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## GROWTH RESPONSE AND CARCASS CHARACTERISTICS OF RABBITS FED SOYABEAN CURD RESIDUE AS REPLACEMENT FOR FULL FAT SOYABEANS

BY

<sup>1</sup>Maidala, A., and <sup>2</sup>Doma, U. D.

<sup>1</sup>Vocational and Technology Education,

<sup>2</sup>Animal production programme,

Abubakar Tafawa Balewa University, P.M.B.248, Bauchi.

[aminumaidala@yahoo.com](mailto:aminumaidala@yahoo.com)

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### ABSTRACT

*An eight week feeding trial was conducted to assess the replacement value of soyabean curd residue meal (SCRM) for full fat soyabean on the growth performance and carcass characteristics of growing rabbits. Thirty rabbits of mixed breeds and sexes were randomly allotted to six treatments in which SCRM replaced full fat soyabean at 0% (control), 20%, 40%, 60%, 80% and 100% levels. There were five rabbits per treatment, replicated five times in a completely randomized design (CRD). Results showed that there were a significant difference in daily feed intake, daily weight gain and feed conversion ratio ( $P < 0.05$ ). There were significant difference in live weight, dressing percentage, weight of hind limbs and liver ( $P < 0.05$ ) SCRM can replace full fat soyabean in the diet of growing rabbits up to 60% level without deleterious effects on growth performance and carcass yield.*

**Keywords:** Soybeans curd residue, full fat soyabean, growth performance, carcass characteristics, and growing rabbits

### INTRODUCTION

Feed is the most important input in a profitable livestock production. It represents 70-85% of the total cost of monogastric production (Sanni and Ogunidipe 2005). The high cost of conventional feeds and feedstuffs brought about the need to have alternative feedstuffs that can replace the expensive ones to reduce the cost of livestock production (Onigemo *et al.*, 2016). Non conventional feedstuffs offer the best alternatives in our environment for reducing feed cost and therefore reduction in the cost of meat and animal products (Onigemu and Anjola, 2013). Despite the numerous advantages associated with consumption of animal protein, the minimum, daily intake of 35g recommended by Food and Agriculture Organization has not been met. An average Nigerian for instance consumes only about

10g per head per day of this minimum daily animal protein requirement. This could be attributed to low level of animal protein production and high cost of animal products. There is therefore, an urgent need to increase livestock production in the country especially those that are highly prolific with rapid turnover rate at very low cost. Rabbit production possesses vast potential in alleviating the problems associated with low protein intake in Nigeria and other developing countries, due to its high fecundity, short generation interval, ability to utilize diverse forages, lean carcass and high linolenic acid composition (Nistor *et al.*, 2013). Rabbits apart from their known reputed proficiency in reproduction have higher quality protein, much lower fat/cholesterol and steady source of income than other livestock species (Owen, *et al.*, 2009).

The initial capital and cost of production is relatively low when compared to other livestock enterprises. Nutritionally, rabbit has a higher protein (20-21%), low fat content (10-11%), when compared with meat from other species. Rabbit meat has less cholesterol value of 169mg/100g (dry matter basis) when compared with beef (200mg), chicken (220mg), and low sodium content (Janieri, 2003). Consequently, rabbit meat has been listed in United State Department of Agriculture as an approved meat source for hypertensive patients. The production of rabbits will be cheaper if agricultural waste like SCRM is incorporated in the diets of rabbits (Iyeghe-Erakpotobor *et al.* 2006), over the years, there has been a great increase in the production of soya beans in Nigeria, which has resulted in a concomitant increase in the consumption of soyabean. Soyabean is used in making various products such as soups, milk, soy moimoi, soy daddawa and cheese. SCRM, a by-product of milk and cheese production is used for feeding ruminants' animal such as cattle, sheep and goats. It is readily available and cheap in towns and villages where cheese is widely produced and eaten (Iyeghe-Erakpotobor, 2010). Large quantities of the materials are available because of these business activities. This study investigated the growth performance, organs and gut weights of weaner rabbits fed different levels of soyabean curd residue meal.

## MATERIALS AND METHODS

### *Experimental site*

Katagum local government is situated on the northern part of Bauchi state, Nigeria. It is located between latitudes  $11^{\circ} 42'$  and  $11^{\circ} 40'$  and longitude  $10^{\circ} 31'$  and  $10^{\circ} 11'$  east (Anon, 2009). It shares common boundary with Itas/Gadau local government in north

west, Jama'are to the west, Dambam to the east, Misau to the south west, Giade to the south and Shira to the southwest (Azare, 2013). It has a landmass of 1,120 square kilometers (NPC, 2009). The climate of the study area is controlled by inter tropical convergent zone (ITCZ) which is marked by the rainy and dry season. The major climate elements that influence the climate of the study area and affecting the farming system are temperature and precipitation (rainfall), the annual temperature ranged between  $22-33^{\circ} \text{C}$  from April to May (Bashir *et al.*, 2001). The mean annual rainfall ranged between 615.6-985mm with peak between July- Augusts. The study area is in the Sudan savanna, the vegetation is greatly determined by the nature of the soil. The soil in the study area is aerosol with sandy and loamy sand texture and a high percolation rate

### *Sources and processing of feed ingredients*

Other feed ingredients were procured at Azare main market. The rabbits used in this study were obtained from the rabbit farmers in Azare. The soya bean residue was sourced from local cheese producers in Azare Metropolis. The processing of the soya milk cheese residue involved soaking the seeds in water for 1 - 2 hours to facilitate the removal of the seed coat. It is then ground and mix with reasonable volume of water to facilitate straining of the solid (residue) from the liquid which is the milk. The residue was then collected and sun dried for 2 - 4 days into smaller chunks. The chunks were grounded to fine particles to be incorporated into the rabbit's diets. The SCRM was used to formulate six experimental diets in which it was included at 0% (control), 20%, 40%, 60%, 80% and 100%. The diets were isonitrogenous; the percentage composition of experimental diets was shown in Table 1.

**Table 1:** Percentage composition of experimental diets fed to rabbits

Ingredients	Diets					
	0%	20%	40%	60%	80%	100%
Maize	60.89	59.19	57.20	54.81	51.93	48.31
Full fat soyabean	21.36	18.45	15.03	10.46	6.06	00.00
Soyabean residue	00.00	4.61	10.02	16.98	24.27	33.86
Wheat offal	15.00	15.00	15.00	15.00	15.00	15.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Common salt	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin mineral premix	0.50	0.25	0.25	0.25	0.25	0.25
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Calculated analysis</b>						
Crude protein	16.00	16.00	16.00	16.00	16.00	16.00
Crude fibre	5.05	5.21	5.38	5.62	5.87	6.20
Ether extract	7.05	6.88	6.69	6.39	6.16	5.80
Metabolisable energy (kcal/kg)	2983	2943	2898	2839	2776	2696

\*Premix to provide the following additional micronutrients: Vit. A: 10,500,000IU; VitD<sub>3</sub> 2,000IU; Vit. E, 20 g; Vit K<sub>3</sub>3 mg; Vit B<sub>12</sub> 0.05 g; Nicotinamide acid: 35 mg; Pantothenate: 15 mg; Cholinechloride, 500 mg; Folicacid; 1 mg; Riboflavin: 6 mg; manganese; 55 mg; Iron: 55 mg; Zinc: 80 g; Copper: 12 mg;Iodine, 1.5 g; Cobalt: 0.3 g; Selenium: 0.15 g and Anti-oxidant: 70 mg. Thirty rabbits of mixed breeds and sexes were randomly allotted to six experimental diets. There are five rabbits per treatment in a completely randomized design (CRD). The SCRM was analyzed according to procedures of AOAC (1990) (Table 2). The experiment lasted for eight weeks.

The average initial weight of the rabbits was taken before the commencement of the experiment. Daily feed intake was measured daily by subtracting the difference between feed giving and remainder, rabbits were measured weekly to determine the weekly weight changes. At the end of the experiment, 12 rabbits (2 from each treatment) were randomly selected, starved overnight, weighed and slaughtered in the morning by slitting the throat. They were skinned, eviscerated then the organs and guts parts were separated; liver, lungs, small intestine, large intestine and ceacum and were weighed individually. Cut parts which include chest, back,

fore limb and hind limb were also remove, weighed and expressed as percentages of their live weight. Data generated for all the parameters recorded were subjected to analysis of variance technique (ANOVA balanced design) as described by Steel and Torrie (1980). Where there was significant difference between treatment means, Duncan multiple range rest (DMRT) was used to separate the means Duncan's (1955).

## RESULTS AND DISCUSSION

The proximate composition of SCRM is presented in Table 2. Results showed that SCRM is

excellent in nutritional profile, it is high in protein (27.29%), and ether extract (9.14%) and nitrogen free extract (50.50%), this crude protein value is in line with the report (26.88%) of Muhammed *et al.*, 2015 on sun dried soyabean cheese residue and slightly higher than

the earlier report of Odeyinka *et al.*, 2007. The daily feed intake showed a significant ( $P < 0.05$ ) dietary effect. Rabbits on 100% soyabean cheese residue consumed significantly more feed.

**Table 2:** Proximate composition of soyabean residue

Parameters	Percentage
Dry matter	89.63
Crude protein	27.29
Crude fibre	7.53
Ether extract	9.14
Ash	5.54
Nitrogen free extract	50.50

The values of feed intake are within the range reported by Maidala *et al.*, 2011 on rabbits fed differently processed soyabean, it is however lower than 111.9g reported by Farinu, 1994. The daily weight gain was significantly ( $P < 0.05$ ) affected by the soyabean residue, the values reported by the weight (13.38-17.86) are higher than the values by Iyeghe-Eracpotobor *et al.*, 2006 who fed soyabean residue, maize and brachiaria hay to rabbits. The feed conversion ratio was better in control diet to 60% level of inclusion ( $P < 0.05$ ). The feed

efficiency ratio is not affected by the different levels of soyabean residue ( $P > 0.05$ ). All rabbits fed SCRM residue were in positive weight balance.

The carcass yield and gut characteristics are presented in Table 3. The live weight increase from 0% to 60% level of inclusion and the values were significantly different ( $P < 0.05$ ) with 80 and 100% replacement value having the least values. A rabbit on 60% SCRM has the highest live weight gain (1591g) and these values were reflection of high daily weight gain.

**Table 3:** Performance characteristics of rabbits fed soyabean residue

Parameters	0%	20%	40%	60%	80%	100%	SEM
Daily feed intake (g)	57.24 <sup>a</sup>	62.10 <sup>a</sup>	63.50 <sup>a</sup>	64.45 <sup>a</sup>	70.26 <sup>b</sup>	74.16 <sup>b</sup>	16.92*
Daily weight gain (g)	16.17 <sup>a</sup>	16.07 <sup>a</sup>	16.45 <sup>a</sup>	17.86 <sup>a</sup>	15.06 <sup>b</sup>	13.38 <sup>b</sup>	7.79*
Feed conversion ratio	3.54 <sup>a</sup>	3.86 <sup>a</sup>	3.86 <sup>a</sup>	3.61 <sup>a</sup>	4.66 <sup>b</sup>	5.55 <sup>b</sup>	2.84*
Feed efficiency ratio	0.28	0.26	0.25	0.28	0.22	0.22	0.92 <sup>NS</sup>
Mortality (%)	0	0	0	0	0	0	-

Means bearing superscripts are statistically different

There is a gradual increase in the dressing percentage of rabbits fed dietary levels of soyabean

residue from control diet to 60% level of inclusion and the values dropped henceforth. The poor dressing

percentage in 80 to 100% level of inclusion of soyabean cheese residue can be implicated to high levels of antinutritional factors present in soyabean cheese residue which affect the utilization of soyabean products in unprocessed form (Maidala *et al.*, 2013). The liver weight showed a significant ( $P < 0.05$ ) dietary effect, the

highest liver weight was shown in 100% level of inclusion (3.86%) this can be attributed to attempt by the liver to metabolize antinutritional factors present in soyabean, liver hypertrophy occurred. Most of the internal organs measurements were not affected ( $P > 0.05$ ) by the level of soyabean cheese residue.

**Table 4:** Carcass parameters of rabbits fed soyabean curd residue

Parameters	Level of soyabean residue						SEM	
	0%	20%	40%	60%	80%	100%		
Live weight (g)		1495 <sup>a</sup>	1490 <sup>a</sup>	1511 <sup>a</sup>	1591 <sup>a</sup>	1438 <sup>b</sup>	1341 <sup>b</sup>	50.67*
Dressing percentage (%)		60.41 <sup>a</sup>	60.48 <sup>a</sup>	61.61 <sup>a</sup>	63.45 <sup>a</sup>	58.21 <sup>b</sup>	54.21 <sup>b</sup>	3.45*
Hind limb (%)		18.21 <sup>a</sup>	18.57 <sup>a</sup>	18.65 <sup>a</sup>	19.18 <sup>a</sup>	18.11 <sup>ab</sup>	17.21 <sup>a</sup>	2.18*
Fore limb (%)		9.65	9.66	9.68	9.89	9.68	9.65	NS
Head (%)		8.95	8.92	8.95	8.97	8.96	8.72	NS
Liver (%)		2.95 <sup>a</sup>	2.98 <sup>a</sup>	2.98 <sup>a</sup>	2.98 <sup>a</sup>	3.25 <sup>a</sup>	3.86 <sup>b</sup>	1.50*
Lungs (%)		0.75	0.75	0.76	0.75	0.74	0.75	NS
Small intestine (%)		5.60	5.64	5.65	5.68	5.65	5.72	NS
Large intestine (%)		3.10	3.15	3.12	3.14	3.25	3.26	NS
Caecum (%)		7.10	7.18	7.25	7.48	8.12	8.12	NS

## CONCLUSION

Soyabean curd residue is a good alternative protein source for growing rabbits. Rabbits can tolerate up to 60% level of soyabean cheese residue without deleterious effect on performance and carcass characteristics. Further research is recommended on effect of soyabean curd residue on anti-nutritional factors on rabbits.

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