# Factors affecting weaning performance of Carmagnola Grey rabbits

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**RIASSUNTO:** *Fattori che influiscono sulla produttività allo svezzamento nel coniglio Grigio di Carmagnola* – E' stato esaminato l'effetto di padre (n = 39), madre (n = 188), ordine di parto (da 1 a ≥ 6), numero di nati vivi (da 1 a 12), stagione ed età di svezzamento (da 29 a 51 giorni) sul numero di svezzati per nidiata, sul peso della stessa (n = 377) e su quello individuale (n = 2195). I parametri esaminati sono caratterizzati da una forte variabilità (n. svezzati per nidiata 5,4 ± 1,4, peso della nidiata 5158,6 ± 1325,6 g, peso individuale 946,3 ± 131,5 g) e la significatività dei fattori padre e madre (P = 0,046-0,001) indica che potrebbe esserci anche una buona variabilità genetica da utilizzare per la selezione.
*Key words:* rabbit, genetic traits, environment, weaning performance

**INTRODUCTION** – In rabbit production the intensive rearing system (*post-partum* mating and weaning at 28 days of age) was replaced by more extended systems (mating at least 11 days *post-partum* and weaning at 35 days or more). So, rural and not selected breeds, which performance must be still tested, could be used instead of selected and specialised animals needing optimum environmental conditions (particularly the room temperature and humidity).
During the preservation programme for an Italian local breed (the Carmagnola Grey rabbit), carried on since 1982 (Pagano Toscano et al., 1983), a big amount of data regarding phenotypic characters, reproductive and fertility parameters, slaughtering weight and carcass traits were collected (Pagano Toscano et al., 1992; Lazzaroni e Pagano Toscano, 1996). 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. In the present study, the effect of some factors of variability on weaning performance was studied.

**MATERIALS AND METHODS** – The trial was performed from April 1996 to August 1998 in the rabbitry of the Department of Animal Science, Turin University, where a pure nucleus of Carmagnola Grey rabbit is bred and environmental parameters, genealogy and performance of rabbit were recorded (377 litters and 2195 weaned).
Effects of buck (39 subjects), doe (188 subjects), parity order (6 classes: from 1 to 6 and more), season (4 classes) and age at weaning (8 classes: from 29 to 51 days), covaried for the number of alive born in each litter (from 1 to 12) were studied

(SAS/STAT, 1990) on the number of weaned kids in each litter, and the litter and individual weights at weaning, using the following model:

$$Y_{i,j,k,l,m,n} = \mu + \alpha_i + \beta_{ij} + \gamma_k + \delta_l + \zeta_m + b1x1 + \varepsilon_{i,j,k,l,m,n}$$

Where: Y = dependent variable; $\mu$ = general mean; $\alpha_i$ = fixed effect of buck; $\beta_{ij}$ = nested effect of doe; $\gamma_k$ = fixed effect of parity order; $\delta_l$ = fixed effect of season at weaning; $\zeta_m$ = fixed effect of weaning age; b1x1 = covaried effect of number of alive born in each litter; $\varepsilon_{i,j,k,l,m,n}$ = residual error.

**RESULTS AND DISCUSSION** – The rabbit performance at weaning are characterised by a large variability (n° of weaned kids in each litter 5.4 ± 1.4, litter weight at weaning 5158.6 ± 1325.6 g, individual weight at weaning 946.3 ± 131.5 g). This variability gives the possibility to improve the breed, and, as the used statistical model is able to explain a big amount of this variability ($R^2$ = .68 ÷ .92), the main factors affecting the examined performance should be found.
In detail the number of weaned in each litter is influenced only by the number of alive born (P = .001); the litter weight at weaning by parents (doe nested buck, P = .046), by weaning age (P = .010), and by the number of alive born (P = .001); the individual weight at weaning by all studied factors (P = .001).

Table 1 – Animal performance at weaning (least square means ± standard error) – *Produttività allo svezzamento (medie stimate ± errore standard)*

| Studied effects *Effetti studiati* | Weaned/Litter (n) *Svezzati/Nidiata (n)* | Litter weight (g) *Peso nidiata (g)* | Individual weight (g) *Peso soggetto (g)* |
|---|---|---|---|
| Parity order – *Ordine di parto* | | | |
| 1 | 5.40 ± 0.21 | 4919.72 ± 192.86 | 888.53 ± 8.11 |
| 2 | 5.81 ± 0.34 | 5434.99 ± 320.73 | 924.17 ± 12.76 |
| 3 | 5.32 ± 0.38 | 5177.06 ± 359.88 | 1009.01 ± 14.56 |
| 4 | 5.33 ± 0.47 | 5039.17 ± 444.97 | 1009.16 ± 18.29 |
| 5 | 5.66 ± 0.55 | 5119.04 ± 521.27 | 967.80 ± 22.39 |
| ≥ 6 | 5.44 ± 0.65 | 5025.40 ± 612.14 | 970.93 ± 25.57 |
| Weaning season – *Stagione di svezzamento* | | | |
| Spring – *Primavera* | 5.19 ± 0.38 | 5171.85 ± 353.77 | 1021.64 ± 14.73 |
| Summer – *Estate* | 5.32 ± 0.35 | 4862.21 ± 332.58 | 936.80 ± 13.74 |
| Autumn – *Autunno* | 5.99 ± 0.40 | 5216.24 ± 373.13 | 911.56 ± 15.50 |
| Winter – *Inverno* | 5.47 ± 0.35 | 5226.62 ± 325.34 | 976.40 ± 13.73 |
| Weaning age (days) – *Età allo svezzamento (giorni)* | | | |
| 29-33 | 5.98 ± 0.46 | 4214.93 ± 429.70 | 683.53 ± 19.21 |
| 34 | 4.71 ± 0.56 | 3879.52 ± 525.36 | 874.38 ± 20.94 |
| 35 | 5.13 ± 0.49 | 4883.84 ± 462.42 | 964.83 ± 19.88 |
| 36 | 6.09 ± 0.45 | 5429.68 ± 424.24 | 940.20 ± 17.39 |
| 37 | 6.41 ± 0.59 | 6670.82 ± 555.93 | 1024.76 ± 21.08 |
| 38 | 5.89 ± 0.41 | 5391.66 ± 384.96 | 924.08 ± 16.21 |
| 39-40 | 5.06 ± 0.52 | 5152.01 ± 486.56 | 1061.21 ± 20.2 |
| 41-51 | 4.67 ± 0.55 | 5331.39 ± 518.57 | 1219.81 ± 23.42 |

Least square means of the studied variables by parity, weaning season, and age are reported in table 1. The parents' effect on the litter and individual weight at weaning pointed out the presence of 6 bucks and 54 does which litters weighted more than 6000 g, and 10 bucks and 80 does which kids weighted more than 1000 g should be mentioned. These results suggest to pay attention to plan mating, to produce rabbit enough heavy, therefore the growing and fattening period could be reduced.

The parity doesn't affect the number of rabbit weaned per litter and the litter weight, but influences the individual weight of weaned rabbit (P=.001): the lighter animals were in the 1st parity (888.53 g) and the heavier in the 4th one (1009.16 g). In the last class should be noticed the presence of a good amount of old does (up to 15th parity) pointing out the good longevity of the breed.

Also the weaning season doesn't affect both the number of rabbit weaned per litter and the litter weight, but only the individual weight: the heavier rabbits were in spring (1021.64 g) and the lighter ones in autumn (911.56 g). Perhaps this result could be influenced by the climatic conditions of the previous season, in which the pregnancy was carried on.

The age of rabbit at weaning affects both litter (P=.010) and individual weight (P=.001), but obviously doesn't affect the number of weaned rabbits per litter. The litter weight is higher in litter weaned at 37 days of age (6670.82 g), but the lower weight is found in litter weaned at 34 days (3879.52 g), because in the oldest litter the rabbits are heavier. In fact, there is a quite constant increase of the individual weight of rabbits, from 683.53 to 1219.81 g, passing from weaning at 29-31 days of age to 41-51 days.

**CONCLUSIONS** – The weaning performance of the Carmagnola Grey rabbit present a good adaptability to more extended rearing systems. These results, together with the performance already achieved (fertility rate 80.4% and daily growth rate 27-44 g; Pagano Toscano et al., 1992; Lazzaroni et al., 1991), allowed us to continue in improving this breed. The purpose is to obtain animals suitable for meat production both as pure breed and using the bucks to produce meat hybrid, also utilising artificial insemination (Lazzaroni et al., 1992; Luzi et al., 1992).

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# Effects of feed withdrawal on slaughter weight and processing yield of turkeys

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**RIASSUNTO:** *Effetti del digiuno pre-macellazione sul peso della carcassa di tacchino* – La sperimentazione è stata condotta su tacchini maschi da carne allevati secondo modalità standard. Da un capannone sono stati isolati 39 soggetti e sottoposti a tre differenti periodi di digiuno alimentare pre-carico (6, 3 e 0 ore). I rilievi sono stati effettuate prima e durante macellazione dei tacchini per stabilire le correlazioni tra i cali del peso degli animali, della loro carcassa durante le diverse fasi di macellazione e periodi di digiuno crescenti. I risultati evidenziano che 6 ore di digiuno rispetto 3 e 0 ore consentono un progressivo svuotamento delle porzioni distali del tratto gastroenterico senza determinare perdite in termini di prodotto edibile con particolare riferimento alla fesa, cosce ed ali.
*Key words*: turkey, feed withdrawal, processing yield

**INTRODUCTION** – Commercial processors of broilers and turkeys usually withdraw feed from birds several hours before transport, holding and slaughter in order to facilitate digestive tract clearance before processing and thereby to maximise eviscerated yield and to reduce the faecal contamination of carcass and processed products. The optimal withdrawal period must be long enough to allow the gastrointestinal tract (GI) to clear, but short enough to limit losses of live weight and carcass yield (Baroli *et al.*, 1997) These aims are usually achieved by keeping broilers off feed for at least 8-12 hours (Bilgili,1988; Farr, 1979). The starving period before slaughtering usually includes feed withdrawal at the farm, the time spent for transport and holding at the plant. However, it must be considered that the physiological effects are different if birds are kept off feed or feed plus water (May and Deaton, 1989; Summers and Leeson, 1979; Wabeck, 1972). The length of feed withdrawal has been the subject of active investigation on broilers for several years while the studies on turkeys are not so common.

**MATERIALS AND METHODS** – The trial was conducted on 39 male commercial turkeys (146 days old). Birds were randomly allocated to separate pens in groups of thirteen and withdrawn from feed 6, 3 and 0 hours before catching by the crew. Drinking water was available during the feed withdrawal at the farm. Transport time and plant holding time before slaughtering were about 1.5 and 4 hours respectively. All birds were slaughtered in a commercial processing plant. Individual body weight was recorded prior and after the feed withdrawal at the farm and also before slaughtering. The carcasses were weighed