydrate (14.09 - 41.48%) (Akinsanmi *et al*., 2017; Eka *et al*., 2010). The range of metabolic energy of RSM (1828.65- 2675.61kcal/kg) fall within the range of metabolizable energy (ME) in other pulses used in feeding livestock. The values of 2750, 2460 and 2069 ME (Kcal/kg) for groundnut cake, soybean cake and cotton seed cake respectively (Olomu, 2011). The high energy and protein values of RSMs show that the meal could also be used as energy source and plant protein if it is properly processed (Oyewusi *et al*., 2007). though RSM is reported to be high in cyanide (18mg/100g) (Akinsanmi *et al*., 2018), those anti nutritional factors found in rubber seed are heat labile and are reduced to tolerable level while toasted (105^{o}C) or stored for 4-6 months before used (Akinsanmi *et al*., 2018). The seed meal or cake of rubber have been reported to have no any noticeable adverse effects on the health status of poultry birds (Akinsanmi *et al*., 2020) and contain higher contents of digestible nutrients than some conventional seed meals and are highly promising as future protein supplements in livestock and animal diets (Oyewusi *et al*., 2007).

Poultry birds can tolerate meal from undecorticated rubber seeds better than pigs because they have a gizzard to grind and help to digest the shell (Amaefule, *et al*., 2020). The crude protein content of rubber seeds and its products ranged between 22% in whole rubber seeds and 41% in commercial decorticated rubber seed meal (Eka *et al*., 2010).The utilization of rubber seed as a feed ingredient for monogastric animals has been limited by the presence of anti-nutritional factors especially hydrogen cyanide and the lack of proper processing methods that are cheaper and easy to adopt by the small scale rubber farmer or small scale poultry farmer living within the rubber producing zone of Nigeria (Akinsanmi *et al*., 2020) . This study was therefore carried out to assess growth performances and carcass characteristics of broiler chickens fed rubber seed meals based diets using two farmers' friendly processing methods and to establish the suitable incorporation levels of rubber seed meal in broilers feed.

II. METHODOLOGY

Sample collection and study site

This experiment was carried out at the Teaching and Research Farm of the Federal University of Technology; Akure which is located between 7.15^{o} North and 5.0^{o} East of the equator with the average annual rainfall of 1524mm and annual temperature of 28^{oc} to 31^{oc} and mean annual relative humidity of about 80% (Ajibefun, 2011). The rubber seeds used for this study were purchased from Ilusin rubber estate, Ilusin, Ogun state, Nigeria.

Sample processing and treatment

The seeds were washed with distilled water, sundried, dehulled and allowed to pass through the different processing methods: (a) soaking in hot water for 12 hours (HWRSM); (b) soaking in ash solution for 12 hours (ASRSM); (c) roasting for 15 minutes and cooled at room temperature (RRSM); (d) Stored at room temperature for thirty five days (STRSM), (e) Chemical de-fattened using Sohlext apparatus (DRSM), while the last sample was unprocessed (URSM). The samples were dried, milled and chemically analysed. Proximate analysis of the samples was carried out using the AOAC method (AOAC, 2000).

Experimental treatments/samples for experiment

Based on the result of the chemical compositions (Akinsanmi *et al*., 2018), the two samples with best chemical compositions (RRSM and HWRSM) were selected for the experiment. Two hundred and fifty (250) day-old broiler chicks of Hubbard strain were purchased from AFGRI BnotHarel hatchery, Ibadan, Oyo-State, Nigeria. Out of which two hundred and ten (210) were selected for the experiment. The chicks were weighed and randomly allotted to seven dietary treatments. Each dietary treatment contained 30 chicks which were divided into three replicates of 10 chicks each. The birds/replicate was housed in floor of 3m x

3m x 2.5m. The floor was covered with wood shavings as litter material. Each pen was equipped with feeding troughs and drinkers. The chicks were electrically brooded for two weeks. The experimental design for this experiment was completely randomized design with 2 by 4 factorial arrangement of two methods of processing (roasted rubber seed meal and hot water soaked rubber seed meal) and four levels of inclusion (0,15, 25 and 35%). Seven straight diets were formulated with equi-protein replacement of soybean meal with rubber seed meal (RSM) at graded levels. Diet 1 served as the control while diets 2, 3 and 4 contained roasted rubber seed meal (RRSM) at graded levels 15, 25 and 35% respectively, diet 5,6 and 7 contained hot water soaked rubber seed meal (HWRSM) at 15, 25 and 35% respectively (Table 1). The birds were offered their respective diets during the period and drinking water of the experiment *ad libitum*. The chicks were given all routine vaccinations and necessary medications. The initial weights of the individual birds were taken at the commencement of the study and subsequent weight at weekly intervals to determine the weekly weight gain using cumulative analysis and final weight. So also the daily feed intake per replicate were recorded for the calculation of total feed intake and feed conversion ratio.

Data analysis

The results were used to assess the profitability of the test treatments. Data generated were analysed using SPSS ((16.0) software version, differences among the means were determined by Duncan's multiple range tests of the same package

Table 1: Gross composition (%) of broiler chickens diets with graded levels of differently processed rubber seed meals

Ingredient	Control		RRSM			HWRSM	35%
replacement level	0%	15%	25%	35%	15%	25%	
Maize	53.00	50.90	49.51	48.11	49.73	47.56	45.38
Wheat offals	7.00	7.00	7.00	7.00	7.00	7.00	5.00
Soybean meal	28.00	23.80	21.00	18.20	23.80	21.00	18.20
RRSM (28.02% CP)	0.00	6.30	10.51	14.69	0.00	0.00	0.00
HWRSM (23.63% CP)	0.00	0.00	0.00	0.00	7.47	12.44	12
Groundnut cake	0.00	0.00	0.00	0.00	2.00	2.00	2.00
Fishmeal	4.00	4.00	4.00	4.00	4.00	4.00	4.00
DCP	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Oyster shell	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Lysine	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Vegetable oil	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated values							
ME (Kcal/kg)	3126.90	3092.00	3068.80	3045.53	3116.78	3019.45	3067.56
Crude Protein	20.43	20.15	20.13	20.09	20.62	20.42	20.23
Crude Fibre	3.52	3.40	3.32	3.25	3.34	3.28	3.21
Calcium	1.13	1.13	1.12	1.12	1.13	1.13	1.13

Av. Phosphorus	0.73	0.71	0.69	0.67	0.69	0.67	0.65
Lysine	1.38	1.58	1.72	1.86	1.66	1.84	2.01
Methionine	0.55	0.67	0.74	0.82	0.69	0.79	0.88
Analyzed values							
MC	9.00	8.44	9.50	9.00	7.91	7.93	7.93
Total Ash	9.56	9.97	9.23	9.99	8.56	9.27	8.95
Crude Protein	21.00	20.89	20.86	21.02	21.08	20.88	20.55
Crude Fibre	3.18	3.52	3.10	3.02	3.52	3.48	3.67
Fat	5.18	5.00	5.22	5.70	4.20	4.39	4.53
CHO	57.01	56.97	58.25	58.11	59.54	58.49	59.46

Keys: HWRSM; Hot water rubber seed meal, RRSM; Roasted rubber seed meal, Premix contained the following: (Univit. 15 Roche) 1500 I.U., Vit. A, 1500 I.U., Vit. D: 3000 I.U., Vit.E, 3.0 g; Vit, B2, 0.3 g; Vit. B6, 8.0 mg; Vit. B12, 8.0 g; Nicotinic acid, 3.0 g; Ca-Pantothenate; 5.0 mg; Fe, 10.00 g; Al, 0.2 g; Cu, 3.5 mg;Zn, 0.15 mg; I, 0.02 g; Co, 0.01 g/kg

III. RESULTS AND DISCUSSION

Growth performance of the birds fed graded levels of differently processed rubber seed meal (RSM) as shown in Table 2 revealed there were no significant ($p \geq 0.05$) differences in all the parameters measured at all levels of inclusion. The final weight (2150.00-2243.07g), weight gained (2106.00-2213.60g), daily weight gained (50.14-52.01g) average feed intake (101.89 -108.46), average feed consumed (4177.67- 4447.00g) and feed conversion ratio (1.91-2.10) were not significantly ($p \geq 0.05$) affected by dietary treatments. Suggesting that soybean meal (SBM) and processed RSM have similar influences on the growth performance of broiler chickens. The fact that there were no significant variations in the treatments at all levels showed that rubber seed meal could be used to replace soybean meal in broiler chicken diets up to 35% equi-protein replacement level. This is agreement with earlier report on performance of pigs fed up to 30% replacement level of soybean meal with RSM (Eka *et al*., 2010). Treatments interaction was not also significantly differed, this mean that the two processing methods have similar influences on the performance of the birds. Therefore, roasting or soaking of rubber seed in hot water can be used to process rubber seed for broiler chickens.

The range of average final weight (2150.00g-2243.07g) and average weight gained (2106.00g – 21213.60g) of birds on the test diets were more than 2kg recommended body weight for broilers chicken at six week (Noordin *et al*., 2012) which justified the inclusion of the processed RSMs in broiler chickens feed. Average daily feed consumed per bird (101.89 -108.46g) were lower than 111.90 – 335.34g/bird and 382.14g/bird reported for broiler chickens at 6-8 weeks fed defatted RSM respectively (Ijaiya *et al*., 2012; Olomu, 2011). The reduced feed intake might be due to high fat content in RSM based diets which might have resulted to high metabolizable energy (ME). Poultry birds eat to meet their energy requirement, so they eat less in high energy feed (Oloruntola *et al*., 2016). It has been reported that fat slow the rate of passage of feed in the alimentary tract thereby allow proper digestion and absorption of nutrients in feed (Jeffre *et al*., 2008).There is a positive relationship between dietary energy concentration and weight gain in broiler chicken (Onuh *et al*., 2010). Therefore, the used of full fat RSM in animal feed have some advantages which includes concentration of energy, increase growth rate and decreased feed intake. Rubber seed is a good potential feedstuff for livestock (Oyewusi *et al*., 2007).

Table 2: Performance of broiler chickens fed graded levels of differently processed rubber seed meals (RSMs) based diets.

Treatments	% replacement of SBM	Average Initial Weight (g)	Average Final Weight (g)	Average Weight gain (g)	Average Weight gain/day (g)	Average Feed intake (g)	Daily feed intake (g)	Feed conversion ratio
Level	0	44.07	2243.07	2213.60	52.01	4228.17	103.13	1.91
	15	43.78	2201.00	2157.18	51.36	4279.03	101.88	1.98
	25	43.83	2186.67	2142.28	51.01	4212.33	104.37	1.97
	35	43.78	2161.67	2117.82	50.42	4204.50	102.55	1.99
	SEM	0.13	28.49	26.17	0.75	38.13	1.06	0.03
	P value	0.93	0.92	0.85	0.67	0.70	0.89	.060
Treatment								
RRSM		43.71	2161.78	2118.00	50.43	4240.67	103.43	2.00
HWRSM		43.89	2204.44	2160.19	51.43	4223.24	103.01	1.96
SEM		0.11	25.07	22.04	0.69	32.89	25.92	0.02
P value		0.93	0.92	0.85	0.67	0.70	0.89	0.68
Treatment x	Level							
Control	0	44.07	2243.07	2213.60	52.01	4228.17	103.13	1.91
RRSM	15	43.17	2228.00	2184.17	52.00	4284.54	104.50	1.96
RRSM	25	43.93	2212.00	2166.97	51.60	4177.67	101.89	1.93
RRSM	35	43.97	2173.33	2129.43	50.70	4243.33	103.50	1.99
HWRSM	15	43.80	2174.00	2130.20	50.70	4409.33	107.54	2.07
HWRSM	25	43.73	2161.33	2117.60	50.42	4447.00	108.46	2.10
HWRSM	35	43.68	2150.00	2106.00	50.14	4365.67	106.48	2.07
SEM		0.01	36.22	34.86	0.90	50.84	0.24	0.06
P value		0.89	0.92	0.93	0.79	0.76	0.92	0.87
Significance								
Level		NS	NS	NS	NS	NS	NS	NS
Treatment		NS	NS	NS	NS	NS	NS	NS
Treatment x	Level	NS	NS	NS	NS	NS	NS	NS

Keys: URSM: Unprocessed rubber seed meal, HWRSM: Hot water soaked rubber seed meal, RRSM: Roasted rubber seed meal, DRSM: Defatted rubber seed meal, ASRSM: Ash soaked rubber seed meal, STRSM: Store at room temperature rubber seed meal. FCR; SBM: soybean meal; NS: not significant Means with the same superscripts in the same row are not significantly ($P \geq 0.05$) different.

Carcass characteristics of the birds as shown in Table 3 revealed that there were no significant [$P \geq 0.05$] difference in the live weight (1.93-2.15kg), dressed weight (% live weight) (86.23-89.53), eviscerated weight (% live weight) (73.25-76.57) at all levels of inclusion. Treatments contrast of dressed weight and eviscerated weight showed that broiler

chickens fed HWRSM performed significantly ($P \leq 0.05$) better than their counterparts on RRSM based diet. Some parts weight (% eviscerated weight) and some relative organs weight (% live weight) measured as revealed in Table 4 and 5 respectively were not equally significantly ($P \geq 0.05$) affected by dietary treatments. The weight reduces gradually as the levels of equi-protein replacement of soybean with RSM increased, this might be due to the presence of residual anti-nutritional factors and variations in the quality of protein in the ingredients (Akinsanmi *et al*., 2018). The similarity observed in the performance of birds fed control and test diets indicates that processed RSM based diet promote similar growth and organs development as soybean meal based diet and can therefore be incorporated into poultry chicken feed to replace scarce and expensive soybean meal by Nigerian poultry farmers.

Table 3: Some carcass traits of broiler chickens fed graded levels of differently processed rubber seed meals (RSMs) based diets.

	% replacement of SBM	Live weight (kg)	Dressed weight (% live weight)	Eviscerated weight (% live weight)
Levels	0	2.08	88.83	73.05
	15	2.04	87.94	73.97
	25	2.08	87.05	72.81
	35	2.06	87.51	73.59
	SEM	0.20	1.27	1.51
	P value	0.81	0.86	0.70
Treatment				
RRSM		2.02	86.06[b]	71.70[b]
HWRSM		2.10	88.94[a]	75.21[a]
SEM		0.23	0.34	0.89
P value		0.13	0.03	0.02
Treatments x levels				
Control	0	2.08	88.83	73.25
RRSM	15	1..93	86.45	71.36
RRSM	25	2.10	86.23	72.32
RRSM	35	2.04	85.49	71.43
HWRSM	15	2.15	89.43	76.57
HWRSM	25	2.07	87.87	73.57
HWRSM	35	2.09	89.53	75.76
SEM		0.06	1.35	1.69
P value		0.16	0.76	0.45
Significance				
Level		NS	NS	NS
Treatment		NS	*	*
Treatment x level		NS	NS	NS

Keys: URSM: Unprocessed rubber seed meal, HWRSM: Hot water soaked rubber seed meal, RRSM: Roasted rubber seed meal, DRSM: Defatted rubber seed meal, ASRSM: Ash soaked rubber seed meal, STRSM: Store at room temperature rubber seed meal. SBM: Soybean meal, means with different superscripts in the same row are significantly ($P \geq 0.05$) different, NS: Not Significant.* Significantly ($P \leq 0.05$) different.

Table 4: Some parts weight (% eviscerated weight) of broiler chickens fed graded levels of differently processed rubber seed meals (RSMs) based diets.

Diets	% replacement of SBM	Head	Shank	Drumstick	Chest	Breast muscle	Abdominal fat	Thigh	Neck	Wing	Back
Level	0	3.36	2.25	5.35	16.89	6.98	1.50	6.154	5.66	4.98	15.29
	15	3.36	2.52	5.36	16.65	6.88	1.71	6.72	5.45	4.88	15.17
	25	3.35	2.47	5.39	16.75	6.72	1.75	7.32	5.54	4.86	15.09
	35	3.36	2.38	5.27	16.92	6.70	1.78	7.67	5.48	4.79	15.23
SEM		0.06	0.01	0.01	0.02	0.03	0.06	0.01	0.04	0.01	0.02
P value		0.76	0.76	0.65	0.72	0.54	0.43	0.45	0.55	0.62	0.34
Treatment											
RRSM		3.36	2.52	5.35	16.76	6.85	1.55	7.13	5.53	4.90	15.16
HWRSM		3.36	2.47	5.34	16.89	6.78	1.76	7.25	5.42	4.82	15.08
SEM		0.05	0.03	0.06	0.09	0.05	0.03	0.07	0.02	0.02	0.01
P value		0.92	0.89	0.88	0.76	0,79	0.77	0.89	0.69	0.87	0.56
Treatment	X level										
Control	0	3.36	2.25	5.35	16.89	6.98	1.50	6.15	5.66	4.98	15.29
RRSM	15	3.37	2.65	5.32	16.79	6.87	1.72	6.73	5.68	4.90	15.30
RRSM	25	3.35	2.52	5.42	16.56	6.86	1.75	6.80	5.58	4.97	14.99
RRSM	35	3.37	2.34	5.29	17.00	6.82	1.78	7.45	5.37	4.75	15.21
HWRSM	15	3.36	2.45	5.45	16.62	6.90	1.72	6.67	5.34	4.89	14.90
HWRSM	25	3.36	2.50	5.37	17.02	6.68	1.74	7.55	5.22	4.78	15.12
HWRSM	35	3.37	2.46	5.26	16.87	6.59	1.79	7.95	5.68	4.89	15.25
SEM		0.09	0.01	0.09	0.03	0.03	0.08	0.01	0.02	0.01	0.03
P value		0.32	0.42	0.45	0.78	0.64	0.56	0.35	0.34	0.64	0.32
Significance											
Level		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Treatment		NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Treatment x	Level	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Keys: URSM: Unprocessed rubber seed meal, HWRSM: Hot water soaked rubber seed meal, RRSM: Roasted rubber seed meal, DRSM: Defatted rubber seed meal, ASRSM: Ash soaked rubber seed meal, STRSM: Store at room temperature rubber seed meal. SBM: Soybean meal, means with different superscripts in the same row are significantly ($P \geq 0.05$) different, NS: not significant.

Table 5: Organs weight (% live weight) of broiler chickens fed graded levels of differently processed rubber seed meals (RSMs) based diets.

Diets	% inclusion of RSM	Liver	Heart	Kidney	Gizzard	Spleen	Pancreas	Lung
Level	0	1.02	0.21	0.10	1.12	0.06	0.10	0.23
	15	1.08	0.27	0.09	1.10	0.06	0.08	0.26
	25	1.09	0.29	0.09	1.01	0.05	0.09	0.23
	35	1.09	0.34	0.11	1.00	0.04	0.10	0.26
	SEM	0.06	0.01	0.01	0.06	0.01	0.01	0.02
	P value	0.66	0.14	0.46	0.48	0.36	0.26	0.62
Treatment								
RRSM		1.09	0.30	0.10	1.07	0.04	0.09	0.26
HWRSM		1.07	0.29	0.09	1.00	0.05	0.09	0.23
SEM		0.06	0.01	0.01	0.05	0.01	0.01	0.06
P value		0.84	0.94	0.32	0.35	0.24	0.70	0.17
Treatment x	Level							
Control	0	1.02	0.21	0.10	1.12	0.06	0.10	0.23
RRSM	15	1.05	0.29	0.09	1.22	0.06	0.09	0.29
RRSM	25	1.03	0.31	0.09	0.98	0.04	0.09	0.26
RRSM	35	1.09	0.38	0.13	1.01	0.03	0.09	0.24
HWRSM	15	1.10	0.26	0.09	0.98	0.05	0.076	0.23
HWRSM	25	1.04	0.29	0.09	1.04	0.050	0.08	0.21
HWRSM	35	1.06	0.32	0.08	0.99	0.05	0.11	0.25
	SEM	0.08	0.02	0.03	0.08	0.01	0.01	0.03
	P value	0.10	0.24	0.28	0.23	0.29	0.29	0.51
Significance								
Level		NS	NS	NS	NS	NS	NS	NS
Treatment		NS	NS	NS	NS	NS	NS	NS
Treatments x	Levels	NS	NSS	NS	NS	NS	NS	NS

Keys: SBM: soybean meal URSM: Unprocessed rubber seed meal, HWRSM: Hot water soaked rubber seed meal, RRSM: Roasted rubber seed meal, DRSM: Defatted rubber seed meal, ASRSM: Ash soaked rubber seed meal, STRSM: Store at room temperature rubber seed meal. SBM Soybean meal, NS: not significant.

IV. CONCLUSION

This study established the fact that equi-protein replacement of soybean meal in broiler chicken feed with graded levels of RSM from both processing methods [roasting and soaking in hot water] up to 35% did not have any noticeable adverse effects on the growth performance and carcass quality of the birds. This justify the call for the inclusion of processed RSM into the list of poultry feed ingredients as an alternative to scarce and expensive soybean meal.

AUTHORS' CONTRIBUTIONS

Conceptualization: S. K Akinsanmi, F.A. Igbasan

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