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Thermal effect on general and excretion behaviour of White New Zealand rabbit kept on moringa (*Moringa oleifera*) pod meal

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Abstract

The objective of the experiment was to study the general, sleeping, and excretion behahaviour as affected by the various environmental temperatures. The field trial was conducted at Hamelmalo Agricultural College (HAC), Eritrea (semi-arid climate) during April and May 2018. Twelve non-lactating female White New Zealand Rabbits were randomly divided into six pairs based on their body weight. One animal from each pair was allotted to control (3.25±0.20 kg) and test groups (3.20±0.18 kg). They were housed in separate cages under the indoor cage system. Concentrates made of HAC cafeteria leftovers were given to the control whereas, in the test group, 15% of it was replaced with the moringa (Moringa oleifera) pod meal on a fresh basis. The animals had free access to green fodder and drinking water and 3 g of common salt. An eight-day adaptation period was followed by a behaviour experiment conducted to study their general, specific nutritional, excretion, and urination behaviour for consecutive 120 hours dived into 24 slots of 5 hours each. The animals were observed at an interval of 15 minutes to fill up behaviour inventory including various aspects related to general, specific, nutritional, excretion, and urination behaviour. The same ambient temperature was recorded. For comparing two feeds 'paired t-test for the difference in means was used. It can be concluded based on the findings of this part of the research project that the thermal effect is one of the important factors which affects the behaviour of the rabbit. The rabbits were found most active at the time when the environmental temperature was low (minimum of 16.9°C during the experiment). So, a feeding strategy may be suggested to schedule the feeding hours of the rabbits during the period when the environmental temperature is low (16.9°C).

Keywords: Behaviour, Environmental temperate, Excretion, Moringa, Resting, Sitting, Sleeping, Standing, Urination, White New Zealand rabbit,

Introduction

The behaviour of the animals is an indicator to examine the health and adaptation of the animals since the beginning of the husbandry of animals. Dawkins (2003) reported the animal welfare issue can be approached by the questions related to the physically healthy and the basic requirements and the behaviour of the animals give the correct answers to the questions. Showing appropriate behaviour in different situations shows that the animals are kept in optimum conditions and were fit for production. The rabbit is light and thermal-sensitive animal. This is the reason any change in environmental temperature is immediately reflected in the behaviour of a healthy rabbit. The environmental temperature range between 16–21˚C showed a better physiological response in the rabbits (Verg et al 2007). This along with the light intensity made the animal nocturnal and they maintain these factors maintained naturally. The behaviour study, therefore, attracts the attention of the research worker to understand more about how the rearing system and season can influence the behaviour, production, and carcass traits of rabbits (El-Sabrout 2018). Along with the other factors, the environmental temperature is also an important factor to affect the productivity of the rabbits. The doe that was capable to produce 10 liters a year may give only 4 to 5 liters in a hot climate (Marai and Rashwan 2004).

The influence of feed nutritional composition on the feeding behaviour of rabbits is poorly understood. Reports are available to show that the nutritional requirements of the animals are varying because of the ambient temperature (Gidenne et al 2010). The rabbit's energy outflow depends on ambient temperature. Feed intake to manage energy needs is therefore it is directly linked to the environmental temperature. The amount eaten at each meal drops and water intake increases with high temperatures (10°C to 30°C). The negative effect of hot ambient temperatures (29-32°C) on daily feed intake could be partly counterbalanced by the distribution of drinking water refreshed at 16-20°C.

The general behaviour of rabbits especially sitting, standing resting, and sleeping behaviour are still to be understood. The information on the time spent on eating is also scanty. The excretion behaviour has also received less attention from the research workers. The present investigation is therefore planned to study the general, sleeping, and excretion behahaviour behaviour as affected by the various environmental temperatures.

Materials and Methods

The field trial was conducted at Rabbit Farm, Hamelmalo Agricultural College (HAC), Hamelmalo, Keren, Zoba Anseba (1286 m above sea level) during April and May 2018. The location has a semi-arid climate with an annual mean rainfall of 440 mm and an average annual temperature of 24^{0}C. The experiment was conducted.

Twelve non-lactating female White New Zealand Rabbits were randomly selected and divided into six pairs based on their body weight. One animal from each pair was allotted to one of the two groups, viz. control (3.25±0.20 kg) and test group (3.20±0.18 kg). The experimental animals were housed in separate cages under the indoor cage system. They were not allowed any routine exercise.

Concentrates made of HAC cafeteria left-overs were given to the experimental animals to meet their daily DCP and ME requirements (Cheeke, 1987; Maertens, 1992) in the control group whereas, in the test group, 15% of the concentrate was replaced with the moringa (Moringa oleifera) pod meal on a fresh basis. All the animals had free access to green fodder and fresh and clean water and also received 3 g of common salt with the concentrate.

During the experiment, an eight-day adaptation period was followed by a five-day behaviour experiment. The animals were also observed for their general, specific nutritional, excretion, and urination behaviour. The behaviour experiment continued for consecutive 120 hours and dived into 24 slots of 5 hours each. The animals were offered weighed amount of feed at the start of the slot. At the same time, feed samples were collected. The refusals of feed and faeces were weighed and sampled at the end of the slot. The samples were preserved for proximate analysis (AOAC, 2000). Gross energy was estimated by using the formula given by Kearl, (1982). During each slot, the animals were observed at an interval of 15 minutes to fill up the behaviour inventory (Kishore, 1998) including various aspects related to general, specific, nutritional, excretion, and urination behaviour. The same ambient temperature was recorded.

For comparing two feeds 'paired t-test for the difference in means (Snedecor and Cochran, 1994) was used. For comparing the behaviour of animals two-way ANOVA with a replication technique was implemented. The data were statistically analyzed using a data analysis pack of MS Office excel 2007 (MS Office, 2006).

Results and Discussion

The thermal effect has been recorded as an important factor that had a significant impact on the general behaviour of the rabbits (Table 1). As the environmental temperature increased, animals spent more time in sitting posture and less in standing ($P<0.01$). The highest standing and lowest sitting time were recorded at the peak of the environmental temperature and vice versa. The change in the general behaviour of the rabbit because of the thermal effect was measured up to 35 (54.68-89.84) and 37 (54.97-91.87) sitting times and 35 (10.16-45.32) and 37 (8.13-45.03) per cent standing time in control and test groups, respectively. However the behaviour of the rabbits in the two groups remained non-significant because of the changing environmental temperature, but the thermal effect on the general behaviour of the experimental animals was similar. The results were indicating that animals were most active if the environmental temperature was lowest and less if it was high. The findings could not be confirmed because of scanty literature.

The environmental temperature played a vital role in changing specific behaviour of rabbits including resting, sleeping, and ingestion behaviours (table 16-18; Fig. 2). With the increase in environmental temperature, the sleeping times of the experimental rabbits increased significantly whereas resting and ingestion times were decreased. The change in time used for resting, sleeping, and ingestion were 26 (41.06-66.96%) and 34 (36.99-69.88), 36 (52.85-16.08), and 44 (13.16-57.32) and 11 11 (6.10-16.96) and (5.69-16.96) per cent in control and test groups, respectively because of change in environmental temperature. The findings for the two diets were non-significantly different in this respect and the environmental temperature was influencing the specific behaviour of the rabbits in the same way ($P>0.01$). The results were indicating that the animals preferred to be involved in standing and related activities (eating) at low environmental temperatures and sitting and related activities (sleeping) when it was high. Present findings were in line with Lebas *et al.,* (1997) who reported that closer analysis of feeding behaviour showed that as the temperature rises the number of solid and liquid meals eaten in 24 hours drops.

The thermal effect had been recorded to influence the excretion behaviour of the rabbits (Table 2). The frequency of faecal excretion was highest at an environmental temperature between 20-30°C in both the groups viz. control and test. An increase or decrease in environmental temperature from this range was the reason for decreased frequency of faecal excretion. It was pointed out that changes in this respect were up to 0.34 (0.12-0.46) and 0.30 (0.02-0.32) per hour in the control and test groups, respectively. As far as the two diets were concerned, the excretion behaviour was significantly different but it followed the same trend in both groups. The findings could not be confirmed because of scanty literature.

Table 1: Thermal effect on general behaviour (time used%)

Environmental Temperature (˚C)	Control	Test	*P-Value*
Sitting			
15-20	54.68±3.88	54.97±4.24	*0.00*
20-25	55.71±2.93	58.83±3.81	
25-30	68.30±2.26	71.73±3.80	
30-35	87.38±2.20	91.67±1.00	
35-40	89.84±1.16	91.87±1.50	
P-Value	*0.16*		
Standing			
15-20	45.32±3.88	45.03±4.24	*0.00*
20-25	44.29±2.93	41.27±3.81	
25-30	31.70±2.26	28.27±3.80	
30-35	12.62±2.20	8.33±1.00	
35-40	10.16±1.16	8.13±1.50	
P-Value	*0.16*		
Sleeping			
15-20	16.08±1.39	13.16±3.23	*0.00*
20-25	14.13±1.71	14.92±1.63	
25-30	22.71±1.95	22.71±4.15	
30-35	52.86±1.48	48.81±4.24	
35-40	52.85±3.25	57.32±5.52	
P-Value	*0.87*		
Resting			
15-20	66.96±2.00	69.88±2.98	*0.00*
20-25	69.84±1.80	65.63±1.40	
25-30	61.44±1.94	60.29±3.59	
30-35	42.46±1.69	45.00±4.14	
35-40	41.06±2.98	36.99±5.17	
P-Value	*0.65*		
Eating			
15-20	16.96±2.78	16.96±2.34	*0.00*
20-25	16.03±0.90	19.44±1.20	
25-30	15.85±1.53	16.99±1.55	
30-35	4.29±0.90	6.19±0.88	
35-40	6.10±1.51	5.69±0.81	
P-Value	*0.23*		

There was a vital thermal effect on the urination behaviour of the experimental animals during the experiment. The frequency of urination was decreased when the environmental temperature was increased. In two groups, control, and test, the urination behaviour was non-significant. Due to changes in the temperature, the frequencies of urination were changed up to 0.34 (0.16-0.50) and 0.13 (0.20-0.33) per hour in both groups. However, the trend in this respect, in both the groups remained similar. The results were indicating that the animals were urinating with higher frequencies during low environmental temperatures and vice versa. The findings could not be confirmed because of scanty literature.

Table 2 Thermal effect on excretion behaviour of White New Zealand rabbits

Environmental Temperature (˚C)	Control	Test	*P-Value*
Faecal Excretion (Frequency per hour)			
15-20	0.69±0.06	0.22±0.09	*0.00*
20-25	0.46±0.06	0.31±0.04	
25-30	0.35±0.06	0.32±0.07	
30-35	0.13±0.04	0.09±0.00	
35-40	0.12±0.06	0.02±0.00	
P-Value	*0.00*		
Urine Excretion (Frequency per hour)			
15-20	0.50±0.08	0.33±0.06	*0.00*
20-25	0.41±0.06	0.32±0.06	
25-30	0.16±0.04	0.26±0.00	
30-35	0.27±0.07	0.11±0.04	
35-40	0.16±0.09	0.20±0.07	
P-Value	*0.17*		

Conclusion

It can be concluded based on the findings of this part of the research project that the thermal effect is one of the important factors which affects the behaviour of the rabbit. The rabbits were found most active at the time when the environmental temperature was low (minimum of 16.9°C during the experiment). So, a feeding strategy may be suggested to schedule the feeding hours of the rabbits during the period when the environmental temperature is low (16.9°C).

References

AOAC. 2000. Official methods of analysis. 17th edn, Association of Official Analytical Chemists.

Cheeke P R. 1987. Rabbit Feeding and Nutrition. Academic Press, Washington D.C.

Dawkins M S. 2003. Behaviour as a tool in the assessment of animal welfare. Zoology. 106(4): 383-387.

El-Sabrout K. 2018. Effect of rearing system and season on behaviour, productive performance and carcass quality of rabbit: A review. Anim. Behav. Biometeorol. 6(4): 102-108.

Gidenne T, Lebas F and Fortun-Lamothe L. 2010. Feeding behaviour of rabbits. CABI Digital Library, pp. 233-252.

Kearl L C. 1982. Nutrient requirements of ruminants in developing countries. International Feedstuffs Institute, Utah Agricultural Experimental Station, Utah State University, Logan, Utah, 381p.

Kishore A. 1998. Manipulation of rumen fermentation using buffers in crossbred cattle. Annual Report 1997-98, RBS College, Agra. 94p.

Lebas F, Coudert P, de Rochambeau H and Thebault R G. 1997. THE RABBIT: Husbandry, health and production. Food and Agriculture Organization of the United Nations, Rome.

Maertens L. 1992. Rabbit nutrition and feeding: A review of some recent developments. Journal of Applied Rabbit Research 15: 889-890.

Marai I F M and Rashwan A A. 2004. Rabbits behavioural response to climatic and managerial conditions – a review, Arch. Anim. Breed. 47: 469–482.

MS Office. 2006. Microsoft office 2007: Microsoft Excel. Microsoft Inc., New York.

Snedecor G W and Cochran W G. 1994. Statistical Methods, 8th Ed., Iowa State University Press, Ames.

Verg M, Luzi F and Carenzi C. 2007. Effects of husbandry and management systems on physiology and behaviour of farmed and laboratory rabbits. Hormones and Behavior. 52(1): 122-129.