



# PROCEEDINGS OF THE 11<sup>th</sup> WORLD RABBIT CONGRESS

Qingdao (China) - June 15-18, 2016

ISSN 2308-1910

## Session Ethology and Welfare

*Masthoff T., Lang C., Hoy St.*

EFFECT OF GROUP SIZE ON FATTENING PERFORMANCE  
AND OF VARIOUS TYPES OF SLATTED FLOOR ON DIRTINESS  
AND OCCURRENCE OF PODODERMATITIS IN GROWING RABBITS.

**Full text of the communication**

*How to cite this paper :*

*Masthoff T., Lang C., Hoy St., 2016 - Effect of group size on fattening performance and of various types of slatted floor on dirtiness and occurrence of pododermatitis in growing rabbits. Proceedings 11th World Rabbit Congress - June 15-18, 2016 - Qingdao - China, 715-718.*



## EFFECT OF GROUP SIZE ON FATTENING PERFORMANCE AND OF VARIOUS TYPES OF SLATTED FLOOR ON DIRTINESS AND OCCURRENCE OF PODODERMATITIS IN GROWING RABBITS

Masthoff T. \*, Lang C., Hoy St.

Dept. of Animal Breeding and Genetics, Justus Liebig University Gießen,  
Leihgesterner Weg 52, 35392 Gießen, Germany

\*Corresponding author: till.m.masthoff@agr.uni-giessen.de

### ABSTRACT

A novel group housing system (rabbit park) that complies with the new regulations of the German animal welfare act was constructed and tested for fattening performance and mortality of rabbits. The rabbit park had 30,000 cm<sup>2</sup> floor area and 11,000 cm<sup>2</sup> elevated platform, housing 35-49 rabbits per round (612-875 cm<sup>2</sup> per animal). Daily weight gain of the rabbits kept in the park system was significantly lower than the weight gain of the rabbits from the control group (enriched flat decks, 10,000 cm<sup>2</sup> floor area, 3,000 cm<sup>2</sup> elevated platform, 8-16 rabbits per group). Regarding the parameters 'animal losses' and 'feed conversion ratio', no differences were observed. Three floor designs were tested for their effect on dirtiness of feet and occurrence of sore hocks (pododermatitis). Rabbits housed on the floor with the highest perforation grade (var. A: 5 mm slats, 13 mm slots) were the cleanest (an average of 0.19 on a 0-3 scale). Almost no cases of pododermatitis were noted. On average, rabbits housed on var. B and C (10 mm slat and slot width in both variants plus an additional elevated platform with a low perforation grade (<15%, only variant C)) were much dirtier (1.41 for B and 1.96 for C). In addition, at the end of the eight week fattening period, rabbits housed in var. B and C developed pododermatitis with 7.5% and 4.0% respectively.

**Key words:** Fattening rabbits, Group housing, Fattening performance, Slatted floor, Animal welfare

### INTRODUCTION

The amendment of the German animal welfare act (TierSchNutzV) from 11/08/2014 makes it necessary to produce rabbit meat in alternative housing systems in the future. Following the regulations of the animal welfare act (Table 1) 8 rabbits must be kept in a cage with 10,000 cm<sup>2</sup> (1,250 cm<sup>2</sup> per animal) while 47 animals must be kept on an area of 40,000 cm<sup>2</sup> (851 cm<sup>2</sup> per animal). It is obvious that the production of rabbit meat on a commercial scale will only be possible in large group-housing units.

**Table 1:** Space requirements for fattening rabbits in Germany (TierSchNutzV 2014)

Number of animals	cm <sup>2</sup> per rabbit
1 <sup>st</sup> to 4 <sup>th</sup>	1,500
5 <sup>th</sup> to 10 <sup>th</sup>	1,000
11 <sup>th</sup> to 24 <sup>th</sup>	850
from the 25 <sup>th</sup>	700

In addition to the new space requirements the regulations regarding the design of the floor are also completely new: If perforated floor is used a maximum slot width of 11 mm is allowed. Furthermore, slot width must be equal to slat width. Also, one third of the total area of the housing unit (floor area plus area of the elevated platform) has to have a maximal perforation grade of 15%.

To our knowledge there are no commercially available housing systems or floor designs that comply with the new animal welfare act. Therefore we constructed an alternative housing system that conforms to the new regulations (rabbit park) to test its impact on fattening performance and to analyze the consequences of implementation of the new regulations in practical use. To test the effect of the demanded floortype on dirtiness of the rabbits and the possible occurrence of pododermatitis, three floor designs were investigated.

## MATERIALS AND METHODS

### Animals and experimental design

In 7 rounds 1,077 weaned Zika hybrids at the age of 35 days were distributed in seven housing units (154-159 animals per round). The animals were fattened for 46 to 53 days.

Seven housing units of two different types were used in this study (tab. 2): 2 large scale group housing units (rabbit parks) with 30,000 cm<sup>2</sup> of floor area and additional 11,000 cm<sup>2</sup> elevated platform and 5 enriched flat deck units with 10,000 cm<sup>2</sup> floor area and additional 3,000 cm<sup>2</sup> elevated platform, serving as control group.

**Table 2:** Details of the used units

	Flat decks	Rabbit parks
Number of animals per round	8-16	38-49
Floor space per animal	625-1,250 cm <sup>2</sup>	612-789 cm <sup>2</sup>
Elevated platform per animal	188-375 cm <sup>2</sup>	224-289 cm <sup>2</sup>
Animal: feeding place ratio	2:1	1:3.2-4.1
Animal: drinking place ratio	1:1.6-3.2	1:4.8-6.1

The first 2 weeks of fattening, rabbits received a starter feed with a coccidiostatic (CP: 15.0%, CL: 2.6%, CF: 18.1%, CA 8.6%). Subsequently, a standard fattening diet (CP: 15.0%, CL: 2.6%, CF: 17.1%, CA: 8.0%). Hay and acidified water were available *ad lib.* throughout the fattening period.

Three floor designs were tested in this study (tab. 3). Var. C complies with the new regulations in Germany. Var. B is an intermediate version, not containing the areas with low perforation on the elevated platform. Var. A (with highest perforation) will not be permitted by law after 2018.

**Table 3:** Details of the used floor types

	Unit	Variant A	Variant B	Variant C
Slat width	mm	5	10	10
Slot width	mm	13	10	10
Perforation	%	75	50	50
Floor type on elevated platform		same as floor	same as floor	perforation less than 15%
Conform to TierSchNutzV		not conform	not conform	conform

At the start of each round rabbits were weighed, sexed and divided into seven groups so that the average weight of the animals was the same for every group. At the end of the fattening period (day 46 to 53) rabbits were weighed again, scored for dirtiness of the feet and examined for sore hocks.

We used a four-stage scoring system (0-3) to record lesions and contamination of hind feet. An unsoiled and undamaged condition was represented by 'zero'.

### Statistical Analysis

Data was evaluated using general linear models (GLM) (initial and final weight, daily gain, feed conversion ratio and losses) or Chi<sup>2</sup> test (dirtiness and lesions of the feet) by use of SPSS 22.0 program package. Interactions had no effect and were omitted from the model. For the analysis of feed conversion effects 'sex (S) was excluded from the GLM:

$$Y_{ijk} = \mu + R_i + G_j + S_k + e_{ijk}$$

$\mu$  = general mean  
 $R_i$  = round (i=1-7)  
 $G_j$  = effect of group (j=1-2, park or flatdeck)  
 $S_k$  = effect of sex (k=1-2)  
 $e_{ijk}$  = random error

## RESULTS AND DISCUSSION

### Growth performance

Due to the equal distribution of the rabbits there were no significant differences between mean initial weights (tab. 4) of the animals in the 7 units. At the end of the fattening period rabbits housed in flat decks were on average 80 g heavier than rabbits from the parks ( $P < 0.001$ ) leading to a 1.5 g higher daily gain ( $P < 0.001$ ). Daily gain was lowest in round 5 (31.1g) and highest in round 4 (40.2g) ( $P < 0.001$ ).

**Table 4:** Fattening performance of rabbits

		Flat decks	Rabbit parks	P
Number of animals at the end of the fattening period		585	456	-
Initial weight	kg	1.01	1.01	n.s.
Final weight	kg	2.97	2.89	>0.001
Daily gain	g	38.6	37.1	>0.001
Losses	%	3.3	3.4	n.s.
Feed conversion ratio		3.88	3.94	n.s.

Regarding the effect of the group size on final weight and daily gain our results are similar to results of other researchers (Maertens and Van Herck 2000, Dal Bosco *et al.* 2002, Szendrő *et al.* 2009, Rommers and Meijerhof 2010). Szendrő *et al.* (2009) found decreasing daily gains in group sizes from 2 to 26 rabbits per pen. Dal Bosco *et al.* (2002) observed increased activity and reduced weight gain in pen housed rabbits compared to rabbits housed in bicellular cages. Maertens and Van Herck (2000) reported a 3.3 g lower daily gain in pen housed rabbits (30 rabbits per pen) compared to rabbits housed in small groups (4 rabbits/ cage).

In our study losses were low in both groups: 36 of 1.077 or 3.3% of animals perished mainly due to digestive disorders or diseases of the respiratory tract. Differences in mortality between groups were not significant. Maertens and De Goote (1984), Maertens and Van Herck (2000), Maertens and Van Oeckel (2001) Princz *et al.* 2009, Szendrő *et al.* 2009 also observed no relation between group size and mortality. Dal Bosco *et al.* (2002) and Lang (2009) detected a significant increase in mortality in larger groups. The feed conversion ratio was approximately the same for both systems in our study. Szendrő *et al.* (2009) reported a significantly better feed conversion ratio for groups of 8 compared to groups of 20. Princz *et al.* (2009) compared the feed conversion ratio between cages of 2 and 13 and found an 8% higher feed conversion ratio in pen housed rabbits (3.12 vs. 3.38, resp.  $P < 0.001$ ). No effect on feed conversion ratio was observed in our study.

### Dirtiness and lesions of the hind feet

Rabbits of var. A were cleanest of all animals included in the study (tab. 5). For var. A the score averages at 0.19. Lesions on the feet occurred sporadically (one case). Regarding dirtiness rabbits kept on var. B had an average score of 1.41 with 7.3 % of the rabbits showing pododermatitis at the end of the fattening period. The dirtiest feet of all rabbits were found in var. C (average of 1.96). 70.9% percent of rabbits were scored with 2 or 3. Furthermore, 4.0% of the animals from var. C developed sore hocks.

To our knowledge there are no comparable studies published regarding the dirtiness of the hind feet of rabbits. Morisse *et al.* (1999) conducted a preference test for growing rabbits to choose between straw and wire grid floor, showing a significant preference for wire grid floor. Morisse *et al.* (1999) conclude that the wire grid was preferred due to higher hygienic conditions. Dal Bosco *et al.* (2002) confirmed these findings observing significantly longer periods of cleaning behaviour in rabbits kept on litter. Pododermatitis is a common problem in does. There are a number of studies concerning sore hocks in does (e.g. Rommers and De Jong 2011, Buijs *et al.* 2014). However, in fattening rabbits pododermatitis is not commonly observed (EFSA 2005). It is likely that the relatively high prevalence of sore hocks in var. B and C is a consequence of the unhygienic conditions.

**Table 5:** Percentage of the scores for dirtiness and lesions for hind feet at the end of fattening. Different letters (in superscript) on the same row indicate significant differences ( $P < 0.001$ ).

	n	Dirtiness: score					Lesions: score			
		0	1	2	3		0	1	2	3
Variant A <sup>a</sup>	254	85.0	12.2	2.0	0.8	Variant A <sup>a</sup>	99.6	0.4	0.0	0.0
Variant B <sup>b</sup>	508	21.1	36.4	23.4	19.1	Variant B <sup>b</sup>	92.5	5.7	1.6	0.2
Variant C <sup>c</sup>	247	8.5	20.6	37.7	33.2	Variant C <sup>b</sup>	96.0	3.2	0.8	0.0

Considered from the point of animal welfare and hygiene our results show that var. B and especially C are to be assessed critically. Due to the wide slats and an almost unperforated elevated platform in var. C, faeces and urine were not removed sufficiently. The constantly wet and dirty feet supported the occurrence of pododermatitis at the end of the fattening period. Furthermore, according to results of Morisse *et al.* (1999) and Dal Bosco *et al.* (2002) we can conclude that rabbits have a general preference for more hygienic housing systems. Therefore, var. A was the most suitable floor type for fattening rabbits in our investigation.

## CONCLUSIONS

The rabbit park is a possibility to implement the new regulations of the German animal welfare act under practical conditions. Disadvantage of the large group size is a lower daily gain compared to the animals from the flat deck system. Furthermore, management of large animal groups is more demanding. As a result of the dirty feet and the occurrence of pododermatitis in var. B and C, we conclude var. A to be the most animal appropriate floor in our study. Floors with wide slats and low perforation seem to have no advantage with regards to animal welfare. Further studies concerning the demanded floor type are needed.

## REFERENCES

- Buijs S., Hermans K., Maertens L., Van Caelenberg A., Tuytens F.A.M. 2014. Effects of semi-group housing and floor type on pododermatitis, spinal deformation and bone quality in rabbit does. *Animal*, 8(10), 1728-1734.
- Dal Bosco A., Castellini C., Mugnai C. 2002. Rearing rabbits on a wire net floor or straw litter: behaviour, growth and meat qualitative traits. *Liv. Prod. Sci.*, 75(2), 149-156.
- EFSA 2005. The impact of the current housing and husbandry systems on the health and welfare of farmed domestic rabbits. *The EFSA Journal* 267, 1-31.
- Lang C. 2009. Klinische und ethologische Untersuchungen zur Haltung wachsender Kaninchen. *Doctoral diss. UB Giessen*.
- Morisse J.P., Boilletot E., Martrenchar A. 1999. Preference testing in intensively kept meat production rabbits for straw on wire grid floor. *Appl. Anim. Behav. Sci.*, 64(1), 71-80.
- Maertens L., de Goote G. 1984. Infl. of the number of fryer rabbits p. cage on their perf.. *J.Appl Rabbit Res.*, 7(4), 151-155.
- Maertens L., Van Herck A. 2000. Performance of weaned rabbits raised in pens or in classical cages: first results. *World Rabbit Sci.*, 8(1), 435-440.
- Maertens L., Van Oeckel M. J. 2001. Effet du logement en cage ou en parc et de son enrichissement sur les performances et la couleur de la viande des lapins. In *French rabbit days*, 31-34.
- Princz Z., Dalle Zotte A., Metzger S., Radnai I., Biró-Németh E., Orova Z., Szendrő Z. 2009. Response of fattening rabbits reared under different housing conditions. 1. Live performance and health status. *Livest. Sci.*, 121(1), 86-91.
- Rommers J., Meijerhof R. 2010. Effect of group size on performance, bone strength and skin lesions of meat rabbits housed under commercial conditions. *World Rabbit Sci.*, 6(3-4), 299-302.
- Rommers J., de Jong I. 2011. Tech. Note: Plastic mats prev. footpad injuries in rabbit does. *World Rabbit Sci.*, 19(4), 233-237.
- Szendrő Zs., Princz Z., Romvári R., Locsmáncsi L., Szabó A., Bázár Gy., Radnai I. Biró-Németh E., Matics Zs. Nagy, I. 2009. Effect of group size and stocking density on productive carcass, meat quality and aggression traits of growing rabbits. *World Rabbit Sci.*, 17(3), 153-162.
- TierSchNutzV 2014. Tierschutz-Nutztierhaltungsverordnung (TierSchNutzV). <http://www.bmel.de/SharedDocs/ExterneLinks/Rechtsgrundlagen/T/Tierschutz-Nutztierhaltungsverordnung.html>.

=====