

PERFORMANCE OF RABBIT DOES IN CAGES WITH OR WITHOUT ELEVATED PLATFORM OR PLASTIC FOOTREST

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ABSTRACT

The aim of the study was to compare the production of does housed in conventional flat-deck cages (with or without footrest) or in two types of enlarged cages equipped with platform (wire-mesh or plastic-mesh platform). Altogether 108 crossbred female rabbits were randomly sorted to four groups of different cage types: CN: common wire-mesh flat-deck cage (86 x 38 x 30 cm) (n=30); CF: cage similar to the CN cage but with footrest (n=30); ECPF: enlarged cage (102.5 x 38 x 61cm) with wire-mesh platform, the cage floor was wire-mesh with a plastic footrest and the size of platform was 28.5 x 38 cm (n=24). EECP: extra enlarged cage (102.5 x 52.5 x 97 cm) with plastic-mesh platform, the cage floor was wire-mesh and the size of platform was 41.5 x 52.5 cm (n=24). The results of five subsequent productive cycles were evaluated. Sore hock on the hind legs was examined at each insemination. Pregnancy rates and the litter size (total, alive, at 21 and 35 days of age) of the groups were not different. The weight of does at kindling was the highest in CF group and the lowest in the CN cage (P<0.001). Significant differences in litter- and individual weights were observed. In the enlarged cages the litter weight at 21 days was significantly higher than that of CN group (3576 and 3516g vs 3291g, resp., P<0.001). For the litter weight at day 35 significant differences were only recorded between the EECP and CN does (P<0.05). Individual body weights at 21 and 35 days were also higher in enlarged cages than that in the small cages (P<0.001). The does with severe sore hock had lower kindling rate. Both plastic platform and footrest had positive effect on the prevention of footpad injuries. The incidence and severity of sore hock were the lowest in EECP group and the highest in CN cages. Based on the larger individual and litter weight and lower incidence of sore hock, housing of rabbit does in enlarged cages with platform seems advantageous. The presence of a footrest to standard cages had only a positive effect on the incidence and severity of sore hocks.

Key words: Rabbit does, housing, platform, footrest, reproductive performance.

INTRODUCTION

The size and shape of the rabbit does' cages can be considered as an important issue from the animal welfare aspect. It is often noted that the breeding cages are too small, uncomfortable and do not provide enough space for the rabbits for carrying out locomotory behaviours. Enlarging the cages or enriching them with platform can be a good solution for the above mentioned problems (Finzi *et al.*, 1996; Rommers and Meijerhof, 1998; Mirabito *et al.*, 1999, 2005; Margarit and Finzi, 2000; Barge *et al.*, 2008). Increasing the size of breeding cages horizontally or vertically (using of an elevated platform) could offer a more comfortable housing and more possibility for locomotion for rabbit does (EFSA, 2005). Moreover, they suppose that in cages with platform the does can avoid the nursing contact of their kits after leaving the nest box. However the results of experiments carried out so far have not demonstrated the benefit of larger cages or the elevated platform. In larger or higher cages the productive performances of the does did not improve (Rommers and Meijerhof, 1998; Mirabito *et al.*, 2005). Equipping the cages with platform generally had no effect on production (Mirabito *et al.*, 1999; Mirabito, 2002). Nevertheless, according to Barge *et al.* (2008) litter size, body weight of the does, litter and individual weight of the kits increased significantly in cages with platform, however,

the pregnancy rate substantially decreased, and the number of kits at 19 d per insemination was larger in the cages without platform.

The aim of that study was to compare the conventional flat-deck cages (with or without footrest) with two different types of enlarged cages with wire-net or plastic-net platform.

MATERIALS AND METHODS

Animals and experimental design

Altogether 108 crossbred female rabbits were used in the experiment which was conducted at the Kaposvár University. The temperature was between 15 and 17 °C, and the lighting schedule was 16 hours light and 8 hours dark. The animals were fed *ad libitum* a commercial pellet (DE: 11.1 MJ/kg, crude protein: 18.0 %, crude fibre: 15.0 %). Water was also available *ad libitum* from nipple drinkers. Does were first mated at 16.5 weeks of age. Artificial insemination (AI) was applied 11 d *post partum* (42 d reproductive rhythm, single batch system). The does did not receive hormonal treatment or biostimulation to induce of oestrus. Litter size of first parity was standardized to eight kits, and to ten for the subsequent parities. Cross-fostering was practiced within groups. Rabbit does with bad sanitary conditions or remaining non-pregnant after two successive inseminations were culled. No replacement was applied. The results of five subsequent kindlings were evaluated.

Female rabbits were randomly allocated into four groups with different cage types:

CN: common wire-mesh (wire diameter of the floor was 2 mm and the hole size of wires was 48 x 10.5 mm) flat-deck cage (86 x 38 x 30 cm, including the 25 x 38 cm floor sized nest box) (n=30);

CF: similar cage to the CN cage but with plastic footrest (40 x 25 cm, width of the plastic-mesh: 17 mm; hole size: 64 x 12 mm) (n=30);

ECPF: enlarged cage (102.5 x 38 x 61cm, included the 25 x 38 cm floor sized nest box) with wire-mesh platform, the cage floor was wire-mesh (wire diameter: 2.5 mm, hole size of wires: 60 x 12.5 mm), the platform (28.5 x 38 cm) was 26.5 cm above the cage floor, a plastic footrest (40 x 25 cm, width of the plastic-mesh: 17 mm, hole size: 64 x 12 mm) was on the lower level (n=24);

EECP: extra enlarged cage (102.5 x 52.5 x 97 cm included the 21.5 x 52.5 cm nest box) with plastic-mesh platform, the cage floor was wire-mesh (wire diameter: 3 mm, the hole size of wires: 73 x 12 mm), the size of platform was 41.5 x 52.5 cm, 25 cm above the cage floor (width of the plastic-mesh: 16 mm; hole size: 60 x 13 mm) (n=24).

The body weight of rabbit does at kindling, the kindling rate, the number of born kits, the born alive and stillborn, the litter size and litter weight at 21 and 35 days of age, the individual body weight at 35 d and the mortality between birth and weaning were recorded. The individual body weight at 21 days was calculated. Sore hock on the hind legs was evaluated at each insemination. The incidence of sore hock was scored according to De Jong *et al.* (2008): 0= intact foot pads; 1= no hairs, callus formed (<2.5 cm); 2= no hairs, callus formed (>2.5 cm); 3= callus opened, cracks have been found; 4= wounds. Sore hock of rabbit does showing scores 3 or 4, were treated with Cyclo Spray. The reproductive performances of does (kindling rate, litter size, litter and individual weight) with sore hock scores 0, 1-2 and 3-4 were compared.

Statistical Analysis

All statistical analyses were carried out using SAS 9.1 software package. The production data (measured in different cage types) were analyzed using the general linear model for the analysis of variance (GLM). The effect of sore-hock on the productive performance was evaluated by means of one-way ANOVA.

Kindling rates and mortality were compared by χ^2 test.

RESULTS AND DISCUSSION

Productive performances are summarized in Table 1.

The kindling rate, litter size (born total and alive, stillborn, at 21 and 35 d) and kit's mortality were not significantly influenced by the different cage types. Difference was found in weight of does between groups CN and CF ($P<0.001$). There were not significant differences between the two conventional cages and between the two enlarged cages in litter and individual weight, but the litter weight at 21 d was higher in enlarged cages than in CF group ($P<0.001$), and at 35 d the difference was significant only between groups CF and EECP. The individual weight at 21 and 35 d were higher in enlarged cages than in conventional cages ($P<0.001$). Most of our results were in agreement with that of the literature (Finzi *et al.*, 1996; Rommers and Meijerhof, 1998; Mirabito *et al.*, 1999, 2005; Margarit and Finzi, 2000). Contrary to Barge *et al.* (2008), no substantial differences were found for the kindling rate. However, the superiority of the litter and individual weight in enlarged cages with platform compared to conventional cages was only observed in our study. This finding could be explained by the fact that does can avoid nursing their kits by reaching the platform. However, this explanation is not straightforward. Mirabito (2002) observed that in the cages with platforms the occurrence rate of nursing did not decreased. According to Mikó *et al.* (2012), the does visited the platform more frequently after the kits have left the nest box, but after the age of 3 weeks the kits also visited the platform with an increased ratio and as a result, the does stayed on the platform less frequently.

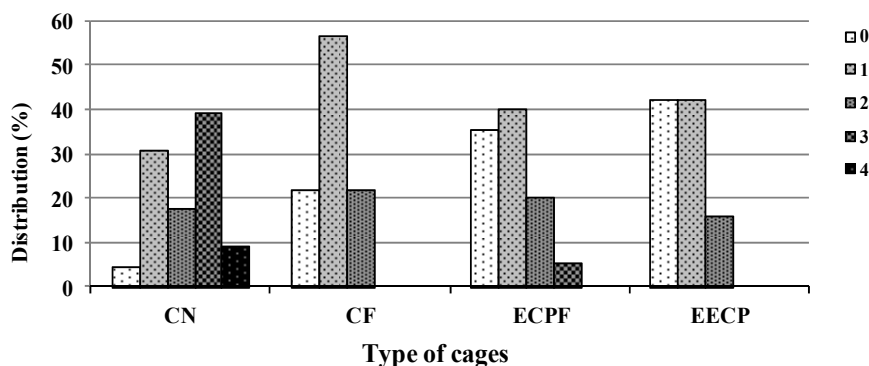
Table 1: The performance of rabbit does in different cage types

Traits	Cage types				Prob.
	CN	CF	ECPF	EECP	
Number of kindlings	103	110	93	85	-
Weight of does at kindling (g)	4337 ^a	4094 ^b	4193 ^{ab}	4267 ^{ab}	<0.001
Kindling rate (%)	80.2	82.9	81.7	76.4	0.634
<i>Litter size</i>					
Total born	11.0	11.5	11.4	11.2	0.548
Stillborn	0.59	0.52	0.5	0.63	0.678
Born alive	10.4	10.9	10.9	10.5	0.376
at 21 d	8.96	8.93	8.78	8.95	0.674
at 35 d	8.79	8.60	8.56	8.78	0.494
<i>Litter weight (g)</i>					
at 21 d	3400 ^{ab}	3291 ^b	3516 ^a	3576 ^a	<0.001
at 35 d	8309 ^{ab}	8060 ^b	8463 ^{ab}	8712 ^a	0.016
<i>Individual body weight (g)</i>					
at 21 d	379 ^b	372 ^b	402 ^a	401 ^a	<0.001
at 35 d	944 ^b	942 ^b	988 ^a	990 ^a	<0.001
<i>Mortality of kits (%)</i>					
0- 21 d	7.5	6.8	7.0	4.8	0.148
0- 35 d	10.2	9.9	8.9	6.9	0.089

CN=flat-deck cages without footrest, CF=flat-deck cages with footrest, ECPF=pens with wire-mesh platform and footrest on the bottom level, EECP=pens with plastic-mesh platform. Means with different letters on the same row differ significantly at $P<0.05$.

At the beginning of the experiment sore hocks were not observed. The incidence of sore hock and their severity increased with the age. At the last period of examination (at the 5th AI) the most severe sore hocks were observed in CN cages (no footrest) (Figure 1). The most favourable results were observed in the EECP group (no footrest, but the platform made of plastic mesh): 85 % of the rabbits had no or only slight injuries (score 0 and 1), while no severe injuries (score 3 or 4) were detected. In cages with footrest (CF and ECPF) problems of sore hock were not serious. According to the observation of Mikó *et al.* (2012) does spend more time on the most comfortable place: on the plastic-mesh platform in

EECP cages and on the lower level (with footrest) in ECPF cages. Similarly to previous results (De Jong *et al.*, 2008; Rosell and de la Fuente, 2009; Rommers and de Jong, 2011) plastic footrests had an effect on the prevention of footpad injuries. It seems that the plastic-mesh platform or footrests are the best option from the animal welfare viewpoint.



0= intact foot pads; 1= no hairs, callus formed (<2.5 cm); 2= no hairs, callus formed (>2.5 cm); 3= callus opened, cracks have been found; 4= wounds. CN=flat-deck cages without footrest, CF=flat-deck cages with footrest, ECPF=pens with wire-mesh platform and footrest on the bottom level, EECP=pens with plastic-mesh platform.

Figure 1: The scale of rabbit does in each type of cages with different levels of sore hock at the 5th AI

Reproductive performance of does was also evaluated according to the severity of sore hocks (Table 2).

Table 2: Effect of severe of sore hock on reproductive performance of rabbit does (2nd- 5th parities)

	Scores of footpad injuries			P
	0	1-2	3-4	
Number of inseminations	176	159	39	-
Kindling rate (%)	76.1 ^b	74.2 ^{ab}	61.5 ^a	<0.05
Number of kits born total	11.8	11.2	12.1	0.181
Number of kits born alive	11.2	10.7	11.6	0.337
Number of kits stillborn	0.63	0.38	0.5	0.159
After equalization	10	10	10	-
Litter size at 21 d	8.94 ^a	9.39 ^b	9.54 ^{ab}	0.008
Litter weight at 21 d (g)	3570	3635	3679	0.546
Mortality 0-21 d (%)	10.6 ^b	6.1 ^a	4.6 ^a	<0.01

^{a, b} Means with different letters on the same row differ significantly at P<0.05 level.

The kindling rate was the lowest for does showing sore hock score 3-4 (P<0.05). When callus was opened and cracks have been formed, footpads were treated to prevent pain and suffering, and also to avoid decreasing reproductive performance. The litter size at birth was not influenced by severe sore hock. In a contrast and surprisingly, the litter size at 21 days and consequently the mortality between birth and 21 days were depressed in group of sore hock score 0. This could be by an increasing production between the 2nd and 5th parities, while the risk and severity of footpad injuries also increased. There were no significant differences in the other reproductive traits (litter size total, born alive, stillborn, litter weight at 21d).

CONCLUSION

Based on the larger individual and litter weight, and lower incidence of sore hock, housing of rabbit does in enlarged cages with plastic-mesh platform or with footrest seems advantageous. The presence of a footrest did not improve the performance of the does but reduced the severity of sore hock problems.

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REFERENCES

- Barge P., Maseru G., Chocco R. 2008. Raising rabbit does in platform cages. *In Proc. 9th World Rabbit Congress, Verona, 1153-1157.*
- De Jong I., Reimert H., Rommers J. 2008. Effect of floor type on footpad injuries in does: a pilot study. *In Proc. 9th World Rabbit Congress, Verona, Italy, June 10-13, 2008. 1171-1175.*
- EFSA (European Food Safety Authority) 2005. The impact of the current housing and husbandry systems on the health and welfare of farmed domestic rabbits. *EFSA Journal, 137.*
- Finzi A., Margarit R., Calabrese A. 1996. A two-floor cage for rabbit welfare. *In Proc. 6th World Rabbit Congress, Toulouse, 423-424.*
- Margarit R., Finzi A. 2000. Setting of feeders, waterers and nest-boxes in two-floor cages for animal welfare. *In Proc. 7th World Rabbit Congress, Valencia. 553-557.*
- Mirabito L., Buthon L., Cialdi G., Galliot P., Souchet C. 1999. Effet du logement des lapines en cages rehaussées avec plateforme: Premiers résultats. *8^{èmes} Journées de la Recherche Cunicole, Paris, 67-70.*
- Mirabito L. 2002. Le bien-être des lapins: impact de nouveaux systèmes de logement. *10^{èmes} Journées de la Recherche Cunicole, Paris, 163-172.*
- Mirabito L., Galliot P., Souchet C. 2005. Effet de la surface disponible et de l'aménagement des cages sur les performances zootechniques et le comportement des lapines. *11^{èmes} Journées de la Recherche Cunicole, Paris, 61-64.*
- Mikó A., Matics Zs., Gerencsér Zs., Radnai I., Odermatt M., Nagy I., Szendrő Zs. 2012. Location preference of lactating rabbit does and their kits in cages with elevated platform. *In Proc. 10th World Rabbit Congress, Sharm El-Sheikh, Egypt (in press)*
- Rommers J., Meijerhof R. 1998. La dimension de la cage influence-t-elle la productivité et le bien-être des lapins? *Cuniculture 140, 67-72.*
- Rommers J., de Jong I. 2011. Technical note: Plastic mats prevent footpad injuries in rabbit does. *World Rabbit Sci., 19 (4), 233-237.*
- Rosell J., de la Fuente L. 2009. Effect of footrests on the incidence of ulcerative pododermatitis in domestic rabbit does. *Animal Welfare, 18: 199-204.*