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Carcass Yield and Economics of Production of Growing Rabbits (*Oryctolagus Cunniculus*) Fed Different Types and Levels of Rumen Content

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Abstract
An experiment was conducted to investigate the carcass yield and economics of production of rabbits fed different types and levels of rumen content. Forty eight (48) mongrel rabbits were randomly allotted to six diets containing rumen content of caprine, ovine and bovine each included at 30 and 40% levels in 3x2 factorial arrangements in a completely randomized design (CRD). Results showed that the interaction effect did not affect live weight (1075.00-187.50g), carcass weight (456.25-775.00g) and dressed weight (38.36-52.86%) (P>0.05). Similarly most of the organs were not affected by the interaction effect (P<0.05) except the lungs (0.42-0.63%), head (7.72-9.25%) and small intestine (3.50-4.38%) which were affected by the interaction effects (P<0.05). Most of the parameters were not affected by the main effect (P>0.05) of types of rumen contents except the kidney (0.15-0.64%), stomach (1.2-1.58%) and small intestine (0.93-1.19%) which were affected (P<0.05). The economics of production showed that feed cost per kg decreased slightly at higher levels of inclusion for the three types of rumen content. The feed cost per kg gain also decreased as the level of rumen content increase. Therefore rumen content should be included at higher levels in the diet of rabbits for enhanced carcass yield and reduce cost of production

Keywords: *Rumen content, Carcass yield, Caprine, Ovine, Bovine*

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I. Introduction

The dietary protein intake in Nigeria is 4.5g falls grossly short of the recommended 35g of animal protein intake per person perday (FAO, 2001). This observed low animal protein intake may be attributed to the declining animal production occasioned by high cost of feeds which is usually accounts for 70-85% of total cost of production (Sanni and Ogundipe, 2005). A possible and most appropriate measures for shortage of animal protein for human consumption lies in the production of fast growing animals like rabbits this is because livestock like cattle, camels , sheep, goats and pigs take longer time to mature. Rabbits stems from the potential of rabbit as animal with short generation interval, high prolificacy (Cheeke *et al*., 1987), good mothering ability, easy management strategy, ability to utilize waste and other unconventional feed sources for maximum meat gain and the ability to thrive on forage with little concentrate. Rabbit meat are also known to contain high quality and quantity protein, low in sodium, low in cholesterol with higher proportion of polyunsaturated linoleic and linolenic fatty acids. All these attributes in addition to less fed cost of production, make rabbit a desirable livestock that can help increase and improve protein intake of an average income earning in Nigeria.

There is therefore an urgent need for alternative locally available and cheap agro- industrial products particularly those that do not attract competition in consumption between humans and livestock or have no direct relevance in human food channel. Rumen digesta is one of thesewastes that pose a problem to the environment. It is an abattoir by product obtained from cattle sheep and goat as well as camel (Maigandi *et al*., 2004). Magaindi and Tukur (2002) reported the proximate analysis of rumen content for camel, cattle sheep and goat slaughtered at the Sokoto abattoir. In their studies, camel rumen content was reported to have 8.39% crude protein (CP), 11.98% ether extract (EE), and 36.74% (CF) while 8.18% CP, 2.68 EE and 33.31% CF were documented for cattle. Sheep rumen digesta had 9.18% CP, 5.57% EE and 33.31% CF while 8.03 % CP, 5.57% EE and 30.83% CF were values for goat. Sun dried rumen content of various ruminants animal by- product which are found mostly in abattoirs when the rumen of the animals is cut open after slaughter.The rumen is a unique organ. Its content (rumen content or digesta) is very heterogenous. It is made up of digested feed at different stages of degradation, saliva (making up the rumen liquor) micro-organisms and the products of their metabolic activities such as proteins, peptides, amino acids, lipids, vitamins and Volatile Fatty Acids (VFA).

The aim of this research work is to include higher levels of rumen content of cattle sheep and goats on carcass characteristics and economics of production of rabbits.

II. Materials And Methods

Experimental site

The experiment was conducted in katagum Local Government area of Bauchi state, Nigeria. It is located between latitudes 11^0 42' and 11^0 40^0 and longitude 10^0 31' and 10^0 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 the 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 22-330 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

The different rumen contents were obtained from Azare Abattoir and suns dried by constant raking and at intervals until constant materials were obtained. Other feed ingredients were procured at Azare main market. The rabbits used in this study were mongrels obtained from the rabbit farmers in Azare. The tree types of rumen content were used to formulate six diets each included at 30 and 40%levels each. The percentage composition of the experimental diet is shown in Table 2. Forty eight mongrel rabbits were randomly allotted to six experimental diets. There are eight rabbits per treatment replicated 4 times (two rabbits per replicate) in a completely randomized design (CRD) in 3x2 factorial arrangement.

Proximate composition of different types of rumen content

The samples of different types of rumen contentwere taken to Biochemistry laboratory of School of Agriculture and Agricultural Technology of Abubakar Tafawa Balewa University Bauchi for proximate analysis. Samples were analyzed for crude protein (CP), crude fibre (CF), ash, crude fat (ether extract) and nitrogen free extract (NFE) using the procedures of AOAC (1990).

Carcass evaluation

At the end of feeding trial 4 rabbits were randomly sampled from each treatment, weighed, starved overnight and slaughtered by severing the jugular vein. During evisceration, the internal organs and other gut contents were removed and weight, the dressed carcass and internal organs were weight and expressed as percentage of the live weight.

$$\text{Dressing \%} = \frac{\text{Dressed carcass weight}}{\text{Live weight}} \times 100$$

The economics of production was based on the prevailing market price at Azare as of the time of the experiment. The experiment lasted for six weeks and both the interaction effects as well as main effects were tested. The data set generated was analyzed according to Steel and Torrie 1980 using the Minitab Statistical software. LSD was used to separate the means.

III. Results and Discussion

Table1showed the percentage composition of the different types of rumen content fed to rabbits. The crude protein,crude fibre and energy were adequate for growing rabbits in the tropics (Aduku, 2004). The proximate composition of different types of rumen content is shown in Table 2. Results showed variation in different types of rumen content in CP, CF, EE, Ash and NFE, the results were similar to those reported by Abubakar(1998), and Dairo (2005). The high CP incaprine rumen contentcan be attributed to grazing habits of goat which prepares browsing of young shoot, twigs and flowers which are more nutritious than the mature plant. Similarly Mohammed *et al*.(2008) showed a wide variation between rumen content of cattle,camel, sheep and Goat. The effect of interaction of carcass of rabbits fed rumen content is shown in Table 3, results showed that final live weight, carcass weight and dressed weight were not affected by the types and levels of rumen content ($P>0.05$), and this findings partly concord with the findings of Ani *et al*. (2015) who reported non-significant difference in rabbits fed dehydrated rumen content. Most of the gut content of different rumen content fed to rabbits where not affected by the types and levels of rumen content except the head, and small intestine which were affected by interaction effect ($P<0.05$). Olabanji *et al*., (2007) reported a significant

difference in small intestine of rabbits fed rumen content. Similarly Esonu *et a*l., (2006) reported that there were no significant differences in organs of rabbits fed rumen content. The main effects of different types of rumen content are shown in Table 4. Results showed that most of the carcass parameters were not affected by the types of rumen content (P>0.05), this results partly agrees with the findings of Okpanchi *et al*., (2010) who reported that there was no significant difference between carcass yield and organs of rabbits fed sun dried rumen content. The economics of production of rabbits fed rabbits fed different rumen content is shown in in table 5. Results showed that the feed cost per kg steadily decline from 30-40% level. Similarly the feed cost per kg gain decreased from 30-40% for the three types of rumen content and this is in line with the earlier reports of Mohammed *et al*., (2011) who reported decline in cost per kg gain of rabbits fed bovine rumen content. The highest fed cost per kg gain was observed in caprine rumen content (₦181.60) while the lowest fed cost was observed in 40% rumen content of bovine (₦137.75)

IV. Conclusion

Rumen content of cattle sheep and goat can be included up to 40% level in diet of growing rabbits without adverse effect on carcass characteristics with reduction in cost of production.

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Table 1: Percentage composition of rumen content fed rabbits

Parameters	Goat rumen content		Sheep rumen content		Cattle rumen content	
	30%	40%	30%	40%	30%	40%
Maize	42.33	34.33	38.33	29.00	35.33	25.00
Rumen content	30.00	40.00	30.00	40.00	30.00	40.00

Soybean	14.67	12.66	18.67	18.00	21.67	22.00
Maize offal	10.00	10.00	10.00	10.00	10.00	10.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50	0.50	0.50
Premix	0.50	0.50	0.50	0.50	0.50	0.50
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis (%)						
Crude protein	16.01	16.07	16.01	16.00	16.01	16.00
Crude fibre	8.34	13.63	13.63	16.97	14.30	17.83
Ether extract	6.05	7.93	5.78	7.40	3.56	4.48
Ash	6.14	7.93	5.78	7.40	3.56	4.48

Premix supply the following per 2.5 contain vitamin of 15.000.000 I.U., Vitamin D_3 3,000,000 I.U, VitaminE 30,000.000, Vitamin K_2 500mg, Thiamine B_1 2000mg, Riboflavin B_2 6000mg, Pyridoxine B_6 400mg, Niacin 40,000mg, Pantothenic acid 10,000mg, Folic acid 1000mg, Biotin 80mg, Choline chloride 500mg, Biotin 80mg, antioxidant 125g, Manganese, 96g, Zink 60g, Iodine 1.4g, Selenium 240g, Cobalt 24mg.

Table 2: Proximate composition of the different types of rumen content

Types of rumen content	**Parameters**					
	DM	**CP**	**CF**	**EE**	**Ash**	**NFE**
Caprine	95.43	15.93	32.58	0.86	11.21	40.85
Ovine	95.23	12.29	33.56	1.15	13.42	34.42
Bovine	96.51	11.23	34.61	1.23	12.54	35.59

Table 3: Types and level interaction effect on carcass, organs and gut characteristics (% body weight) of rabbits

Parameters	**Diets**							
	Caprine		***Ovine***		***Bovine***			
	30%	**40%**	**30%**	**40%**	**30%**	**40%**	**SEM**	**LSD**
Final live weight (g)	1293.30	1200.00	1075.00	1130.00	1368.80	1487.50	126.74	NS
Carcass weight (g)	593.75	456.25	531.25	668.75	718.75	775.00	64.13	NS
Dressed weight %	44.97	38.36	50.08	51.75	52.25	52.86	3.17	NS
Liver %	2.52	2.50	3.25	2.35	2.29	2.77	0.31	NS
Lungs %	0.63^{b}	0.54^{b}	1.34^{a}	0.51^{b}	0.42^{b}	0.60	0.19	0.46
Heart %	0.21	0.13	0.19	0.17	0.15	0.13	0.03	NS
Kidney %	0.53	0.56	0.59	0.50	0.16	0.67	0.25	NS
Abdominal fat %	0.53	0.56	0.59	0.50	0.16	0.67	0.25	NS
Head %	8.23^{b}	8.48^{b}	9.25^{a}	7.73^{b}	7.72^{b}	7.95^{b}	0.38	0.90
Feet %	2.19	2.57	2.66	2.12	2.06	1.93	0.19	NS
Pelt %	7.29	6.15	6.68	6.87	5.92	5.80	0.48	NS
Stomach %	1.39	1.60	1.87	1.62	1.48	1.36	0.12	NS
Small intestine %	3.88	3.50	5.42	3.50	4.35	4.38	0.36	NS
Large intestine %	0.96	0.89	1.13	0.77	1.05	1.32	0.23	NS
Caecum %	2.75	2.32	3.04	2.75	2.50	2.26	0.24	NS

Note: Means bearing different superscripts are statistically different ($P<0.05$), NS= Not significant

Table 4: Main effects of rumen content type and levels on carcass, organs and gut characteristics (% body weight) of rabbits

Parameter	Diets						
	Caprine	Ovine	Bovine	LSD	30%	40%	LSD
Final live weight (g)	1246.90	1187.50	1428.10	NS	1245.80	1329.20	NS
Carcass weight (g)	525.00	600.00	746.87	157.60**	614.58	633.33	NS
Dressed weight %	41.67[a]	50.92[b]	52.55[c]	7.76**	49.10	47.66	NS
Liver %	2.51	2.80	2.54	NS	2.69	2.54	NS
Lungs %	0.59	0.93	0.53	NS	0.79	0.56	NS
Heart %	0.17	0.18	0.14	NS	0.18	0.14	NS
Kidney %	0.44[a]	0.64[c]	0.48[b]	0.15	0.57	0.49	*
Abdominal fat %	0.45	0.55	0.41	NS	0.43	0.51	NS
Head %	8.35	8.49	7.83	NS	8.39	8.05	NS
Feet %	2.88	2.39	1.99	NS	2.31	2.21	NS
Pelt %	6.72	6.78	5.86	NS	6.63	6.27	NS
Stomach %	1.49	1.75	1.42	NS	1.58	1.53	*
Small intestine %	3.69	4.46	4.36	NS	4.57	3.79	*
Large intestine %	0.93	0.95	1.19	NS	1.05	0.99	NS
Caecum %	2.54	2.89	2.38	NS	2.76	2.44	NS

Note: Means bearing different superscripts are statistically different (P<0.05), NS= Not significant

Table 5: Economics of production of rabbits fed rumen content based diet

Parameters	Diets					
	Caprine		Ovine		Bovine	
	30%	40%	30%	40%	30%	40%
Total feed intake (kg)	2.59	3.29	2.52	2.75	2.64	2.57
Feed cost (₦/kg)	24.54	21.23	25.77	22.87	26.61	24.12
Total feed cost (₦)	63.68	69.85	64.94	62.89	70.25	61.99
Total weight gain (kg)	0.35	0.45	0.37	0.39	0.42	0.45
Feed cost (₦/kg) gain	181.60	155.22	175.51	161..26	167.26	137.75

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