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EFFECTS OF FLOOR TYPE AND STOCKING DENSITY ON THE BEHAVIOUR MODES OF GROWING RABBITS

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Original scientific paper

SUMMARY

The experiment was carried out with 120 Pannon White growing rabbits, which were reared from 5 to 11 weeks of age on four types of floor:

1. ***wire net floor from 5 to 11 weeks of age,***
2. ***wire net floor from 5 to 7 weeks of age, and straw litter thereafter,***
3. ***wire net floor from 5 to 9 weeks of age, and straw litter thereafter,***
4. ***straw litter from 5 to 11 weeks of age.***

In each group three different stocking densities (8, 12 and 16 rabbits/m²) were used. As for the rabbits 24-hours video recordings were made every week on the same day. The actual behavioral form of each rabbit was recorded in every 10 minutes. Based on the results it was found out, that the frequency of eating decreased, when wire net floor was changed to straw litter. The frequency of drinking was less than 0.5% in the 1st experimental group and mostly higher than 1% in the other three groups during the whole rearing period. The moving activity of the rabbits was higher on the straw litter, while resting was observed more often on the wire net floor.

Key-words: rabbits, behaviour, floor type, stocking density

INTRODUCTION

Efficient and safe production fulfilling animal welfare and environmental aspects is a requirement in animal breeding becoming increasingly widespread worldwide. From the viewpoint of animal welfare the most common problems are the high stocking density, large group size and the restriction of the social and locomotor behaviours. Application of large groups, environmental enrichment, advantageous floor type (taking into account welfare aspects) is a research area of high general interest (Kustos et al., 2003a; 2003b; Verga et al., 2004; Maertens et al., 2004; Trocino et al., 2004; Princz et al., 2005a; 2005b). The results of these experiments can be used to develop animal welfare recommendations in the EU.

In rabbit breeding currently the application of deep litter and rearing in relatively large groups is advocated. It has to be remembered however that the weaned rabbits (sensitive to enteric diseases) reared on deep litter may have high risk of coccidiosis. According to Kustos et al. (2002) housing the rabbits on deep litter at a later age can lower the risk of coccidiosis.

The objective of the present study was to analyse some of the behaviour forms of rabbits kept on wire net (for the whole fattening period) and that of the rabbits housed on deep litter at various ages using different stocking densities.

MATERIAL AND METHODS

Animals, housing conditions

The experiment was carried out at the University of Kaposvar using 120 Pannon White rabbits of both sexes. During the experiment rabbits were housed in 12 pens, each having a size of 50 × 170 × 80 cm using a lighting regime of 16L/8D in a closed rabbit house.

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The temperature in the building was 16-17 ºC. Three different stocking densities were used (7, 10 and 13 rabbits per pen, i.e. 8, 12 and 16 rabbits per m^2). The feeder of each pen was 40 cm long and water was available ad libitum from nipple drinkers (two drinkers per pen). The 4-4-4 cages of the same stocking densities differed only in the floor type:

1. wire net during the whole experiment,
2. wire net until the age of 7 weeks, then deep litter,
3. wire net until the age of 9 weeks, then deep litter,
4. deep litter during the whole experiment.

Rabbits included in the experiment were between the ages of 5 to 11 weeks. The growing rabbits received ad libitum medicated pellet until the age of 9 weeks (14.5% crude protein, 17.5% crude fibre, 2.0% ether extract, and 10.3 MJ DE/kg) then ad libitum commercial pellet (16.0% crude protein, 16.0% crude fibre, 3.0% ether extract, and 10.6 MJ DE/kg).

Behaviour analysis

During the 6 week experiment 24 hour video recordings were performed using infrared cameras at the same day of the weeks. Using the 24 hour recordings every 10^{th} minute was evaluated recording the behaviour form of every animal. Then the frequency of each behaviour form was calculated for the 24 hours. The following behaviour forms were examined: eating, drinking, movement, resting, comfort and social behaviours.

Statistical analysis

Frequency differences of the behaviour forms of rabbits kept under various floor types and stocking densities were determined by means of chi-square test applying SPSS 10.0 software package (SPSS for Windows, 1999).

RESULTS AND DISCUSSION

The frequency of eating was ranged between 9-12% in every group until the age of 9 weeks. Changing the medicated to commercial pellet however, decreased the eating frequency being only 6-9% from the 10^{th} week of age (Table 1).

Changing of floor type also affected the eating frequency. From the age of 7 and 9 weeks the eating frequency of rabbits decreased after placing the bedding material in the pens. The phenomenon may be explained by the deep litter consumption of the rabbits. The eating frequency also decreased to 70% that of the first week with the advanced age. This is very similar to the results of Verga et al. (2004), who observed a decrease in the frequency of eating during the rearing period.

The drinking frequency was also affected by placing bedding material in the pens. The frequency dropped to 60-75% compared to the drinking frequency observed before the changing of floor type (Table 2).

Stocking density also affected the drinking frequency observing 0.5-1.5% and 1.5-2.5% using the largest (16 rabbits per m^2) and smaller (8 and 12 rabbits per m^2) densities, respectively. Similarly to eating the highest drinking frequency was observed at the beginning of the experiment (at the age of 6 and 7 weeks). At the last monitoring point (at the age of 11 weeks) drinking frequency decreased to 65% compared to the first week. These results are in accordance with the results of Morisse et al. (1997), who observed a similar decrease in the frequency of eating and drinking during the growing period.

Movement behaviours showed a substantial decrease in frequency compared to the placing time (6 weeks of age) and dropped to 50% one week after housing the rabbits in the pens (Table 3). The high movement frequency at the first week can possibly be explained by the novel environment and the relatively large available place. Similar observations were also made by Verga et al. (2004), who have found a significantly higher frequency of movement at the beginning of the experiment compared to that at the end of rearing.

Examining the effect of stocking density the rabbits kept in the smallest stocking density (8 rabbits per m^2) showed – in accordance with the results of Verga et al. (2004) – the highest movement frequency.

The resting behaviour showed the highest frequency among the behaviour forms reaching occasionally 70% (Table 4).

Table 1. Frequency of the eating behaviour of the growing rabbits depending on the floor type and stocking density

Floor type	Age																	
	6 weeks			7 weeks			8 weeks			9 weeks			10 weeks			11 weeks		
	Stocking density (rabbits/m²)																	
	8	12	16	8	12	16	8	12	16	8	12	16	8	12	16	8	12	16
Wire net	13.3^{aA}	9.3^{bA}	10.3^{b}	10.6^{A}	11.6^{AB}	10.3^{AB}	7.0^{aA}	9.9^{bAC}	11.4^{bA}	12.7^{aA}	9.0^{bA}	9.9^{b}	5.7^{a}	7.6^{b}	8.0^{bAB}	8.4	7.6	7.6^{A}
Deep litter from 9 weeks of age	11.8^{AB}	12.8^{B}	11.5	13.0^{B}	11.9^{A}	11.3^{A}	12.2^{aB}	10.8^{abAC}	9.7^{bAB}	11.9^{aAB}	11.9^{aB}	9.9^{b}	6.6	7.4	6.9^{A}	7.4^{ab}	7.2^{a}	9.5^{bB}
Deep litter from 7 weeks of age	11.1^{AB}	10.1^{A}	11.4	10.8^{A}	11.4^{AB}	11.5^{A}	9.2^{aA}	6.8^{bB}	8.9^{aB}	9.6^{aB}	5.3^{bC}	9.9^{a}	6.0^{a}	7.9^{ab}	9.5^{bB}	6.7^{a}	7.2^{a}	10.0^{bB}
Deep litter	9.3^{abB}	9.2^{aA}	11.4^{b}	11.1^{AB}	9.7^{B}	9.2^{B}	9.0^{aA}	11.8^{bC}	9.9^{aAB}	11.0^{aAB}	9.2^{abA}	8.5^{b}	6.9^{ab}	8.5^{a}	6.7^{bA}	7.1	8.3	8.7^{AB}

$^{a, b, c}$ The different letters in the same row indicate significant differences (P<0.05)
$^{A, B, C}$ The different letters in the same column indicate significant differences (P<0.05)

Table 2. Frequency of the drinking behaviour of the growing rabbits depending on the floor type and stocking density

Floor type	Age																	
	6 weeks			7 weeks			8 weeks			9 weeks			10 weeks			11 weeks		
	Stocking density (rabbits/m²)																	
	8	12	16	8	12	16	8	12	16	8	12	16	8	12	16	8	12	16
Wire net	1.4^{A}	1.8^{A}	0.1^{A}	0.4^{aA}	2.1^{b}	0.5^{aA}	1.0^{aA}	1.1^{a}	0.1^{bA}	0.9^{a}	1.4^{aA}	0.2^{bA}	0.4^{A}	0.7	0.4^{A}	1.3^{a}	1.5^{a}	0.0^{bA}
Deep litter from 9 weeks of age	3.3^{B}	2.7^{B}	1.6^{B}	2.6^{B}	2.7	2.3^{B}	1.3^{AB}	1.6	1.3^{B}	1.7^{ab}	2.7^{aB}	1.7^{bB}	1.1^{B}	1.1	1.5^{B}	1.3	1.2	1.3^{B}
Deep litter from 7 weeks of age	2.9^{B}	1.7^{A}	0.9^{C}	2.1^{aB}	1.8^{ab}	1.1^{bC}	1.4^{abAB}	1.9^{a}	0.7^{bB}	1.5^{a}	1.2^{aA}	0.5^{bC}	1.2^{aB}	0.8^{ab}	0.4^{bA}	1.9	1.2	1.1^{B}
Deep litter	1.6^{A}	2.2^{AB}	0.9^{C}	2.6^{aB}	1.9^{ab}	1.4^{bBC}	2.2^{aB}	1.7^{ab}	1.0^{bB}	1.9^{a}	1.0^{abA}	0.6^{bC}	0.9^{AB}	1.4	1.1^{B}	1.2	1.7	1.1^{B}

$^{a, b, c}$ The different letters in the same row indicate significant differences (P<0.05)
$^{A, B, C}$ The different letters in the same column indicate significant differences (P<0.05)

Table 3. Frequency of the movement behaviour of the growing rabbits depending on the floor type and stocking density

Floor type	Age																	
	6 weeks			7 weeks			8 weeks			9 weeks			10 weeks			11 weeks		
	Stocking density (rabbits/m²)																	
	8	12	16	8	12	16	8	12	16	8	12	16	8	12	16	8	12	16
Wire net	4.6^{A}	5.0	7.6^{A}	2.6^{A}	2.0^{A}	2.6^{A}	3.1^{a}	1.0^{bA}	6.5^{cAC}	4.0^{A}	3.6^{A}	3.6^{A}	6.8^{A}	2.3^{A}	2.9^{A}	6.9^{a}	5.0^{bA}	3.3^{cA}
Deep litter from 9 weeks of age	10.3^{B}	6.1	7.1^{A}	3.9^{abAB}	2.6^{aAB}	4.4^{bB}	3.8	3.1^{B}	3.8^{B}	2.3^{aBC}	6.5^{bB}	5.7^{bB}	3.7^{B}	3.7^{B}	3.8^{AB}	9.0^{a}	5.8^{bA}	8.1^{aB}
Deep litter from 7 weeks of age	7.4^{C}	5.9	4.7^{B}	3.4^{A}	2.5^{AB}	3.0^{A}	4.3	4.4^{B}	5.1^{A}	1.7^{aB}	3.7^{bA}	3.5^{bA}	5.0^{AB}	4.0^{B}	4.4^{B}	8.8^{a}	8.1^{bB}	3.3^{cA}
Deep litter	10.4^{B}	6.1	8.4^{A}	5.5^{aB}	3.5^{bB}	6.5^{aC}	4.6^{a}	3.1^{bB}	6.8^{cC}	3.4^{aAC}	4.7^{abA}	5.9^{bB}	5.4^{AB}	4.5^{B}	4.1^{B}	9.0^{a}	5.7^{bA}	4.5^{bA}

Table 4. Frequency of the resting behaviour of the growing rabbits depending on the floor type and stocking density

Floor type	Age																	
	6 weeks			7 weeks			8 weeks			9 weeks			10 weeks			11 weeks		
	Stocking density (rabbits/m²)																	
	8	12	16	8	12	16	8	12	16	8	12	16	8	12	16	8	12	16
Wire net	59.7	64.9^{AB}	70.4^{A}	62.0	61.2	62.7^{A}	56.2^{A}	64.7^{AB}	65.8^{A}	56.9^{aA}	63.4^{bA}	64.6^{bA}	65.6^{A}	64.2^{AB}	64.0	59.6^{aA}	71.5^{bA}	64.9^{cA}
Deep litter from 9 weeks of age	59.2	63.3^{A}	62.3^{B}	59.3	60.1	57.3^{B}	61.5^{B}	62.5^{A}	62.3^{B}	63.7^{aBC}	53.8^{bB}	62.6^{aAB}	71.1^{B}	62.8^{A}	63.8	66.3^{aB}	61.0^{bB}	63.9^{abA}
Deep litter from 7 weeks of age	57.4	67.4^{B}	65.6^{C}	58.4^{a}	62.3^{b}	59.2^{abB}	57.4^{A}	66.7^{B}	63.8^{AB}	65.1^{abB}	66.4^{aAC}	61.6^{bB}	67.7^{A}	66.6^{B}	64.1	56.7^{aA}	64.5^{bC}	66.9^{bA}
Deep litter	60.5	66.0^{AB}	64.9^{BC}	59.6	59.9	57.5^{B}	58.3^{AB}	63.8^{AB}	63.5^{AB}	59.7^{aAC}	67.5^{bC}	61.4^{aB}	66.4^{A}	63.1^{A}	65.3	58.8^{A}	59.5^{B}	59.0^{B}

The effect of stocking density on the resting behaviour could be detected at the age of 6 weeks (just after housing the rabbits in pens). At this age rabbits kept in the smallest stocking density (8 rabbits per m^2) had the smallest resting frequency compared to rabbits kept in larger stocking densities (12 and 16 rabbits per m^2). This finding was in accordance with high movement frequency of rabbits (at the beginning of the experiment) kept in low stocking density.
Social and comfort behaviour forms were not affected by stocking density, age and floor type. No clear tendencies could be established.

CONCLUSION

It can be concluded that the floor type and stocking density did not affect the frequency of the most important behaviour forms of rabbits. Nevertheless placing bedding material to wire net may result in consumption decreasing the eating behaviour and presumably the average daily gain.

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