Nutrient Digestibility of Growing Rabbits Fed Varying Levels of Vitamin E (Alpha-Tocopherol) In A Humid Tropical Environment

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Abstract- ***The study was conducted to determine the nutrient digestibility and nutrient intake/utilization of growing Rabbits fed varying levels of Vitamin E. A total (16) Chinchilla Weaner Rabbits were randomly assigned to four treatment groups T1, T2, T3, T4 in a completely randomized design (CRD). Each treatment was replicated four times. The Rabbits were fed a formulated diet. The feed and water were given ad libitum to the Rabbits for eight weeks. Digestibility study was carried out using eight Rabbits, (two rabbits from each treatment) during the eight weeks of the feeding trial. Faecal samples were collected daily for five days. The samples collected were bulked for each animal on a daily basis and sun dried and later oven dried to achieve complete dryness, they were then sent to the laboratory digestibility studies. At the end of each collection, data were collected and used to determine the digestibility coefficient and nutrient intake. Proximate analysis was carried out on the feed. There were variations on dry matter (DM), Crude Protein (CP), Crude Fibre (CF), Ether Extract (EE), Ash and Nitrogen-free extract (NFE) when proximate analysis was compared. The results for Nutrient Intake showed no significant difference (P > 0.05) except in Crude Protein and Nitrogen-free extract also the result for digestibility coefficient showed that there was significant difference (P <0.05) except in Ether Extract. It could be concluded that inclusion of Vitamin E in their diet can enhance their nutrient intake and digestibility, thus enabling them to thrive successfully in a humid tropical environment.***

Indexed Terms- ***Rabbits, Vitamin E, nutrient digestibility***

I. INTRODUCTION

Rabbits are valuable livestock animals that provide high-quality meat and fur. Efficient nutrient utilization is crucial for optimal growth and productivity, but raising rabbits in tropical environments poses challenges due to high ambient temperatures. Vitamin E, a potent antioxidant, plays a critical role in physiological functions, including growth, reproduction, and immune response in rabbits. Investigating the effects of varying levels of vitamin E supplementation on nutrient digestibility in rabbits raised in tropical environments is of great importance (Gacek, 2002).

High ambient temperatures can negatively affect feed intake and production, leading to reduced performance. High reproduction potentials are influenced by climatic conditions, such as temperature and humidity, which cause heat stress. The optimal temperature-humidity index for rabbit husbandry is 27.8, and the temperature-humidity index (THI) is widely used to assess the impact of heat stress on rabbits (Marai, 2002).

Heat stress is a major environmental stressor and causes substantial economic loss in the rabbit industry (Maria *et al.*, 2007). Vitamin E, an intracellular antioxidant, can help maintain cell membrane function, reduce the release of creatine kinase, alleviate immunosuppression, promote the synthesis of immunoglobulin, and reduce serum cortisol levels, reducing rabbits' adverse reactions to heat stress (Packer *et al.*, 2001).

II. MATERIALS AND METHOD

- Location and Duration of Study

This experiment was carried out at the Rivers State University Teaching and Research Farm, Nkpolu-Oroworukwo, Port Harcourt which is located on longitude 4°48'18.50"N and latitude 6°58'39.12"E and on and elevation of 18m above sea level (David *et al.*, 2019). Mean annual rainfall is between 2000mm to 3000mm and annual temperature ranges from 25°C to 31°C. The experiment lasted for 63 days (9 weeks), 1 week for acclimatization and 8 weeks for administering of treatment.

- Experimental Animals and Management

A total of 16 mixed sexes of Chinchilla weaner rabbits about 5-6 weeks with an average weight of 1.3kg from Unberik International Limited Farms, Rivers State, were allocated to 4 experimental treatments (replicated four (4) times with each treatment having 4 rabbits in a Completely Randomized Design (CRD) as described by Wahua (2017). The rabbits were treated for Coccidiosis using Coccidiostat powder and were also treated for internal and external parasites using Invermectrin administered at 0.2Ml per rabbit subcutaneously at Unberik International Farms before they were transported to the experimental site.

The rabbits were randomly alloted to four treatments and weighed for initial weight. Treatment 1 (T1) was the control, Treatment 2 (T2) was given 200ml of vitamin E, Treatment 3 (T3) was given 300ml of vitamin E and Treatment 4 (T4) was given 400ml of vitamin E. The rabbits were housed in individual hutches on arrival and fed compounded rations and during the first 1 week of arrival, the rabbits were allowed to acclimatize with the new environment. During the second week, one rabbit was observed to have a lesion on the leg, it was isolated and treated with penicillin ointment till it healed completely.

A formulated pelleted diet was used as the experimental diet. The feed and water were given *ad libitum*. At the 6th week, one rabbits was observed to have *Mucoidal Enteritis*, it was immediately isolated and treated with 0.2ml of Oxytetracyclin for three days and all the other rabbits were given a shot of Oxytetracyclin each for prevention. Forages like *centrocema pubesens* (Rabbit weed) and *Carica Papaya* (Paw paw leaves) were given to supplement the formulated pellets for palatability, and variety.

III. RESULTS AND DISCUSSION

The Nutrient intake of growing rabbits fed varying levels of vitamin E.

The results for Nutrient intake of growing rabbits fed varying levels of vitamin E are presented in Table 1 The result showed no significant difference ($p > 0.05$) except in crude protein and nitrogen free extract in which 200 mg (T2) fed rabbits had significantly higher mean values of (18.8 and 17.6) than other levels across that mean.

Table 1: Nutrient intake of growing rabbits fed varying levels of Vitamin E

Vitamin E levels(mgkg^{-1})	0	200	300	400	
Components (%)/Treatments	T1 (0mg)	T2(200mg)	T3(300mg)	T4(400mg)	SEM
Crude protein	17.6^{b}	18.8^{a}	13.5^{c}	13.5^{c}	0.73
Crude Fibre	10.6	9.66	9.87	9.67	0.14
Ash	9.94	9.66	9.87	9.67	0.13
Ether extract	2.87	2.88	2.87	2.93	0.18
Nitrogen free-extract	52.6^{b}	61.1^{a}	54.9^{b}	56.1^{b}	0.78

^{abc} means with different superscripts across a given row differ significantly ($p<0.05$). SEM= standard error of mean

Digestibility coefficient of growing rabbits fed varying levels of vitamin E

The results for Digestibility coefficient of growing rabbits fed varying levels of vitamin E presented in Table 2. The results showed that there was significant difference ($p < 0.05$) across all mean except in Ether extract.

Table 2: Digestibility coefficient of growing rabbits fed varying levels of Vitamin E

Vitamin E levels($mgkg^{-1}$)	0	200	300	400	
Components (%)/Treatments	T1 (0mg)	T2(200mg)	T3(300mg)	T4(400mg)	SEM
Dry matter	87.7^{b}	93.8^{a}	93.9^{a}	94.9^{a}	1.19
Crude protein	90.6^{a}	95.0^{a}	94.0^{a}	83.7^{b}	0.43
Crude fibre	95.1^{a}	93.1^{a}	70.5^{b}	68.9^{b}	3.91
Ether extract	93.4	92.2	91.5	94.2	1.49
Nitrogen free-extract	96.0^{a}	90.1^{b}	90.3^{b}	97.3^{a}	0.93

^{abc} means with different superscripts across a given row differ significantly ($p<0.05$). SEM= standard error of mean

IV. DISCUSSION

This study was concerned with evaluating the nutrient intake utilization and nutrient digestibility of growing rabbits fed varying levels of vitamin E. There has been published data that feed intake plays a significant role in determining the Digestibility of nutrients in rabbits. According to this data, it has been found that there is a positive relationship between feed intake and digestibility in rabbits, Higher feed intake generally leads to increased digestibility of nutrient and vice versa (Garcia *et al.,* 2022).

Studies have shown that vitamin E is an intracellular antioxidant, maintaining the function of the cell membrane system and reducing the release of creatine kinase in muscle cells during stress thereby preventing excessive calcium influx and interfering with normal cell metabolism and its lipid solubility makes it a suitable membrane antioxidant against oxidative damage (Packer *et al* 2001). As shown in Table 1, rabbits on T2 increased ($P<0.05$) on crude protein and nitrogen free extract (NFE), this result is similar to that of Dalle Zotte *et al*., (2020) who observed that inclusion of dietary vitamin E (200kg diet) increased crude protein of rabbits however in disagreement with his finding, Dalle zotte *et al*., (2020) recorded a significant increase ($P<0.05$) in Ether extract also, this isn't the same with the results found, ether extract on the contrary showed no significant difference($P>0.05$), this may be due to factors such as the heat stress being too prevalent and strong. From Table 2, supplementation of 200mg of vitamin E increased dry matter (DM) and nitrogen free extract (NFE), this result is similar to the finding of Rawia *et al.*, (2007) who observed that supplementation of 10mg of vitamin E increased dry matter (DM) and nitrogen free extract (NFE) digestibility. Rawai *et al*., (2007) again observed that supplementation of 20mg of vitamin E increased crude protein (CP), and ether extract (EE) digestibility coefficient, this result is similar to the result in Table 2, were there was an increase in crude protein (CP) but disagrees with his finding of increase in Ether extract. Rawia *et al*., (2007) also concluded that supplementation of vitamin E did not significantly affect digestibility of various nutrient, this is similar to the finding in this research.

Dietary treatments had no significant effect on crude fiber (CF) and crude ash (CA) intake by rabbits (Table 1). However, treatments had significant effects ($P <0.05$) on the intakes of crude protein (CP), ether extract (EE) and nitrogen free extract (NFE) by rabbits. The result shows that the inclusion of vitamin E in the diets enhanced nutrient intake (Halfer *et al.,* 1995).

Data on digestibility of diets as presented in Table 2, showed that treatment had significant effects ($P < 0.0$) on digestibility % of dry matter (DM), crude protein (CP), crude fiber (CF), ether extract and nitrogen free extract (NFE). However, inclusion of vitamin E did not enhance digestibility because rabbits on the control group had similar digestibility % with those of other treatment groups.

CONCLUSION

The study showed a positive effect on the nutrient intake of growing rabbits as well as the utilization. According to the results, the intake of nutrients was recorded to be maximum by adding 200 mg of vitamin E to the feed of the rabbits and checking the quantity of vitamin E present in their faces to how much was absorbed. Also, the Digestibility coefficient was determined concurrently and was found to be maximum with increase of feed. And again, the finding suggests that the inclusion of vitamin E in a rabbit diets in hot tropical environments can positively improve the overall health and growth of the animal by mitigation heat stress and improving nutrient intake.

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