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Productive performance of Carmagnola Grey rabbits from birth to weaning

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Abstract

To evaluate the improvement of productive performance of Carmagnola Grey rabbits, an endangered breed indigenous to Northern Italy (Piemonte region) under selection since 1982, a research has been carried out from 2001 to 2003 on 673 litters. According to previous works, effect of parity (from 1 to 6 and more) and birth seasons (spring, summer, autumn, winter) were studied on the number of total and alive born and on the mortality rate at birth, while the effect of parity, weaning seasons and age at weaning (between 29 and 49 days of age) were studied on the number of weaned, the mortality rate at weaning and the litter and average individual weight at weaning.
The results showed a good number of born alive (8.0), low mortality rate at birth (3.36 %) and at weaning (14.99%), and a good weight at weaning, both as litter (7069 g) and as individual value (1020 g). There was a seasonal effect on the most interesting productive parameters.
These results, with the performance already achieved, allowed us to continue in improving the Carmagnola Grey rabbit, a rabbit suitable for meat production and to be used as bucks in hybrid production, which performance are comparable to the commercial lines.

Introduction

In the last years, the use of local breed is increased also in rabbit production (Bolet et al., 1997; Lopez and Sierra, 1998; Gauci-Maistre J., 1999; Ponce de Leon et al., 1999), due to the consumer interest for typical products and for the genetic conservation for endangered breeds, so as the adoption of rearing systems not so intensive as in the past, with mating at least 11 days *post-partum* and weaning at 35 days or more instead of *post-partum* mating and weaning at 28 days of age, and more suitable to such animals.
In Italy, one of the most studied local breeds is the Carmagnola Grey rabbit (Photos 1 and 2), native of the north west of Italy (Piemonte region) and already described in detail in previous works (Pagano Toscano et al., 1992; Lazzaroni, 2002; Toscano Pagano and Lazzaroni, 2004), which selection started in 1982. During the preservation and selection programme a big amount of data regarding phenotypic characters, reproductive and fertility parameters, slaughtering weight and carcass traits were collected. Particularly performance of does related to environmental factors (Pagano Toscano et al., 1990), and individual weights of rabbit - weaned at 28 days - from birth to 91 days of age (Lazzaroni et al., 1991) were analysed. Also weaning performance were studied (Lazzaroni et al., 1999a and 1999b), but as the breed is still under selection it will be interesting evaluate if in the meantime there was an improvement of such parameters, mainly according to parity order and season effects.

Photo 1 – Doe.

Photo 2 – Litter of 20 days of age.

Materials and methods

The trial was performed from January 2001 to December 2003 in the rabbitry of the Department of Animal Science, Turin University, where a pure nucleus of Carmagnola Grey rabbit is bred under controlled environmental conditions, recording genealogy and performance of rabbits.

Data on 673 litters and 4713 weaned kids were analysed according two different models, for the birth and the weaning data (SAS/STAT, 1990).

Effects of parity order (5 classes: from 1 to 6 and more) and birth season (4 classes: spring, summer, autumn, winter) were studied on the number of total and alive born kids in each litter, and on mortality rate at birth, using the following model:

$$Y_{i,j,k} = \mu + \alpha_i + \beta_j + \varepsilon_{i,j,k}$$

Where: Y = dependent variable; μ = general mean; α_i = fixed effect of parity order; β_j = fixed effect of season at birth; $\varepsilon_{i,j,k}$ = residual error.

Again, effects of parity order (5 classes: from 1 to 6 and more), weaning season (4 classes: spring, summer, autumn, winter) and age at weaning (5 classes: from 29 to 49 days), covaried for the number of alive born or weaned kids in each litter (from 1 to 17) were studied on the number of weaned kids in each litter, the litter and the average individual weight at weaning, and the morality rate at weaning, using the following model:

$$Y_{i,j,k,l} = \mu + \alpha_i + \beta_j + \gamma_k + b1x1 + \varepsilon_{i,j,k,l}$$

Where: Y = dependent variable; μ = general mean; α_i = fixed effect of parity order; β_j = fixed effect of season at weaning; γ_k = fixed effect of weaning age; b1x1 = covaried effect of number of alive born in each litter; $\varepsilon_{i,j,k,l}$ = residual error.

Results and discussion

The results of the performance at birth (table 1) showed that the parity didn't influence the number of total and alive born and the mortality rate.

Instead, the birth' season affected the number of total (P=0.001) and alive born (P=0.003): the higher values were in winter (8.68 born and 8.35 alive, respectively) and the lower in summer (7.48 born and 7.28 alive, respectively), probably due to the climatic effect.

No significant interaction between parity order and season was found.

Table 1 – Rabbit performance at birth according to the parity order and the season (estimated means ± standard error).

Effects	Total born (n)	Alive born (n)	Mortality rate (%)
Parity order	P=0.66	P=0.61	P=0.51
1	8.10 ± 0.19	7.77 ± 0.20	4.25 ± 0.89
2	8.42 ± 0.21	8.20 ± 0.21	3.20 ± 0.96
3	8.26 ± 0.24	8.04 ± 0.25	2.40 ± 1.12
4-5	8.01 ± 0.21	7.83 ± 0.22	2.16 ± 0.97
≥ 6	8.27 ± 0.22	7.93 ± 0.23	3.66 ± 1.01
Birth season	P=0.001	P=0.003	P=0.48
Spring (21.3-21.6)	8.44 ± 0.17	8.15 ± 0.18	3.43 ± 0.80
Summer (21.6-21.9)	7.48 ± 0.22	7.28 ± 0.23	2.62 ± 1.04
Autumn (21.9-21.12)	8.25 ± 0.21	8.04 ± 0.22	2.38 ± 0.99
Winter (21.12-21.3)	8.68 ± 0.17	8.35 ± 0.17	4.11 ± 0.77

Least Square Means of the studied variables according to the parity order, weaning season and individual weight at weaning are reported in table 2.

The parity order didn't influence the number of rabbit weaned per litter and the litter weight. On the contrary, it affected the individual weight of weaned rabbits (P=0.003): the lighter animals were in the first parity (968.28 g) and the heavier in the last ones (1030.31 g).

The weaning season affected both the number of rabbit weaned per litter, the litter weight and also the individual weight (P=0.001). The better values were in winter (7.29 weaned; 7664.67 g litter weight; 1066.14 g individual weight), while the worst were in summer (6.68 weaned; 6025.06 g litter weight; 914.63 g individual weight).

The age of rabbit at weaning influenced both litter and individual weight (P=0.001), but didn't affect the number oh weaned rabbit per litter. The litter weight at weaning was higher in litters weaned at 41-49 days of age (7851.82 g); the lower weight is found in litters weaned at 29-35 days of age (5753.99 g) because in the oldest litters the rabbits are heavier.

Again, there wasn't any significant interaction between parity order, season and weaning age.

Table 2 – Rabbit performance at weaning according to the parity order and season (estimated means ± standard error).

Effects	Weaned (n)	Litter weight at weaning (g)	Individual average weight at weaning (g)	Mortality rate (%)
Parity order	P=0.64	P=0.08	P=0.003	P=0.94
1	6.82 ± 0.13	6598.61 ± 142.63	968.28 ± 10.40	16.07 ± 1.30
2	7.05 ± 0.14	6971.67 ± 149.39	998.19 ± 10.89	15.40 ± 1.36
3	6.88 ± 0.17	6945.48 ± 176.22	1020.31 ± 12.85	15.87 ± 1.60
4-5	7.07 ± 0.14	7161.24 ± 151.57	1027.48 ± 11.05	15.05 ± 1.38
≥ 6	6.97 ± 0.15	7076.71 ± 161.18	1030.31 ± 11.75	14.63 ± 1.47
Weaning season	P=0.001	P=0.001	P=0.001	P=0.008
Spring (21.3-21.6)	7.16 ± 0.13	7117.09 ± 140.43	1000.06 ± 10.24	16.35 ± 1.28
Summer (21.6-21.9)	6.68 ± 0.15	6025.06 ± 155.02	914.63 ± 11.30	16.70 ± 1.41
Autumn (21.9-21.12)	6.71 ± 0.14	6996.14 ± 152.09	1054.82 ± 11.09	16.82 ± 1.39
Winter (21.12-21.3)	7.29 ± 0.13	7664.67 ± 133.17	1066.14 ± 9.71	11.74 ± 1.21
Weaning age	P=0.36	P=0.001	P=0.001	P=0.01
29-35 d	6.84 ± 0.18	5753.99 ± 184.88	839.29 ± 13.48	17.85 ± 1.68
36-37 d	7.18 ± 0.15	7123.11 ± 153.89	998.82 ± 11.22	12.06 ± 1.40
38 d	6.98 ± 0.14	6983.05 ± 150.92	1009.58 ± 11.01	14.56 ± 1.37
39-40 d	6.78 ± 0.15	7041.74 ± 162.81	1050.13 ± 11.87	18.41 ± 1.48
41-49 d	7.01 ± 0.14	7851.82 ± 150.99	1146.75 ± 11.01	14.13 ± 1.38

Conclusions

The results showed a good number of born alive (8.0), low mortality rate at birth (3.4%) and at weaning (15%), a good weight at weaning, both as litter (7069 g) and as individual values (1020 g). Furthermore, these results were better than the performance already achieved (Lazzaroni et al., 1999a and 1999b; Toscano Pagano and Lazzaroni, 2004), allowed us to continue in improving the Carmagnola Grey rabbit, a rabbit suitable for meat production and to be used as bucks in high productive systems with performance comparable to the commercial lines (Bolet et al., 1999 and 2004; Ponce de Leon et al., 2003).

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