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PERFORMANCE OF RABBITS ON EXCLUSIVE DAY AND/OR NIGHT FEEDING REGIME IN THE DERIVED SAVANNAH ZONE OF NIGERIA

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ABSTRACT*:* This study was carried out using Twenty four growing rabbits with an average initial weight of between 667 - 676 g. The rabbits were randomly allocated into three groups of eight rabbits each, with each rabbit serving as a replicate in a completely randomized design experiment. The rabbits were fed conventionally on concentrate (l00g) and fresh forages –*Aspilia africana- Tndax procumbens* (200g) per animal per day. The first group which served as the control were provided with feed and water *ad libitum* while the second group (day feeding) were fed once during the day (08:00 hrs) and provided with only water at night. The third group (night feeding) were fed once in the evening (06:30 hrs) and provided with water during the day. The experiment lasted for eight weeks. Parameters recorded were temperature and humidity of the rabbitary, rectal temperature of the rabbits, feed intake and left over, water consumption, weight gain as well as the pulse rate of the rabbits. Rabbits on exclusive night feeding had final weights (1.62 kg) comparable (P>0.05) with the control (1.58 kg) that were fed ad-libitum (day and night) and higher (P<0.05) than the weight of rabbits (1.48 kg) fed exclusively during the day. Feed wastage was much lower (P<0.05) in rabbits fed exclusively at night. The relative organ weights shows that the kidney, spleen, and intestinal weights were not affected (P>0.05) but there were differences (P<0.05) in weights of lungs, heart and liver for the feeding regimes. It can be concluded that feeding rabbits at night is better to take advantage of their nocturnal habit. This will encourage the participation of individuals whose schedules are busy during the day in rabbit meat production thus making more rabbit available for consumption.

Keywords: Concentrate, Feed Intake, Feed Wastage, Forages, Nocturnal Habit, Weight Gain.

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INTRODUCTION

Feeding involves a complex series of decisions and depends upon an elaborate array of mental, motor and digestive abilities. The initiation of feeding behavior can be affected by diurnal rhythms and social factors but input from monitors of the body state are of particular importance (Fraser and Broom, 1990). Signals reported to be of importance in several species include visual input, input from taste receptors, inputs resulting from stomach contractions, insulin effects, plasma glucose detector input and fat store monitor inputs (Mogenson and Arnold, 1974). Once food is found, the rate of ingestion will limit intake and this will depend upon oral mechanics and other abilities of the animal; the physical and mechanical properties of the food; the availability of water; the nutrient qualities of the food and the effects of disturbances such as those due to danger of predation, attacks by insects, or competition from other members of the species. It thus appears that the point at which ingestion of meal ceases will depend on gut size and input to the brain from sensory receptors, such as those which signal that the gut is full (Frazer and Broom, 1990). In rabbits the consumption of solid and liquid feed fluctuates over a 24 hour period with much feed consumed in the dark than in the light Lebas et al. (1986).

According to Prud'hon (1975) as a rabbit grows older the nocturnal nature of its feeding habit becomes more pronounced. The number of feeds during light period drops and the morning 'feeding rest' tends to lengthen. Feeding of rabbits can therefore be timed to such periods when intake is high and wastage lower. With increased intake growth performance is enhanced while reduction in feed wastage will ultimately lead to some savings in terms expenditure on feed. This experiment was conducted to compare the effect of two feeding regimes: exclusive day and/or night feeding on the performance of growing rabbits.

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MATERIALS AND METHODS

Experimental site

The experiment was carried out at the Rabbitary unit of the Teaching and Research Farm located within the campus of Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. The study site lies between latitudes 8007'N and 8012'N and longitudes 4004'E and 4015'E. According to the University weather station report, the climate condition of Ogbomoso area is between humid and fairly hot sub-humid tropical with marked wet and dry seasons. There is a short period of harmattan in between the two seasons (wet and dry). The mean annual rainfall is 1,400mm with a weekly developed bimodal pattern of distribution, reaching peak around July and September. The air temperature ranged between 25.8°C in August and 30.5°C in March with the mean annual temperature of 27°C. The average relative humidity is 77% with as high as 92.9% and 61.4% in morning and afternoon respectively.

Experimental animals and management

Twenty four growing rabbits of mixed breed (New Zealand white X California white) with an average weight of between 667 ± 23.4 and 676 ± 49.2g were used for the study. They rabbits were randomly divided into three groups of eight rabbits each after weight balancing, each rabbit served as an experimental unit in a completely randomized design. The rabbits were fed conventionally on a mixture of 100g concentrate containing 17% protein and Metabolizable energy of 2500Kcal/kg and a mixture of fresh forages –*Aspilia Africana* (17.3% crude protein, 14.9% crude fibre and 3.89Kcal/g of Gross energy)- *Tridax procumbens* (16.9% crude protein, 15.9% crude fibre and 3.92Kcal/g of Gross energy) -200g per animal per day. The first group which served as control was provided with feed and water ad libitum. While the second group were fed once during the day (08:00hrs) and provided with only water at night. The third group were fed once in the evening (06:30 hrs) and provided with water during the day. The rabbits were housed individually in wood-wire cages with dimensions of 44×34×44cm. The drinking and feeding troughs used (earthen pots re-enforced with cement to prevent tipping off) were removable types for easy cleaning. The experiment lasted for eight weeks. Various parameters such as temperature and humidity of the rabbitary, rectal temperature of the rabbits, feed intake and left over, water consumption, weight gain of the rabbits, and pulse rate of the rabbits were recorded.

Carcass evaluation

After the experiment the five rabbits that had weights close to the mean for the group were selected per treatment for carcass evaluation. They were fasted for twelve hours weighed, stunned, bled, scalded and eviscerated to remove the internal organs. The dressed carcasses were then weighed and used to calculate the dressing percentage.

Data analysis

Data collected were subjected to analysis of variance using the General Linear Model (GLM) of (SAS 2000). Duncan Multiple Range Test of the same statistical package was used for comparing the means.

RESULTS AND DISCUSSION

The Performance of rabbits fed at different periods of the day is presented in Table 1. The Final weights of rabbits on night feeding and ad lib feeding were similar ($P>0.05$) but higher ($P<0.05$) than day feeding. Similar trend was observed for daily weight gain. The final weight of between 1483g and 1621g observed in this study is higher than 1120g to 1415.00g reported by Onimisi et al. (2006). Factors influencing final weight could be inheritance, environment and nutrition. The daily weight gain obtained in this study (between 14.5g-16.9g) are lower than 17.6g to 24.6g reported by Onimisi et al. (2006) but higher than 6.68g to7.30g reported by (Babarinde, (2006). The values obtained fall within the ideal growth rate of rabbits in the tropics which is between 12g to 20g per day as reported by Tegbe et al. (2004). The daily feed intake ranged from 57.9g to 69.0g. The lower daily feed intake of rabbits on ad lib feeding could be as a result of relatively high temperature during the day compared to night temperature. Lebas et al. (1986) reported that high temperature affects growing rabbits negatively resulting in reduced rate of live weight gain caused by reduction in feed intake. He further stated that when rabbits are raised at 18-20°C they can reach a live weight of 3kg by 112 days whereas at 30-51°C they only reach 2.5 kg. This could be improved by night feeding as rabbits would have access to feed in the cooler part of the day and also within their natural feeding regime. It was observed in this study that rabbits on night feeding did not waste feed as the rabbits in other treatments. This observation might be attributed to the nocturnal habit of rabbits and the fact that at night temperatures are normally lower than day.

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Table 1 - Performance characteristics of the experimental Rabbits

Parameters	Ad lib feeding	Day feeding	Night feeding	P value
Initial weight(g)	676±49.15	667±23.4	673±57.3	0.0004
Final weight (kg)	1.58±0.0534[a]	1.48±0.0.0512[b]	1.62±0.0633[a]	0.0001
Daily weight gain (g/rabbit)	16.1±1.03[a]	14.5±0.98[b]	16.9±0.86[a]	0.153
Daily feed intake (concentrate) (g/rabbit)	62.7±0.91[b]	57.9±1.56[b]	69.9±1.81[a]	0.0001
Daily forage intake (g/rabbit)	197±0.22	197±0.32	198±0.15	0.623
Daily water intake (ml)	52.9±1.61[b]	41.8±2.31[c]	63.4±1.95[a]	0.0003
Daily forage waste (g/rabbit)	2.50±0.09[b]	3.00±1.26[a]	1.88±0.62[c]	0.0004
Daily concentrate waste (g/rabbit)	37.4±0.92[b]	41.6±1.45[a]	30.0±1.85[c]	0.0001

abc Means along the same row with similar superscripts are not significantly different (P>0.05)

Table 2 - Physiological responses of the experimental rabbits

Parameters	Ad lib feeding	Day feeding	Night feeding	P - value
Daily atmospheric temperature (OC)	27.5±3.31[a]	26.4±1.21[a]	24.8±1.39[b]	0.0004
Daily relative humidity (%)	77.5±3.31[a]	62.0±0.78[b]	75.1±1.21[a]	0.0001
Daily pulse rate (bpm)	62.7±0.14	62.2±0.53	63.9±0.35	0.546
Daily rectal temperature °C	35.5±0.11	35.9±0.21	36.7±0.42	0.002

[abc] Means along the same row with similar superscripts are not significantly different (P>0.05)

Table 3 - Carcass and relative organ weights of the experimental rabbits

Parameters	Ad lib feeding	Day feeding	Night feeding	*P*value
Live weight (g)	1576±53.4[a]	1483±51.2[b]	1621±63.3[a]	0.0002
Dressed weight (g)	1043±35.32	894±30.3	1083±36.7	0.0003
Dressing percentage (%)	66.2±6.47[a]	60.32±9.42[b]	66.8±3.97[a]	0.546
Organs weights (% of live weight)				
Lung	0.46±0.05[b]	0.43±0.03[b]	0.53±0.07[a]	0.0001
Heart	0.13±0.02[b]	0.16±0.03[a]	0.19±0.02[a]	0.0002
Kidney	0.64±0.18	0.61±0.21	0.66±0.05	0.002
Spleen	0.06±0.01	0.062±0.00	0.05±0.01	0.499
liver	3.34±0.24[a]	2.96±0.21[b]	3.76±0.77[a]	0.0003
Intestine	19.3±2.51	19.0±2.58	20.5±4.31	0.0004

[abc] Means along the same row with similar superscripts are not significantly different (P>0.05)

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There is increased activity, less stress and boredom unlike the experience during the day. When rabbits are bored, they express this by playing and scratching the cage and equipment therein and at times it can result in tipping off of the feeders thus leading to wastage. The daily atmospheric temperature was between 24.9°C and 27.5°C (Table 2). This is within the thermo-comfort zone of rabbits. Nguyen QuangSuc (1985) reported that the suitable ambient environment for rabbit production is a temperature range of 18-28°C. The relative humidity was generally high during the day and night.

The interaction between ambient temperature and relative humidity especially during the day might have an effect on feed intake and weight gain of the rabbits. There was no difference in pulse rate of rabbits on the feeding regime. Pulse rate obtained are ideal for rabbits and indicates that the rabbits were not under any stress. The pulse rate obtained were also lower than 101-147 beats per minute reported by Iyeghe – Erakpotobor et al. (2012) for rabbits raised under sub-humid tropical environment, and 137 cpm reported for Egyptian "Giza" rabbits (Fayez et al., 1994). The normal pulse rate observed also indicates that the interplay between ambient temperature and humidity in the study area did not constitute any form of stress to the rabbits.

Rectal temperature of the rabbits were also not affected (P>0.05) by feeding regime. This is expected because the environment during the study was close to the rabbit's thermo-comfort zone. Rectal temperature of 35.5- 36.7°C obtained in this study are lower than 39.4°C (Fayez et al 1994), 38.4- 39.3oC (Iyeghe-Erakpotoboret al 2012). Peter (1999) reported that at normal rectal temperature (comfort temperature); rabbits ingest approximately twice as much water as feed. This applies to the rabbits fed exclusively at night hours but offered only water during day. This argument is in line with the findings of Reddy (1999) who reported that a continuous supply of fresh, cool and clean water will be beneficial in reducing heat stress and that fresh, cool drinking water around 15°C increased feed intake by 5-10% compared with warm drinking water at around 29°C during heat stress. The observed slightly lower temperature at night which was close to thermo-neutral zone enhanced feed intake and growth of rabbits on night feeding. Feeding of rabbits during the night with supply of water during the day could find good application in areas where the ambient temperatures are high especially during the day by aiding to reduce heat stress through a reduction in heat increment of feeding.

Carcass and organ characteristics of rabbits fed at different period of the day as presented in Table 3 shows that the dressing percentage obtained for rabbits fed during the day (60.3) was lower (P<0.05) than 66.2% and 66.8% for the control and rabbits on night feeding respectively. All the values however compares favourably with 60.0 to 69.9 reported by Amaefule and Ironkwe (2002) and are higher than 52.0-55.5% reported by Iyeghe-Erakpotobor (2006) for rabbits fed concentrate and Stylosanthesverano 52.05-53.36% by Sobayo et al. (2008) on fermented maize gluten and 41.1–49.5% reported by Fayeye et al. (2000) for crossbred rabbits of New Zealand White, California and Chinchilla.

The values obtained for dressing percentage in this study are higher than 50-57% recommended by Aduku and Olukosi (1990) for rabbits under tropical conditions. The range of values reported for the heart (0.17 to 0.19) obtained in this study is lower than the values reported by Aduku and Olukosi (1990). Since the animals were fed the same diet though at different feeding regime in this study, it cannot be said that the differences in relative weights of the hearts is due to any incriminating factor resulting from feed. The relative weights of the liver shows differences between feeding regime with rabbits on the control and night feeding having higher weights (3.34 and 3.76 respectively) than those on day feeding (2.96). Sobayo et al. (2008) observed similar change in percentage liver of rabbits fed fermented maize gluten though there were no differences in heart proportions. Liver size is known to increase in response to several factors, especially deficiencies in protein and amino acids accumulation of fat (Velu *et al.* 1971), or presence of anti-nutritional factors (Aderemi, 2003). The differences observed in relative liver weights in this study however showed the liver to be directly proportional to the body weights of the rabbits. According to Butcher et al (1983), external and internal offal percentages tend to increase as slaughtered weight of the animal increase. This is similar to the report of Adeniji (2004) that the amount of viscera depends on body weight. However, the values obtained for kidney and spleen shows no significant differences.

CONCLUSION

From the results obtained in this study, it can be concluded that rabbits can be fed exclusively at night. This is for convenience as well as serves as encouragement for individuals with busy schedule during the day to keep rabbits. The reduction in feed wastage will lead to some cost savings thus improving the income accruable to the rearers.

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