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Effects of Various Durations of Water Deprivation on Performance of Weaner Rabbits in a Sub-Humid Environment

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Abstract: An experiment was conducted to assess the effects of various duration of water deprivation on performance of weaner rabbits in a sub-humid environment. Forty eight (48) nine-week old weaner rabbits of mixed breed and sex with an average initial weight of 622 ± 0.12g were used for the study which lasted 56 days There were four watering treatments such that water supply was restricted for 0, 6, 12 or 18 hours corresponding to 24, 18, 12 or 6 hours of access to water per day respectively. The rabbits were randomly assigned based on initial live weight and sex to the four watering treatments in a completely randomized design. Free water intake decreased linearly and significantly ($P<0.05$) as the duration of water deprivation increased. There were no significant treatment effects ($P>0.05$) on daily feed intake. There were significant ($P<0.05$) decreases in live weight gains, feed efficiency and water to feed ratio with increase in duration of water deprivation respectively. Mortality rate of about 16 and 33% were recorded among rabbits groups deprived of water for 12 and 18 hours per day respectively. Results of the study showed that for optimum growth performance, weaning rabbits should have access to free drinking water for a minimum period of 12 hours in a day.

Key word: Water deprivation, weaner rabbits, sub-humid environment

Introduction

About 60-70% of the total body weight of an animal is comprised of water which is second only to oxygen in importance for maintenance of life (Eusebio, 1980). As a major components of the body fluid system (e.g. blood, urine, sweat, saliva), water facilitates several chemical reactions in the body. It acts as a medium and universal solvent in almost all vital body processes like digestion, absorption, intermediary metabolism, excretion and even in reproduction.

Water also maintains the homeothermy of the animals and the pH of body fluids within normal range. In view of these functions of water, Balogun *et al.* (1997) opined that for efficient growth and production performance, animals should be provided with adequate clean water at all times. Although rabbits can derive their water from feed (especially succulent green forages) and through the metabolic processes of the body, drinking water still accounts for 70 percent of the sources of water to the animals (Maynard *et al.* 1979; Sastry and Thomas, 1981 and Cheeke *et at.,* 1987).

Most rabbit farmers live in peri-urban areas and villages where lack of adequate portable water for both human and livestock consumption is prominent. Furthermore in certain areas of the tropics like northern part of Nigeria, water is a scarce commodity especially during the long dry season. The amount of water supply to the animal is often influenced by the quantity available and the judgment of the attendants which often results in an under supply of water. While reports of the effect of water restriction on performance of broilers, pullets and small ruminants abound in literature (Balogun *et al.,* 1997; Ummuna *et al.,* 1981 and Narinda and Taneja, 1978), similar investigations with rabbits is still scanty. The study was therefore conducted to assess the response of weaner rabbits to various durations of water deprivation in a sub-humid environment.

Materials and Methods

Environment: The experiment was conducted in Zaria, Kaduna State (Nigeria) at the on set of the rainy season in the months of May - June. Zaria area is located in the Northern Guinea Savannah zone with a sub-humid tropical environment. The average annual precipitation is 1200mm, which spreads from Mid- May to October. It has a Relative Humidity of 65 - 80% and environmental temperature of 22-30^{o}C. Rainfall during the months of May - June is between 85 and 160mm (Table 2).

Rabbits and management: Forty eight Weaner rabbits of mixed breeds and sexes with an average initial live weight of 622 ± 0.12g were allotted on the basis of sex and initial live weight to 4 groups of 12 rabbits per treatment in a randomized design. Within each treatment group, the animals were randomly allotted to individual wire cages measuring 40cm x 40cm x 60cm equipped with feeders and waterers. The rabbits were subjected to four watering regimes as follows:

T1 - Water supply *ad lib* (control).

T2 - 18 hours access to water supplied per day

T3 -12 hours access to water supplied per day
T4 - 6 hours access to water supplied per day
Daily water intake was determined by volumetric difference between water supplied and water refused after 24, 18, 12 or 6 hours respectively. Daily water intake was corrected for evaporative loss using a drinker of similar design and capacity placed in one of the unused cages.
The rabbits were fed a common diet (Table 1) *ad libitum.* All feed residues were removed daily, air-dried and weighed. The rabbits were weighted on weekly basis. At the end of the 56-day experimental period, the average daily feed intake, daily gain, feed efficiency and water to feed efficiency and water to feed ratio were computed.
The meteorological data for the period of the experiments are presented in Table 2.

Statistical analysis: Analysis of variance was used to establish significant difference or otherwise (Steel and Torrie, 1980) and means were separated by use of Duncan's multiple range test (Duncan, 1985).

Table 1: Composition of Experimental Diets (%)

Ingredients	Composition
Maize	52.00
Wheat offals	25.00
Full-fat soyabeans[a]	18.30
Blood meals	2.50
Bone Meal	1.50
Limestone	0.50
Vitamin premix[b]	0.20
Total	100.00
Calculated analysis	
Crude protein*	17.23
Metabolizable energy ME kcal/kg	27.23
Crude fibre %*	5.03
Ether Extract %*	6.40
Ash*	3.16

[a]Cooked soyabeans. [b]A Roche product, supplying the following per kg of diet: Vit. A, 15,000 I.U.; Vit. D_3, 30,000 I.U.; Vit. E, 12 I.V.; Vit. K. 2.4 mg; Thiamine, 2.0mg; Riboflavin. 6.0mg; Prurodpxine, 4.8mg; nicotinic acid, 43 mg; calcium Pantothenate, 12 mg; Choline Chloride, 600mg; Mn 180mg; Fe, 60mg, and Ethoxyquin 120mg. ℃Determined by Laboratory analysis.

Table 2: Air Temperature, Relative humidity and total Rainfall for the period of the experiment (May-June, 2000)

Parameter	May	June
Mean minimum temperature ^{0}C	21.10	20.50
Mean maximum temperature ^{0}C	32.10	30.10
Mean Relative humidity (%)	74.90	79.60
Total rainfall (mm)	86.40	155.20
Hours of sunshine	7.80	5.80

Source: Meterological data, unit IAR, Samaru Zaria.

Results and Discussion

Mean minimum room temperature of the rabbit house during the experimental period was 20.50^{o}C with a range of 20-22^{o}C while the mean maximum temperature was 32.2^{o}C ranging from 28 to 33℃. The temperature values did not exhibit any significant fluctuations throughout the study period.
The results of the experiment are summarized in Table 3. Analyses of variance of these data showed that watering regime had a significant (P<0.05) effect on final live weight, water consumption, daily weight gain, feed efficiency, water to feed intake but not on feed consumption pattern.
Rabbits fed water ad lib had the highest final weight which differed significantly (P<0.05) from those 'that had access to water for 12 and 6 hours per day respectively. However, the final live weight of the rabbits supplied drinking water for 18 hours per day (Treatment 2) was statistically comparable to those fed water *ad libitum* (control). The trend of final live weight result could be a reflection of feed intake and efficiency of feed conversion which was better for the rabbits on Treatments 1 and 2 than those on Treatment 3 and 4.
The water consumption pattern of the experimental animals revealed that rabbits in the control group recorded the highest water intake. This in comparison with those in treatments 2, 3, and 4 may be attributed to the fact that rabbits in treatments 1 had more access to water (24 hours) than those of other groups (18, 12 and 6 hours respectively). The 18 - hour water deprived group (treatment 4) expectedly had significantly (P<0.05) lowered water intake than those in the other treatments. This could be due to the longer period of water restriction regimen for rabbits in this treatment compared to the others.
Daily feed intake was not significantly (P>0.05) affected by the watering regime. This was in line with the reports of Olumeyan *et al.* (1997). Earlier workers (Lepkovsky *et al.,* l960 and Savory, 1973) however, have reported a significant depression in feed intake as a result of inadequate water intake in broilers. Bierer *et al.* (1960) had also indicated that a reduction in normal water intake by 20 percent or more could result in a marked decrease in feed consumption with a proportional decrease in growth of broiler chicken. That the rabbits in Treatment 1 had slightly but non-significantly (P>0.05) higher feed intake compared to others may be attributed to more accessibility to water as reported earlier (Oluyemi and Roberts, 1979; Nwokoro and Ugwunze, 1995).
Weight gain of the animals was significantly (P<0.5) affected when deprived of water for 12 hours and above. This is in agreement with Monsi and Agbogidi (1991) who reported depressed growth rate as a typical symptom of water starvation. Apart from depression in appetite insufficient water intake (as it is with rabbits in 12 and 18 hours water restricted treatments in the present study) is also known to affect vital metabolic processes such as digestion of food, absorption and

Table 3: Effects of Various duration of water deprivation on performance of weaner rabbits

	Duration of access time to Water supply					Level of Significance
Factors	24	18	12	6	SEM	
Initial live weight (g)	620.00	630.00	620.00	621.70	18.91	NS
Final live weight (g)	1120.00	1102.50	839.50	795.00	20.92	*
Daily water intake (mls)	110.71[a]	84.99[ab]	83.07[ab]	66.84[b]	31.79	*
Daily feed intake (g)	47.72	47.20	44.68	39.46	13.79	NS
Daily weight gain (g)	7.46[a]	7.92[a]	3.66[b]	2.59[b]	2.19	*
Feed efficiency (F/G)	5.96[a]	6.40[a]	12.21[b]	15.24[b]	2.35	*
Water intake/feed intake (ml/g feed)	2.32[a]	1.80[b]	1.86[b]	1.70[b]	2.46	*
Mortality rate (%)	-	-	16	33	-	-

[ab]:means within each row bearing different superscripts are significantly different (P<0.05). NS- Not significant. * - Significant at (P<0.05).

utilization of nutrients and other intermediary metabolism (Olumeyan *et al.*, 1997). It is possible that subjecting the rabbits to 12 or 18 hours of water deprivation (Treatments 3 and 4) in the present study affected these activities to bring about poor growth of the animals.

The feed efficiency result followed the same trend with that of the weight gain. The significant decrease (P<0.05) in feed efficiency of rabbits deprived of water for 12 or 18 hours is an indication that the efficiency of feed utilization by an animal is affected by water availability. Kellerup *et al.* (1965) had earlier reported a reduction in efficiency of feed utilization of animal deprived of water.

Water to feed ratio data also followed the same trend with those of weight gain and feed efficiency. That the rabbits on the 24 hours water supply groups had higher water to feed ratio than the water restricted groups could be related to the significantly higher water intake of rabbits on the control group.

The mortality rate was higher (33%) for rabbits deprived of water for 18 hours per day and was followed by those deprived of water for 12 hours per day (16%). No mortality was however recorded for rabbits groups fed water ad libitum and 18 hours per day. The mortality rate obtained for rabbits in Treatment 3 and 4 could be a reflection of the effect of stress of water deprivation. The postmortem results showed that the carcass were dried and shrunken, the ingesta was dry and flaky. Furthermore there was a sloughing of the intestinal and gastric mususa of rabbits deprived of water for 18 hours in a day. About 70-80% of the body of young rabbits (as used in the present trial) is water (Maynard and Loosli (1973) and a loss of one-tenth of this total body water may result in death. Adewumi (1995) have also indicated that an animal will die faster if deprived of water than feed.

Conclusion: Adequate water supply to rabbit should be a major concern in the tropics where environmental temperature and humidities prevail all the year round at levels detrimental to satisfactory performance of rabbits. It is inferred from this study that provision of drinking water *ad libitum* to weaning rabbit should be the general recommendation. However, where drinking water is scarce and must be supplied on a rationed basis, depriving weaning rabbits of access to water beyond 6 hours in a day may result in poor performance.

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