EFFECT OF SOYBEAN, SORGHUM AND TIGER NUT OFFAL COMPOUNDED WITH SHEEP BONE MEAL ON JAPANESE QUAIL PERFORMANCE

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ABSTRACT
A feeding trial was conducted with one hundred and thirty-two Japanese quails at 5 weeks old, to determine the influence of soybean offal, sorghum offal and tiger nut offal compounded with sheep bone meal, on feed intake, sexual maturity and mortality. The experimental diets were designated as T1: Commercial feed (Control), T2 (50% soybean offal and 50% sheep bone meal), T3 (50% sorghum offal and 50% sheep bone meal) and T4 (50% tiger nut offal and 50% sheep bone meal). The birds were weighed and randomly grouped into four experimental treatments, based on weight with three replicates of 11 birds per treatment, in a completely randomized design. The birds were offered the experimental diets with clean drinking water ad libitum for 5 weeks. Data collected were proximate compositions of the sheep bone and experimental feeds as well as feed intake, age at first egg drop and mortality. It was observed that the sheep bone contained 17.5% crude protein, 47.7% ash and 9.4% crude fibre. While T1 feed contained 13.13% crude protein, T2, T3 and T4 had 24.06%, 21.69% and 20.94%, respectively. The weekly feed intake was higher (104.78g) in T1, compared to 92.78g, 72.89g and 55.18g recorded in T2, T3 and T4, in that order. While the hens in T1 started laying at 6 weeks old, the treated birds did not lay eggs at all throughout the experimental period. There was mortality among the hens in T2 (0.73), T3 (0.76) and T4 (0.91) yet, no single death was recorded in T1 (0.0). Consequently, combination of soybean, sorghum and tiger nut offal with sheep bone at 50:50 weight for weight ratio, may be deleterious to Japanese quail hens. However, since this trial is at the preliminary phase, detailed investigation may be required.
Keywords: Bone meal, mortality, sexual maturity, unconventional feed

INTRODUCTION

Poultry production is recognized as the fastest growing industry that is capable of addressing animal protein deficiency, particularly in third-world countries like Nigeria. Thus, development of this industry could be regarded as the most expedient means of alleviating animal protein deficiency due to the high turnover rate associated with poultry production and its economic efficiency (Dipeolu *et al*., 2004). Japanese quail is one of the poultry species that is generally accepted by many Nigerians hence, should be reared at homestead by every household in order to boost poultry products availability. According to Inuwa *et al*. (2020), Japanese quails have short generation interval, high turnover rate and economic efficiency. However, there seems to be elevated cost of conventional feed ingredients, especially energy and protein sources hence, the need for unconventional feedstuff utilisation in Japanese quail production.

This will cut down the production cost and enhance more production, leading to available poultry products. Such unconventional feed resources are basically derived from agro-industrial by-products that are cost-effective, easily accessible and underutilized as feed in poultry production (Lawan *et al*., 2020). They could be of plant origin like soybean, sorghum and tiger nut or animal origin like bones. All these are readily available at homestead in most communities in Nigeria. Meanwhile, Abdullahi *et al*. (2021) described these unconventional feedstuffs as "alternative feed ingredients" that offer viable options for reducing feed cost, consequently lowering the cost of meat production and ensuring greater availability of animal protein. Combination of these unconventional feedstuffs with feed additives like antibiotics, vitamins, minerals and probiotics have been reported to enhance animal performance especially in broiler chickens. Similar performance improvement has been reported when these unconventional feedstuffs were combined with enzymes (Marte *et al*., 2021; Lawan *et al*., 2022). Interestingly, soybean residue has been singled out as a widely accessible and locally available

feedstuff that provides both energy and protein (Minh 2000; Hong *et al*., 2003). Unfortunately, little is known about the utilisation of soybean, sorghum and tiger nut offal combined with sheep bone meal in poultry nutrition hence this study was conducted.

MATERIALS AND METHODS

Experimental site

The research was carried out at the Poultry Unit, Teaching and Research Farm, Nasarawa State University, Keffi, Shabu-Lafia Campus, located in the Guinea savanna zone of North Central Nigeria, with latitude 080 35' N, longitude 080 33' E and mean temperature (32.75°C), relative humidity (79.00%), rainfall (207.45mm) and evaporation of 2.5ml (NIMET, 2023).

Preparation of experimental diets

Soybean, sorghum and tiger nut offal were gathered from different cottage points were "kunu", soybean and tiger nut milk were processed within Lafia metropolis. All the offal was dried in the sun until crispy, crushed using a hammer mill of 2 mm mesh size. The sheep bones were gotten from Keffi abattoir, dried in kiln until crispy and crushed using a hammer mill of 2 mm mesh size. Thereafter, the crushed bones and each of soybean, sorghum and tiger nut offal were thoroughly mixed at a ratio of 50:50 weight for weight basis and stored in sacks during the feeding trial. The commercial feed was obtained from a reliable poultry feed dealer in Lafia. Aliquots of the crushed sheep bones and mixtures of the soybean, sorghum and tiger nut offal with the crushed sheep bones, were taken separately to the laboratory for proximate composition determination following standard procedures.

Plate 1: Drying of sheep bones in a kiln

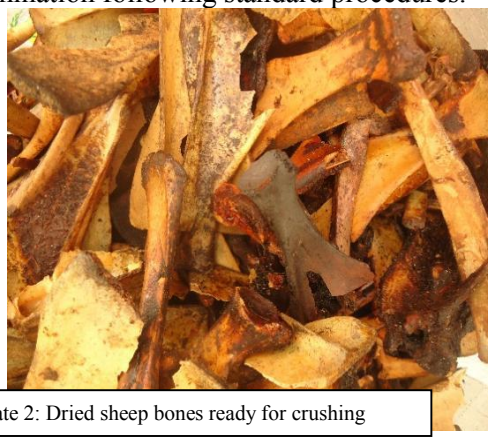

Plate 2: Dried sheep bones ready for crushing

Experimental design

A total of one hundred and thirty-two Japanese quail hens at 5 weeks old were weighed and allocated to four dietary treatments designated as T1, T2, T3 and T4 with T1 as control. The birds in T1 were fed commercial feed while those in T2 were fed 50% soybean offal and 50% sheep bone meal, T3 (50% sorghum offal and 50% sheep bone meal) and those in T4 were fed 50% tiger nut offal and 50% sheep bone meal. The birds were weighed and randomly assigned to the treatments, based on weight with three replicates of 11 birds, making a total of 33 hens per treatment, in a completely randomized design. The birds were offered the experimental diets with clean drinking water *ad libitum* for 5 weeks.

Data collection and statistical analysis

Proximate compositions of the processed bones and the experimental feed samples were determined to obtain the nutritional contents. The difference between feed offered and remnant was considered as the feed intake. The age at first egg drop was recorded to obtain sexual maturity and dead bird was recorded to obtain the mortality value. Data collected (where applicable) were subjected to analysis of variance using SPSS (2019) and the significant means were compared using Duncan's Multiple Range Test of the same software package.

RESULTS AND DISCUSSION

Proximate composition of the experimental diets fed to the Japanese quail hens is provided in table 1. It was observed that the sheep bone contained up to 17.5% crude protein, 47.7% ash and crude fibre of 9.4%, that seemingly makes it a veritable feedstuff in livestock production. However, it is not

known if these nutrients will be available for body metabolism as speculated that bone's protein is locked up in the collagens and are not biologically available. This apparently played out when the hens were dying in their numbers, during the study. Interestingly, the crude protein of T2, T3 and T4 feeds improved tremendously to a range of 20.94 – 24%, compared to 13.13% recorded in the commercial feed. This could be purely due to the inclusion of the processed sheep bones to the feeds. This protein value is similar to a range of 16 – 24% that Olomu (2011) recommended for chicks, growers and layers. Therefore, properly processed bone meal may be used as poultry feedstuff.

Table 1: Proximate composition of the experimental diets fed to Japanese quail hens

	Proximate composition (%)					
Treatment	**MC**	**ASH**	**CP**	**EE**	**CF**	**NFE**
Sheep bone	3.28	47.72	17.50	10.05	9.40	12.05
T1	9.32	8.63	13.13	17.15	2.26	49.51
T2	6.14	39.65	24.06	11.90	7.21	22.41
T3	5.40	47.03	21.69	12.79	8.36	2.36
T4	7.61	39.38	20.94	10.35	7.35	24.37

MC: Moisture content; CP: Crude protein; EE: Ether extract; CF: Crude fibre; NFE: Nitrogen free extract

Table 2 gives the weekly feed intake, age at first egg drop and mortality of the experimental hens. There were significant differences ($P<0.05$) in all the parameters evaluated across the treatments. The weekly feed intake was higher (104.78g) in TI, followed by 92.78 (T2), 72.89 (T3) and 55.18 (T4), accordingly. These values were similar to a range of 93.7 – 94.4g reported when different commercial feeds were offered to Japanese quails at 5 – 6 weeks of age (Bulus *et al*., 2013). These values are in consonance with a range of 14 – 18g of feed per day, recommended for adult Japanese quails (Randall, 2008). However, the higher feed intake in T1, may be purely due to low quality nutrients, that seemingly forced the birds to eat more in order to meet the daily nutrients and energy need. Therefore, combination of soybean, sorghum and tiger nut offal and processed sheep bones as feed for Japanese quails, may not compromise feed consumption.

Table 2: Weekly feed intake, age at first egg drop and mortality of experimental hens

	Treatments				
Parameters	**T1**	**T2**	**T3**	**T4**	**LOS**
Feed intake (g/bird/week)	104.78 ± 0.76^{a}	92.78 ± 6.69^{b}	72.89 ± 6.28^{c}	55.18 ± 7.17^{d}	*
Age at first egg (weeks)	6.4 ± 0.43^{a}	0 ± 0.00^{b}	0 ± 0.00^{b}	0 ± 0.00^{b}	*
Mortality	0.00 ± 0.00^{b}	0.73 ± 0.18^{a}	0.76 ± 0.19^{a}	0.91 ± 0.23^{a}	*

$^{a,b,c,d:}$ Mean values in the same row with different superscript are significantly different at 5%

First egg drop was recorded in T1 at week 6 and no single egg drop was recorded in T2, T3 and T4 throughout the study duration. This observation contracted Bulus *et al*. (2013), who recorded first egg drop at exactly 5 weeks of age in Japanese quails, offered different commercial feeds. Since the treated hens did not lay eggs at all, combination of soybean, sorghum and tiger nut offal with processed sheep bones as feed for Japanese quails, may disrupt egg production.

The recorded mortality may be purely due to antinutritional factors and partly due to contamination of the soybean, sorghum and tiger nut offal used in this study. More so, it could be due to the palisade tissues and the collagenous nature of the sheep bones that are speculated not to be readily digestible. However, Woyengo *et al*. (2022), created an awareness that animal-derived calcium phosphates can be cheaper and more sustainable sources of P and Ca than rock-derived. Thus, processed sheep bones could be used as feedstuff in poultry nutrition, to provide other nutrients besides minerals.

CONCLUSION

Sheep bone contains approximately 18% crude protein thus, could be used as feedstuff in poultry nutrition. Feed consumption was somewhat not compromised but egg production was apparently disrupted and only the treated hens died. Thus, combination of soybean, sorghum and tiger nut offal with sheep bone at 50:50 weight for weight, may be deleterious to Japanese quail hens.

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