ANALYSIS OF THE BEHAVIOUR OF GROWING RABBITS HOUSED IN DEEP LITTER AT DIFFERENT STAGES OF REARING

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ABSTRACT

The experiment was conducted with 240 Pannon white growing rabbits of both sexes, which were housed in a closed building with a temperature of 16-17 °C using a light regime of 16L/8D. The rabbits were housed in 80 cm high open top pens each having a basic area of 50x170 cm. Depending on the time of deep litter placement into the pens the following groups were formed: 1. Rabbits stayed on wire net floor throughout the experiment; 2. Rabbits stayed on wire net until the age of 7 weeks, time at which the deep litter was added; 3. Rabbits stayed on wire net until the age of 9 weeks, time at which the deep litter was added; 4. Rabbits stayed on deep litter throughout the experiment. Within all four groups 3 stocking densities (8, 12 and 16 rabbits/m²) were used. The experiment lasted between the ages of 5 and 11 weeks. A 24 hour video recording was performed once a week using infrared cameras on the same day of every week during the 6 week long experiment. Using the 24 hour video recording every 10^{th} minute was evaluated. The activities performed at these times were recorded and their frequencies and percentages were calculated for 24 hours. The following activities were analyzed: eating, drinking, locomotion, rest, comfort, social, and agonistic behaviours, stereotypes and the frequency of deep litter consumption (for rabbits housed in deep litter). The frequency of eating was affected significantly by the type of floor. After placing deep litter on the wire net floor the frequency of eating (but not of drinking) significantly decreased. The highest locomotor activity of the rabbits was observed during the first week of the experiment and placing deep litter on the wire net floor did not change the animals' activity. Contrary to our expectations a significantly higher frequency of resting was observed on the wire net than on the presumably more comfortable deep litter. A significantly higher frequency of comfort behaviours was also found on wire net than on deep litter, which became soiled during rearing. Rabbits showed agonistic behaviours only occasionally; consequently, the effects of floor type, stocking density and age on this behaviour could not be analyzed. The occurrence of stereotypic behaviours was relatively high during the first two weeks of the experiment after which it decreased and, during the last two weeks of the experiment, it was not observed in either group. Based on the results of this study it was concluded that after placing deep litter on the wire net floor the rabbits willingly consumed the litter material which, in turn, decreased their pellet consumption. Placing deep litter on the wire net floor did not alter the frequency of other behaviours and, thus, did not improve the rabbits' well being.

Key words: Rabbit, Behaviour, Welfare, Ethology, Deep litter.

INTRODUCTION

The requirement of efficient and safe production that takes into account environmental and animal welfare aspects is gaining importance world wide. From the animal welfare viewpoint the most often mentioned problems are the too high stocking density and the restriction of locomotion.

Housing the growing rabbits in larger groups (Morisse and Maurice, 1997; Kustos *et al*., 2003a), application of a more comfortable floor type (Matics *et al*., 2007), and environmental enrichment (Hansen and Berthelsen, 2000; Maertens *et al*., 2004; Verga *et al*., 2004; Princz *et al*., 2007) are all issues being targeted by research. The published results of these experiments support the development of EU recommendation for animal housing requirements. Yet, as housing in deep litter may promote

the occurrence of coccidiosis Kustos *et al*. (2003b) have suggested that this risk be reduced if the rabbits are placed into deep litter not directly after weaning. Thus, the objective of this study was to evaluate the behaviour of growing rabbits reared on a wire net floor or housed in deep litter at different stages of rearing.

MATERIALS AND METHODS

The experiment was conducted at the Faculty of Animal Science of Kaposvár University using 240 Pannon white growing rabbits of both sexes. The rabbits were housed in a closed building with a temperature of 16-17 °C using a light regime of 16L/8D. The rabbits were housed in 80 cm high open top pens each having a basic area of 50x170 cm. Every pen was equipped with a 40 cm long feeder and with two nipple drinkers. Depending on the time of deep litter placement to pens the following groups were formed: 1. rabbits stayed on wire net floor throughout the experiment; 2. rabbits stayed on wire net until the age of 7 weeks, time at which the deep litter was added; 3. rabbits stayed on wire net until the age of 9 weeks, time at which the deep litter was added; 4. rabbits stayed on deep litter throughout the experiment. Within all four groups 3 stocking densities (8, 12 and 16 rabbits/m²) were used. The experiment lasted between the ages of 5-11 weeks. Until the age of 9 weeks rabbits received medicated pellet (DE 10.3 MJ/kg, crude protein 14.5%, ether extract 2%, crude fibre 17.5%, Tilmikozin 50 000 mg/kg, Pulmotil 200 0.025%), from the age of 9 weeks they were fed with a pellet free from medication (DE 10.6 MJ/kg, crude protein 16%, ether extract 3%, crude fibre 16%) *ad libitum*. Drinking water was available also *ad libitum.*

A 24 hour video recording was performed once a week using infrared cameras on the same day of every week during the 6 week long experiment. Using the 24 hour video recording every 10th minute was evaluated. The activities performed at these times were recorded and their frequencies and percentages were calculated for 24 hours. The following activities were analyzed: eating, drinking, locomotion, rest, comfort, social, and agonistic behaviours, stereotypies and the frequency of deep litter consumption (for rabbits housed in deep litter).

The effect of floor type, stocking density and age on the various behaviours were evaluated by means of analysis of variance with multiple factors using the following model:

$$BF_{(\%)ij} = \mu + F_i + SD_j + A_k + e_{ijkl}$$

(BF = behaviour, μ = grand mean, F_i = floor type (i = 1-4), SD_j = stocking density (j = 1-3), A_k = age (k = 1-6), e_{ijkl} = residual).

The analyses were conducted using the SPSS 10.0 software package (SPSS for Windows, 1999).

RESULTS AND DISCUSSION

The frequency of eating was affected significantly by the floor type and age (Table 1). The observed frequency of eating was significantly higher for rabbits kept on wire net floors. Although the eating frequency was not affected significantly by the stocking density a decreasing tendency was observed by increasing the number of rabbits housed per m^2. Similarly, the eating frequency decreased continuously with advancing age. After placing deep litter on the wire net floor the frequency of eating decreased significantly (Table 2). This may be explained by the fact that the rabbits willingly consumed the straw after its placement in the pens. Additionally, eating frequency decreased in all groups after the age of 9 weeks possibly because the rabbits were fed a medication free pellet.

Drinking frequency was not affected by the floor type (Table 1) while stocking density and age had significant effects on this parameter. Using a stocking density of 16 rabbits/m² significantly reduced the rabbits' drinking frequency while under lower stocking densities similar drinking frequencies were

observed. Drinking frequency decreased with advancing age but placing deep litter on the wire net floor did not modify this behaviour (Table 2).

Frequency of locomotion was not affected significantly by the floor type or stocking density (Table 1). The highest activity of the rabbits could be observed during the first week of the experiment, perhaps because of the novel environment. The frequency of locomotion significantly decreased thereafter and varied between 3.80 and 4.71%. An increase in the frequency of locomotion was found in the last week of the experiment but placing deep litter on the wire net floor did not change the rabbits' activity at any age (Table 2).

Frequency of resting was significantly affected by stocking density and age (Table 1). Contrary to our expectations a significantly higher frequency of resting was observed on the wire net than on the presumably more comfortable deep litter. Increasing stocking density resulted in a higher frequency of resting; this behaviour increased from 60-61% (first four weeks) to 65-66% by the end of the experiment.

A significantly higher frequency of comfort behaviours was also found on wire net than on deep litter, which became soiled during rearing (Table 1). The highest frequency of comfort behaviours was found using the highest stocking density. During the first week of the experiment relatively low values were found for comfort behaviours (10.54%), which increased to 15-16% between the ages of 6 and 10 weeks and declined during the last week of the experiment. Placing deep litter on the wire net floor pens at the age of 9 (but not 7) weeks significantly reduced the occurrence of comfort behaviours (Table 2).

Rabbits showed agonistic behaviours only occasionally; consequently, the effects of floor type, stocking density and age on this behaviour could not be analyzed.

The occurrence of stereotypic behaviour was relatively high during the first two weeks of the experiment after which it decreased and, during the last two weeks of the experiment, it was not observed in either group. Although stocking density had no significant effect on the frequency of stereotype behaviours it was found more frequently (0.20%) at a stocking density of 8 rabbits/m² than at higher stocking densities (0.06%, and 0.02%).

Social behaviours were occasionally affected by stocking density and age but no clear tendencies could be detected (Table 1). Changing the floor type from wire net to deep litter did not affect the frequency of these behaviours (Table 2).

Table 1: Effects of floor type, stocking density and age on the frequency of some behaviours in growing rabbits (%)

Activity	Floor type		Stocking density (rabbit/m²)			Age (week)						S.E.	Significance		
	Wire	Deep litter	8	12	16	5-6	6-7	7-8	8-9	9-10	10-11		Floor type	Stocking density	Age
Eating	9.58[a]	7.36[b]	8.74	8.45	8.23	9.71[a]	9.35[a]	9.32[a]	8.72[a]	7.08[b]	6.65[b]	0.264	<0.001	0.349	<0.001
Drinking	1.41	1.41	1.58[a]	1.60[a]	1.05[b]	1.85[a]	1.62[ab]	1.45[bc]	1.18[c]	1.13[c]	1.23[c]	0.062	0.974	<0.001	<0.001
Locomotion	5.04	5.02	5.51	4.65	4.94	7.18[a]	4.10[b]	4.34[b]	3.80[b]	4.71[b]	6.06[a]	0.216	0.949	0.105	<0.001
Resting	63.48[a]	60.25[b]	59.57[a]	62.60[b]	63.43[b]	60.96[a]	60.24[a]	60.61[a]	60.09[a]	63.66[b]	65.64[b]	0.461	<0.001	<0.001	<0.001
Comfort behaviours	16.70[a]	12.70[b]	14.29[a]	13.52[a]	15.48[b]	10.54[a]	15.82[b]	15.62[b]	15.94[b]	15.77[b]	13.60[c]	0.419	<0.001	0.006	<0.001
Social behaviours	4.18	4.78	4.32[a]	5.89[b]	3.21[c]	4.53[ab]	4.35[a]	3.89[a]	5.77[b]	4.26[a]	4.07[a]	0.233	0.149	<0.001	0.075
Stereotypies	0.06	0.13	0.20	0.06	0.02	0.10[a]	0.45[b]	0.03[a]	0.03[a]	0.00[a]	0.00[a]	0.040	0.334	0.116	0.005

[abc] Different letters in the same row – within an examined effect – mean significant differences (P<0.05)

Table 2: Effect of age on the frequency of some behaviours in growing rabbits reared on different types of floor (%)

Floor type	Age (week)	Eating	Drinking	Locomotion	Resting	Comfort behaviours	Social behaviours	Agonistic behaviours	Stereotypies	Straw consumption
Wire net throughout the trial	5-7	10.93[a]	1.37	5.02	62.85[ab]	15.12	4.65	0.03	0.05	0.00
	7-9	10.35[a]	1.18	4.33	60.83[a]	17.82	4.91	0.00	0.06	0.00
	9-11	6.72[b]	1.03	5.33	66.37[b]	17.50	3.04	0.00	0.00	0.00
Deep litter from the age of 9 weeks	5-7	11.65[a]	2.23[a]	5.47	61.13	15.49[a]	3.64	0.03	0.33[a]	0.00
	7-9	10.62[a]	1.38[b]	4.27	62.75	16.36[a]	4.59	0.00	0.01[b]	0.00
	9-11	5.95[b]	1.35[b]	5.57	63.53	11.36[b]	4.60	0.00	0.00[b]	7.67
Deep litter from the age of 7 weeks	5-7	9.88[a]	1.83[a]	6.10	62.90[a]	14.59	4.51	0.00	0.18	0.00
	7-9	7.70[b]	1.33[ab]	3.63	57.55[b]	14.34	5.96	0.00	0.03	9.40
	9-11	6.48[b]	1.07[b]	5.72	64.85[a]	11.52	4.34	0.03	0.00	6.03
Deep litter throughout the trial	5-7	7.88[a]	1.52	6.00[a]	58.75	11.21	4.35	0.00	0.46[a]	10.30
	7-9	7.40[a]	1.37	4.05[b]	60.27	14.63	3.86	0.00	0.02[b]	8.42
	9-11	6.10[b]	1.27	4.90[ab]	60.62	14.66	5.28	0.00	0.00[b]	7.25

[abc] Different letters in the same column – within a certain floor type – mean significant differences (P<0.05)

In groups kept in deep litter throughout the experiment and in those housed in this material from the age of 7 weeks onwards the frequency of straw consumption continuously decreased (Table 2). This effect was not seen in rabbits housed in deep litter from the age of 9 weeks.

In agreement with other authors (Trocino *et al*., 2004) it can be concluded that placing 12 or 16 rabbits per m^2 did not affect the frequency of eating, locomotion or resting. The effect of floor type on the frequency of eating and resting behaviours was similar to that reported by Morisse and Maurice (1997) and Dal Bosco *et al*. (2002). The decreased frequency of eating behaviour after placing deep litter into pens is also in accordance with the results of Kustos *et al*. (2003b). The effect can be explained by the deep litter consumption of the rabbits. The higher frequency of resting on the wire net also coincides with the results of the free choice experiments made by Morisse *et al*. (1999) and Orova *et al*. (2004).

CONCLUSIONS

Placing deep litter on the wire net led to a consumption of the litter material and a decreased pellet consumption. Changing the pellet from medicated to medication free had similar effects. Placing deep litter on the wire net floor did not alter the frequency of other behaviours and, thus, did not improve the rabbits' well being.

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