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## EFFECT OF DIETS CONTAINING PYRIDOXINE AND ASCORBIC ACID AT GRADED LEVELS ON GROWTH PERFORMANCE OF WEST AFRICAN DWARF GOATS

Bomodeoku, G.T.<sup>1</sup>, Oderinwale, O.A.<sup>1&3</sup>, Ismaila, E.O.<sup>1</sup>, Toviesi, D.P.<sup>1</sup>, Oluwatosin, B. O.<sup>1</sup>, Adekunle, E. O.<sup>2</sup>.

<sup>1</sup>Department of Animal production and Health, Federal University of Agriculture, Abeokuta, PMB 2240, Ogun State, Nigeria

<sup>2</sup>Department of Animal physiology, Federal University of Agriculture, Abeokuta, PMB 2240, Ogun State, Nigeria

<sup>3</sup>Department of Animal Sciences, North Carolina A&T State University, Greensboro, North Carolina, United States

Corresponding Author: [bomodeokugbolahan1998@gmail.com](mailto:bomodeokugbolahan1998@gmail.com), +234(0)8071438040, +234(0)7039324535

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### ABSTRACT

Vitamin C and B6 play crucial roles in enhancing appetite and promoting feed intake of ruminant animals. These vitamins are involved in the regulation of various biological processes, including the synthesis of neurotransmitters that control hunger and satiety. By providing an adequate amount of Vitamin C and B6 in the diet, West African Dwarf goats are likely to exhibit improved feed intake, resulting in a greater nutrient intake and better growth performance. A study was conducted to investigate the effect of diets containing ascorbic acid and pyridoxine at graded levels on the growth performance of WAD goats. A total of twenty (20) West African Dwarf (WAD) goats aged less than a year old were used for a feeding trial that lasted for 12 weeks. This study was carried out at the Small Ruminant Unit of the College of Animal Science and Livestock Production (COLANIM), Federal University of Agriculture, Abeokuta (FUNAAB), Nigeria. The goats were randomly allotted on weight equalization into four (4) dietary treatments consisting of five (5) goats per treatments which were: basal concentrate diet (control), basal concentrate diet (100kg) + 50g of ascorbic acid, basal concentrate diet (100kg) + 50g of pyridoxine, basal concentrate diet (100kg) + 25g of ascorbic acid + 25g of pyridoxine. Data were collected on feed intake, weight gain, and feed conversion ratio. Data obtained were subjected to one-way analysis of variance (ANOVA) at 5% probability level. Results obtained also showed that the treatments had no significant ( $P < 0.05$ ) effect on all the growth performance parameters under consideration. Goats fed diets containing 50g of pyridoxine had highest value for total feed intake (248.29g/day) and total protein intake (22.18g/day) while goats fed diets containing 50g ascorbic acid had higher mean values for majority of growth performance parameters which were final weight (8.20kg), metabolic weight gain (4.45g/day/W0.75), metabolic final weight (4.84g/day/W0.75), daily weight gain (20.40g/day). The results of this study indicated that the inclusion of Ascorbic Acid at 50g inclusion rate (T2) is best in supplementing concentrate diets for a better growth performance.

**Key words:** Pyridoxine, Ascorbic acid, Growth performance, Goat, Basal concentrate diet

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### INTRODUCTION

Livestock played a very important role as an integral part of farming and rural life in developed countries; providing food and the critical cash reserve and income for many farmers who grow crops and reared animals essentially for subsistence purposes (Preston and Leng, 1987). In the rural areas where most of the resource-poor farmers in Africa live, goats played an important socio-economic role (Anaeto et al., 2009), and formed an integral part of the cultural life system of Nigeria's peasantry (Ajala, 2004). West African Dwarf (WAD) goats served an important role in the rural village economy of West Africa, especially among small-holder livestock owners. Growth performance is typically measured by tracking the average weight gain of an animal. Vitamins C are water-soluble antioxidants that help to protect cells against oxidative damage to the aqueous components of cell membranes, therefore preserving the functionality and integrity of the cells (Halliwell and Gutteridge, 1985). Vitamin C has the capacity to reduce organ damage (Umar et al., 2000). Vitamin B<sub>6</sub> has long been recognized as a cofactor for many enzymes in various metabolic reactions, most of which are

involved in the metabolism of Amino acids and protein, including nucleotide and protein synthesis (Axelrod and Trakatellis, 1964).

## MATERIALS AND METHODS

### Description of experimental site

The experiment was carried out at the Small Ruminant Unit of the Directorate of University Farms (DUFARMS), Federal University of Agriculture, Abeokuta, Alabata Road, Nigeria. Alabata is in Odeda Local Government Area of Ogun State. It falls within the rainforest vegetation zone of south-west Nigeria on the latitude 7°S 13' 49.66'N and longitude 3°26'11.98 E and 76 metres above sea level (Google earth, 2023). The climate is tropical humid with a mean annual rainfall of 1,037mm, The area has a tropical climate characterized with annual rainfall of about 1,037mm, minimum and maximum temperature of 20.66°C and 35.48°C respectively.

### Sources of Experimental Animals and Management

Twenty (20) growing and physically healthy West African Dwarf goats that are less than 12 months old were purchased from a reputable livestock market in Iwo, Osun state. The management system was an intensive system as feed and water were supplied to the goat in their pen for twelve weeks. The goats were tagged and randomly allocated to 4 experimental diets with 5 goats per treatment. The goats were individually housed during the experiment, where they were fed at 5% of their body weight per day.

### Preparation of the experimental diets

Vitamin C and Vitamin B6 were purchased from a reputable veterinary shop ground with clean mortar and pestle, and then incorporated in the experimental diets as indicated below:

Treatment 1: Basal concentrate diet (as control)

Treatment 2: Basal concentrate diet + 50g of Ascorbic Acid as Vitamin C

Treatment 3: Basal concentrate diet + 50g of Pyridoxine as Vitamin B<sub>6</sub>

Treatment 4: Basal concentrate diet + 25g of Vitamin C + 25g of Vitamin B<sub>6</sub>

**Table 1: Gross composition (%) of basal concentrate diet**

Ingredients	Quantity (%)
Maize	10.00
Corn Bran	10.00
Wheat Offal	30.00
Palm Kernel Cake	34.00
Rice Bran	10.00
Bone Meal	3.00
Limestone	3.00
Salt (NaCl)	2.00
*Grower's Premix	0.50
Total	100

\*contains vitamin A (IU) 10,000; vitamin D2 (IU) 2,000,000; vitamin E (IU) 20,000; vitamin K (mg) 2250; riboflavin (mg) 5000; pyridoxine (mg) 275; biotin (mg) 50; pantothenic acid (mg) 7500; vitamin B<sub>1</sub> (mg) 175; vitamin B<sub>12</sub> (mg) 15.0; niacin (mg) 27,500; folic acid (mg) 7500; chlorine chloride (mg) 400; antioxidant (mg) 125; Fe (g) 20.0; Zn (g) 50.0; Mn (g) 80.0; Cu (g) 5.0g; I (g) 12.0; Co (mg) 200; Se (mg) 200.

## RESULTS AND DISCUSSION

Any feed's nutritional content, especially the amount of protein and energy in an appropriate ratio, determines its quality. The crude protein 11.20%, ash 15.50% and Ether Extract 11.42% were higher in the experimental diets compared to the basal diet (Guinea Grass). The protein content obtained in the experimental diets was higher than the 8% recommended for ruminant maintenance (Norton, 2003). The experimental diets influenced the intakes of nutrient and growth performance of West African Dwarf goats. Dry matter intake (DMI) is an important factor determining the utilization of feed in ruminants, which simply referred to critical determinant of energy intake (Devendra, 1997). The dry matter intake of concentrate diet were statistically similar for the T1 control diets, T2 (diets containing 50g Vitamin C), T3 (50g Vitamin B<sub>6</sub>), while T3 175.80(g/day) had the highest dry matter.

However, T4 (diets containing 25g Vitamin C and 25g Vitamin B<sub>6</sub>) had the lowest 155.31(g/day) dry matter intake. The same pattern was observed for the total feed intake and protein intake of the West African Dwarf goats.

**Table 2: Chemical composition of concentrate diet and grass fed for the study**

Parameters	Concentrate Diet	Guinea Grass
Dry Matter (%)	90.81	96.65
Crude Protein (%)	11.20	7.00
Crude Fibre (%)	10.00	26.51
Ash (%)	15.50	9.00
Ether Extract (%)	11.42	9.46
Nitrogen Free Extract (%)	51.88	48.03
Organic Matter (%)	84.50	91.00
Neutral Detergent Fibre (%)	47.74	64.60
Acid Detergent Fibre (%)	15.84	39.00
Acid Detergent Lignin (%)	9.82	12.00
Hemicellulose (%)	31.90	25.60
Cellulose (%)	6.02	27.00
Metabolizable Energy (MJ/kg DM)	12.59	12.45

**Table 3: Effects of diets containing Vitamin C and B<sub>6</sub> on the growth performance of West African Dwarf goats**

Parameters	T1	T2	T3	T4	SEM
Dry Matter Intake from Conc. (g/day)	172.18 <sup>a</sup>	171.43 <sup>a</sup>	175.80 <sup>a</sup>	155.31 <sup>b</sup>	168.68
Dry Matter Intake from Grass (g/day)	75.97	72.18	72.49	68.37	72.25
Total Feed Intake (g/day)	248.15 <sup>a</sup>	243.60 <sup>a</sup>	248.29 <sup>a</sup>	223.68 <sup>b</sup>	240.93
Total Crude Protein intake (g/day)	24.34 <sup>a</sup>	24.54 <sup>a</sup>	24.98 <sup>a</sup>	22.18 <sup>b</sup>	24.00
Initial Weight (kg)	6.37	6.48	6.45	6.35	6.41
Final Weight (kg)	7.77	8.20	7.92	7.80	7.92
Metabolic Weight gain (g/day/W0.75)	4.33	4.45	4.38	4.33	4.38
Metabolic Initial Weight (g/day/W0.75)	4.00	4.05	4.04	3.99	4.02
Metabolic Final Weight (g/day/W0.75)	4.65	4.84	4.72	4.66	4.72
Weight Gain (kg)	1.4	1.71	1.47	1.44	1.51
Daily Weight Gain (g/day)	16.71	20.40	17.44	17.18	17.93
Feed Conversion Ratio	15.29	13.14	15.03	13.11	14.14
Protein Efficiency Ratio	0.69	0.83	0.70	0.77	0.75

<sup>ab</sup>Means on the same row having different superscripts are significantly different. T1 Basal concentrate diet (as control), T2 Basal concentrate diet + 50g of Ascorbic Acid as Vitamin C, T3 Basal concentrate diet + 50g of Pyridoxine as Vitamin B<sub>6</sub>, T4 Basal concentrate diet + 25g of Vitamin C + 25g of Vitamin B<sub>6</sub>, SEM is Standard error of mean.

There were some similarities among the treatment groups regarding initial weight, final weight, metabolic weight gain, metabolic final weight, final weight gain, daily weight gain, Protein efficiency ratio and feed conversion ratio (FCR) though numerical increase occurred in T2 (diets containing 50g Vitamin C) with respect to the growth parameters observed probably due to vitamin C supplementation, since it enhances feed intake which positively affect growth performance. The value recorded for daily weight gain in this study 16.71-20.40(g/day) were lower to the values of 22.65-49.40(g/day) reported by Yusuf *et al.* (2019) from their study where they intensively raised West African Dwarf (WAD) goats Supplemented with dietary Vitamin C and Selenium. Meanwhile, Yu *et al.* (2021) reported no effect on growth performance of broiler chickens on vitamin C supplement.

Vitamin B<sub>6</sub> is an essential nutrient required to maintain normal physiological functions of animals, including pyridoxine (PN), pyridoxal (PL) and pyridoxamine (PM), with equivalent activity in mammals. Pyridoxine deficiency produces retarded growth, dermatitis, convulsions, anemia, scaly

skin, alopecia, diarrhea and a fatty liver, among other symptoms. In the rabbit, PN deficiency can cause inflammation around the eyes and nose, scaly thickening of the skin around the ears, alopecia in the forelegs and skin desquamation (Bräunlich, 1974). There is a numerical increase of weight gain of T3 (diets containing 50g Vitamin B6) with respect to the growth parameters observed probably due to vitamin B<sub>6</sub> supplementation since it enhances feed intake which positively affects growth performance. The value for daily weight gain recorded for treatment 3 is 17.44g/day which is higher than the value 11.7-16.7(g/day) reported by Gongyan Liu et al., (2018) from their study where they supplemented Vitamin B<sub>6</sub> in the diet of rabbits.

## CONCLUSION

From the results of the study, It can be concluded that the West African Dwarf goats fed diets containing 50g Vitamin B6 (T3) had the highest value for total feed intake which was 248.29g/day and total protein intake which was 24.98g/day. It is therefore recommended that Vitamin B6 up to 50g could be included in a goat's diet.

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