LOCATION PREFERENCE OF RABBIT DOES IN A PEN SYSTEM COMBINING GROUP AND INDIVIDUAL HOUSING

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ABSTRACT

The aim of the experiment was to test the preference of rabbit does in a special pen system of combination of group and individual housing. The experiment was conducted at Kaposvár University with multiparous pregnant and lactating Pannon White rabbit does (n=48). The 1.83 x 2.00 m open top pen consisted of four individual cages (0.5 x 0.91 m) which were connected to the 1.83 x 1.00 m common area throughout a 0.25 m long and 0.20 m wide lockable corridor. The rabbit does were randomly divided into three groups (3 experimental units per group). The groups differed in the material of walls of the individual cages: pen with solid wall cages (Solid, n=16); pen with wire-mesh wall cages (Wire, n=16) and pen with two solid and two wire-mesh wall cages (Mix, MP, n=16). Four rabbit does were placed into one of the closed individual cages 3 days before the expected parturition for 21 days. Day 18 after kindling the entrances of the individual cages were opened, and a 21-day group-housing started. During this period, 4 does and their kits in each pen could use all individual cages and the common area freely. The kits were weaned at 35 days of age. The injuries on ears, and body of does were checked on days 2, 4, 8, 14 and 22 after grouping. The 24-h video recordings were made on days 1, 2, 3, 7 and 13 after opening the doors, and location of does was registered at every 15 min. On day 1, rabbit does preferred to stay alone than together (Solid: 62.3%; Wire: 64.3%; Mix: 82.8%). Later on, less rabbit does located alone (on day 13: Solid: 30.8%; Wire: 51.0%; Mix: 39.2%). On day 1 in all pens the majority of the does located in the individual cages (Solid: 77.3%; Wire: 76.8%; Mix: 83.9%), however later the percentage of does in the individual cages decreased until day 13. At almost every day less rabbit does preferred the individual cages in the Solid than in Wire or Mix group. The ratio of injured rabbits was higher than 50% in each system. Based on the results it can be concluded that the main problems of group housing of does (aggressiveness, injuries) have not been solved in this system.

Keywords: rabbit does, group housing, location preference, aggressive behaviour

INTRODUCTION

Nowadays, the rabbit does are usually kept individually (EFSA, 2005). The main problem with the group housing is the high level of aggression and the high proportion of the injured rabbits and the decrease of the lifespan of the rabbit does. These are the reasons why the group housing of rabbit does is contrary to animal welfare (Szendrő et al., 2016, 2019). Using semi-group housing method, Maertens et al. (2011) and Maertens and Bujis (2015) achieved almost similar production performance as in the individual system, but the number of injuries was very high after regrouping. At the same time some experiments examined the opportunity of the decreasing of aggressiveness with special technological elements and environmental enrichment (Rommers et al., 2011; 2013; 2014), or with special methods of regrouping (Graf et al., 2011, Andrist et al., 2012), but there is no solution of the problem yet. In the present study, a combination of individual and group housing was tested, with four individual cages in addition to the common area. In this paper, the location of the rabbits does is presented.

MATERIALS AND METHODS

The study was carried out at the Kaposvár University. The room temperature was in the rage 15-18ºC and the daily lighting was 16 hours (6:00-22:00). The commercial pelleted diet and the water were available freely for the rabbits.
The pens with 3.66 m^2 of basic area (2.0 x 1.83 m) were divided into four individual cages of 0.5 x 0.91 m and a common area (1.0 x 1.83 m) which were connected by a 0.25-m long and 0.2-m wide corridors. Each cage had one feeder and one nipple drinker, and the common area had eight nipple drinkers and two 0.35 m wide feeders. A nest-box (0.37 x 0.21 m) also belonged to each cage.
Based on the material of the cage walls three groups were formed:
Pen with solid walls (Solid, SP; n = 16 individual cages): the side walls of the individual cages were made of plastic sheet, which prevented visual contact between does staying in different parts of pen. **Pen with wire net walls** (Wire, WP; n = 16): the side walls of the four individual cages were made of 25 x 50 mm spot welded wire mesh (allowed visual contact). **Mixed pen** (Mix, MP; n = 16): the side walls of two individual cages were made of plastic sheet and of the other two cages the walls were made of wire mesh.
A pregnant multiparous Pannon White female rabbit (12 pens, 48 does) was put into each individual cage, 3 days prior to expected parturition. At this time the door of the cages were closed. After litter equalization, all does nursed 10 kits. Free suckling was used. The rabbit does were artificially inseminated on the 11th day after parturition (42-day reproduction rhythm). On day 18 after parturition, the doors of individual cages were opened and the four does and their kits freely used the common area and all individual cages. From that time, the entrance of the nest boxes was narrowed, so only the kits could enter it. This allowed the kits to hide from any aggressive does into the nest box. The experiment was repeated four times. In each repetition, new pregnant rabbit does were used. (i.e. the group changed from one repetition to another).
Using infrared cameras (KPC-S50 NV, B/W CCD) and a special software (GeoVision GV-800 System, Multicam Surveillance System 6.1), 24-hour video recordings were made on days 1, 2, 3, 7 and 13 after grouping. The rabbit does were individually marked with animal marker ink with different marks. Based on the recordings the location preference of rabbit does was analysed. The location preference of rabbit does and the proportion of injuries were evaluated by the Likelihood Ratio test using SPSS 10.0. software package.

RESULTS AND DISCUSSION

On the first day after grouping the proportion of does staying alone was twice the proportion of those staying together in the Solid and Wire groups and more than four times in the Mix pen (Table 1). At every day, the highest proportion of does staying together was in the Solid pen (higher than 50% from day 2); the lowest was in the Mix group. The rate of staying together increased in each group with the days after grouping. Similar tendencies were observed in a previous study testing non-pregnant rabbits (Farkas et al., 2017).
The explanation for the results may be that the unfamiliar rabbits meetings may cause aggression (Mykytowycz and Hesterman, 1974), so the rabbits avoid each other's company in this period of life. After the emergence of the dominance order, the number of aggressive interactions decreases (Verga, 2000), and the rabbits are more likely to be together.

A similar tendency was observed with regards to the use of individual cage area or common area (Table 2). In all pens, the location of does in individual cages was the highest on day 1, and it decreased continuously with the days after grouping. However, in the Solid group, from day 7 after grouping, the use of common area was higher than that of the individual cages. In a previous study with non-pregnant rabbits, similar results were obtained (Farkas et al., 2017).

Table 1: Location of rabbit does: staying alone or together (%), depending on the pen type and the observation days after grouping of does

Days	Type of pen									
	Solid			Wire			Mix			Prob.
	Alone	Together	Prob.	Alone	Together	Prob.	Alone	Together	Prob.	Pen
n		16			12			16		
1	62.3^{aD}	37.7	<0.001	64.3^{aB}	35.7	<0.001	82.8^{bD}	17.2	<0.001	<0.001
2	47.3^{aC}	52.7	0.003	61.3^{bB}	38.7	<0.001	66.3^{cC}	33.7	<0.001	<0.001
3	46.9^{aC}	53.1	< 0.001	49.9^{aA}	50.1	0.942	55.9^{bB}	44.1	<0.001	<0.001
7	41.5^{aB}	58.5	<0.001	50.3^{bA}	49.7	0.709	50.1^{bB}	49.9	0.942	<0.001
13	30.8^{aA}	69.2	<0.001	51.0^{cA}	49.0	0.264	39.2^{bA}	60.8	<0.001	<0.001
Prob.	<0.001			<0.001			<0.001			

$^{a, b, c}$ indicates significant differences among the different types of pens (P<0.05); $^{A, B, C, D}$ indicates significant differences among days after regrouping the does within pen type (P<0.05).

According to some authors, the visual contact is very important for rabbits to see rabbits (Negretti et al., 2008; Seaman et al., 2008) or a mirror image (Dalle Zotte et al., 2009). This could be the reason for which the rabbit does preferred more the common area in the Solid group than in the other two groups when visual contact was possible through the wire net walls.

Table 2: Location preference of does in individual cages and common area (%), depending on the pen type and the observation days after grouping of does

Days	Type of pen									Prob.
	Solid			Wire			Mix			
	I^1	C^2	Prob.	I^1	C^2	Prob.	I^1	C^2	Prob.	Pen
n		16			12			16		
1	77.3^{aE}	22.7	< 0.001	76.8^{aD}	23.2	< 0.001	83.9^{bD}	16.1	< 0.001	< 0.001
2	65.7^{aD}	34.3	< 0.001	74.6^{cCD}	25.4	< 0.001	69.5^{bC}	30.5	< 0.001	< 0.001
3	61.6^{aC}	38.4	< 0.001	71.7^{bC}	28.3	< 0.001	62.8^{aB}	37.2	< 0.001	< 0.001
7	47.2^{aB}	52.8	0.002	62.7^{bB}	37.3	< 0.001	60.9^{bB}	39.1	< 0.001	< 0.001
13	37.0^{aA}	63.0	< 0.001	56.8^{bA}	43.2	< 0.001	55.5^{bA}	44.5	< 0.001	< 0.001
Prob.	< 0.001			< 0.001			< 0.001			

[1]I: individual cage [2]C: common area; $^{a, b, c}$ indicates significant differences among the different types of pens (P<0.05); $^{A, B, C, D}$ indicates significant differences among the different days and periods of day within pen type (P<0.05).

The ratio of injured does during the whole period was more than 50% in all pens. The proportion of injuries due to aggressive behaviour was higher in the Solid group on the days 2, 4 and 8 and on the whole experimental period, but the differences were not significant (Table 3). In contrast, in a previous experiment with non-pregnant rabbits (Farkas et al., 2017), the proportion of injured rabbits was higher in the Mix group, but in that experiment the percentage of injured rabbits was lower than 50%.

Table 3: Ratio of injured rabbits (%), on different experimental days

Days	Type of pen			
	Solid	Wire	Mixed	Prob.
n	16	16	16	
2	37.5^{B}	25.0	25.0	0.674
4	18.8^{B}	18.8	6.3	0.469
8	12.5^{AB}	0.0	0.0	0.102
14	0.0^{A}	6.3	12.5	0.234
22	0.0^{A}	6.3	12.5	0.234
Total	**68.7**	**56.2**	**56.2**	**0.815**
Prob.	0.012	0.070	0.120	

$^{A, B}$ indicates significant differences among the different days within pen type (P<0.05).

CONCLUSION

Based on the results it can be concluded that the location preference of rabbit does is affected by the material of individual cage walls. The preference for the common area is lower when visual contact is possible (wire walls) than when the visual contact is inhibited (solid walls). The tested pens provide an opportunity for the rabbits to express their social behaviour, but they do not provide adequate chance to escape from aggressive individuals, which has resulted in a very high proportion of injured rabbits.

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