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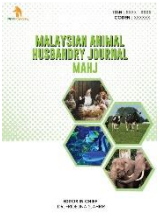

RESEARCH ARTICLE

GROWTH PERFORMANCE OF WEANER RABBITS FED DIETS CONTAINING MORINGA OLEIFERA LEAF MEAL AND GONGRONEMA LATIFOLIUM LEAF MEAL

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ABSTRACT

Twenty-four weaner rabbits of same breed and mixed sex were used in an experiment to evaluate the effects of varying dietary inclusion of Gongronema latifolium lef meal (GLLM) and Moringa oleifera leaf meals (MOLM) on the growth performance and nutrient digestibility of weaner rabbits. The rabbits were allocated to four treatment groups in a Completely Randomized Design (CRD) and each treatment was replicated thrice with two rabbits in each replicate. The rabbits were fed with T1 diet which contained only the basal diets without MOLM and GLLM, T2 diet which contained 3% MOLM , T3 diet which contained 3% GLLM and T4 diet which contained 1.5% MOLM and 1.5% GLLM. Growth Performance criteria determined were feed intake, final weight gain, average daily weight gain, average daily feed intake, feed conversion ratio and nutrient digestibility. Rabbits fed the control diet recorded significantly ($p<0.05$) higher total feed intake and protein digestibility. The results of the experiment suggest that treatment one which does not contain MOLM and GLLM performed better than other treatments and should be adopted in rabbit production.

KEYWORDS

Growth, rabbit, Gongronema latifolium, Moringa oleifera, digestibility

1. INTRODUCTION

The global human population is rapidly increasing but not with a commensurate increase in meat production to meet the increasing demand for safe animal products and byproducts for humans consumption that is free from residual antibiotics through the use of alternative natural resources. Antibiotic resistance has necessitated the move to minimize the use of antibiotic in livestock and poultry breeding. Animal breeders have used so many medicinal plants and their extracts as feed supplements for alternative antibiotics in livestock production. Animal scientists are now carrying out research that is geared towards the use of unconventional natural feed resources, which may help improve the productive performance and health conditions of rabbits. Thus, researchers are highly interested in getting potential natural feed resources that can be considered safe and environmentally friendly. *Moringa oleifera and Gongronema latifolium* are well-known cultivated species of medicinal plants that have such potentials.

Different parts of Moringa especially the seed and leaves have variously been used for industrial and medicinal purposes. The different parts of *M. oleifera* tree are consumed as food by humans traditionally in different parts of the world. The polyelectrolytes contained in the seed powder of *M. oleifera* are the most important active substances for water purification. *Moringa oleifera leaves are highly nutritious and are used as feed supplement in animal nutrition.* The leaves of *M. oleifera* contain high level of vitamin K, Vitamin B complex, vitamin C, pro-vitamin A as beta-carotene, manganese, and protein with other essential nutrients (El-Harairy et al., 2016). *Moringa oleifera* leaves also have antibiotic properties and are rich with fats, proteins, vitamins, and minerals. *Moringa oleifera* leaf extract contain small quantity of polyphenols, but can still have effects on blood lipid metabolism. Supplementation of Moringa oleifera at 1.5g per kg of rabbits diets had significant effects on growth performance, antioxidant capacity, and improvement in the nutrient value of the rabbit meat (Selim et al., 2021). Supplementing Moringa oleifera at 70% on concentrate diet promoted greater growth performance and meat quality of rabbit than feeding the rabbit with Moringa oleifera leaf meal alone (Bhatt et al., 2023).

Moringa oleifera can be used as food source and also as feed supplement in rabbit diets. The phytochemical content of *Moringa oleifera* leaf powder has anti-septic and detergent properties. *Moringa oleifera* can also boost the immune system due to their sources of vitamins and amino acids. *Moringa oleifera* equally exhibits anti-oxidant properties that can suppress formation of reactive oxygen species (ROS) and free radicals. The use of Moringa oleifera to improve the growth performance of farm animals has not gained wide popularity until recently. The medicinal value of *Moringa. oleifera* on the health of rabbits has been established but the inclusion levels in rabbit ration and their mode of actions are still being investigation. Aljohani and Abduljawad (2018) reported that dried Moringa olefira leaves included at 1000 g/Kg in diet might improve growth performance, antioxidant, biochemical parameters, bacterial community and blood profiles of rabbits.

Gongronema latifolium Benth belongs to the family Asclepiadaceae. It is an edible nutritional as well as medicinal plant which is mostly found in the rainforest zones in Nigeria and other tropical African countries. The plant can be propagated through seed and cuttings and it produces white and yellow flowers. The inclusion of Gongronema latifolium leaf meal in animal diets including rabbit ration is still not significant because of high reliance on synthetic vitamins and mineral sources (Alabi et al., 2008). This plant is mostly found in tropical rainforest and is used as traditional medicine and as vegetable for human consumption (Ugochukwu et al., 2003).

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Gongronema lactifolium has been identified as a highly nutritious plant with high levels of minerals, vitamins and proteins (Okafor, 2005). This medicinal plant can be used to cure many diseases like diabetes and hypertension (Etukudo, 2003; Agbo et al., 2005). It improves the immune system (Mesah et al., 2008) and is also used to cure other diseases like chronic cough, malaria, stomach upset, typhoid fever, dysentery, etc (Agbo et al., 2005). It is important to use those locally available feed ingredients that will serve both as sources of nutrients and medicine as feed and for the control of rabbit diseases. Moreover, the inclusion in the ration may also help to reduce the cost of production. Increasing Rabbit production in Nigeria can help to meet the animal protein requirements (Iyeghe Erakpotobor et al., 2002). Rabbits are highly prolific with very high growth rate at a minimum cost of production. The average daily weight gain of rabbit is high in proportion to the body and it attains sexual maturity early. The high cost of livestock feeds especially in Nigeria and the scarcity of conventional proteins and energy concentrates ingredients gave rise to the search for attractive, cheaper and readily available protein and energy feed ingredients. Hence, the feeding trial involving the uses of *M. oleifera* and *G. latifolium* as natural potential feed sources as well as an alternative to antibiotics that can enhance the growth performance and health conditions of rabbits.

2. Materials and Methods

2.1 Study location

The research was conducted at the Rabbit section of the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Nnamdi Azikiwe University, Awka, Anambra state. The location is within the coordinate $6^{0}12^{1}25^{11}$N and $7^{0}04^{1}04^{1}$E of the tropical rainforest zone of Nigeria and experiences rainy and dry seasons determined by north east trade wind and south west trade wind. The climate of the study area is tropical with relative humidity ranging from 70% to 90% and mean temperature of 25-27 ^{0}C.

2.2 Collection and preparation of *Moringa oleifera Leaf Meal (MOLM)and Gongronema latifolium Leaf Meal (GLLM)*

The Moringa leaves were washed after harvesting and dried at room temperature until they were crispy to touch but still retaining the green color. Hammer mill with 3mm screen was used to grind the leaves into Moringa oleifera leaf meal. The grounded leaf meal was used in formulating the experimental diets.

The Gongronema latifolium leaves used in the study were harvested and washed to remove dust particles. The leaves were further dried at room temperature for 72hrs before it was grounded into coarse powder using a mechanical blender.

2.3 Experimental Animals, Procurement and Management

Twenty- four weaner rabbits of same breeds and mixed sexes were used in this study. The Animals were procured from a reputable farm and were between 6 and 8 weeks old and with initial average live weight of 450-900g. The rabbits were randomly allocated to four (4) Treatment diets (T1, T2, T3 and T4) with each treatment having three replicates of two rabbits each. The experimental animals were acclimatized to the experimental diets for one week in well constructed wooden cages. The rabbits were de-wormed with (IVERMET 0-1, USO VETERINARIO VMD, Belgium) and also given antibiotics (Oxykel 80, KELA N.V, Belgium) against infectious diseases during this period. Fresh feed and water were given to the rabbit during the experiment.

2.4 Design of the experiment

Completely randomized design (CRD) as described by researchers in 2004 was used in the study (Akindele et al., 2004). Data were collected and analyzed with statistical software (statistical package for social sciences (SPSS) version 17.0) using one way analysis of variance (ANOVA). Significant treatment means were separated using Duncan's New Multiple Range Test.

2.5 Data Collection

Data of feed intake was collected daily while body weight was collected at weekly interval. Other variables such as feed conversion ratio, average daily weight gain, average daily feed intake, protein digestibility, carbohydrate digestibility, fat digestibility, fibre digestibility and total feed intake were calculated.

2.6 Experimental Diets

Four treatment diets were formed. Treatment one was the control and does not contain Moringa oliefera and Gongronema latifolium leaf meals. Treatment two contains 3% Moringa oliefera leaf meal, treatment three contains 3% Gongronema latifolium leaf meal and treatment four contains 1.5% MOLM plus 1.5% GLLM.

Table 1: Feed formulation table for weaner rabbit

NUTRIENTS	T1	T2	T3	T4
Maize	45	45	45	45
Soybean meal	7.5	6.5	6.5	6.5
Wheat bran	12	11	11	11
Limestone	5	4.55	4.55	4.85
Bonemeal	2.55	2.0	2.0	2.0
Palm kernel	12	12	12	12
Groundnut cake	15	15	15	15
Premix	0.5	0.5	0.5	0.5
Toxin binder	0.15	0.15	0.15	0.15
MOLM	0	3.0	0	1.5
GLLM	0	0	3.0	1.5
Salt	0.3	0.3	0.3	0.3
TOTAL	100	100	100	100
Crude protein(%)	18.62	18.40	18.46	18.40
Energy (Kcal/kg)	4,179.60	4,169.00	4,160.20	4,170.00

2.7 Digestibility Trial

Feed digestibility is a measure of the quantity of the feed which can be made available for absorption by the animal and utilized for growth, reproduction and other physiological purposes. Digestibility to some extent is an indication of nutrient quality of feed. Data from digestibility study can show if an animal was properly fed or not. Towards the last week of this study, faeces were collected from each replicate. The faeces collected towards the last week of the experiment were dried under the sun before being analyzed. Not only faeces were analyzed, treatment diets were also analyzed. Apparent digestibilities of the diets were determined using proximate composition of faeces collected from different treatment and that of the diets.

3. Results

3.1 The Proximate Composition of the Experimental Diets and Fecal Samples

The proximate compositions of the treatment diets and the fecal samples are shown in table 2 and 3 respectively. It can be observed on the table that treatment one has the highest crude protein while treatment three has the lowest crude protein value. Treatment four also has the highest crude fibre while treatment three has the lowest crude fibre. Ash content ranges from 8.60 to 10.05% in the treatment diets and from 7.30 to 14.45% in the fecal sample. Carbohydrate content in diets also ranges from 57.61 to 60.58% and from 44.83 to 56.03% in fecal sample. Moisture content was higher in fecal sample with the range of 17.50 to 20.8% and lower in the experimental diets with the range of 7.55 to 8.45%.

Table 2: Proximate composition of treatment diets

	Moisture (%)	Ash (%)	Fibre (%)	Fat (%)	Protein (%)	Carbohydrate (%)
T1	7.55	8.90	4.40	1.95	18.83	58.37
T2	8.45	9.55	4.73	1.90	16.20	59.17
T3	8.30	8.60	4.25	1.20	17.07	60.58
T4	8.25	10.05	4.98	1.60	17.51	57.61

Table 3: Proximate composition of Fecal Sample

	Moisture (%)	Ash (%)	Fibre (%)	Fat (%)	Protein (%)	Carbohydrate (%)
T1	19.50	14.45	7.23	0.25	11.38	47.19
T2	17.90	8.80	4.35	1.10	12.70	55.15
T3	20.80	12.55	6.23	0.70	14.89	44.83
T4	17.50	7.30	3.60	0.25	15.32	56.03

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3.2 Growth Performance of rabbits fed diets containing Moringa oleifera and Gongronema latifolium leaf meal.

The growth performance of rabbit fed diets containing Moringa oleifera and Gongronema latifolium leaf meal is presented in table 4.

Table 4: Growth performance of rabbits fed diets containing Moringa oleifera and Gongronema latifolium leaf meal

Parameter	T1	T2	T3	T4	Pvalue
Initial weight	0.3667	0.3833	0.5167	0.3167	0.271
Final weight	0.8500	1.0000	0.9500	0.9000	0.902
Total weight gain	0.4500	0.6167	0.4333	0.5833	0.836
Average daily weight gain	0.0099	0.0105	0.0077	0.0114	0.909
Total feed intake	3.2100^{b}	2.8200^{a}	2.9000^{ab}	2.6767^{a}	0.045
Feed Conversion Ratio	13.5667	4.6533	8.7867	6.1667	0.524

Means on the same row with different superscript are statistically different ($p<0.05$)

There was no significant difference ($p>0.05$) in initial weight, final weight, total weight gain and average daily weight gain of rabbits used in the experiment. There was significant difference ($P<0.05$) in total feed intake among the treatment diets. Total feed intake of rabbits in treatment one was higher than the other treatments while rabbits fed treatment four diets had the lowest total feed intake. There was no significant difference ($p>0.05$) in total feed intake of rabbits fed diets containing 3%MOLM and those fed diets containing 3%GLLM.

3.3 Nutrient digestibility in rabbits fed diets containing Moringa oleifera and Gongronema latifolium leaf meal

The nutrient digestibility in rabbit fed diets containing Moringa oleifera leaf meal and Gongronema latifolium leaf meal is presented in table 5.

Table 5: Nutrient digestibility in rabbits fed diets containing Moringa oleifera and Gongronema latifolium leaf meal

Parameter	T1	T2	T3	T4	Pvalue
Protein digestibility	0.4000^{c}	0.2300^{b}	0.1300^{a}	0.1283^{a}	0.000
Carbohydrate digestibility	0.1900^{c}	0.0690^{b}	0.25000^{a}	0.0300^{a}	0.000

Means on the same row having different superscript are statistically different ($p<0.05$)

There were significant differences ($P<0.05$) in protein digestibility and carbohydrate digestibility among the rabbits fed the treatment diets. The protein content of treatment one diets had the highest digestibility. This was followed by the digestibility of the protein content of treatment two, treatment three while treatment four had the lowest protein digestibility. Treatment three diets had the highest carbohydrate digestibility followed by diet one, two and diet four. Treatment four had the lowest protein and carbohydrate digestibility.

4. Discussion

4.1 The Proximate composition of the experimental diets and fecal samples

The proximate composition of the experimental diets is a reflection of their ingredient composition. This may be due to the quantity of both Moringa oleifera leaf meal and Gongronema latifolium leaf meal in the diets. The moisture, ash and fibre percentages in the fecal samples were more than that of the diets while the fat, protein and carbohydrate content of the diets were more than that of the fecal samples. This shows that part of the fat, protein and carbohydrate contents of the diets have been digested and utilized by the animals for growth and *development.*

4.2 Growth performance of rabbits fed diets containing Moringa oleifera and Gongronema latifolium leaf meal

Rabbits fed treatment one (control ration) had the highest significant value, followed by treatment three, treatment two and then treatment four. The rabbits in Treatment 1 and Treatment 3 had higher feed intake and this could be the reason for the higher weight of growing rabbits fed with the diet containing GLLM. This may be as a result of the antioxidant, antimicrobial together with the high protein, minerals and high vitamin contents of Gongronema latifolium leaf meals. These results agree with the findings of researchers in 2008 (Annor et al., 2008). The differences in growth response of growing rabbits may be relatively due to differences in nutrient concentration in these experimental diets which may probably be explained by the ability of rabbits to adjust their feed intake to meet their nutrient requirement. The diet palatability, texture and flavor may also have contributed to the differences in the total feed intake of the rabbits fed the different treatment diets. The rabbits consumed the treatment diets more than the other treatment diets and that is an indication that the control diet was more palatable and had better flavor than the other treatment diets. The practice of coprophagy established in rabbits, which may be another source of protein, may help adjust the protein requirement of rabbits. There was no significant difference ($P>0.05$) in the feed conversion ratio between the treatment diets. Feed conversion ratio (FCR) was higher in Treatment 1(control), followed by Treatment 3, Treatment 2 (MOLM), and lowest in Treatment 4 (mixture of MOLM and GLLM). The values obtained in this study for feed conversion ratio were comparable with the findings of (Oppong et al., 2008). Further explanation may be based on the role of microbes of the caecum and large intestine in fermentation of cellulose and hemicelluloses component of the feed into volatile fatty acids and microbial proteins.

4.3 Nutrient digestibility in rabbits fed diets containing Moringa oleifera and Gongronema latifolium leaf meals

Protein digestibility was highest in treatment one and lowest in treatment four. This implies that the protein content of diets given to rabbit in treatment one was digested and made more available for absorption than the protein content of the diets of the other treatment diets. Carbohydrate digestibility was highest in rabbits fed diets containing GLLM followed by those fed the control diet and was lowest in rabbit fed treatment four diet. Highest digestibility value in treatment three containing GLLM implies that more energy was made available to the rabbit in treatment three than the other treatments. The protein and carbohydrate digestibility values got in this experiment can be compared favorably with the values got by (Rahmy et. al., 2023). The general observation was that MOLM and GLLM did not produce synergistic effects in this experiment neither did it show antagonistic effects when the growth performance results are critically analyzed.

5. Conclussion

The results of this study show that control diet which do not contain Moringa oleifera leaf meal and Gongronema oleifera leaf meal was consumed more by rabbit than the other treatment diets and its protein content was also more digestible than the other treatment diets. Therefore, the nutrient composition of the control diet in this experiment should be used to feed rabbit without adding MOLM or GLLM, for better results.

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