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The effect of stocking density in a cage on the results of fattening in rabbits

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The aim of the study was to assess the well-being of New Zealand White rabbits kept at different stocking densities during the fattening period, determined on the basis of deaths of animals and carcass traits. During the experiment the animals were divided into two groups: 4 animals per cage and 2 animals per cage. The number of deaths was low in both groups, which may indicate that conditions for the animals during the fattening period were satisfactory. The carcass parameters calculated (weight gain, feed intake and dressing percentage) were similar in both groups, indicating that cage size adopted in the Animal Protection Act and the Regulation concerning minimal housing conditions for different livestock species ensures that rabbits have adequate space.

KEY WORDS: fattening of rabbits / stocking density / carcass traits

In rearing of rabbits for slaughter it is essential to ensure the animals the best possible environmental conditions, including appropriate cage size. Breeders aim for optimal use of their farm buildings, placing the greatest possible number of cages with the highest possible stocking density, while at the same time the animals should be kept in the best possible conditions, including minimal space for an appropriate level of animal welfare. Legal provisions are a compromise reconciling these seemingly contradictory goals. These provisions are contained in a legislative act [10] and a regulation of the Minister of Agriculture and Rural Development, which is an executive act accompanying this legislation [7]. Under current regulations further research can be conducted to answer the question of how performance parameters of rabbits will be influenced by housing them in groups of different size while maintaining the minimum cage area permitted by law. In a group of rabbits housed at lower stocking density, less exposed to confrontation with other individuals, will rabbits exhibit better feed conversion and attain higher weight gain, or will the reverse be observed—in a larger group, with more social contact with other individuals in

the cage, will the stress level be reduced, which will be reflected in improved performance parameters?

The aim of the study was to determine whether stocking density of rabbits in a cage during fattening can affect the most important parameters of meat performance.

Material and methods

An experiment was conducted on New Zealand White rabbits kept on an experimental farm belonging to the Fur and Small Animals Division of the Warsaw University of Life Sciences. The animals were housed in cages indoors. These were two-storey, inclined--slope battery cages. The cage dimensions (60 cm x 40 cm x 40 cm) were in compliance with the Minister's regulation [7] and were suitable for four rabbits; the regulation refers to an area of 0.06 m^2 per rabbit with body weight up to 2.5 kg reared in a group. Each cage was equipped with an automatic nipple drinker and feeder, with constant access to feed. The animals were fed the complete mix Rabbit Plus, with the following nutrient content: crude protein 16.5%, crude fibre 15.5%, crude fat 2.4%, and minerals 7.5%. The experiment lasted from weaning of the rabbits at the age of 35 days until the age of 84 days. The animals were divided into experimental groups as shown in Table 1.

Table 1
Division of experimental animals into groups

Group	Number of animals per cage	Number of cages	Number of animals per group
1	2	12	24
2	4	7	28
Number of animals in experiment			52

The following indicators were calculated, comparing the results each time for the two groups of animals (2 or 4 individuals per cage):

1. Health condition and deaths of animals during the fattening period (days 35 to 84). This parameter was determined during weekly weighing of the animals, observing them and noting symptoms of diarrhoea.

2. Change in body weight in grams (weight gain). This value was calculated as the difference in body weight between the start and end of the experiment. Weight gain was calculated separately for each rabbit, and then the mean for each group was calculated (group with 2 or 4 animals per cage).

3. Weight gain in the rabbits in consecutive weeks of fattening, expressed as g/day, calculated for the entire fattening period (from week 6 to 13), according to the following formula:

$$P6 = \frac{M6 - M5}{7}$$

where:

P6 – mean daily weight gain (g) in week 6 (from day 35 to day 42)

M6 – body weight (g) at the age of 6 weeks (42 days)

M5 – body weight (g) at the age of 5 weeks (35 days)

Weight gain was calculated separately for each rabbit, and then the mean for each group was calculated (group with 2 or 4 animals per cage). Weight gains in subsequent weeks of fattening were calculated in the same manner.

4. Feed consumption per kg weight gain for the entire fattening period, expressed as kg feed/kg weight gain, calculated from the ratio of the amount of feed consumed to the value of the weight gain. Feed consumption was calculated for the entire cage and then converted to the value for a single rabbit in the cage for its weight gain over the entire fattening period, after which the mean for the group was calculated (group with 2 or 4 animals per cage).

5. Dressing percentage, expressed as %, calculated from the ratio of the weight of the chilled carcass to the weight before slaughter, according to the following formula:

$$\frac{Ms}{Mk} \times 100\,(\%)$$

where:

Ms – chilled carcass weight after 24 hours, without the head, limbs, and internal organs (g)

Mk – final body weight before slaughter (g)

Dressing percentage was calculated separately for each rabbit, and then the mean for the group was calculated (group with 2 or 4 animals per cage).

Statistical analysis was carried out by one-way analysis of variance in SPSS 14.0 PL software [8], comparing the results for each group (2 or 4 rabbits per cage) and calculating means and standard deviation. Significance of differences was determined by Student's t-test.

Results and discussion

The results of the evaluation of the health condition of the rabbits during the fattening period are presented in Table 2.

The results are consistent with data cited by Bielański and Kowalska [2], according to whom deaths during the rearing period should not exceed 10%. Symptoms of diarrhoea

Table 2
Comparison of survival rates of rabbits during the fattening period depending on stocking density in the cage

Specification	Group 1*	Group 2**
Number of animals at the age of 35 days	24	28
Animals with diarrhoea	5	5
Downs	2	1
Number of animals at the age of 84 days	22	27
Survival rate (%)	91.7	96.4

*Group with 2 rabbits per cage; **Group with 4 rabbits per cage
The analysis revealed no statistically significant differences between groups

Table 3
Body weight gain during fattening of rabbits in successive weeks, depending on stocking density in the cage

Specification	Group 1*		Group 2**	
	$\bar{x}$	V	$\bar{x}$	V
Mean body weight at weaning (g)	948	19.8	971	17.3
Mean weekly weight gain per rabbit (g/day)				
from day 35 to 42	37.6	23.8	42.6	17.1
from day 43 to 49	39.6	19.9	40.2	25.6
from day 50 to 56	35.3	21.1	36.8	26.1
from day 57 to 63	32.3	19.6	29.7	28.4
from day 64 to 70	30.3	20.0	33.4	20.7
from day 71 to 77	30.5	23.6	27.4	28.0
from day 78 to 84	13.2	21.6	13.9	26.8
Total weight gain (g)	1532.0	21.3	1568.0	24.6
Mean final body weight (g)	2480	23.1	2539	26.4
Mean daily weight gain during entire fattening period (g/day)	31.3	21.3	32.0	24.6

$\bar{x}$ – mean (g); V – trait variability (%); *Group with 2 rabbits per cage; **Group with 4 rabbits per cage
The analysis revealed no statistically significant differences between groups

were mainly observed in the second and third week after weaning, which is attributed to impaired immunity during this period due to weaning stress [5, 12]. The diarrhoea was usually mild and the animals recovered.

Comparison of the size of the rabbits at weaning and after completion of the fattening period, as well as the progression of fattening, are presented in Table 3.

The results obtained were similar to those cited in the literature for rabbits raised for meat [6, 9, 11]. Mean daily weight gains in the rabbits in successive weeks of fattening were similar in the two groups, and the differences between groups were statistically non--significant. The differences in the mean final weight of the rabbits in the two groups, with high variation within groups, were also statistically non-significant.

The results pertaining to feed consumption are presented in Table 4.

Feed consumption during fattening, according to various literature sources, ranges from 3.5 kg to 4.0 kg per kg of weight gain [2, 4, 14]. The results obtained in the study are similar to the highest values given in the literature. The two groups did not differ in terms of this parameter, and the level of variation was similar as well.

Table 4
Comparison of feed intake per kg of growth in each group

Specification	Group 1*	Group 2**
Number of animals per group	22	27
Mean feed intake (kg/kg of body weight gain)	4.05	4.05
Trait variability (%)	8.6	12.0

*Group with 2 rabbits per cage; **Group with 4 rabbits per cage
The analysis revealed no statistically significant differences between groups

Table 5
Comparison of dressing percentage in each group

Specification	Group 1*	Group 2**
Number of animals per group	22	27
Mean dressing percentage	51.9	52.7
Trait variability (%)	8.9	9.4

*Group with 2 rabbits per cage; **Group with 4 rabbits per cage
The analysis revealed no statistically significant differences between groups

The dressing percentage values are given in Table 5.

Dressing percentage is usually calculated using the carcass weight after chilling, as in the present study. The results were comparable to those cited in the literature [3, 6]. Edible parts may also include internal organs, especially the liver, as well as the head. Then the dressing percentage may be higher—up to 60% [1, 2, 13]. The dressing percentage in the present study was similar for the two groups of rabbits. A minimally higher index was obtained in the group with four individuals per cage, but the differences were statistically non-significant.

To sum up, the results obtained for the two groups of rabbits indicate proper growth and development. The increase in the surface area per rabbit did not affect performance results. The study confirmed that the cage area per rabbit specified in the act and regulation on conditions for housing livestock ensures the animals suitable living space.

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