



Growth and Reproductive Performance of Yankasa Ewes Fed Varying Levels of Dietary Premix

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Abstract

The purpose of this research was to assess the influence of nutritional premix on the growth and reproductive performance of confined Yankasa ewes. The experiment was designed using a Complete Randomized Design (CRD), in which twenty-five (25) Yankasa lambs were randomly assigned to five (5) treatment groups, each with five animals. The animals were randomly assigned to groups based on their weights and given baseline diets and four amounts of premix produced industrially and locally. Throughout the duration, 1 kilogram of basal feed (5 percent of the ewe's body weight) was supplied daily. Dietary premix was fed to the animals at four inclusion levels (0.25, 0.50, 0.75, and 1) in the morning in a restricted area; the amount of feed supplied and left over was recorded daily. The sheep were weighed at the start of the trial and then regularly afterwards. The study's results indicated that dietary interventions had an influence on final weight, total weight increase, and feed conversion ratio ($P < 0.05$). However, the dietary treatments had no significant effect on average daily weight increase, total feed intake, or average daily feed intake ($P > 0.05$). Additionally, the findings indicated that when the amount of premix added to the diet rises, the final and total weight gain increases. The findings of T5 vary considerably from those of T1 and T2, but are statistically equivalent to those of T3 and T4. However, animals fed T5 (14.86) exhibited a higher feed conversion ratio ($P < 0.05$) than those fed T2 or T1.

Introduction

The primary objective and emphasis of livestock production and development in Nigeria has been to meet the citizenry's need for animal protein. Nigeria's economy is still based on livestock production, namely sheep, goats, and big ruminants, and the majority of the rural community is dependent on livestock and their by-products (Ben-salem and Smith, 2008). Apart from meat production, tiny ruminants contribute to the leather industry by producing skin estimated at 7,500 tonnes yearly by the Food and Agricultural Organization (Mubi et al., 2012). The short generation period of sheep, along with the high frequency of multiple births, enabled fast population growth (Markos, 2006). Small ruminants, which account for about 63.7 percent of Nigeria's total grazing domestic livestock, are extensively spread across rural, urban, and peri-urban regions. 70% of these tiny ruminants are located in the country's northern region. In order of significance, the indigenous sheep breeds are Yankasa 60%, West African Dwarf 20%, Uda 10%, and Balami 10%. The Yankasa breed is believed to account for over 60% of the country's 39 million sheep population, making sheep the country's second most significant livestock species (FAOSTAT, 2013; Sudi et al., 2019). The Yankasa sheep breed is

the most abundant in Nigeria and also the most widespread, occurring across the sub humid and semi-arid zones. In Nigeria, 96 percent of traditionally maintained sheep are free ranging and tethered, and chronic feed shortages are significant restraints on livestock productivity in a number of underdeveloped nations worldwide (Ibrahim et al., 2014). A significant restraint on cattle output in the nation is a scarcity of feeds, particularly during the dry season. Grains are increasingly being used in biofuel production, which has driven the cost of the majority of cereals to record highs (Ahmed, 2020). These data emphasize the need of developing diversified techniques for animal feeding that include different sources of nutrients and reduce reliance on cereals. Concentrates are added to ruminant diets to boost nutritional energy, protein, minerals, and vitamins and to maximize feed utilization efficiency (FAO, 2008) Grain addition, on the other hand, may impair the digestibility of forage-based diets for cattle and sheep. According to reports, reproductive success is a significant determinant of profitability in sheep breeding (Musa et al., 2018). Sheep conventional fattening diets are always offered ad hoc and uncontrolled, which results in considerable wastage (Houndjo et al., 2018). Energy and protein are often the most constraining elements for ruminants and have attracted the greatest amount of attention in assessment systems (Mapato et al., 2010). When developing diets for ruminants, it is critical to maximize the balance of energy and protein in the feed to ensure balanced rumen fermentation and maximal voluntary intake and feed utilization (Anusorn et al., 2010).

Numerous conventional items' nutritional quality may be enhanced by value addition to create products that are rich in protein, energy, minerals, vitamins, fiber, and so on, or to create low-calorie or low-carbohydrate products (Dachana et al., 2010; Gupta & Prakash, 2011a; 2011b; Dhinda et al., 2012). The purpose of this research was to determine the influence of food premix on the growth and reproduction of Yankasa ewes.

Experimental Location

In Abuja, Nigeria, researchers performed their investigation at the University of Abuja's Teaching and Research Farm. In the core of the nation, Abuja serves as the country's capital. It is physically situated at latitude 9.0724o, longitude 7.4912o, and an elevation of 491 m. The city is the seat of the Nigerian government (Euromonitor, 2010). The rainy season begins in April and finishes in October, with daytime temperatures ranging between 28 and 30 degrees Celsius and nighttime temperatures ranging between 22 and 23 degrees Celsius. During the dry season, daytime temperatures may reach 40 degrees Celsius, while nighttime temperatures can drop to 12 degrees Celsius (Euromonitor, 2010).

Experimental Animals, Diets And Their Management

To carry out the research, 25 Yankasa ewes with an average live weight of 10-15 kg and an age of (six to seven) six to seven months were employed. It was determined that the animals would be acquired from local markets around the Federal Capital Territory's six Area Councils. The ages of the participants were determined using dental identification. Animals from the Yankasa flock were quarantined for two weeks upon arrival at the teaching and research farms, during which time they were treated against ecto- and endo-parasites with Ivermetin® as a dewormer, with a broad spectrum antihelmintic (Albendazole®), and with an injectable antibiotic oxytetracycline to prevent infections and boost the animals' ability to withstand the experimental rigors. The sheep were also vaccinated against Peste de Petis Ruminantes (PPR) vaccine, which was administered intramuscularly. This is important since Peste de Petis Ruminantes (PPR) is a prevalent illness of sheep in the research region, and the vaccination is intended to confer protection against it. They were then kept separately in concrete flooring pens that were 1.2 m² in size. After this time, they were all tagged and examined to confirm

that they were not pregnant, and samples of both their faeces and blood were gathered for baseline tests. To keep the animals healthy, feeding and drinking troughs were given for each individual enclosure, and wood shavings were laid on the floor to act as litter, which was changed every two weeks.

Feed Formulation and Experimental Design

A daily baseline feed of 5 percent of their body weights was supplied to them on a daily basis throughout the duration of the experiment. The nutritional premix was provided to the animals via their meal at five different inclusion levels: 0, 0.25, 0.50, 0.75, and 1. The animals were divided into groups based on their weights and given a combination of basic diets and four levels of premix that had been industrially and locally manufactured. A Complete Randomized Design (CRD) was employed for the investigation, in which twenty-five (25) Yankasa lambs were randomly assigned to five (5) treatment groups, each of which had five animals.

Data Collection

Feed Intake

A limited supply of clean water was made available in the mornings in a restricted area. Every day, the amount of food provided and the amount of food left over were noted. The sheep were weighed at the start of the trial and then once a week for the duration of the study.

Source of Experimental Materials

Industrial Compounded Premix For Ewes

It was acquired from Agri-dom Agricultural Freedom, a commercial animal feed firm situated at 20/22, Kolawole Shonibare Street, Ajao Estate, Lagos, Nigeria. The premix was used in the production of a commercial animal feed product. There were several minerals, vitamins, and other substances in the premix that were necessary for sheep (Table 1).

Raw ingredients for locally prepared premix for ewes

The raw ingredients were purchased from the local markets in and around the Federal Capital Territory and Kaduna central market; the raw ingredients used were cauliflower leaves (*Brassica oleracea*), cumin seeds (*Cuminum cyminum*), wheat (*Triticum aestivum*), flax seeds (*Linum usitatissimum*), and fenugreek seeds (*Trigonella foenum*), and all of the ingredients were thoroughly cleaned before use. The final product was

Premix was formulated by mixing the ingredients in the following proportions

Dehydrated greens powder- 200 g,

Roasted flaxseed powder - 200 g,

Roasted cumin seed powder - 100 g,

Sprouted and dried fenugreek seed powder- 100 g.

These were mixed well stored under refrigeration in airtight Polyethylene terephthalate (PET) containers and used for further studies

Methods

Preparation of dry premixes with natural components for potential inclusion into various recipes for value addition was the goal of the research. The nutritional makeup of all of the raw materials and pre-made premixes was determined. The moisture sorption isotherm was used to assess the shelf stability of premixes on the shelf. In order to determine the effectiveness of the

premises for value addition, they were examined for their sensory acceptability and nutritional quality by mixing them into a conventional product.

Preparation of premix

The greens were cleaned and rinsed with regular tap water before being used. The edible section was washed with glass distilled water one more before being oven dried at 60 degrees Celsius for 8 hours. The dried leaves were ground up in a blender and kept in transparent PET (polyethylene terephthalate) containers to preserve their freshness. Flaxseeds and cumin seeds were cleaned and roasted for 5 minutes on a low heat, after which they were pulverized in a blender to make a paste. The seeds of fenugreek were steeped in water for 5 hours, after which the water was drained from them. During the experiment, seeds were put on a damp towel in a germinating chamber with humidity control set at room temperature (28 OC) and left to germinate for three days in the dark. The sprouting fenugreek seeds were dried for 10 hours at 60 degrees Celsius in an oven before being pulverized and stored. Wheat was cleaned and processed into flour, which was then stored for future use (Table 2).

The basal diet formulation and inclusion of the premix

It was decided to use locally obtained feed components in the preparation of the baseline diet. These included maize offal, Brewer's Dried Grains (BDG), cassava peel and cowpea husk, salt, and the industrially manufactured premix (Table 3).

Body weight changes

The body weight of the lambs was measured in kilograms, and the individual weights of each lamb were recorded at the start of the trial and then on a weekly basis throughout the duration of the study. The changes in body weight were finally tabulated and divided into five treatment groups, which were then divided further. The difference between the final and beginning live weights was used to calculate the live weight changes, and the daily record of feed intake was derived by subtracting the amount of feed left over from the amount of feed supplied the previous day.

Nutrients digestibility trial

At the conclusion of the growth research, three animals from each treatment were randomly chosen to participate in the digestibility experiment. The chosen animals were relocated to a series of metabolic cages with slatted flooring that were specifically designed for the collection of faeces and urine samples. Before the first faecal sample collection for the next seven days, a time of seven days adjustment was permitted. The feces from lambs in each treatment were bulked and well mixed before being divided into sub-samples. The quantity of feed consumed was also determined by calculating the difference between the amount of feed provided and the amount of feed declined. In order to maintain consistent weight, both feed and faeces samples were dried at 65 o C, processed, and stored in airtight containers until they were needed for analysis. In this study, the apparent digestibility of the food was determined as the difference between nutrient intake and excretion in the feces reported as a percentage of nutrient intake.

Data Analysis

ANOVA was performed on all of the data collected for this investigation, with the General Linear Model (GLM) technique of SAS being used to do so (2008). The Least Significant Difference (LSD) test from the same package was used to distinguish between the means

Results and Discussion

Table 1. Composition and proximate analysis of the basal experimental diets fed the Yankasa lambs

Parameters	T1	T2	T3	T4	T5
Maize offal (kg)	25.00	25.00	25.00	25.00	25.00
BDG (kg)	32.00	32.00	32.00	32.00	32.00
Cassava peel (kg)	19.50	19.50	19.50	19.50	19.50
Cowpea husk (kg)	23.00	23.00	23.00	23.00	23.00
Salt (kg)	0.50	0.50	0.50	0.50	0.50
Premix (kg)	0.00	0.25	0.50	0.75	1.00
Proximate Analysis					
Dry matter (%)	96.72	96.19	95.67	96.02	95.69
Crude protein (%)	14.40	14.50	14.44	14.65	14.10
Crude fibre (%)	11.63	12.49	11.98	12.11	11.63
Ash (%)	8.72	10.90	12.08	13.60	14.24
Ether extract (%)	3.41	4.11	4.71	3.92	3.98
Nitrogen Free Extract (%)	28.48	38.36	28.53	28.95	29.61
Metabolizable Energy (kcal/kg)	1822.78	1879.47	1932.37	1890.43	1898.00

Table 1 shows the approximate composition of the basic experimental diets provided to the Yankasa lambs. The Dry matter (DM) contents of the experimental diets used in this research vary between 95.67 percent in (T3) and 96.72 percent in (T4) (T1). The basal feed dry matter values obtained in the present study were not in agreement with the results reported by Usman et al. (2008), who found that fore stomach digesta and poultry waste were fed to Uda lambs and obtained dry matter values ranging between 61.39 percent and 84.37 percent when fed to Uda lambs. Longe (1987), Ademola (2003), Olayeni (2007), and 11.40 percent obtained for *Ficus polita* (Ndamitso et al., 2010) were all higher than the 14.10 -14.65 percent crude protein (CP) contents of the basal diets in this study, which was lower than the 15.40 percent reported by Lanyasunya et al. (2006), 20.3 percent Onimisi & Omage (2007), and 10.80 percent reported (2006). These readings did not fall within the range of recommended crude protein levels for developing sheep (16-19 percent) established by the American Rhinological Society (1990). Although the crude protein (CP) value in this study is less than the recommended threshold (14.10-14.65 percent), it still supports the necessity for dietary supplementation. crude fibre (CF) levels varied significantly amongst tissues, with the greatest concentrations found in T3 (12.49 percent) and the lowest concentrations found in T1, T5 (both 11.63 percent). In contrast to Garba et al. (2010b), who reported that Ash values ranging from 5.27 to 7.46 percent intake were statistically significant for Yankasa rams fed graded levels of *Guiera senegalensis*, the results of this study show a higher Ash content of 14.24 percent in (T5) and a lower Ash content of 8.72 percent in (T1). T3 sheep had the largest consumption of Ether extract (4.71 percent), whereas T1 ewes had the lowest intake (0.3 percent) (3.41 percent). According to the findings of this study, Abubakar et al. (2016) reported the lowest Ether extract value of 1.48 in T1 and the highest value of 2.95 in T3 on nutrient intake, digestibility, and growth performance of Yankasa sheep fed varying proportions of *ficus polita* and *pennisetum pedicellatum* supplemented with wheat-offal, in which the values were generally lower than those found in the current study. According to the results of this investigation, the Nitrogen Free Extract (NFE) in treatments 1 to 5 ranged from 28,48 to 38.36 to 28,53 to 28,95 and 29.61, which is lower than the 63.50 to 86.77 to 44.00 to 30-00 to 26.90 in treatment 1 to 5 reported by (Bello et al., 2013) in treatment 1 to 5. The reduced level of NFE might most likely be attributed to the presence of anti-nutritional factors such as cyanide in the meals, which could have

interfered with the animals' ability to use the available nutrients in their diets (Ndamitso et al., 2010).

According to Eniolorunda et al. (2011), the ME values ranged from 1822.78 to 1898.00 MJ/kg in treatments 1 to 5, which is not in keeping with their findings of 5.73 MJ/kg in consumption and growth performance of West Africa Dwarf Moringa oleifera is fed to goats. Gliricidia sepium and Leucaena leucocephala are two species of leucaena. Cassava peels may be supplemented with dried leaves.

Table 2. Growth performance of Yankasa ewes fed varying levels of premix supplemented diet

Parameter	T1	T2	T3	T4	T5	SEM	P-values
Initial Weight (Kg)	10.20	10.34	10.36	10.34	10.26	0.44	0.79
Final weight (Kg)	16.74 ^e	19.50 ^d	21.30 ^c	22.90 ^b	24.10 ^a	0.54	0.001
Total weight gain (Kg)	6.54 ^c	9.16 ^{bc}	10.94 ^b	12.56 ^a	13.84 ^a	0.53	0.001
Average daily weight gain (Kg)	0.05	0.07	0.08	0.09	0.10	0.04	0.358
Total feed intake (Kg)	185.36	185.07	184.52	186.22	222.01	6.91	0.358
Average daily feed intake (kg)	1.32	1.32	1.32	1.33	1.59	0.04	0.360
Feed conversion ratio (FCR)	28.55 ^c	20.21 ^{bc}	16.89 ^b	16.49 ^b	14.86 ^a	1.12	0.001

abcde ** Means in the same row with different superscripts differ significantly (P<0.05)

The findings of Table 2 revealed that dietary interventions had an influence (P0.05) on final weight, total weight growth, and feed conversion ratio. Table 2: In contrast, the dietary treatments had no statistically significant effect on the average daily weight increase, total feed intake, or average daily feed intake (P>0.05) of the animals. The findings also revealed that when the amount of premix supplementation in the diet is increased, the amount of final and total weight gain rises as well. The feed conversion ratio (FCR) findings obtained in T5 are statistically different from those obtained in T1 and T2, but are statistically similar to those obtained in T3 and T4. When compared to animals on T2 and T1, animals on T5 (14.86) exhibited a greater feed conversion ratio (P0.05) than those on T2 and T1.

There were no significant (P>0.05) changes in any of the parameters assessed for reproductive performance of Yankasa ewes in this investigation, except for lamb weight and sex ratio values, which were substantially (P0.05) different in this study, as shown in Table 3. The litter weight of ewes given 0.75 and 1 kg of dietary supplemented locally produced premix was considerably greater than the litter weight of the other treatment groups (Table 3).

Table 3. Reproductive performance of the Yankasa ewes fed varying levels of supplemented premix diets

Parameters	T1	T2	T3	T4	T5	SEM	LS
Gestation Length (days)	148.00	147.80	146.60	149.20	148.60	12.87	NS
Gestation Gain (kg)	2.74	3.88	3.00	4.34	3.66	0.46	NS
Lambing Loss (kg)	0.20	0.20	0.20	0.20	0.20	0.07	NS

Lamb Weight (kg)	1.08 ^b	1.60 ^b	1.96 ^b	2.56 ^a	2.50 ^a	0.23	**
Lambs per Ewe	1.00	1.00	1.00	1.00	1.00	000	NS
Neonatal Mortality	2.00	1.00	1.00	1.00	1.00	0.07	NS
Sex Ratio (M: F)	2:3	4:1	3:2	4:1	1:4	0.00	**

abde ** Means in the same row with different superscripts differ significantly (P<0.05)

T3 groups had considerably higher average weight of lambs at birth (AWLB) values than T5 groups, which had significantly lower values (P0.05) than T3 groups.

Table 4. Pre-weaning performance of Yankasa ewes' lambs fed varying levels of supplemented premix

Parameters	T1	T2	T3	T4	T5	SEM	LS
Av. wt. of lamb at birth (kg)	1.92 ^b	1.94 ^b	2.04 ^a	1.60 ^b	1.00 ^c	0.17	**
Av. wt. of lamb at weaning (kg)	3.56 ^a	3.50 ^a	3.64 ^a	3.00 ^a	2.60 ^b	0.32	**
Total wt. gain of lamb (kg)	10.36 ^a	10.38 ^a	10.98 ^a	8.80 ^b	7.40 ^b	0.98	**
Av. no. of males at weaning	1.00 ^b	1.00 ^b	1.00 ^b	3.00 ^a	1.00 ^b	0.08	**
Av. no. of female at weaning	1.00	1.00	2.00	1.00	2.00	0.08	NS
Av. lamb size at weaning	2.00 ^b	2.00 ^b	2.00 ^b	3.00 ^a	4.00 ^a	0.10	**

abcde ** Means in the same row with different superscripts differ significantly (P<0.05)

Table 4 presents the findings of the pre-weaning performance characteristics of lambs from Yankasa ewes given varied quantities of nutritional premix. When lambs were weaned (21 days postpartum), the average weight was substantially lower (P0.05) in T5 (2.06 kg) and greatest statistically (P0.05) in T1 to T4 (3.00– 3.64 kg). Weight increase of the lamb varied between 7.40 and 10.98 kg and was substantially lower in ewes given 1 and 0.75 kg dietary local premix (7.40 and 8.80 kg, respectively) compared to the control group. When compared to the other treatment groups, ewes given 0.75 of dietary local premix had a substantial number of males at weaning (1.00 and 3.00) when compared to the other treatment groups. The average lamb size at weaning was significantly larger in ewes given 0.75 kg and 1 kilogram of supplemented local premix, respectively (2.00 and 4.00 g/kg body weight).

Conclusion

Following the completion of this research, it was shown that the effects of dietary premix on growth and reproductive performance of Yankasa ewes were dependent on the amount of dietary premix provided. The findings of this research support the conclusion that Yankasa ewes who were given regionally cuisine premix at inclusion levels ranging from 0.50 to 1kg had satisfactory growth, body condition score, and reproductive performance reported. In addition, haematological and biochemical data, as well as carcass characteristics, were assessed. The diet had the highest feed utilization, increase in live weight growth, feed intake, and apparent digestibility parameters of any other diet tested to date. The diet is recommended for the feeding and control of sheep's nutrition. Through government services and public-private partnerships, the practice of premix supplementation and its acceptance as an enhanced livestock feeding practice and health care are being promoted. Research on the influence of mineral and vitamin premixes on digestibility of energy and fibre-rich feed resources in Nigeria that may be utilized for intensive sheep production and management are now being carried out in the country.

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