

## OUTDOOR REARING SYSTEM FOR FATTENING RABBITS: EFFECT OF GROUP SIZE

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### ABSTRACT

This study aimed to evaluate in outdoor rearing system the effect of group size on the performance of a slow growing local rabbit population "Grigia Rustica". The rabbits were weaned at 35 d and housed indoor in colony cages until  $56\pm 3$  d of age. During this period all the animals received a coccidiostatic treatment for 5 d. At  $56\pm 3$  d of age, 88 rabbits were transferred to outdoor pens, located in a wooded area, housed in wire net floor colony cages and divided into three groups *at random*: thesis 4 animals/cage (T4), thesis 8 animals/cage (T8), thesis 16 animals/cage (T16), maintaining a density of 5 animals/m<sup>2</sup>. The animals were fed a complete feed and alfalfa hay *ad libitum*. Growth, feed intake and health status were checked from weaning to slaughter. At  $103\pm 3$  d, 12 animals for each group were slaughtered and carcasses chilled for 24 h in a ventilated cold room (+4°C). Hot carcass, skin, full gastrointestinal tract, chilled commercial carcass and reference carcass weights were recorded; the left hind leg was dissected to establish the meat to bone ratio. The productive performance were analyzed by least squares means considering as categorical variable the group size. The carcass parameters were analyzed by least squares means considering rearing system as main categorical factor nested within cage and using slaughtering weight as covariate. No mortality was observed, even if during the last fifteen days of the trial one rabbit of the T8 group and three rabbits of the T16 group showed aggressiveness and, for this reason, they were excluded by the experiment. The slaughtering weight, studied at parity of initial live weight, showed differences between groups ( $P<0.01$ ): generally lower productive performances were observed with increasing group size. Rabbits in group T4 showed the highest live weight at slaughtering age than T8 that showed the lowest values. The rabbits of the group T4 showed a significantly higher weight gain than groups T8 and T16. T4 group showed a significantly higher slaughtering weight and the lowest skin percentage. The highest values of meat to bone ratio were observed in T4 and T16 groups: in the first case it is probably due to the more rapid growth than the other groups, while in the second case it may be explained by the more intensive physical exercise. In conclusion the best performance of the rabbits reared with the lowest group size showed that it is possible to reduce the rearing period of about one week, improving the productive efficiency of this kind of rearing system. The onset of the aggressiveness was observed during the last days of rearing in the higher group size that need a longer time to growth. These results may suggest the opportunity to raise even the slow growing rabbits with low group size.

**Key words:** Rabbit, Rearing system, Outdoor, Group size, Productive performance.

### INTRODUCTION

The recent report of EFSA (European Food and Safety Authority) underlines that the current housing systems do not respect the rabbit's biological characteristics and for this reason points out some recommendations to produce in according to the health and welfare of rabbit (EFSA, 2005). Between the recommendations the group size is considered one of the most suitable condition for rabbit to express the behavioural typical pattern and one of the system in order to increase comfort. The effect of group size on productive performance and behaviour was studied, even if the data are confused by other factors as density, slaughter age, etc.; the group size plays an important role on behaviour and productive performance. Some Authors showed that group size, at equal high stocking densities, negatively affects productive performances and increases the aggressiveness with increasing age (Maertens and Van Herck, 2000; Martrenchar *et al.*, 2001; Postollec *et al.*, 2003; Morittu *et al.*, 2004,

Aubret and Duperray, 1992; Bigler and Oester, 1996; Morisse and Maurice, 1997; Paci *et al.*, 2004b). Jehl *et al.* (2003) report a significant high incidence of mortality in high groups size. Moreover carcass and meat quality is not always affected by the group housing system (Combes and Lebas, 2003; Trocino *et al.*, 2004). All remembered studies were carried out using commercial hybrids, selected to express their productivity when housed in cage. In our previous experience it was studied the effect of group size with a genotype characterized by slow growing and reared in indoor pen: the rabbits showed a good productivity and adaptability to housing system with a low incidence of mortality rate and intestinal disease (Lambertini *et al.*, 2005).

The objective of this study was to evaluate, in outdoor rearing system, the effect of group size on the performance of slow growing local rabbit population, “Grigia Rustica”.

## MATERIALS AND METHODS

### Animals and experimental design

The rabbits of a slow growing population (Grigia Rustica) were weaned at 35 d and housed indoor in colony cages until 56±3 days old. During this period all the animals received a pharmacologic prophylactic treatment for coccidiosis for 5 days and at 42 days old the rabbits were immunized against MEV and Mixomatosis. At 56±3 days of age, 88 rabbits were selected and divided into three groups *at random*. The groups were transferred to outdoor pen, located in a wooded area, and housed in wire net floor colony cages. Each colony cages measured cm 100x150x76 h. Three different groups size were studied: thesis 4 animals/cage (T4), thesis 8 animals/cage (T8), thesis 16 animals/cage (T16) and to maintain a density of 5 animals/m<sup>2</sup> the different group sizes were performed by dividing the cage into two parts or combining two cages. The different age of the rabbits transferred outdoor depended on the lack of the hormonal treatments for oestrus synchronization of does. The animals were fed a complete feed and alfalfa hay *ad libitum*. At 103±3 days, 12 animals for each group were slaughtered according to WRSA Commission (Blasco and Ouhayoun, 1993). After one hour from slaughtering, carcasses were put in a ventilated cold room (+4°C) and chilled for 24 hours.

### Measurements

Growth, feed intake and health status were checked from weaning to slaughtering age. All animals were weighed individually every week. Feed conversion efficiency was calculated per cage.

At slaughtering for each animal the weight of the hot carcass, of the skin and of the full gastrointestinal tract were recorded and the chilled commercial carcass was weighed. Head, liver, kidneys and thorax organs were separated to obtain the reference carcass. Chilled reference carcasses were divided into technological joints; from the hind part, the left hind leg was carefully dissected to separate bone from edible meat in order to establish the meat to bone ratio according to Blasco and Ouhayoun (1993).

### Statistical analysis

The *infra vitam* productive performance were analyzed by least squares means considering as categorical variable the group size. The initial live weight was analyzed using age as covariate. The carcass parameters were analyzed by least squares means considering rearing system as main categorical factor nested within cage and using slaughtering weight as covariate; statistical significance of differences was assessed by the t-test (SAS, 2002). Slaughtering parameters were analyzed as weight, but they are expressed in percentage.

## RESULTS AND DISCUSSION

During the trial no mortality was observed, even if during the last fifteen days of the trial one rabbit of the T8 group and three rabbits of the T16 group showed aggressiveness and, for this reason, they were excluded by the experiment.

In Table 1 the growth performance, the feed intake and the feed efficiency for the different group sizes are reported. The slaughtering weight, studied at parity of initial live weight showed significant differences between groups ( $P < 0.01$ ): generally lower productive performances were observed with increasing of group size. Rabbits housed in group T4 showed the highest live weight at slaughtering age than T8 that showed the lowest values. These results are in according to the data observed in the same population (Lambertini *et al.*, 2006) and in commercial hybrids housed in pen (Jehl *et al.*, 2003; Lambertini *et al.*, 2001; Martrenchar *et al.*, 2001; Morittu *et al.*, 2004). On the contrary other Authors did not note any decrease of the productive performance (Trocino *et al.*, 2004; Verga *et al.*, 2004), also when higher stocking densities than those normally applied in intensive rearing were used (Morisse and Maurice, 1996). Also daily weight gain showed a similar trend: in fact the rabbits of the group T4 showed a significantly higher weight gain than that observed in the groups T8 and T16. These results are in according to the data reported by Maertens and van Herck (2000) who noted a significantly lower weight gain in rabbits housed in pens with a great dimension of group size. As regarding the feed conversion efficiency, all groups showed high values similar to those observed in our previous experiences on the same population (Paci *et al.*, 2004). This is probably due to the slow growing that characterized this population, to the less constant environmental conditions and to the diet rich in fibre in form of hay. However the T4 group showed a slightly more favourable conversion index. The reason of this result could be explained by the shorter period of rearing of T4 group that was slaughtered one week earlier than T16 group; moreover the less available space probably induced a reduction of all the activities, as locomotory and exploration behaviour, that normally require an higher energetic consumption.

**Table 1:** Productive performance according to the different group sizes rabbit

	T4	T8	T16	Prob.	MSE
Rabbit (n.)	16	24	48		
Initial live weight (g)	1383	1267	1344	0.08	28145
Rabbit (n.)	16	23	45		
Slaughtering weight (g)	2657A	2468B	2574AB	0,01	36462
Daily weight gain (g)	30.1A	24.2B	25.3B	0.01	16.23
Cage (n.)	4	3	3		
Feed intake:					
Complete feed (g)	137.7	119.5	149.1	0.08	185.6
Feed conversion efficiency	4.6	4.9	5.9	0.06	0.36

In Table 2 the main slaughtering data are reported. Among considered parameters, only slaughtering weight, skin percentage and meat to bone ratio showed significant differences. It is interesting to note that T4 group has a significantly higher slaughtering weight: considering that the commercial weight is about 2500 g, this result implies that T4 animals could be slaughtered previously, so that the time of rearing could be reduced of about a further week.

The T4 group, slaughtered earlier, showed the lowest skin percentage probably due to the fact that the allometry coefficient of the skin is below one (Cantier *et al.*, 1969). The highest values of meat to bone ratio were observed in T4 and T16 groups: in the first case it may be explained by the more rapid growing than that observed in the other groups (Ouhayoun, 1998), while in the second case it may be explained by the more intensive physical exercise due to the more dispoable space (Dal Bosco *et al.*, 2002; Pla, 2007).

As regard the other parameters, it is only interesting to underline the high dressing out percentage, similar among groups, that is confirmed by previous research carried out on the same population (Lambertini *et al.*, 2006; Paci *et al.*, 2004).

**Table 2:** Slaughtering parameters according to the different group sizes rabbit

	T4	T8	T16	Prob.	MSE
Rabbit (n.)	12	12	12		
Slaughtering weight (g)	2747A	2441B	2568B	0.01	15125
Skin (%)	16.38B	17.62A	17.97A	0.01	0.62
Full gastrointestinal tract (%)	16.15	16.22	15.33	0.28	0.64
Dressing out (%)	62.65	62.57	63.26	0.37	1.58
Chilled carcass (%)	61.01	60.13	60.96	0.31	1.37
Drip loss (%)	4.14	3.90	3.63	0.27	0.46
Head (%)	8.15	7.89	8.27	0.42	0.39
Liver (%)	5.01	4.92	5.11	0.78	0.39
Reference carcass (%)	83.81	84.70	84.01	0.23	0.85
Loin (%)	22.38	21.76	21.64	0.41	1,22
Hind leg (%)	34.71	34.31	34.84	0.25	0.45
Meat to bone ratio	4.83A	3.83B	4,63A	0.04	0.21

## CONCLUSIONS

In conclusion the best productive performance of the rabbits reared with the lowest group size showed that it is possible to reduce the rearing period, improving the productive efficiency of this kind of rearing system. Moreover, in this trial the onset of the aggressiveness, whose study will be reported in another note, was observed during the last days of rearing and only in the groups with higher group size that need a longer time to growth. These results may suggest the opportunity to raise even the slow growing rabbits with low group size.

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