

## COMPARISON OF THE SLAUGHTER CHARACTERISTICS OF GROWING RABBITS REARED ON WIRE NET OR COMBINED (WIRE NET/STRAW) FLOOR

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### ABSTRACT

One hundred twenty-four rabbits were placed into 12 pens (50×170 cm) differing in the type of floor: wire net (6 pens) or a combined (half of the floor wire net and half of the floor straw litter) floor (6 pens). Within floor types, three stocking densities (8, 12 and 16 rabbits/m<sup>2</sup>) were applied. Thirty-six rabbits were placed into conventional cages (2 rabbits/cage) as control. The experiment took place between the ages of 5 and 11 weeks. At 11 weeks of age animals were slaughtered and carcasses dissected. Rabbits on the wire net floor had significantly higher liveweight at slaughter than rabbits on the combined floor (2575 vs. 2498 g). The dressing percentage (ratio of warm carcass to the live weight) was higher in animals reared on the combined floor (60.5% vs. 61.1%). The type of floor had a significant effect also on the ratio of the hind part to the chilled carcass (30.6% vs. 31.3%; P<0.01). The ratio of *m. Longissimus dorsi* to the chilled carcass differed also significantly between the two pen-raised groups (9.17% vs. 9.48%; P<0.05). The heart and the lungs ratio was very similar, while the ratio of the liver and kidneys was higher in rabbits on the wire net floor (6.25% vs. 5.94% and 1.38% vs. 1.26% to the chilled carcass, respectively). The perirenal fat was significantly higher on the wire net than on the combined floor (1.64% vs. 1.34%; P<0.01). Rabbits reared at the highest stocking density (16 rabbits/m<sup>2</sup>) had the highest ratio of the fore part (25.3%), and these animals accumulated the highest amount of fat (1.68%) in their abdominal region. Comparing the experimental groups to the control it was found that rabbits in the conventional cages reached the highest live weight at 11 weeks of age (2690 g). Rabbits in pens on wire net reached 93-124 g, rabbits in pens on combined floor 174-239 g less slaughter weight than the controls. Similar tendency was observed also in the ratio of perirenal fat to the chilled carcass. Presumably due to the higher moving activity, rabbits in pens on the combined floor had higher ratio of hind legs to the chilled carcass (29.0-29.5%) than rabbits in pens on wire net floor (28.3-28.8%) or rabbits in the conventional cages (28.2%). In conclusion the advantage of the combined floor (wire net/straw) could be that rabbits on this floor have higher hind part in the carcass and lower amount of fat in the perirenal region, which could be favourable for the slaughterhouses and consumers.

**Key words:** Growing rabbit, Floor type, Carcass traits, Stocking density.

### INTRODUCTION

Nowadays, taking into consideration the expectations of the animal protection organizations and the requirements of the consumers, experiments in rabbit housing are focused on developing alternative housing systems, which can increase the animal comfort and welfare during the rearing period.

In former experiments different types of alternative rearing methods were tested. Rabbits' behaviour and production was compared in different size of groups (Morisse and Maurice, 1997), in different size of cages and pens (Maertens and Van Herck, 2000), on different types of floor (Morisse *et al.*, 1999; Dal Bosco *et al.*, 2002; Trocino *et al.*, 2004) and also at different stocking densities (Trocino *et al.*, 2004). Avoiding abnormal behaviours and aggression, gnawing stick, hay and straw were also put

into the cages or pens (Hansen and Berthelsen, 2000; Maertens *et al.*, 2004; Verga *et al.*, 2004; Princz *et al.*, 2007).

In this study the effect of combined (wire net/straw) floor on the slaughter characteristics of growing rabbits was analyzed at different stocking densities.

## MATERIALS AND METHODS

The experiment was carried out at the Faculty of Animal Science of the Kaposvár University, using Pannon White rabbits of both sexes. Animals were kept in a closed building with a temperature of 16-17°C using a lighting regime of 16L/8D. One hundred twenty-four rabbits were placed to 12 pens, each having a basic area of 50×170 cm. The pens differed only in the type of floor. Six pens had a wire net, six pens a combined floor (half of the floor wire net and half of the floor straw litter). On both floor types (wire net and combined) three stocking densities (8, 12 and 16 rabbits/m<sup>2</sup>) were applied. Thirty-six rabbits were placed into conventional cages (2 rabbits/cage) as control group.

The experiment took place between the ages of 5 to 11 weeks. Growing rabbits consumed medicated pellet until the age of 9 weeks (14.5% crude protein, 17.5% crude fibre, 2.0% ether extract, 10.3 MJ DE/kg, 50 000 mg/kg Tilmikozin and 0.025% Pulmotil 200) and a non-medicated pellet (16.0% crude protein, 16.0% crude fibre, 3.0% ether extract, and 10.6 MJ DE/kg) thereafter *ad libitum*. Drinking water was available continuously from self-drinkers.

At 11 weeks of age all of the animals were slaughtered. During the slaughter procedure rabbits were dissected according to Blasco and Ouhayoun (1996). The weight of the different organs and body parts were weighted and their ratio to the chilled carcass weight was calculated.

The effect of floor type and stocking density on the carcass traits was analysed by means of analysis of variance with multiple factors using the following model:

$$ST_{(%)ij} = \mu + F_i + SD_j + F_i \times SD_j + e_{ijk}$$

where ST = slaughter trait,  $\mu$  = overall mean,  $F_i$  = type of floor ( $i = 1-2$ ),  $SD_j$  = stocking density ( $j = 1-3$ ),  $F_i \times SD_j$  = interaction,  $e_{ijk}$  = random error.

Significance of the differences from the control group was tested by the Dunnett-test. For the statistical evaluation the SAS 9.1.3. statistical software package was used (SAS for Windows, 2003).

## RESULTS AND DISCUSSION

Examining the effect of floor it was established, that rabbits on the wire net floor had significantly higher liveweight at slaughter, than rabbits on the combined floor (Table 1).

The rearing on the wire net floor resulted in a 3% higher liveweight at 11 weeks of age, than rearing on the combined floor.

In spite of the slaughter weight the dressing percentage (ratio of warm carcass to the liveweight) was higher in animals reared on the combined floor. The difference between the two pen-raised groups was significant at  $P < 0.05$  level.

The type of floor had a significant effect also on the ratio of the hind part to the chilled carcass. The between group difference was significant at  $P < 0.01$  level. The ratio of *musculus Longissimus dorsi* to the chilled carcass differed also significantly ( $P < 0.05$ ) between the two pen-raised groups.

**Table 1:** Effect of type of floor and stocking density on the carcass traits of growing rabbits

Traits	Floor type		Stocking density (rabbits/m <sup>2</sup> )			SE	Level of significance		
	Wire net	Combined	8	12	16		Floor type	Stocking density	Interaction
Liveweight (SW) (g)	2575 <sup>a</sup>	2498 <sup>b</sup>	2554	2519	2537	16.75	0.013	0.810	0.492
Chilled carcass (CC) (g)	1511	1480	1508	1488	1490	10.05	0.088	0.807	0.704
Gut (%SW)	18.3	17.9	18.4	18.3	17.7	0.122	0.125	0.066	0.223
Warm carcass (%SW)	60.5 <sup>a</sup>	61.1 <sup>b</sup>	60.8	60.8	60.9	0.125	0.041	0.986	0.094
Chilled carcass (%SW)	58.7	59.3	59.0	59.1	58.8	0.153	0.069	0.594	0.562
Fore part (%CC)	24.8	25.0	24.6 <sup>a</sup>	24.8 <sup>ab</sup>	25.3 <sup>b</sup>	0.114	0.496	0.035	0.534
Middle part (%CC)	25.7	25.9	25.9	25.8	25.8	0.116	0.470	0.871	0.678
Hind part (%CC)	30.6 <sup>a</sup>	31.3 <sup>b</sup>	31.0	31.0	30.9	0.139	0.004	0.893	0.580
Hind legs (%CC)	28.7 <sup>a</sup>	29.3 <sup>b</sup>	28.9	29.1	29.0	0.132	0.005	0.897	0.582
mLD (%CC)	9.17 <sup>a</sup>	9.48 <sup>b</sup>	9.34	9.42	9.29	0.059	0.023	0.284	0.379
Heart + lungs (%CC)	1.48	1.49	1.54	1.41	1.50	0.024	0.960	0.178	0.919
Liver (%CC)	6.25 <sup>a</sup>	5.94 <sup>b</sup>	6.19	6.18	5.92	0.098	0.044	0.449	0.339
Kidneys (%CC)	1.38 <sup>a</sup>	1.26 <sup>b</sup>	1.34	1.32	1.30	0.019	0.006	0.587	0.261
Perirenal fat (%CC)	1.64 <sup>a</sup>	1.34 <sup>b</sup>	1.39 <sup>a</sup>	1.39 <sup>a</sup>	1.68 <sup>b</sup>	0.049	0.004	0.010	0.846
Scapular fat (%CC)	0.52	0.51	0.58	0.44	0.52	0.023	0.709	0.124	0.870
Head (%CC)	8.35	8.41	8.42	8.38	8.35	0.048	0.474	0.845	0.646
Skin (%CC)	24.2	23.8	23.8	23.8	24.4	0.163	0.106	0.199	0.843
Feet (%CC)	5.76	5.75	5.78	5.68	5.81	0.036	0.860	0.274	0.290

<sup>abc</sup> Different superscripts in the same row – within an examined effect – sign significant differences (P<0.05)

From the edible organs the ratio of the heart and the lungs to the chilled carcass was very similar on the two types of floor, while the ratio of the liver and kidneys was higher in rabbits on the wire net floor. The between group difference was significant at P<0.05 level in the case of the liver and at P<0.01 level in the case of the kidneys.

The perirenal fat was significantly (P<0.01) higher on the wire net floor than on the combined floor. In the case of the scapular fat no between group differences were observed.

The stocking density showed a significant effect only in the case of the fore part and in the case of the perirenal fat. Rabbits reared at the highest stocking density (16 rabbits/m<sup>2</sup>) had the highest ratio of the fore part, and these animals accumulated the highest amount of fat in their abdominal region.

The interactions were not significant in all of the measured parameters.

Comparing the experimental groups to the control it was established, that rabbits in the conventional cages reached the highest liveweight at 11 weeks of age (Table 2).

Rabbits in pens on wire net reached 93-124 g, rabbits in pens on combined floor 174-239 g less weight than the controls. Similar tendency was observed also in the ratio of perirenal fat to the chilled carcass.

Rabbits in pens on the combined floor had higher ratio of hind legs (29.0-29.5%) to the chilled carcass than rabbits in pens on wire net floor (28.3-28.8%) or rabbits in the conventional cages (28.2%).

From the not edible parts of the rabbits the ratio of the head and the feet was significantly lower in the control animals, than in the pen-raised ones.

Similarly to Dal Bosco *et al.* (2002) our results showed, that the slaughter weight of pen-raised rabbits is lower than that of the rabbits reared in conventional cages. It was also similar to the results of the mentioned authors, that the ratio of the hind part was higher in the pen-raised rabbits, than in the animals reared in cages. The positive effect of the combined floor on the ratio of the hind part was not surprising, because in a former experiment a similar difference was found between those rabbits, which were reared in straw bedded or in wire netted pens (Dal Bosco *et al.*, 2002).

**Table 2:** Slaughter traits of growing rabbits reared in cages (control) or in pens on wire net or combined (wire net / straw) floor

Traits	Floor type						Control	SE
	Wire net			Combined				
	Stocking density (rabbits/m <sup>2</sup> )			Stocking density (rabbits/m <sup>2</sup> )				
	8	12	16	8	12	16		
Liveweight (SW) (g)	2566	2597	2574	2516*	2467***	2500**	2690	15.67
Chilled carcass (CC) (g)	1511	1524	1519	1483*	1471**	1473**	1591	9.63
Warm carcass (%SW)	60.5	60.5	60.9	60.8	61.4	60.8	61.1	0.107
Gastrointestinal tract (%SW)	18.4	18.7	17.8	16.7	17.8	17.7	18.0	0.167
Chilled carcass (%SW)	58.9	58.6	59.0	58.9	59.6	58.9	59.2	0.130
Fore part (%CC)	24.6	24.6	25.1	24.2	24.8	25.3	25.1	0.070
Middle part (%CC)	25.9	25.5	25.5	26.3	25.6	25.8	25.9	0.069
Hind part (%CC)	30.8	30.6	30.1	31.4	30.9	31.4*	30.0	0.086
Hind legs (%CC)	28.8	28.7	28.3	29.3	29.0	29.5*	28.2	0.081
mLD (%CC)	9.13	9.22	9.09	9.58	9.48	9.26	9.26	0.036
Heart + lungs (%CC)	1.52	1.41	1.49	1.61	1.44	1.48	1.56	0.013
Liver (%CC)	6.11	6.52	6.11	6.11	5.94	5.67*	6.50	0.050
Kidneys (%CC)	1.45	1.33	1.34	1.25	1.30	1.25	1.35	0.009
Perirenal fat (%CC)	1.57*	1.60*	1.78	1.21***	1.25***	1.56**	2.09	0.030
Scapular fat (%CC)	0.56	0.46	0.53	0.59	0.43	0.51	0.62	0.013
Head (%CC)	8.46**	8.27*	8.25**	8.36*	8.44***	8.39***	7.81	0.027
Skin (%CC)	23.9	24.1	24.5	24.0	23.6	24.0	24.6	0.072
Feet (%CC)	5.81**	5.72**	5.70**	5.85**	5.62	5.88***	5.35	0.019

\*the difference from the control is significant at P<0.05 level

\*\*the difference from the control is significant at P<0.01 level

\*\*\*the difference from the control is significant at P<0.001 level

Similarly to Trocino *et al.* (2004) it was also pointed out, that the stocking density has no significant effect on the most of the slaughter traits of the rabbits. The exceptions in our trial were only the ratio of fore part and perirenal fat to the chilled carcass, which both decreased with decreasing the stocking density.

## CONCLUSIONS

Based on the results it can be concluded, that pen-raised rabbits have a lower liveweight at slaughter, than rabbits reared in cages. When wire net floor is combined with straw in the pens, then the liveweight at slaughter decreases further. The advantage of the combined floor (wire net/straw) could be, that rabbits on this floor have higher hind part in the carcass and lower amount of fat in the perirenal region, which could be favourable for the slaughter houses and consumers.

## REFERENCES

- Blasco A., Ouhayoun J. 1996. Harmonization of criteria and terminology in rabbit meat research. *World Rabbit Sci.*, 4, 93-99.
- Dal Bosco A., Castellini C., Mugnai C. 2002. Rearing rabbits on a wire net floor or straw litter: behaviour, growth and meat qualitative traits. *Livest. Prod. Sci.*, 75 (2), 149-156.
- Hansen L. T., Berthelsen H. 2000. The effect of environmental enrichment on the behaviour of caged rabbits (*Oryctolagus cuniculus*). *Appl. Anim. Behav. Sci.*, 68 (2), 163-178.
- Maertens L., Tuytens F., Van Poucke E. 2004. Grouphousing of broiler rabbits: performances in enriched vs barren pens. In: *Proc. 8<sup>th</sup> World Rabbit Congress, 2004 September, Puebla, Mexico, 1247-1250.*
- Maertens L., Van Herck A. 2000. Performance of weaned rabbits raised in pens or in classical cages: first results. *World Rabbit Sci.*, 8 (1), 435-440.
- Morisse J.P., Boilletot E., Martrenchar A. 1999. Preference testing in intensively kept meat production rabbits for straw on wire grid floor. *Appl. Anim. Behav. Sci.*, 64 (1), 71-80.
- Morisse J. P., Maurice R. 1997. Influence of stocking density or group size on behaviour of fattening rabbits kept under intensive conditions. *Appl. Anim. Behav. Sci.*, 54 (4), 351-357.
- Princz Z., Orova Z., Nagy I., Jordan D., Stuhec I., Luzi F., Verga M., Szendrő Zs. 2007. Application of gnawing stick in rabbit housing. *World Rabbit Sci.*, 15, 29-36.
- SAS for Windows 2003. Copyright SAS Institute Inc., Cary, NC, USA.

- Trocino A., Xiccato G., Queaque P. I., Sartori A. 2004. Group housing of growing rabbits: effect of stocking density and cage floor on performance, welfare and meat quality. *In: Proc. 8<sup>th</sup> World Rabbit Congress, 2004 September, Puebla, Mexico, 1277-1282.*
- Verga M., Zingarelli I., Heinzl E., Ferrante V., Martino P. A., Luzi F. 2004. Effect of housing and environmental enrichment on performance and behaviour in fattening rabbits. *In: Proc. 8<sup>th</sup> World Rabbit Congress, 2004 September, Puebla, Mexico, 183-1288.*

