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WITH AND WITHOUT MULTILEVEL PLATFORMS**

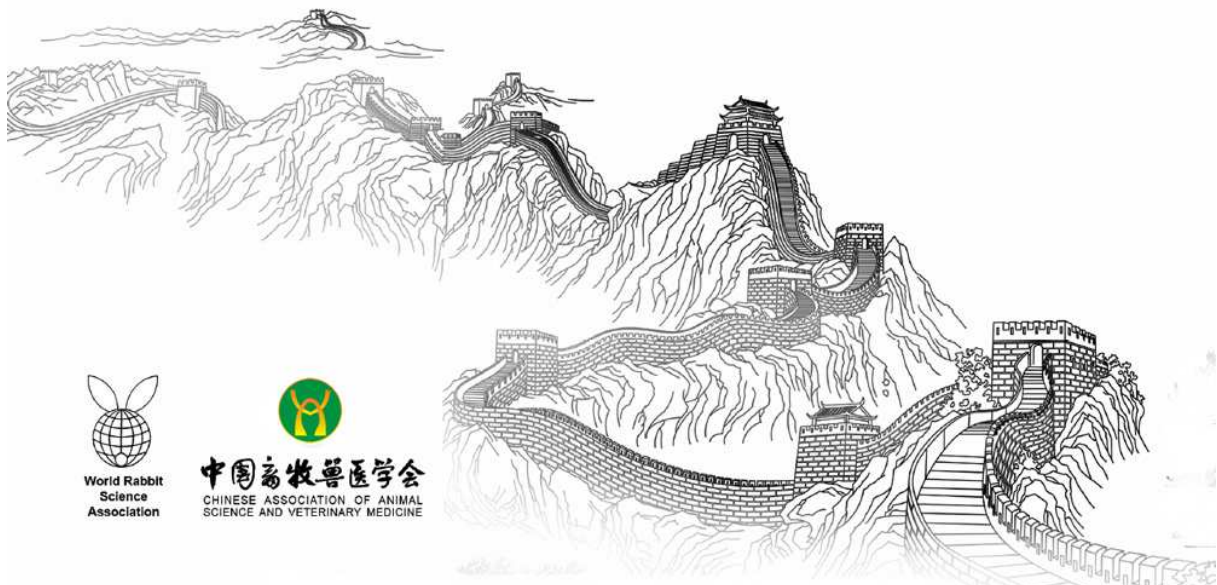
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PRODUCTION OF GROWING RABBITS IN LARGE PENS WITH AND WITHOUT MULTILEVEL PLATFORMS

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ABSTRACT

The experiment was conducted at the Kaposvár University using the maternal line (Pannon Ka) of the Pannon Breeding Program. A total of 174 rabbits of both sexes, weaned at 5 weeks of age were studied. They were randomly divided into three groups: 2 pens without platform, 2 pens with two-level wire-mesh elevated platforms, 2 pens with two-level plastic-mesh elevated platforms. The size of each pen was 1.0 x 1.83 m (29 rabbits/pen, 16 rabbits/m² calculated for bottom level or 9.14 rabbits/m² calculated with the surface of platforms). Body weight, weight gain, feed intake, feed conversion ratio, morbidity and mortality were not significantly different among the groups. It can be concluded that the enriched pens, the greater possibilities for movement (using platform), the lower stocking density did not influence the production of growing rabbits.

Key words: Growing rabbit, Housing, Elevated platform, Productive traits, Large pen.

INTRODUCTION

Sometimes there are conflicts between farmers, people's expectations, recommendations of animal protection organizations and the needs of rabbits. In previous years, in some countries (e.g. in Italy and Hungary) the common practice was to house growing rabbits in pairs in bicellular cages (Trocino and Xiccato, 2006) because it gave better health status (Verga *et al.*, 2007) and growth performance than housing them in larger groups (Trocino and Xiccato, 2006; Princz *et al.*, 2009; Xiccato *et al.*, 2013). However, the European Food and Safety Authority (EFSA, 2005) proposed the group housing system (>3 rabbits/cage) with maximum 16 rabbits/m² (40 kg/m²) stocking density. Szendrő and Dalle Zotte (2011) suggested housing a litter (8-10 kits) in a cage or in a pen.

One possibility to increase group size on the same floor size and maintaining low stocking density is installing elevated platforms, which was also recommended to provide environmental enrichment (de Jong *et al.*, 2011). The elevated platform in combination with a low stocking density resulted in a higher feed intake and better daily weight gain during early fattening period (Maertens *et al.*, 2004), but the results of Lang and Hoy (2011) showed that the usage of an elevated platform did not affect the weight gain, mortality and occurrence of body lesions on the growing rabbits. Until now, only a few papers have been published comparing the effect of different platform materials on productive performance and behaviour of growing rabbits (Lang and Hoy, 2011; Szendrő *et al.*, 2012; Matics *et al.*, 2014a). Most of the researches have focused only on the floor material of the cages, comparing wire-mesh, plastic-mesh, steel-slat and plastic-slat floors (Trocino *et al.*, 2008; Princz *et al.*, 2009).

The objective of the experiment was to examine the productive performance of growing rabbits housed in different types of pens (with or without wire-mesh or plastic-mesh elevated platforms).

MATERIALS AND METHODS

Animals and experimental design

The experiment was conducted at the rabbit farm of Kaposvár University using the maternal line (Pannon Ka) growing rabbits of the Pannon Breeding Program (Matics et al., 2014b). The temperature was 15-18 °C and 16-hour lighting was used. The rabbits were fed *ad libitum* with commercial pelleted diets (between 5 and 9 weeks of age: 9.6 MJ DE/kg, 16.1% CP, 2.7% EE, 18.5 % CF and medicated with 1 ppm Clinacox (diclazuril), 500 ppm OTC, 50 ppm Tiamulin; and between 9 and 11 weeks of age: 9.7 MJ DE/kg, 17.0% CP, 3.0% EE, 18.0% CF, without medication), and water was available from nipple drinkers (5 drinkers/pen). A total of 174 rabbits of both sexes (1:1) were weaned at 5 weeks of age. They were randomly divided into three groups (58 rabbits/group) and distributed into six pens (1.0 x 1.83 m) with wire-mesh floor and walls (29 rabbits/pen, 2 pens/treatment). The thickness and hole size of wire-mesh floor were 2.5 mm and 10.7 x 49.6 mm, respectively. The pens only differed in the presence or not and the material of platforms.

Pens without platform (NoP): The stocking density was 16 rabbits/m².

Pens with wire-mesh platforms (WP) were equipped with seven elevated platforms which were placed on two levels: three platforms on the first level (one of 0.35 m² and two of 0.165 m² surface area) inserted 25 cm above the floor, and four platforms on the second level (each 0.165 m²) placed 50 cm above the floor. The total area of platforms was 1.34 m², the floor area under the platforms was 1.15 m², and it was 0.68 m² in front of the platforms. The stocking density was 16 rabbits/m² (calculated on the floor area) and 9.14 rabbits/m² (when the areas of platforms were included). The platforms were made of wire-mesh (wire: 2.05 mm thick, hole size: 10.9 x 23.5 mm).

Pens with plastic-mesh platforms (PP). The number, size and position of plastic-mesh platforms were similar to the platforms in the WP pens. The plastic-mesh was 4.5 mm thick and the diagonal hole size 14.5 x 23 mm.

Measurements and sampling

Individual body weight and feed intake per pen were measured weekly (between 5 and 11 weeks of age), daily weight gain and feed conversion ratio were calculated. Injuries (on ears and genitals) and morbidity (animals with health problems, e.g. diarrhoea) were recorded once a week, at the time of weighing. Mortality was registered daily. 24-h-pool-faeces samples of each pen were collected at 7, 9 and 11 weeks of age to evaluate the corticosterone metabolite concentration. Assays were done at the Veterinary Faculty of Szent István University (Hungary), using a slight modification of the method described by Palme et al. (1999).

Statistical Analysis

Body weight and weight gain were evaluated by means of multi-factor analysis of variance (treatment and replication), and concentration of corticosterone metabolites, feed intake and feed conversion ratio were evaluated by one-factor ANOVA, morbidity, mortality and ratio of injured rabbits were evaluated by chi square test using the SPSS 10.0 software package.

RESULTS AND DISCUSSION

The body weight, weight gain, feed intake, feed conversion ratio, morbidity and mortality were not affected by the housing system (Table 1). Maybe the elevated platforms did not modify substantially the locomotors activity, because rabbits could also have the possibility to move a lot in pens without platforms. The material of the platforms had no significant influence on productive performance, which result is similar to findings of Matics *et al.* (2003), Trocino *et al.* (2004), Princz *et al.* (2009) who pointed out that floor type had no effect on productive performance of rabbits.

Table 1: Effect of housing system on productive performance of growing rabbits between 5 and 11 weeks of age

Traits	Groups			SE	Prob.
	NoP	PP	WP		
n	58	58	58		
Body weight at 11 wk, g	2426	2387	2408	17.5	0.646
Weight gain, g/day	36.6	35.9	36.4	0.36	0.703
Feed intake, g/day	139	139	135	0.84	0.119
Feed conversion ratio	3.79	3.87	3.72	0.04	0.258
Morbidity, %	26.9	25.0	21.4	-	0.879
Mortality, %	6.9	3.4	3.4	-	0.594

NoP: Pens without platform, PP: Pens with plastic-mesh platforms, WP: Pens with wire-mesh platforms

No significant differences were found in concentration of corticosterone metabolites in faeces among the groups (Table 2). However, significantly higher values were measured at the ages 7 and 9 week than at 11 week in NoP and WP pens ($P < 0.05$ and $P < 0.001$, respectively) which tendency was similar in PP group, without significant difference.

Table 2: Effect of housing system on concentration of cortisol metabolites in faeces (nmol/g)

Age, week	Groups			SE	Prob.
	NoP	PP	WP		
7	27.4 ^b	27.6	27.4 ^b	0.64	0.994
9	28.6 ^b	28.2	28.3 ^b	0.46	0.947
11	23.7 ^a	25.0	23.6 ^a	0.42	0.341
SE	0.80	0.60	0.62		
Prob.	0.021	0.068	<0.001		

NoP: Pens without platform, PP: Pens with plastic-mesh platforms, WP: Pens with wire-mesh platforms

^{a,b}: different superscripts within a column show significant differences ($P < 0.05$)

The percentage of injured rabbits was not affected by the pen type, and no sign of aggressiveness was observed at 6, 10 and 11 week of age in any group (Table 3). The aggressiveness occurs at the age when starting the sexual maturity, and the frequency of aggressive rabbits could be between 1 and 2% (Szendrő and Dalle Zotte, 2011).

Table 3: Effect of housing system on percentage of injured rabbits, %

Age, week	Groups			Prob.
	NoP	PP	WP	
n	58	58	58	
6	0	0	0	1.000
7	5.2	3.4	3.4	0.862
8	0	1.7	0	0.368
9	0	1.7	0	0.368
10	0	0	0	1.000
11	0	0	0	1.000

NoP: Pens without platform, PP: Pens with plastic-mesh platforms, WP: Pens with wire-mesh platforms

In other experiments higher percentages of injured rabbits were observed in larger groups (Bigler and Oester, 1996; Szendrő *et al.*, 2009). It seems that in the present experiment there were no aggressive rabbits in the groups.

CONCLUSIONS

It can be concluded that the enriched pens with wire-mesh or plastic-mesh elevated platforms, the greater possibilities for movement, the lower stocking density did not influence the production, stress hormone level and aggressiveness of growing rabbits. For more reliable results further replications should be carried out.

ACKNOWLEDGEMENTS

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AIM

The objective of the experiment was to examine the productive performance of growing rabbits housed in pens with or without wire-mesh or plastic-mesh elevated platforms.

MATERIAL AND METHODS

A total of 174 growing rabbits were randomly divided into three groups (58 rabbits/group; 29 rabbits/pen, 2 pens/treatment):

➤ **Pens without platform (NoP):** Stocking density: 16 rabbits/m².

Pens with platforms: three platforms on the first level, four platforms on the second level. Stocking density calculated on the floor without platforms: 16 rabbits/m² and with platforms: 9.14 rabbits/m²:

➤ **Pens with wire-mesh platforms (WP).**

➤ **Pens with plastic-mesh platforms (PP).**



Figure 1: Pens with wire-mesh and plastic mesh platforms

RESULTS

Table 1: Productive performance of growing rabbits between 5 and 11 weeks of age

Traits	Groups			SE	Prob.
	NoP	PP	WP		
n	58	58	58		
Body weight at 11 wk, g	2426	2387	2408	17.5	0.646
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11	23.7 ^a	25.0	23.6 ^a	0.42	0.341
SE	0.80	0.60	0.62		
Prob.	0.021	0.068	<0.001		

The platform and its material had no significant influence on productive performance (*Table 1*), on concentration of corticosterone metabolites in faeces (*Table 2*), and on percentage of injured rabbits (*Table 3*).

Table 3: Effect of housing system on percentage of injured rabbits, %

Age, week	Groups			Prob.
	NoP	PP	WP	
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CONCLUSION

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