

## **Effect of the split weaning on the performance of growing rabbits**

### **Efeito do desmame parcelado sobre o desempenho de coelhos em crescimento**

### **Efecto del destete parcelado sobre el desempeño de conejos en crecimiento**

**Diones Montes da Silva<sup>1</sup>, Maria Cristina de Oliveira<sup>2</sup>, Daisa Mirelle Borges Dias<sup>2</sup>, Bruno Nunes Gonçalves<sup>2</sup>, Leonardo Azevedo Machado<sup>2</sup>, João Carlos de Oliveira<sup>3</sup>**

<sup>1</sup>Mestrando em Zootecnia, Instituto Federal Goiano, Campus Rio Verde, Rio Verde, GO.

<sup>2</sup>Faculdade de Medicina Veterinária, Universidade de Rio Verde, Campus Universitário s/n, Rio Verde, GO. 75901-910 - E-mail: mcorv@ig.com.br

<sup>3</sup>Centro Federal de Educação Tecnológica de Minas Gerais - CEFET, Divinópolis, MG.

#### **ABSTRACT**

This research was carried out in order to determine the effects of the weaning at 28 or 35 days of age or the split weaning, at 28 and 35 days of age, on the productive performance of growing rabbits. Eighty White New Zealand rabbits were used, weaned at 28 and 35 days of age, distributed in a randomized blocks design with four treatments and five replicates. The treatments were: totally weaned litter at 28 days of age (T1), totally weaned litter at 35 days of age (T2), half litter (heavier rabbits) weaned at 28 days of age (T3) and half litter (lighter rabbits of the same litter than T3) weaned at 35 days of age (T4). The evaluated parameters were the performance, carcass characteristics and economic viability. Weaning age did not influence ( $P>0.05$ ) the body weight, daily feed consumption, feed gain ratio and carcass characteristics at 84 days of age. However, rabbits totally or split weaned at 28 days showed a higher ( $P<0.05$ ) daily weight gain compared with the ones weaned at 35 days of age. Age at weaning did not influence ( $P>0.05$ ) body weight, daily feed intake, feed conversion ratio, livability rate and carcass traits at 84 days of age. Entirely or partially weaned rabbits at 28 days of age presented greater ( $P<0.05$ ) daily weight gain in comparison to those weaned at 35 days of age. The split weaning resulted in a higher gross margin when the animals were sold alive or slaughtered. The split weaning can be used by rabbit breeders without impairments to the animal's productive performance e due to its economic viability.

**Key words:** age at weaning, compensatory gain, rabbit's management.

## RESUMO

Esta pesquisa foi realizada para determinar os efeitos do desmame aos 28 ou 35 dias de idade e do desmame parcelado, aos 28 e 35 dias de idade, sobre o desempenho produtivo de coelhos em crescimento. Foram utilizados 80 coelhos da raça Nova Zelândia Branco desmamados com 28 e 35 dias de idade, distribuídos em delineamento em blocos ao acaso com quatro tratamentos e cinco repetições. Os tratamentos foram: ninhada totalmente desmamada aos 28 dias de idade (T1), ninhada totalmente desmamada aos 35 dias de idade (T2), metade da ninhada (lápares mais pesados) desmamada aos 28 dias (T3) e metade da ninhada (lápares mais leves da mesma ninhada que T3) desmamada aos 35 dias de idade (T4). Os parâmetros avaliados foram o desempenho, características de carcaça e viabilidade econômica. A idade ao desmame não influenciou ( $P>0,05$ ) o peso corporal, o consumo de ração diário, a conversão alimentar, a taxa de sobrevivência e as características de carcaça aos 84 dias de idade. Entretanto, coelhos desmamados integralmente ou parceladamente aos 28 dias apresentaram maior ( $P<0,05$ ) ganho de peso diário em comparação com aqueles desmamados aos 35 dias de idade. Os coelhos que foram desmamados parcialmente aos 28 dias e, posteriormente, aos 35 dias de idade promoveram maior margem bruta tanto quando vendidos vivos quanto já abatidos. Concluiu-se que o sistema de desmame parcelado pode ser adotado por cunicultores sem que haja prejuízos ao desempenho produtivo dos animais e por ser economicamente viável.

**Palavras chave:** idade ao desmame, ganho compensatório, manejo de coelhos.

## RESUMEN

Esta investigación fue realizada para determinar los efectos del destete a los 28 o 35 días de edad y del destete parcelado, a los 28 y 35 días de edad, sobre el desempeño productivo de conejos en crecimiento. Se utilizaron 80 conejos, raza Nueva Zelanda Blanco, destetados con 28 y 35 días de edad, distribuidos en diseño en bloques aleatorizados con cuatro tratamientos y cinco repeticiones. Los tratamientos fueron: camada totalmente destetada a los 28 días de edad (T1); camada totalmente destetada a los 35 días de edad (T2); mitad de la camada (conejos más pesados) destetadas a los 28 días (T3) y mitad de la camada (conejos más leves de la misma camada que T3) destetada a los 35 días de edad (T4). El desempeño productivo, las características de las canales y la viabilidad económica fueron evaluados. La edad al destete no influyó ( $P>0.05$ ) el peso corporal, el consumo de pienso diario, la conversión

alimenticia, la tasa de supervivencia y las características de las canales a los 84 días de edad. Entretanto, conejos destetados a los 28 días de edad (toda la camada o la mitad) tuvieron mayor ( $P<0.05$ ) ganancia de peso diario en comparación con aquellos destetados a los 35 días de edad. Los conejos destetados parcialmente a los 28 días y los destetados a los 35 días de edad, resultaron en mayor margen bruto, tanto cuando vendidos vivos como abatidos. Se ha concluido que el destete parcelado puede ser adoptado por productores de conejos sin efectos negativos al desempeño productivo de los animales y por ser económicamente viable.

**Palabras clave:** edad al destete, ganancia compensatoria, manejo de conejos.

## INTRODUCTION

Weaning is the most crucial period for growing rabbits, since during this stage rabbits are susceptible to several disorders, specially digestive ones (Gallois *et al.*, 2008). Young rabbits ability for growing is outstanding, although it can be limited by the insufficient milk intake. Promoting and increase in growing rate during pre-weaning period might be a differential for the forthcoming growing cycle.

Rabbits weaning occurs, usually, between 30 and 35 days of age. However, weaning rabbits earlier might be advantageous as much for the doe as for the offspring, once it would reduce the contact time between the doe and the young rabbits, therefore reducing the energy expenditure for milk production by the doe (Xicatto *et al.*, 2003; Pascual *et al.*, 2006).

Weaning age might interfere on doe fertility which, when weaned at 42 days of

nursing presented 36% less young rabbits at weaning and litter interval delayed in 2.6 days in comparison to those weaned at 35 days of age (Guillén *et al.*, 2008).

Weaning age has been anticipated due to the variations occurred in rabbit breeding during the last two decades. Particularly, its change from rural to industrial activity caused the intensification of breeding techniques with a productive response typically quantitative (Marongiu *et al.* (2006).

Kovács *et al.* (2008) evaluated the effects of weaning at 21, 28 and 35 days of age and reported that, at 42 days, rabbits weaned at 35 days were heavier (1,175 g) than rabbits weaned at 21 and 28 days, although feed intake was greater in animals weaned at 28 and 35 days. Nevertheless, Zita *et al.* (2007) did not report effect of weaning age of 25, 28, 31 and 35 days on body weight and feed intake at 84 days of age.

Split weaning (SW) is a practice spread in pork breeding and minimizes the pathogens transmission from the sow to the piglets. It consists in the weaning of heavier piglets a few days before the complete weaning (Tarocco *et al.*, 2000; Smith *et al.*, 2008). Pluske and Williams (1996) observed greater growth rates in light piglets submitted to SW, which grew faster than piglets kept in entire litters, at 21 days. However, at the 9<sup>th</sup> week of age there was no weight difference among them.

This research was performed in order to evaluate the effects of the split weaning, at 28 and 35 days of age, on productive performance of growing rabbits and on the economic viability.

## **MATERIAL AND METHODS**

For this purpose, 80 White New Zealand rabbits were used, with initial weight of  $355.31 \pm 59.24$ g and of  $529.69 \pm 53.76$ g, respectively for weaned rabbits with 28 and 35 days of age.

Animals were distributed in a randomized blocks design with four treatments and five replicates. Treatments consisted of T1 – totally weaned litter at 28 days of age, T2 – litter weaned completely at 35 days of age, T3 – split weaning with half litter (heavier young rabbits) weaned

at 28 days and T4 - the other half litter (lighter young rabbits) weaned at 35 days of age.

All young rabbits used in the experiment were taken from eight-rabbit litters and, for complete weaning at 28 or 35 days, only four rabbits with intermediate body weight from each litter were used. For the split weaning, the four heaviest young rabbits were weaned at 28 days and put into a cage and the four lightest remaining rabbits were weaned at 35 days and put into another cage.

During the whole experimental period, young rabbits received water and commercial diet *ad libitum* (Table 1). Animals were weighed at the beginning of the experiment, and at 84 days of age in order to measure body weight and daily weight gain. Feed intake and feed conversion ratio were also measured.

When completing 84 days of age, two young rabbits of each replicate were submitted to fasting for eight hours and weighed (slaughter weight). After slaughter, carcass without head, feet, skin and viscera was weighed and its yield was calculated based on slaughter weight. Liver, heart and kidneys were also weighed and their relative weight was calculated based on the carcass weight.

Economic viability of treatments was calculated taking into account the final body weight for animals sold alive (R\$ 7.50/kg), carcass weight for animals sold slaughtered (R\$ 12.00/kg) and the feed cost (R\$ 0.91/kg). Gross margin was

calculated as follow: final body weight (kg) x R\$7.50 or carcass weight x R\$12.00 - feed consumed (kg) x R\$0.91.

Data were submitted to analysis of variance and means were compared through the Tukey test at 5% probability.

Table 1 – Commercial pelleted diet composition<sup>1,2</sup> provided to the growing rabbits

Nutrient	Composition
Dry matter (%) <sup>3</sup>	83,60
Crude protein (%) <sup>3</sup>	17,89
Ether extract (%) <sup>3</sup>	3,80
Crude fiber (%) <sup>4</sup>	15,00
Mineral matter (%) <sup>3</sup>	5,39
Calcium (%) <sup>3</sup>	1,02
Total phosphorus (%) <sup>3</sup>	0,71
Lysine (%) <sup>4</sup>	0,94
Methionine + cystine (%) <sup>4</sup>	0,63
Digestible energy (kcal/kg) <sup>4</sup>	2300

<sup>1</sup>In dry matter basis.

<sup>2</sup>Enriched by kg: 8000 UI vitamin A, 1000 UI vitamin D<sub>3</sub>, 15 UI vitamin E, 1.50 mg vitamin K<sub>3</sub>, 2 mg vitamin B<sub>1</sub>, 5 mg vitamin B<sub>2</sub>, 2 mg vitamin B<sub>6</sub>, 10 mcg vitamin B<sub>12</sub>, 1 mg folic acid, 18 mg pantothenic acid, 35 mg nicotinic acid, 500 mg choline, 1,50 mg cobalt, 6 mg copper, 50 mg zinc, 0,30 mg iodine, 40 mg iron, 40 mg manganese, 0,10 mg selenium, 10 mg growth promoter and 125 mg antioxidant.

<sup>3</sup>Determined through laboratory analysis.

<sup>4</sup>According to the manufacturer.

## RESULTS AND DISCUSSION

Age at weaning did not influence (P>0.05) body weight, daily feed intake, feed conversion rate and livability rate at 84 days of age. However, rabbits that were

fully weaned at 35 days presented lower (P<0.05) daily weight gain in comparison to those weaned fully at 28 or split weaned at 28 and 35 days of age (Table 2).

Table 2 – Growth performance of rabbits weaned in different ages

Parameters	Complete weaning		Split weaning		CV (%)
	28 days	35 days	28 days	35 days	
Weaning weight (g)	337b	547a	374b	513a	5.23
Body weight at 84 days of age (g)	2120	2052	2156	2137	3.05
Daily weight gain (g/d)	39.28a	36.22b	39.42a	38.69a	2.88
Daily feed consumption (g/d)	113.06	117.33	106.09	94.91	3.56
Feed: gain ratio	2.88	3.01	2.71	2.46	3.01
Livability rate (%)	81.25	93.75	87.50	93.75	7.36

As expected, animals weaned at 28 days presented a lower weight at weaning than those rabbits weaned at 35 days in 36.29 and 27.09%, respectively for traditional and split weaning. Rabbits weaned at 28 days of age grew 14.43 and 9.92% faster than those rabbits weaned at 35 days through the traditional and split weaning, respectively. After weaning, rabbits should be capable of digesting nutrients such as starch and protein contained in their new diet and, for this purpose, it is necessary that their enzymatic system to be active. These results were similar to the Zita *et al.* (2007) e Gallois *et al.* (2008).

Salivary amylase activity in jejunum of rabbits is not different on d 21 and 35 of age, suggesting that the feed stimulates amylase biosynthesis (Sabatakou *et al.*, 2007). Also, considering that the protein level in the milk is high (12-13%), young suckling rabbits already present a high proteolytic activity (Pascual, 2001), which remains constant from birth to 42 days of age (0.13-0.16 IU/mg of protein) (Debray *et al.*, 2003). Besides, small intestines length of previously weaned rabbits becomes greater (Gallois *et al.*, 2008), which increases the nutrients absorptive area.

In animals weaned at 35 days solid feed intake had already increased before weaning due to the diminished milk intake, and hence, weaning effects on feed intake were less evident.

Silva *et al.* (2009) also reported lower weight at weaning for rabbits weaned at 28 than 35 days of age. However, at 70 days, animals' weights were similar (2019 x 2008 g). Daily weight gain was greater for animals weaned at 35 days (34.9 g/d); nevertheless, there was no difference for feed intake and feed conversion ratio at the end of the experimental period. Different results were found by Feugier *et al.* (2006) which studied the effects of weaning at 23 and 35 days of age. Authors noticed that growth rate and body weight were greater in rabbits weaned at 35 days of age.

In the split weaning, heavier animals are weaned a few days before, reducing the competition for the doe's teats, allowing lighter young rabbits to ingest greater amount of milk and to be weaned with increased body weight. In this study, at the end of the experimental period, this effect disappeared and rabbits presented similar body weights, irrespectively of the treatment. This occurs because rabbits submitted to a smaller period of milk

ingestion compensate with greater feed intake, mainly right after weaning, which enable them to attain similar growth to those unrestricted rabbits (weaned at 35 days of age) (Gallois *et al.*, 2008).

Kugonza and Mutetikka (2005) in a study using piglets, reported that animals submitted to split weaning presented lower body weight than those from control treatment up to 7<sup>th</sup> week of age, although at the 8<sup>th</sup> week observed weights were similar

between treatments. Authors observed that there was a greater intake of feed by the piglets submitted to split weaning, which was not observed in the current study.

There was no difference ( $P>0.05$ ) of age at weaning on carcass yields and relative weights of liver, heart and kidneys, which demonstrates that age at weaning does not influence protein deposition in the carcass nor in viscera growth (Table 3).

Table 3 – Carcass and viscera weigh (absolute and relative) of weaned rabbits in different ages

Parameters	Complete weaning		Split weaning		CV (%)
	28 days	35 days	28 days	35 days	
Slaughter weight (g)	1985	2020	2083	2053	4.58
Carcass weight (g)	1105	1086	1130	1085	4.13
Liver weight (g)	42.07	41.65	40.08	47.30	4.31
Heart weight (g)	4.52	4.51	4.97	4.59	4.87
Kidneys weight (g)	12.85	13.73	13.68	13.22	3.14
Carcass relative weight (%)	54.73	54.91	54.27	52.79	3.84
Liver relative weight (%)	3.82	3.81	3.55	4.40	3.28
Heart relative weight (%)	0.41	0.42	0.44	0.43	3.81
Kidneys relative weight (%)	1.17	1.27	1.21	1.23	4.21

Due to the high rate of weight gain, and possibly, the greater length of the small intestines, rabbits weaned at 28 days presented meat deposition rates in the carcass and development of edible viscera similar to those weaned at 35 days. Zita *et al.* (2007) evaluated the performance of rabbits weaned 25, 28, 31 and 35 days of age and did not find effect at 84 days of age on weight at slaughter, carcass weight

and yield and relative weight of liver and kidneys. Silva *et al.* (2009) also did not find differences in carcass weight and yield and edible viscera weight of weaned rabbits at 28 and 35 days of age.

Rabbits that were partially weaned at 28 days and, lately, at 35 days of age promoted greater gross margin no matter if sold alive (+1.54 and 7.66%, respectively for weaning at 28 and 35 days of age) or



slaughtered (+2.45 and 2.52%, respectively for weaning at 28 and 35 days of age) (Table 4).

Independent of treatment, final body and carcass weights were similar, indicating that weaning at 28 days, under the traditional or split system, do not cause

negative effects on rabbits productivity. Silva *et al.* (2009) also demonstrated that rabbits weaned early are more economic viability. According to the authors, the kilogram of body weight obtained was of R\$2.17 and R\$1.98 for rabbits weaned at 28 and 35 days, respectively.

Table 4 – Economic viability of weaning of rabbits in different ages

	Sale of living animals			
	Body weight (kg)	Price of animal alive (R\$)	Cost of ration ingested (R\$)	Gross margin (R\$)
<i>Complete weaning</i>				
28 days	2.120	15.90	5.51	10.39
35 days	2.052	15.39	4.30	11.09
<i>Split weaning</i>				
28 days	2.156	16.17	5.62	10.55
35 days	2.137	16.02	4.08	11.94
	Sale of slaughtered animals			
	Carcass weight (kg)	Carcass price (R\$)	Cost of ration ingested (R\$)	Gross margin (R\$)
<i>Complete weaning</i>				
28 days	1.105	13.26	5.51	7.75
35 days	1.086	13.03	4.30	8.72
<i>Split weaning</i>				
28 days	1.130	13.56	5.62	7.94
35 days	1.085	13.02	4.08	8.94

## CONCLUSION

Split weaning is feasible to be adopted by rabbit's breeders without harms to the productive performance of animals and due to its economic viability.

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