EFFECTS OF HAIR SHEARING ON PRODUCTION PERFORMANCE AND CARCASS TRAITS OF GROWING RABBITS IN HIGH AMBIENT TEMPERATURE

Gerencsér Zs.[1]*, Kasza R.[1], Radnai I.[1], Matics Zs.[1], Dalle Zotte A.[2], Cullere M.[2], Szendrő Zs.[1]

[1]Institute of Animal Science, Kaposvár University, 40 Guba S. str., H-7400 Kaposvár, Hungary
[3]Department of Animal Medicine, Production and Health, University of Padova, Agripolis, Viale dell'Università 16, 35020 Legnaro, Padova, Italy
[*]Corresponding author: gerencser.zsolt@ke.hu

ABSTRACT

The aim of the study was to examine the effect of hair shearing of growing rabbits reared in high temperatures. For this purpose, a total of 150 five weeks old rabbits were assigned to three experimental groups: rabbits reared at 20 °C and not sheared (N, n= 50), at 28 °C and not sheared (W, n= 50), and at 28 °C and sheared at week 5, 7 and 9 (WS, n= 50). The experiment was conducted over 7 weeks, during which performance data was recorded. At the end of the experiment, the rabbits were slaughtered and carcass traits were evaluated. Feed intake of groups W and WS decreased by 29.0% and 20.4%, respectively, when compared to N rabbits. A similar trend was observed for live weight gain (24.6% and 16.9%) and for body weight at 12 weeks (16.8% and 11.5%). Concurrently, feed conversion rate improved in groups W and WS compared to group N (N: 3.53, W: 3.34, WS: 3.31; P<0.001). The mortality of groups remained unaffected by treatments. Under heat stress conditions, rabbit shearing improved slaughter weight (P<0.001) and reference carcass weight (P<0.001) compared to W rabbits; N rabbits, however, always showed the highest values for those traits. It can be concluded that the effect of high temperatures on growing rabbits can be significantly mitigated by hair shearing, suggesting that it is a possible strategy for improving animal welfare. However, as this method is time- and money-consuming (cost of labour), this method could be used mainly on small farms located in tropical areas or in temperate zones during summer peak season.

Key words: Rabbit production, Heat stress, Shearing method, Live performance, Slaughter traits

INTRODUCTION

Global warming is a major contributor to the continuous rise of the average temperatures on the Earth (NASA Goddard Institute for Space Studies). At the same time, the frequency and duration of extreme weather conditions increase. The periods of high ambient temperatures are problematic in areas characterised by hot climates and also in the temperate zones during the summer seasons. Rabbits are highly sensitive to high temperatures as their bodies are covered with fur and they only have few functional sweat glands, which limits their ability to eliminate excess body heat (Maya-Soriano et al., 2015).
Literature research already observed some detrimental effects on rabbits live performance due to high ambient temperature (Stephan, 1980; Marai et al., 2002; Zeferino et al., 2011).

Since perspiration is an ineffective method of heat control, reducing hair length can be considered as a possible tool to reduce the effects of heat stress. Schlolaut (1995) stated that after shearing angora rabbits, there was a sudden increase in feed intake, which was independent from season and decreased again parallel with the increase in wool length. Finzi et al. (1992) also reported a higher feed intake in sheared rabbit bucks which had no effect on semen quantity or quality. Lukefahr et al. (2003) observed

lower body temperatures and higher growth rates in fur clipped growing rabbits reared in warm ambient temperatures. Szendrő et al. (2007) observed that shearing rabbits increased milk yield and litter weight in warmer seasons. The hypothesis by Jackson et al. (2006) stated that genetically hairless rabbits are possibly better adapted to hot climates when compared to furred growing rabbits. Genetically hairless rabbit body weights and feed intakes were higher.

Based on the above-mentioned regarding the possible positive effect of rabbit hair shortening, the objective of the present study was to compare the effect of high ambient temperatures on the production performance and carcass traits of furred and sheared growing rabbits.

MATERIALS AND METHODS

The study was approved by the Institutional Animal Welfare Committee as the animal-welfare body of the Kaposvár University. All animals were handled according to the principles stated in the EC Directive 86/60963/2010 EU regarding the protection of animals used for experimental and other scientific purposes.

Animals and experimental design

The experiment was conducted on the experimental rabbit farm of Kaposvár University. A total of 150 Five weeks old rabbits were housed in two rooms with different ambient temperatures. Rabbits reared in a normal temperature (20 °C) were furred (N group, n = 50), whereas half of the rabbits reared in a warmer temperature (28 °C) were all furred (W group, n = 50) and the other half were sheared (WS group, n = 50). The body areas that were sheared were the backs and both sides. This handling was done at 5, 7 and 9 weeks of age and a shearing machine (Aesculap Favorita II) for angora rabbits was used. Their hair was sheared to a 2 mm length.

Both rooms maintained 16 hours of light daily. All the rabbits received the same commercial pelleted diet (5-9 weeks: DE: 9.94 MJ/kg, CP: 15.7%, CF: 19% and medication: Diclazuril: 1 mg/kg, Oxytetracycline 500 mg/kg, Tiamulin: 50 mg/kg, 9-12 weeks: DE: 10.6 MJ/kg, CP: 16.3%, CF: 17.7% without medication) *ad libitum* and the water was freely available from nipple drinkers. Rabbits were kept in wire mesh cages (40x38x30 cm; 2 rabbits/cage).

Body weights (BW) were measured at 5, 7, 9, 11 and 12 weeks of age. Feed intake (FI) was recorded and the daily weight gain (DWG) and feed conversion ratio (FCR) were consequently calculated. Evaluations of BW and DWG were based on the individual's data, whereas feed intake and feed conversion ratio were based on the cage units. When calculating feed intake, it was assumed that died rabbits did not consume any pellets for the 2 days preceding their slaughter. Mortalities were recorded daily. Rabbits were slaughtered at 12 weeks of age. The slaughtering and carcass dissection procedures were performed following the recommendations of the World Rabbit Science Association (WRSA), as described by Blasco and Ouhayoun (1996).

Statistical Analysis

Production performance and carcass traits were analyzed by One-way ANOVA, using R software version 3.5.1 (R Core Team, 2018). Mortality data was analysed with a chi-square test.

RESULTS AND DISCUSSION

Results for production performance are shown in Table 1. Previous research demonstrated that high ambient temperatures primarily affects the FI directly (Szendrő et al., 2018). In accordance with this, FI decreased by 29.0% in W group compared to N rabbits, whereas the decline was 8.6% lower in WS group (20.4). The decrease in FI became more pronounced as the rabbits' age increased (5-9 wk 20.5% and 14.0%, 9-11 wk 31.3% and 22.0% in W and WS groups, respectively).

Table 1: Production performance of furred and sheared growing rabbits housed in normal and high ambient temperatures

Traits	Ambient temperature			SEM	Prob.
	20°C	28°C			
	Hair shearing				
	No	Yes	No		
Group	N	WS	W		
N.	50	50	50		
Body weight at 5 weeks, g	904	900	900	6,52	0.956
Body weight at 12 weeks, g	2817[c]	2494[b]	2344[a]	21,9	<0.001
Daily weight gain between 5-12 weeks, g	39.1[c]	32.5[b]	29.5[a]	0.42	<0.001
Daily feed intake between 5-12 weeks, g	137[c]	109[b]	97.3[a]	2.22	<0.001
Feed conversion ratio between 5-12 weeks	3.53[b]	3.34[a]	3.31[a]	0.03	<0.001
Mortality, %	2.00	4.00	0.00	-	0.360

Means with different letters on the same row differ significantly at P<0.05 level.

Chiericato et al. (1996) observed smaller differences compared to the present findings, whereas Zeferino et al. (2011) noted a similar decrease in FI. Jackson et al. (2006) reported a larger difference between the furred and genetically hairless rabbits (20.8%) than what was observed in the present experiment between W and WS group (10.7%). It should however be considered that in the present trial the rabbits were still covered with hair. The difference was the hair length, which changed during the experimental period. DWG decreased by 24.6% and 16.9% for W and WS groups, respectively, compared to N rabbits (P<0.001). The observed effect of heat stress on DWG was thus lower in the experiment of Chiericato et al. (1996) than in the present trial; Zeferino et al. (2011) observed a genotype x temperature interaction. Examining the DWG of W and WS groups, it can be speculated that Jackson et al. (2006) reported similar differences between the furred and genetically hairless rabbits (9.2% and 10.9%, respectively). The initial BWs were similar but, due to the difference in weight gain displayed by the groups, the BWs of W and WS rabbits were lower than in N group by 16.5% and 11.5%, respectively. Chiericato et al. (1996) observed a lower decline in BW, but the difference between W and WS groups was similar than that in the experiment of Jackson et al. (2006). Other researchers also reported some positive results when rabbit bucks (Finzi et al., 1992) or does were sheared (Szendrő et al., 2007). Together with the positive findings of the present experiment, hair shearing is favourable in view of animal welfare as the body temperature of sheared rabbits may decrease; this was also observed in genetically hairless rabbits (Lukefahr et al., 2003). Mortality among groups did not differ.

Results of carcass traits are summarized in Table 2. Similar differences among experimental groups were observed in the slaughter and carcass weights than in BWs with hair shearing providing better results than W group. There were however no differences found for dressing percentage. In contrast, Chiericato et al. (1996) observed the better results in rabbits reared at high temperatures. Ratio of fore part to reference carcass was higher, while the ratio of hind part was lower in N than in W and WS rabbits. Chiericato et al. (1996) found opposite results. Similar to previous findings, in the present experiment there was a close correlation between FI and ratio of fat deposits. Overall, neither high ambient temperatures nor shearing had a considerable effect on the carcass traits. To the best of our knowledge this is the first experiment that investigated the slaughter traits of sheared rabbit reared in high ambient temperature.

Table 2: Carcass traits of furred and sheared growing rabbits housed in normal and high ambient temperatures

Traits	Ambient temperature			SEM	Prob.
	20 °C	28 °C			
	Shearing				
	No	Yes	No		
Group	N	WS	W	-	-
N.	49	47	47		
Slaughter weight (SW), g	2752[c]	2458[b]	2310[a]	21.1	<0.001
Hot carcass, g	1739[c]	1556[b]	1468[a]	13.2	<0.001
Reference carcass (RC), g	1440[c]	1289[b]	1219[a]	11.2	<0.001
Hot carcass, %SW	63.2	63.3	63.6	0.15	0.664
Fore part, % RC	28.9[b]	28.3[a]	28.4[a]	0.08	0.005
Mid part, % RC	31.4	31.5	31.5	0.10	0.870
Hind part, % RC	30.8[a]	31.9[b]	32.2[b]	0.10	<0.001
Perirenal fat, % RC	2.60[b]	1.81[a]	1.61[a]	0.06	<0.001
Scapular fat, % RC	0.87[c]	0.66[b]	0.51[a]	0.02	<0.001

Means with different letters on the same row differ significantly at P<0.05 level.

CONCLUSIONS

Hair shearing was shown to mitigate the negative effects of high ambient temperatures on growing rabbits' production performance. However, as this method is time- and money-consuming (cost of labour), this method could be used mainly on small farms located in tropical areas or in temperate zones during summer peak season.

ACKNOWLEDGEMENTS

The work was supported by the GINOP-2.3.4-15-2016-00005 project. Publication was supported by the EFOP-3.6.3-VEKOP-16–2017–00008 project. The project is co-funded by the European Union and the European Social Fund.

REFERENCES

Blasco, A., Ouhayoun, J. 1996. Harmonization of criteria and terminology in rabbit meat research. Revised proposal. *World Rabbit Sci., 4, 93-99.*

Finzi, A., Morera, P., Kuzminsky, G. 1992. Effect of shearing on rabbit bucks performances in hot ambient conditions. *J. Appl. Rabbit Res., 15. 489-494.*

Jackson, R., A. D. Rogers, and S. D. Lukefahr. 2006. Effects of the naked gene on postweaning performance and thermotolerance characters in fryer rabbits: Final results. *World Rabbit Sci., 14, 147-155*.

Lukefahr, S. D., and C. A. Ruiz-Feria. 2003. Rabbit growth performance in a subtropical and semi-arid environment: Effects of fur clipping, ear length, and body temperature. *Livest. Res. Rural Devel. (15) 2. http://www.cipav.org.co/lrrd/lrrd15/2/luke152.*

Marai I.F.M. Habeeb A.A.M. Gad A.E. 2002 Rabbits´ productive, reproductive and physiological performance traits as affected by heat stress: a review. *Livest. Prod. Sci., 78, 71-90.*

Maya-Soriano M.J., Taberner E., Sabes-Alsina M., Ramon J., Rafel O., Tusell L., Piles M., Lopez-Bejar M. 2015. Daily exposure to summer temperatures affects the motile subpopulation structure of epididymal sperm cells but not male fertility in an in vivo rabbit model. *Theriogenology, 84, 384-389.*

NASA https://climate.nasa.gov/

R Core Team. 2018. R: A Language and Environment for Statistical Computing. *R Foundation for Statistical Computing, Vienna. https://www.R-project.org*

Schlolaut W. 1995. Das grosse Buch vom Kaninchen. *DLG-Verlag, Frankfurt am Main*

Stephan E. 1980. The influence of environmental temperatures on meat rabbits of different breeds. *Commercial Rabbit. 8, 12-15.*

Szendrő Zs., Rashwan R.R., Bíró_németh E., Radnai I., Orova Z. 2007. Effect of shearing of hair in summer on production of rabbit does. *Acta Agr. Kapos., 11, 37-42.*

Szendrő Zs., Papp Z., Kustos K. 2018. Effect of ambient temperature and restrisced feeding on the production of rabbit does and their kits. *Acta Agr. Kapos., 22. 1-17.*

Zeferino P.C., Moura T.M.A.S.A., Fernandes S., Kanayama S.J., Scapinello C., Sartori R.J. 2011. Genetic group×ambient temperature interaction effects on physiological responses and growth performance of rabbits. *Livest. Sci., 140, 177-183*.