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J. Amin. Prod. Res. (2015) 27:157-161

PERFORMANCE OF WEANED HYLA RABBITS SUPPLEMENTED WITH VITAMIN C

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ABSTRACT

Performances of 40 weaned Hyla rabbits divided into 4 groups with different water nutritional supplementation were analysed. This study was conducted at the rabbitry unit of National Animal Production Research Institute during hot- dry season 2012. The first group received a nutritional supplementation of 100mg vitamin C in water. The second group received 150 mg, the third group received 200 mg and the fourth received 250 mg of vitamin C. Temperature Humidity Index (THI) inside the rabbitry was estimated for the period of the studies. Temperature in the morning and afternoon was significantly ($P<0.05$) higher in May than June and July. THI in the morning and afternoon was significantly ($P<0.05$) higher in April but lower in June and July. The results indicated that there was no significant ($P>0.05$) effect of Vitamin C on water intake, feed intake and water to feed ratio. However, there was significant ($P<0.05$) effect of Vitamin C on final weight, weight gain, vitamin C intake and feed conversion efficiency. There was significant ($P>0.05$) interaction between month and vitamin C on water intake, feed intake and water to feed ratio. Final weight was higher for rabbits on 200 vitamin C than 250 and 100 though similar to 150 vitamin C. weight gain was higher for 150 and 200 vitamin C than 250 and 100 vitamin C. Average daily gain was lower for 100 vitamin C than for 150, 200 and 250 vitamin C. Vitamin C intake was significantly ($P<0.05$) higher for 250 than for 200, 150 and 100 levels. Feed conversion efficiency was better for 150 and 200 vitamin C than for 100 and 250 vitamin C. Performance of weaned Hyla rabbits could be improved during the hot period by supplementing 150- 200 mg vitamin C in water.

Keywords: Heat stress, weaners, performance, vitamin C, THI, Hyla rabbit.

INTRODUCTION

A temperature of 21°C is known as the "Comfort Zone" for rabbits (Marai *et al*., 2002). At either higher or lower temperatures, the animal has to spend energy to maintain the body temperature. Rabbit meat production is developed in countries with high temperatures (Spain, China, Egypt), and in many cases in semi-open and even open-air housing systems.

In those systems, animals are highly exposed to climate changes. In hot periods, rabbits have difficulty eliminating body heat because of their non-functional sweat glands (Marai *et al*., 2002). High temperatures affect negatively growth performance (Chiericato *et al*., 1992). In addition weaning is a determinant moment for rabbits because their environment is changing (separation from their dams, change of ambient conditions, change of cages etc). For these reasons, it's important to reduce the stress in order to maintain good health status and high growing performance.

Furthermore, vitamin C supplementation significantly improved body weight gain and feed conversion in rabbits (Yousef *et al*., 2003), and pigs (Campbell *et al*., 1995). Vitamin C also controls the increase of free radicals in the blood which can affect the cardiovascular system and reduce growth performances. The elevation of temperature will activate the respiratory rate about 1.5 and 2.5 times at 25°C and 33°C, respectively (Naqvi *et al*., 1995)., and the dilation of veins of the ear. Both of these parameters generate minerals losses and affect the performance of rabbits. Therefore an experiment was set up to evaluate the effect of vitamin C supplementation on performance of weaned Hyla rabbits during the hot period.

MATERIALS AND METHODS

The study was conducted at the rabbitry unit of the National Animal Production Research Institute, Shika, Zaria. The study was carried out from May to July, 2012.

Animals, diets, water supplementation and housing

A total of 40 Hyla rabbits were allotted at weaning (35 days) and randomly assigned to four groups as follows: (1) vitamin C supplemented at 100 mg, (2) vitamin C supplemented at 150 mg, (3) vitamin C supplemented at 200 mg and (4) vitamin C supplemented at 250 mg per 500 ml of water per rabbit per day, water intake, vitamin C intake and water left over was calculated. The vitamin C was dissolved into drinking water. Evaporative loss of water was estimated by measuring equal amount (500ml) of water in an earthen pot, and kept in an empty cage. The water was measured the following morning and water loss was then subtracted from the water intake. Feed intake, initial weight, weight gain, final weight, daily gain, water to feed ratio, feed conversion efficiency were calculated. The experiment lasted for 3 months (May, June and July).

Rabbits were housed individually in meshed metal cages. Feed distribution was manual. Feed and water intake were measured daily. In each treatment, animals were weighted weekly. Temperature and relative humidity was also recorded each day with a Temperature relative humidity clock in order to determine the Temperature Humidity Index (THI).

Statistical Analysis

Data obtain from the studies were analyzed using the General Linear Model Procedure of SAS while means separation was done using pairwise difference (Pdiff) method. (SAS, 2001).

RESULTS AND DISCUSSIONS

The monthly temperatures and Temperature Humidity Index (THI) inside the rabbitry during the experimental period is presented in Table 1. Temperature in the morning was significantly ($P<0.05$) higher in May than June and July while temperature in the afternoon was significantly ($P<0.05$) higher in May but lower and similar for June and July. THI in the morning and afternoon was significantly ($P<0.05$) higher in April but lower and similar for both morning and afternoon in June and July.

THI ranged from 20.62- 22.68 and 24.77- 30.59 for morning and afternoon respectively. These ranges exceeded some of the ranges reported in literature at similar periods. Marai *et al*. (2003) reported a THI value of 17.3 and 28.8 for mild and hot period in subtropical climate of Egypt while Adenkola (2010) reported 15-25 and 21-23 in the morning and late evening hours, while it was very high (24-26) in the afternoon during harmatan period in Zaria. The observed differences could be due to climatic differences and period of the year. THI in the mornings

indicated absence of heat stress and exposure of the animals to very severe heat stress in the afternoon especially in May.

Table 1: Temperatures and Temperature Humidity Index of the Rabbitry during the period of the study

Month	Temp M	THI M	Temp A	THI A
May	23.46±0.34^{a}	22.68±0.24^{a}	32.45±0.44^{a}	30.59±0.41^{a}
June	22.08±0.35^{b}	21.74±0.24^{b}	25.76±0.45^{b}	24.83±0.41^{b}
July	21.03±0.35^{c}	20.62±0.24^{b}	25.15±0.44^{b}	24.47±0.41^{b}

THI M-Temperature Humidity Index Morning, Temp M-Temperature Morning, THI A-Temperature Humidity Index Afternoon, Temp A-Temperature Afternoon, abcd :Means with different superscripts in the same row are significantly (P<0.05) different

Final weight, weight gain, daily gain, water intake, vitamin C intake, feed intake, water to feed ratio and feed conversion efficiency of hyla weaned rabbits fed vitamin C is presented in Table 2. The results indicated that there was no significant (P>0.05) effect of Vitamin C on water intake, feed intake and water to feed ratio. However, there was significant (P<0.05) effect of Vitamin C on final weight, weight gain, vitamin C intake and feed conversion efficiency.

Final weight was significantly (P<0.05) higher for rabbits on 200 vitamin C than 250 and 100 though similar to 150 vitamin C. weight gain was significantly (P<0.05) higher for 150 and 200 vitamin C than 250 and 100 vitamin C. Average daily gain was significantly (P>0.05) lower for 100 vitamin C than for 150, 200 and 250 vitamin C. Vitamin C intake was significantly (P<0.05) higher for 250 than for 200, 150 and 100 levels. Feed conversion efficiency was significantly higher for 150 and 200 vitamin C than for 100 and 250 vitamin C.

The effect of Vitamin C level on water intake, feed intake and water to feed ratio of hyla weaned rabbits as affected by month is presented in Table 3. There was significant (P<0.05) effect of vitamin C and month on average water intake, feed intake and water to feed ratio. The average water intake and feed intake increased from May to July for all the treatment groups. On the other hand, water to feed ratio decreased from May to July for all the treatment groups.

Table 2: Effect of vitamin C level on productive performance of Hyla weaner rabbit

Parameters	100 VC	150 VC	200VC	250 VC	P-value
Initial weight(Kg)	0.75±0.00	0.70±0.00	0.80±0.00	0.75±0.00	ns
Final weight (Kg)	2.54±0.09^{c}	2.90±0.10^{ab}	3.05±0.09^{a}	2.65±0.09^{b}	0.007
Weight gain (g)	1787.5±88.15^{b}	2200.0±101.78^{a}	2250.0±88.15^{a}	1900.0±88.15^{b}	0.009
ADG (g/day)	21.28±1.05^{b}	26.19±1.21^{a}	26.79±1.05^{a}	22.62±1.05^{a}	0.008
Water intake(ml/day)	250.88±5.41	256.27±4.68	259.04±5.16	264.40±4.90	ns
Feed intake(g/day)	43.88±1.02	44.02±0.89	45.63±0.98	46.41±0.92	ns
Vitamin C intake(mg)	58.04±2.48^{d}	87.98±2.14^{c}	114.44±2.60^{b}	147.75±2.32^{a}	0.034
Water/feed Ratio	5.93±0.14	6.22±0.12	5.95±0.13	6.20±1.13	ns
FCE	0.49±0.02^{b}	0.57±0.02^{a}	0.57±0.02^{a}	0.53±0.03^{b}	0.038

Means with different superscripts in the same row are significantly (p<0.05) different. ADG = Average Daily Gain. FCE = Feed Conversion Efficiency

Daily feed intake decreased in rabbits reared under high temperatures compared to normal or lower temperature. The negative effect of high temperature increase on feed intake was also noted by Iyeghe *et al.* (1993*)* and Ayyat *et al*. (2004). The increase in water: feed ratio in May compared to June and July was also reported by Marai *et al.* (2001), that high ambient temperature during the summer season induces a significant increase in average water: feed ratio and body water in relation to those animals maintained under comfortable conditions during the winter season for both New Zealand White and California rabbits in growing and adult females.

The increase in water: feed ratio during the summer season is due to the increase in water intake and decrease in feed intake (Habeeb *et al*., 1999). High consumption of water in heat stressed rabbits helps the animal to increase heat loss through respiratory vaporization of water (Chiericato *et al*., 1992). Regarding the effect of ascorbic acid supplementation on live weight, it was noticed that, irrespective of the effects of ambient temperature, the addition of 300 mg ascorbic acid resulted in significant improvement in live body weight of females (Ayo *et al*., 2011). Previous studies showed that vitamin C supplementation stimulated weight gain in rabbits (Yassein *et al.*, 2008) which is in agreement with results obtained in this study. The beneficial effect of ascorbic acid noted in the present study can be attributed to the antioxidant effects of vitamin C which is a scavenger of oxygen free radicals which are toxic byproducts of many metabolic processes.

In conclusion, performance of Hyla weaned rabbits could be improved during the hot period by supplementing 150 mg vitamin C in water. It is therefore, recommended that 150 mg/500ml vitamin C should be supplemented to enhance performance of rabbits during the hot period.

Table 3: **Effect of month and vitamin C level on water intake, feed intake and water to feed ratio in Hyla weaner rabbits**

Vitamm C Level	Month	Water (mls/day)		Feed (g/day)		W/F Ratio	
		Mean	±SE	Mean	±SE	Mean	±SE
100 VC	May	187.01	±9.03^{c}	25.65	±1.98^{c}	6.87	±0.27^{b}
	Jun	261.91	±9.32^{bc}	44.86	±1.77^{b}	5.91	±0.24bc
	Jul	313.35	±8.28^{a}	61.13	±1.57^{ab}	5.16	±0.21c
150 VC	May	187.33	±9.03^{c}	24.47	±1.72^{c}	7.56	±0.23ab
	Jun	274.07	±8.07^{b}	46.22	±1.53^{b}	6.06	±0.21bc
	Jul	307.72	±7.08^{ab}	61.37	±1.35^{ab}	5.05	±0.18cd
200 VC	May	195.04	±9.03^{c}	26.97	±1.72^{c}	6.9	±0.23ab
	Jun	283.32	±8.76^{b}	49.92	±1.66^{b}	5.79	±0.23bc
	Jul	306.47	±9.03^{ab}	60.00	±1.72^{ab}	5.15	±0.23c
250 VC	May	177.38	±10.42^{c}	25.72	±1.72^{c}	7.61	±0.23a
	Jun	286.63	±8.51^{b}	48.45	±1.62^{b}	6.1	±0.23b
	Jul	311.53	±7.70^{a}	65.06	±1.46^{a}	4.88	±0.20d

Means with different superscripts in the same column are significantly (P<0.05) different.

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