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Growth Performance of Male Rabbits Orally Gavaged with Different Levels of Monosodium Glutamate in the Semi-Arid Zone of Nigeria

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ABSTRACT

This study evaluated the effects of graded levels of monosodium glutamate (MSG) administered orally on the growth performance of male rabbits. Thirty-two mongrel bucks (average weight 1039 ± 15.6 g) were housed in a completely randomized design at the University Teaching and Research Farm, Federal University Dutse, Jigawa State. Rabbits were fed commercial pelletized growers MAXX diet and water ad libitum. After 14 days of acclimatization, they were assigned to four treatments of eight rabbits each. A stock solution was prepared by dissolving 40 g MSG in 1 L of distilled water. Group 1 served as control and received 2 ml distilled water only, while Groups 2, 3, and 4 received 2, 4, and 6 ml MSG/kg BW, respectively, administered orally every 48 hours for 56 days using a round-head syringe. Initial body weights showed no significant differences ($P > 0.05$) among groups. However, rabbits in T3 (4 ml MSG) recorded significantly ($P < 0.05$) higher final weight (3037.60 g), total weight gain (2002.40 g), and average daily gain (35.75 g) compared with other treatments. Daily and total feed intake were significantly ($P < 0.05$) influenced by MSG, with the highest values (126.13 g/day; 7063.30 g total) observed in T4 (6 ml MSG). Feed conversion ratio (FCR) was significantly ($P < 0.05$) poorer in T4 (4.29). It was concluded that oral administration of MSG at 4 ml/kg BW enhanced rabbit performance, and its use at this level is recommended.

1. Introduction

Rapid growth rate and ability to utilize forages into high quality meat are considered as some of the attributes that promote rabbit production amongst the farmers (Ogbonna, 2015). Rabbits have a short gestation length, attain early sexual maturity and have the ability to rebreed several times within a year (Sharp *et al.*, 2007). The report of Ogbuwu *et al.* (2012) have shown that the low level of animal protein intake by Nigerians has

generated concern as it affects both the physical and mental development of youth and labor force in Nigeria. And this issue can be solved by the use of animals with high rates of production and growth (Akinmutimi and Onen, 2008).

Flavouring agents, including feed additives, are dietary supplements incorporated to improve feed intake by enhancing palatability and acceptability (Jay *et al.*, 2010). Monosodium glutamate (MSG) is one such



additive that can be applied in rabbit production to promote both growth and reproductive performance. Previous findings have shown that MSG significantly increased feed intake and body weight gain in rabbits (Gbore *et al.*, 2016). However, detailed research on the effects of MSG on the growth performance of male rabbits remains limited. Hence, this study was designed to assess the impact of MSG on growth performance of male rabbits.

2.0 MATERIALS AND METHODS

2.1 Experimental Site

The study was conducted at the Teaching and Research Farm of the Faculty of Agriculture, Federal University Dutse, Jigawa State, Nigeria. Dutse is located at latitude 11.760°N and longitude 9.341°E. The area experiences an average annual temperature of approximately 25°C, with temperatures ranging from 21°C in the coldest month to above 31°C in the hottest month. The total annual rainfall is around 600 mm (Ibrahim *et al.*, 2012).

2.2 Experimental Layout

The thirty-two male adult rabbits were divided into four treatment groups of eight animals each, following a Completely Randomized Design (CRD).

2.3 Sources, Preparation and Administration of Monosodium Glutamate

Monosodium glutamate was procured from reputable store in Shuwarin market of Kiyawa LGA. A 40 g of MSG was dissolved in one (1) litre of distilled water. Group 1 was the control and received no MSG solution but was given 2 ml distilled water only. Rabbits in group 2, 3 and 4 received 2, 4 and 6 mg of MSG/kg BW orally, respectfully administered for every 48hours for 56days using a round-head syringe. The control group received normal water for the duration of the experiment.

2.4 Management of Experimental Animals

Adult rabbits with average body weights of 1039±15.6g were procured from various market sources. The animals were housed in cages measuring 35 × 35 × 55 cm (width × length × height), which were cleaned regularly. Drinkers and feeding troughs were provided in each cage, and the drinkers were washed daily. Both feed and water were supplied ad libitum during the experimental period. The rabbits were treated for coccidiosis and mange with prophylactic coccidiostat (Amprovitracycline) and cinatic powder as per the manufacturers' instructions. The animals were housed in 16 pens containing 2 rabbit each.

2.5 Experimental Diet and Source

The rabbits were fed commercial pelletized growers feed, which contains 16% crude protein, 5% fat, 3% crude fiber (min.), 1.0% calcium (min.), 0.40% (min.) available phosphorus, and 2600 kcal/kg metabolizable energy.

2.6 Body weight

Body weight (g) of each rabbit was taken at the beginning of the experiment (day 0). Subsequently, the measurement was carried out weekly, using digital weighing scale.

2.7 Feed intake

Feed intake (g) was recorded daily by subtracting the leftover from the quantity of feed offered to the animals the previous day.

Feed intake (g/rabbit) = Feed offered (g) - Leftover (g), using digital weighing Scale.

2.8 Feed conversion ratio

Feed conversion ratio was determined using feed intake and body weight gain.

Feed conversion ratio (FCR) FCR= Feed Intake (g) / live weight gain (g).

2.9 Average daily gain (ADG)

Average daily gain (ADG) was calculated from weight gain and total number of days of the experimental period.

Average daily gain (ADG) = (final body weight – initial body weight) / total days of the experiment.

2. 10 Data Analysis

The data collected from the experiment were subjected to analysis of variance (ANOVA) using General Linear Model (GLM) procedure of SAS version 9.1.3 (SAS 2008). Where significant differences were observed with Duncan multiple range test (DMRT) was used to separate the means. The difference between the means were reported at (P<0.05) level of significance.

3. RESULTS AND DISCUSSION

The result is presented in Table 1. According to the result of the study, the initial weights of the rabbits doesn't show any significant (P > 0.05) differences. However, the rabbits placed on T₃ (4 mg MSG) showed a significantly (P<0.05) higher mean values of final body weight (3037.60 g), total weight gain (2002.40 g) and average daily weight gain (35.75 g) when compared with those placed on the other treatments. This disagreed with the report of Nagbila *et al.* (2021) who recorded the highest values of final weight gain, weight change and daily gain in rabbits fed diet containing 0.4g MSG/kg. The results of the present study agreed with reports of Gbore *et al.* (2016) who reported a significant increase in growth performance in rabbits fed with 4mg MSG/kg of body weight but contrary to the findings of Kondoh and Torri (2008) who reported smaller body performance of rats treated with monosodium glutamate. These disparities in growth performances could be attributed to species, breed and quality of diets used.

The results showed that the daily and the total feed intake increases with an increase in inclusion levels of MSG where the significantly highest (P<0.05) daily feed



intake (126.13 g) and total feed intake (7063.30 g) was observed in rabbits fed T₄ (6 ml MSG), while the lowest values were recorded in T₁ (0 mg MSG), respectfully. The results disagreed with report of Olarotimi *et al.* (2021) who recorded the least feed intake among the rabbits in the groups that received 4 ml MSG/BW. The feed conversion ratio (FCR) showed significantly (P < 0.05) higher mean value (4.29) in rabbits placed on T₄ (6 mg MSG). The increase in feed intake showed the appetite enhancing ability of MSG on rabbits. This study agreed with Moore (2003) who reported that MSG affects the appetite positively as well as improving the palatability of meals by stimulating the orosensory receptors and consequently enhances weight gain. These results showed that MSG is detrimental to the normal feeding physiology by abnormally inducing appetite by, probably modulating the appetite control centre of the brain Gbore *et al.* (2016) equally reported enhanced weight gain, feed intake and feed conversion ratio in rabbit does orally administered low to medium dosage of MSG. Since the MSG was not added to the diet, the

increased feed intake and the resultant proportionate increase in the weight gained by the animals could be due to improved appetite enhancement as a result of the positive influence of MSG on the appetite control center of the brain as observed in rats administered MSG subcutaneously by Reddy *et al.* (1986). Contrary to that, FSANZ (2003) stated that the excessive use of MSG could be self-limiting as it reduces palatability. Soltan (2009) equally buttressed this view by stating that over use of MSG could trigger toxicity, thereby, preventing palatability.

Monosodium glutamate had significantly (P<0.05) influenced the feed conversion ratio across the treatment groups as it increases with a relative increase in MSG level but decreased in rabbits on 6 mg/kg BW of MSG, respectfully. The rabbits administered with 4 mg/kg BW of MSG were more efficient in feed conversion compared with those administered with other doses, including the control. The results obtained in this study on FCR was in line with report of Gbore *et al.* (2016) who reported a similar trend.

Table 1: Growth Performance of Rabbit Administered Varied Concentration of MSG

Parameters	Treatments				SEM
	T1 (0 mg)	T2 (2 mg)	T3 (4 mg)	T4 (6 mg)	
Initial weight (g)	1036.88	1036.50	1035.13	1037.50	5.20
Final weight (g)	2499.00 ^b	2694.40 ^b	3037.60 ^a	2682.20 ^b	56.07
Total weight gain (g)	1464.70 ^b	1657.90 ^b	2002.40 ^a	1647.20 ^b	54.62
Average daily weight gain (g)	26.16 ^b	29.61 ^b	35.75 ^a	29.41 ^b	6.14
Daily feed intake (g)	87.81 ^c	97.00 ^b	102.50 ^b	126.13 ^a	1.65
Total feed intake (g)	4921.00 ^c	5432.00 ^b	5741.00 ^b	7063.30 ^a	169.20
Feed conversion ratio	3.40 ^b	3.28 ^{bc}	2.88 ^c	4.29 ^a	0.09

^{ab} Means in the same row with different superscript are significantly different (P<0.05), SEM = Standard error of means, IBW = Initial Body Weight, FBW= Final Body Weight, TWG = Total Weight Gain, ADW = Average Daily Weight, TFI = Total Feed Intake, FCR= Feed Conversion Ratio. T₁=control 0mg/kg MSG, T₂= 2mg/kg MSG, T₃=4mg/kg MSG and T₄=6mg/kg MSG

4. CONCLUSION AND RECOMMENDATIONS

It can be concluded that the administration of MSG at dose rate of 4 mg/KG BW improved growth performance without adverse effects, while higher doses increased intake but worsened feed conversion ratio (FCR). It therefore recommended that monosodium glutamate can be administered orally to the mongrel rabbit at optimum level of 4 mg/kg BW.

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