COMMERCIAL NANO-NUTRIENT SUPPLEMENTATION IN GROWING RABBITS' DIETS

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ABSTRACT
The use of nanoparticles in livestock is becoming more popular for improvement in performance. The study was conducted to examine the growth performance and nutrient digestibility of growing rabbits fed diet supplemented with Nano-nutrients. Thirty-two (32) cross bred growing rabbits of mix sexes were randomly distributed into four treatments consisting eight (8) animals each serving as a replicate. Treatment 1 served as the control without nano-nutrient, rabbits in Treatment 2 were given nano-nutrients orally (15g/10liters of water), Treatment 3 were fed diet supplemented with nano-nutrient at 62.5g/25kg of feed and Treatment 4 were fed both diet supplemented with nano-nutrient at 62.5g/25kg and nano-nutrients orally at 15g/10 liters of water. Feed and water were given ad libitum during the 9 weeks of the experiment. Data were collected on growth performance and nutrient digestibility which were subjected to ANOVA using SPSS version-21. The results showed that the treatments had no significant (P>0.05) effect on the performance characteristics and nutrient digestibility. However, the nano-nutrient strengthens the animal's immune system and the use of antibiotics was avoided. It was concluded that nano-nutrients could be included in the feed or water of rabbits without any deleterious effect.
Keywords: Nano-nutrient, Rabbits, Growth performance, Nutrient digestibility

INTRODUCTION

Production and multiplication of rabbits is one of the sustainable ways of meeting and sustaining the animal protein requirements of the Nigerian populace (Ojebiyi *et al*., 2009). Rabbit is an animal of choice due to the recognizable advantages it has over other livestock. When compared with other livestock, rabbit is characterized by early maturity, high prolificacy, relatively short gestation period, short generation interval, high productive potential, good ability to utilize forages and fibrous plant materials and its profitability for small-scale system of production (Ojebiyi *et al*., 2013). Rabbits are important contributors to food and nutrition security and aid in the provision of high quality protein (Gino *et al*., 2013).

Recently, there has been interest in the utilization of nano-nutrients (El-sayed and kamel, 2020). The biological properties of nanoparticles such as lesser dose, lower antagonism, greater absorption rate and better tissue distribution can be beneficial to the animals (Amlan and Lalhriatpull, 2020). The incorporation of nano-materials to animal feed or water can improve both the final product's quality and the process of production (Dong *et al*., 2022). Nano minerals can also inhibit harmful pathogens in feed and address reproductive problems in livestock (Laurent *et al.,* 2008). Nano minerals have also been used to treat disease. For example, Nano zinc oxide can increase the development rate, immunity and reproductive performance of farm animals, as well as lower the incidence of diarrhea (Hassan *et al.,* 2021). In medicine, emerging nano medicines have several advantages over traditional treatments, one of which is their self-control ability. They improve feed durability and thereby increasing the nutrients digestibility (Reddy *et al.,* 2010). The objective of this study was to determine the effect of commercial nano-nutrient on performance and nutrient digestibility of growing rabbits.

MATERIALS AND METHODS

The experiment was carried out at the Rabbit Production Unit of Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. The test ingredient used (Oossoo Chitosan Nano) was produced from 100% natural substance extracted from nature. It was manufactured in Nong chook Bangkok, Thailand and the recommended doses are 250gm per 100kg of animal feed and or 1 table spoon (15g) per 5-10 liters of water.

Experimental Animals and Management

Thirty-two (32) growing rabbits were used for the experiment. The rabbits were weighed at the commencement of the experiment and randomly divided into 4 treatments of 8 replicates. The rabbits were managed intensively and all necessary medications were used appropriately, especially on the control. Each replicate was housed in a metal cage measuring 14cm x 18cm x 12cm. The rabbits were offered feed and water on *ad-libitum* basis throughout the experiment period that lasted for 9 weeks. The gross composition of the experimental diets is presented in Table 1.

Table 1: Gross composition of Broiler Starter Diets (g/100g)

Ingredients	T1	T2	T3	T4
Maize	20.00	20.00	20.00	20.00
Soybean meal	19.50	19.50	19.50	19.50
Corn bran	15.00	15.00	15.00	15.00
Corn cobs	5.00	5.00	5.00	5.00
Rice husk	10.00	10.00	10.00	10.00
Wheat offals	10.00	10.00	10.00	10.00
Cassava meal	6.00	6.00	6.00	6.00
Palm Kernel Cake	11.50	11.50	11.50	11.50
Bone meal	2.00	2.00	2.00	2.00
Methionine	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
*Nano nutrient	Nil	IW	IF	BWF
Total				
Proximate analysis				
Crude protein (%)	17.17	17.17	17.17	17.17
Metabolizable energy (kcal/kg)	2503.38	2503.38	2503.38	2503.38
Crude fibre (%)	14.76	14.76	14.76	14.76
Ether extract (%)	84.88	84.88	84.88	84.88
Lysine (%)	0.76	0.76	0.76	0.76
Methionine (%)	0.71	0.71	0.71	0.71
Phosphorus (%)	0.52	0.52	0.52	0.52
Calcium (%)	6.34	6.34	6.34	6.34
Cost/kg	735.83	735.83	735.83	735.83

**Premix Composition: Vitamin B1 (mg) 3000, vitamin B2 (mg) 4000, vitamin B6 (mg) 3050, Vitamin A (i.u) 8000 000, vitamin D (i.u) 1875 000, vitamin E (i.u) 20 000, vitamin K3 (mg) 5500, vitamin B12 (mg) 2000, Biotin (mg) 1500, Choline (mg) 400 000, Copper (mg) 6500, Iodine (mg) 400, Selenium, (mg) 80, Folic (mg) 1250, Iron (mg) & 200, Niacin PP (mg) 25 000, Cobalt (mg) 200, Antioxidant (mg) 1250, Zinc (mg) 85 500, Manganese (mg) 75 000.*

*15g/10litres of water, 62.5g/25kg of feed, IW – orally in water only, IF – added to feed only, BWF – added to both feed and water

Data Collection

Growth parameters

Daily weight gain, daily feed intake, feed to gain ratio, feed cost/kg weight gain were all estimated according to the method of Ojebiyi *et al.* (2013).

Nutrient digestibility

Digestibility of nutrients was determined at the 9th week of the experiment by the method of Ojebiyi *et al*. (2013) collection of faeces for 5days. Records of the wet as well as dry weight of the faeces were kept and after bulking together, samples were taken for determination of proximate composition.

Experimental Design and Laboratory analysis

The experiment was a Completely Randomized Design. Proximate compositions of experimental diets and faecal samples were analysed according to the procedures of AOAC, (2012).

Statistical Analysis

All data collected were subjected to one-way analysis of variance (ANOVA) using IBM SPSS version 25, and significant means were separated using Duncan's Multiple Range Test in the same software. Significance difference was determined at $P < 0.05$.

RESULTS AND DISCUSSION

Table 2 shows the performance characteristics of rabbits at 9weeks. Total weight gain, daily weight gain and total feed intake showed no significant differences. This finding is in line with the report of Alagawang *et al.*, (2016) who reported no significance effect in average daily weight gain of growing rabbit treated with garlic (*Allium Sativa*). However, the daily feed intake ranges between 77.35 to 86.13g which is lower than the value of 107.00g reported by Noha *et al*, (2019) who studied the effect of dietary nano-zinc and nano-selenium on productive and physiological performance of growing rabbits at fattening period. Rabbits in the control group had the highest feed cost/kg/weight gain (₦1877.29) and the counterpart on dietary Treatment 4 had the least feed cost/kg/weight gain (₦1739.00) which implies that the use of nano-nutrient in water and or feed is economical compared to using conventional antibiotics and medications.

Table 2: Effect of Nano nutrient (Oosoo chitosan) on Performance of growing rabbits

Parameter	T1	T2	T3	T4	SEM	P-value
Initial weight (g)	867.63	860.25	870.13	871.13	24.87	0.99
Final weight (g)	1954.38	1901.25	1971.38	1980.63	54.33	0.77
Daily weight gain (g)	17.25	16.52	17.48	17.61	0.83	0.80
Daily feed intake (g)	86.13	77.35	85.58	81.25	3.73	0.74
Feed:Gain	4.99	4.68	4.90	4.61	0.24	0.74
Feed cost/kg	376.21	373.07	366.04	377.22	-	-
Feed cost/kg/wg (₦)	1877.29	1745.98	1793.58	1739.00	-	-

T1: control, T2: Nano nutrient in water, T3: Nano nutrient in feed, T4: Nano nutrient in water and feed

Table 3 shows the effect of Oosso chitosan nano on nutrient digestibility, there were no significant difference among the treatments in all the parameters measured. The values obtained for crude protein (82.14 – 83.54%) and crude fat (83.37 – 84.92%) are higher than the values of (69.30 – 71.60%) and (48.80 – 52.50%) reported by Noha (2019) who fed nano-zinc and nano-selenium to rabbits.

Table 3: Effect of feeding Oossoo chitosan nano on nutrient digestibility of growing rabbits

Parameters (%)	T1	T2	T3	T4	SEM	P-value
Dry matter	62.78	60.00	61.78	59.24	1.16	0.07
Crude protein	83.54	82.63	82.90	82.14	1.54	0.09
Crude fat	84.53	83.94	84.92	83.37	0.99	0.21
Crude fibre	58.11	51.61	57.01	51.48	0.81	0.82
Nitrogen free extract	55.48	52.53	54.30	51.68	0.72	0.07
Ash	62.78	61.57	64.34	59.99	0.80	0.91

NFE (Nitrogen free extract) = DM – %(CP+CFat+CFibre+Ash)
T1: control, T2: Nano nutrient in water, T3: Nano nutrient in feed, T4: Nano nutrient in water and feed

The medication schedule and the cost of medication for the growing rabbits during the period of experiment is shown in Table 4. The total cost of medication (₦367.51) for the control group is higher than ₦121.88 for the other dietary treatments (T2, T3 and T4). This implies that the use of nano-nutrient in feed and or water is cost effective because it reduces the cost of medication by 66.84% which is an added advantage to farmers to reduce the cost of production and increase their profit margin.

Table 4: Medication schedule for the growing rabbits

Parameter	T1	T2	T3	T4
Nano + water	-	+	-	-
Nano + feed	-	-	+	-
Nano + feed and water	-	-	-	+
Medication at week 1	+	+	+	+
Medication at week 2 to 9	+	-	-	-
Total cost of medication (₦)	367.51	121.88	121.88	121.88

+ means inclusion, - means no inclusion, T1: control, T2: Nano nutrient in water, T3: Nano nutrient in feed, T4: Nano nutrient in water and feed

CONCLUSION

It was concluded that Oosso chitosan nano could be included in the feed and or water of rabbits with no deleterious effect. Since, there is paucity of information on the use of nano-nutrient in rabbit, this experiment has confirmed

that inclusion in feed or water is safe. Hence, higher dose in either water or feed is recommended to determine the possibility of improved performance.

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