EFFECT OF DIETARY SUBSTITUTION OF BREWER'S DRIED GRAINS WITH TREATED RICE THRESHING WASTE MEAL ON PERFORMANCE OF WEANER RABBITS

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Abstract

Scarcity and high cost of conventional animal feed ingredients has resulted to soaring cost of meat. This situation calls for exploration into ways of harnessing agro waste products so as to fit into animal feeding. This study therefore, investigated the effect of substituting Brewer's Dried Grain (BDG) with 2%NaOH treated Rice Threshing Waste meal (TRTWM) on the performance of weaned rabbits. The TRTW was used to formulate four treatment diets such that the control (T_1) contained no TRTW while in T_2, T_3 and T_4, TRTW replaced BDG at 33.33%, 66.67%, and 100% rates respectively. The diets were assigned to 24 weaned rabbits of 8 weeks old in a complete randomized design. Data were collected on weight gain and feed intake within a period of 12 weeks. The proximate analysis of TRTWM and untreated one showed that the treatment caused a reduction in the crude protein, crude fibre and crude fat while the ash content of the untreated increased. The rabbits in all the treatment groups gained weight at equal pace ($P>0.05$) while the rabbits in the control group consumed less feed ($P<0.05$) than those in which TRTW substituted BDG in their diets. Feed conversion ratio of the rabbits in the control group was however similar ($P>0.05$) with rabbits in T_2 and T_3 groups but significantly better than those in T_4 group. It was concluded that 2%NaOH treatment can impact on nutrients and that TRTW can be used to substitute BDG in rabbit diet at up to 66.67% rate.

Key words: Diet, NaOH treatment, Performance, Rabbits, Rice Threshing Waste

Introduction

The present escalating cost of animal feeding which accounts for about 75% of production cost (sheriff et al., 2012) has been a great challenge in animal agriculture. Animal nutritionists believed that for this challenge to be solved, the ingredient base for animal feeding should be broadened through discovery of more agricultural waste that will fit in, as feed ingredient. Rabbit production is an important sector of animal agriculture through which majority of the population derive livelihood, as it contributes to food security and provides quality protein to the citizenry. Rabbit has numerous advantages among which include early maturity, highly prolific, short gestation period, rapid growth and good ability to utilize forage/fibrous material (Okorie, Ikpe and Oko, 2020). Despite these advantages, rabbit producers are still unable to contribute sufficiently to food security due to escalated feeding cost. This has necessitated the exploration of alternatives feed resources in feeding rabbits. Rice threshing waste (RTW) which is a waste that emanates from threshing of rice stalk in the rice field to obtain the rice paddy is one the agricultural waste which can fit in as feed ingredient in rabbit production. Exploring into this waste from rice is of interest due to the quantity that is generated in Nigeria. Presently, the countries' rice production has increased from two million tonnes in 2015 to nine million tonnes in 2021(Kenoma, 2020). RTW contain about 3.66kcal/g energy, 5.25% crude protein, 33% fibre and essential minerals- potassium 1.58%, calcium 0.53%, magnesium 0.24%, manganese (0.07), but low in phosphorus, iron and sodium (IRRI, 2008). Different degradation techniques can reduce the high fibre content. Treatments with sodium hydroxide (NaOH) application (Ndazi et al., 2007; Ikpe, Oko and Vining-Ogu, 2020) are used to increase fiber digestibility and improve nutritional value of feed ingredients.

This study therefore, explored the proximate composition of RTW, that of 2%NaOH treated, and the performance of weaned rabbits fed diet containing different inclusion levels of TRTWM.

Materials and Methods

The research was conducted at the Teaching and Research Farm, Akanu Ibiam Federal Polytechnic, Unwana, AfikpoEbonyi State. Unwana is in tropical rain forest zone of Nigeria.

Experimental material and collection

The rice threshing waste used for this study was collected from the rice field at Edda, Afikpo South Local Government Area, Ebonyi State, sorted of unwanted materials and milled using hammer mill to obtain the rice threshing waste meal (RTWM).

Treatment of the RTWM using 2%NaOH

The treatment was carried out using the method of Ikpe et al. (2019). A solution of 2% w/v of sodium hydroxide (NaOH) was prepared in a 200L capacity and RTWMadded at a ratio of 1L of the solution to 1 kg of RTWM. The content was properly stirred with long strong stick to achieve even mixture and covered with the lid of the container then left for 24 hours at room temperature of 27^0C. Afterwhich, the treated RTWMwas brought out, spread on a platform and sundried to well dried. The Sample of which and that of untreated were analyzed for their chemical composition as described by AOAC (2016).

Experimental Design and Management of Experimental Animals

A total of 24cross breed rabbits of Chinchilla and Hyla, of mixed sex (12 males and 12 females) and age within 6-8 weeks was obtained from a reputable Rabbitary farm for the research. The rabbits were randomly assigned to four (4) treatment groups in a complete randomized design of 6 rabbits to a treatment. Each treatment group was housed in a separate cage measuring 1m x 2m dimension. The animals were treated of parasites and allowed for 5 days to be acclimatized with the new environment before the commencement of the experiment. Feed and water were given *ad libitum*. The experiment lasted for 12 weeks.

Experimental Diets

Four experimental diets were formulated for the research. Diet 1 which was the control contained no TRTWM, while in diets 2, 3 and 4 the TRTWM substituted BDG at 33.33, 66.67 and 100% rates(10, 20 and 30% inclusion levels) respectively on weight for weight basis. The diets were pelletized. The ingredient composition of the diets is presented in Ttable 1.

Table 1. Ingredient and calculated nutrient composition of the experimental diets

Ingredients	Treatment levels (% RTW)			
	T_1(0)	T_2(10)	T_3(20)	T_4(30)
Maize	40.00	40.00	40.00	40.00
Soya bean meal	2.00	2.00	2.00	2.00
Groundnut meal	3.00	3.00	3.00	3.00
Palm Kernel cake	7.00	7.00	7.00	7.00
Brewer's dried grain	30.00	20.00	10.00	0.00
RTW	0.00	10.00	20.00	30.00
Wheat offal	12.00	12.00	12.00	12.00
Fish meal	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
*Min. &vit. Premix	0.25	0.25	0.25	0.25
Salt	2.25	2.25	2.25	2.25
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated Nutrient Composition of the diets				
Crude protein (%)	17.87	16.02	14.74	12.96
Crude fibre (%)	6.8	6.5	7.1	7.7
Calcium (%)	1.3	1.2	1.2	1.2
Phosphorus (%)	1.1	1	0.9	0.8
Met. Energy (kcal/kg)	2668.36	2537.54	2407.12	2276.7

*Premix in diets provided per kg; Vit. A 10000iu, vit. B2000iu, Vit. E 13000iU, Vit. K1500mg, Vit. B12 10mg, Ruboflavin 5000mg, Pyridoxine 1300mg, Thiamine 1300mg, Panthothenic acid 8000mg, Nicotinic acid 2800mg, folic acid 500mg, Biotin 40mg, Copper 7000mg, manganese 48000mg, iron 58000mg,, Zinc 58000mg, Selenium 120mg, lodine 60mg, Cobalt 300mg, Choline 27500mg.

Data collection and analysis

The rabbits were weighed using a digital table scale at the beginning and end of the research to obtain their weight gain. Feed intake was determined by subtracting the weight of the leftover feed from the weight of feed offered after 24 hours. Feed conversion ratio was obtained by dividing the feed intake with weight gain while mortality was monitored during the course of the research. The data obtained were subjected to statistical analysis using one-way analysis of variance procedure at ($P < 0.05$) level of significance and computed with SAS statistics analytical software.

Results and discussion

Proximate composition

The results of the proximate composition of untreated RTWM and the TRTWM as presented in Table 2 showed that the treatment caused a reduction in the crude protein, crude fibre and crude fat while the ash content increased. A similar result was reported by Ikpe et al. (2019) on their treatment of rice husk with 4% NaOH.

Table 2. Proximate composition of 2% NaOH treated RTW and untreated RTW (% DM)

Nutrients	Untreated RTW	2%NaOH treated RTW
Moisture	7.00	8.50
Crude protein (%)	10.50	8.75
Crude fat (%)	1.84	1.50
Crude fibre (%)	18.42	17.40
Ash (%)	15.50	22.00
Nitrogen free extract (%)	46.74	41.85
Energy (kcal/kg)	347.78	208.82

Source: Field report, 2022

Performance of the rabbits fed different inclusion levels of TRTWM

The results of the growth performance of the rabbits fed different levels of TRTWM as presented in table 3. showed no significant differences ($P>0.05$) among the treatment groups on the final weight and weight gain while there was a significant ($P<0.05$) effect on feed intake and feed conversion ratio. The insignificant result in weight gain is an indication that the rabbits utilized the TRTWM at par with the BDG and its suitability in feeding rabbits. A similar result was obtained in the work of Ikpe et al. (2022) using treated RTW to replace BDG in the diet of finishing broilers. In the present research, the rabbits whose diets contained TRTW consumed more feed than the rabbits on the control group. The increased feed intake could be as a result of low energy level of the diets that contained TRTW (Akinmutimi and Anakebe, 2008). Also, the increased intake could be as result of NaOH treatment which served as an additive and which also improved the color of the diets. Additives have the tendency of enhancing palatability and appetite of animals(DalleZotte, Celia and Szendrö, 2016). The increased feed intake however did not translate to better feed conversion ratio as the feed conversion ratio for rabbits on control group was same for$T_2$and T_3 but significantly ($P<0.05$) lower than that of T_4 while T_2, T3 and T4 were similar when compared among the 3 groups. There was no mortality during the research which showed that the TRTWM is not lethal to rabbits.

Table 3. Growth Performance of weaner rabbits fed different levels of TRTWM

Parameters	Treatment Levels (%)				SEM
	T_1(0.00RTW)	T_2(10.00RTW)	T_3(20.00RTW)	T_4(30.00RTW)	

Initial wt(g)	900.00	966.67	1066.67	1000.00	140.93
Final wt(g)	1500.00	1600.00	1616.67	1458.33	171.90
Wtgain (g)	600.00	633.33	550.00	458.33	78.84
Feed intake	2850.00[b]	3400.00[a]	3341.33[a]	3401.33[a]	81.76
FCR	4.77[b]	5.47[ab]	6.40[ab]	7.45[a]	0.86
Mortality (no)	0	0	0	0	-

Note: No superscript =not significant, means on the same row with different superscript differ significantly (P<0.05) SEM = standard error mean. Wt = weight, FCR = feed conversion ratio

Conclusion and Recommendation

TRTW can substitute BDG at up to 66.67% in weaned rabbits diet without any adverse effect and therefore recommended.

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