

EFFECT OF NURSING METHOD AND FEEDING SCHEME ON THE PERFORMANCE OF GROWING RABBITS TILL FIRST MATING

Mónika GYOVAI^{a)}, Zsolt SZENDRŐ^{b)*}, Edit BIRÓ-NÉMETH^{a)},
István RADNAI^{a)} and Zsolt MATICS^{a)}

^{a)} Univ. of Kaposvár, Fac. of Animal Science, Guba Sándor str. 40, H-7400 Kaposvár, Hungary, M.Sc.

^{b)} same address, Prof., Ph.D.

* Corresponding author: Tel. +36 82 314155; fax: +36 82 320175, e-mail: szendro@mail.atk.u-kaposvar.hu.

ABSTRACT

The aim of the experiment was to study the effect of the nutrient supply of suckling and growing rabbits on productive traits. The experiment was set-up using a 2x2 factorial design. Half of the litters were nursed by one doe and the other half by two does. Kids were weaned at 3 weeks of age. From the age of 4 weeks each group was halved and one part was fed *ad libitum* (AL) and restricted feeding (RF) was applied for the others. The productive traits of 136 nursing and growing rabbits were examined. The nursing method affected the kids' body weight but the difference between groups was significant only till 4 weeks of age (443 and 523g, $P < 0.05$). The daily weight gain and feed intake were independent of the number of nursing does but the feed conversion between 6 and 9 weeks of age was significantly superior to kids nursed by one doe (2.99 and 3.29 g g⁻¹, $P < 0.01$). The effect of feeding scheme was significant on feed intake and weight gain from 4 weeks and on the body weight between 12 and 16 weeks of age. The feed conversion was better between weeks 9–12 in AL while between weeks 12 and 16 in RF group. The body weight of rabbits in groups of AL nursed by two does and RF nursed by one doe were 1042 and 950, 1875 and 1763, 2671 and 2502, 3549 and 3392 at the age of 6, 9, 12 and 16 weeks, respectively.

Key words: rabbits / animal nutrition / feeding scheme / milk / feed intake / weight gain / body weight / feed conversion

VPLIV NAČINA NAPAJANJA IN SCHEME KRMLJENJA NA UČINKOVITOST RASTI KUNCEV DO PRVE PARITVE

IZVLEČEK

Namen raziskave je bil proučiti vpliv prehranske oskrbe sesnih in rastočih kuncev na produktivne lastnosti. Polovica kuncev iz gnezda je sesala pri eni kunki, druga polovica pri dveh kunkah. Kunci so bili odstavljani pri starosti treh tednov. Od četrtega tedna starosti dalje je bila vsaka skupina razdeljena na polovico. Ena polovica je dobivala krmo po volji (AD), druga je bila restriktivno krmljena (RK). Meritve proizvodnih lastnosti so bile opravljene na 136 sesnih in rastočih kuncih. Način dojenja je vplival na telesno maso kuncev, vendar so bile razlike značilno različne samo do starosti štirih tednov (443 in 523 g; $p < 0,05$). Dnevni prirast in konzumacija krme nista bila odvisna od števila kunk v skupini. Konverzija krme je bila med 6. in 9. tednom starosti boljša pri tistih kuncih, ki so sesali samo pri eni kunki (2,99 in 3,29 g g⁻¹, $p = 0,01$). Način krmljenja je vplival na konzumacijo in dnevni prirast po 4. tednu starosti ter na telesno maso med 12. in 16. tednom starosti. Konverzija krme je bila boljša med 9. in 12. tednom v skupini AL in med 12. in 16. tednom starosti v skupini RK. Telesna masa kuncev v skupini AL, ki so sesali pri dveh kunkah, in v skupini RK, ki so sesali pri eni kunki, je znašala 1042 g in 950 g pri starosti 6 tednov, 1875 g in 1763 g pri starosti 9 tednov, 2671 g in 2502 g pri starosti 12 tednov ter 3549 in 3392 g pri starosti 16 tednov.

Ključne besede: kunci / prehrana živali / režim krmljenja / mleko / količina / prirast / telesna teža / konverzija

INTRODUCTION

In intensive systems the life span of rabbit does is short, the renewal rate is about 120–130% (Guerder, 2001). The life permanence of does can be connected with the method of their rearing. The nutrient supply before and after weaning may play a role in this respect.

Most of the previous studies have focused on the effect of a single factor. In one of our studies, the effect of nutrient status of foetuses (birth weight) and that of the suckling and growing rabbits (nursed by one or two does and fed *ad libitum* or restricted) in associated with the age at first mating were studied on reproductive performance of does (Gyovai *et al.*, 2004). According to the results the two main factors were the milk and pellet supply. Maertens (1992) also pointed out the role of feeding scheme during rearing.

The aim of this study was to examine the effect of milk supply (nursing of kids by one or two does) and that of the feeding scheme after weaning (*ad libitum* or restricted) on the performance of suckling and growing rabbits till the age of 16 weeks. The final aim of the experiments is to find the best rearing method for the long term productivity of rabbit does.

MATERIAL AND METHODS

The experiment was carried out at the rabbit farm of University of Kaposvár with Pannon White breed. The animals were housed in closed building, in wire net flat-deck cages. The rabbitry was heated in winter (min. 16 °C), the photoperiod was 16L:8D.

One part of kids were born naturally on day 31st of the pregnancy but the others on the same day by oxytocin injection (5 IU/animal) of does. After kindling the nest boxes were closed and next morning before nursing the one-day old kids (with empty stomach) were weighed.

Litters with 8 medium-weighted (50–60g) female rabbits were formed. One half of the litters were nursed by one doe and the other half by two does as described by Szendrő *et al.* (2002). In this case one of the kindled does nursed in the morning and the other which was at the top of the lactation, after weaning her kids at 3 weeks of age, late afternoon. At 17 days of age this doe was moved into another cage and the nest-boxes were opened and the kids were weaned at 3 weeks of age. After weaning the young were housed in fattening cages (330x500mm, 2 kids/cage) and all of them were fed *ad libitum*. At 4 weeks of age both groups were halved. One of them was fed *ad libitum* and the other restricted (by restriction of feeding time). The daily feeding time was shortened to 10, 9, 8 and 7 hours between the ages of 4–6, 6–9, 9–12 and 12–16 weeks. The feeders were closes for the rest of the day. All rabbits received medicated pellet (10.3MJ DE kg⁻¹, crude protein=16%, crude fiber=15.5%, supplemental medication: 195 mg kg⁻¹ zink-bacitracin, 390 mg kg⁻¹ oxytetracycline, 1 mg kg⁻¹ diclazuril).

The experimental data were evaluated by two-way analysis of variance, using SPSS 10.0 programme package, according to the following modell:

$$Y_{ijk} = \mu + N_i + F_j + NF_{ij} + e_{ijk}$$

where

μ = mean of the population

N_i = effect of number of nursing does ($i=1-2$)

F_j = effect of feeding scheme ($j=1-2$)

NF_{ij} = effect of interaction between the nursing method and feeding scheme

e_{ijk} = random error.

RESULTS AND DISCUSSION

The results of the experiment are summarized in Table 1.

Table 1. Effect of the rearing methods on the performance of the suckling and growing rabbits till the first mating

Traits	Nursing does		Feeding		SE	Effects		One doe		Two does	
	One	Two	<i>Ad lib</i>	Restr.		Nur-sing	Feed-ing	<i>Ad lib</i>	Restr.	<i>Ad lib</i>	Restr.
Birth weight, g	55.7	56.2	55.9		0.27	-	-				
Weight gain, g day ⁻¹ till 3 weeks of age	14.6a	16.7b	15.7		0.25	0.000	-				
3. week (n)	68	68	136		-	136	136				
Body weight at 3 weeks of age, g	365a	408b	387		5.27	0.000	-				
4. week (n)	67	65	132		-	132	132				
Feed intake, g day ⁻¹ (1)	26.9	25.4	26.2		0.57	NS	-				
Weight gain, g day ⁻¹ (1)	18.1	17.4	17.8		0.61	NS	-				
Feed conversion, g g ⁻¹ (1)	1.46	1.43	1.44		0.03	NS	-				
Body weight at 4 weeks of age, g	493a	523b	508		6.48	0.016	-				
6. week (n)	63	64	65	62	-	127	127	29	34	36	28
Feed intake, g day ⁻¹ (2)	75.4	79.3	83.0a	71.9b	1.27	NS	0.000	82.0	70.4	89.9	73.9
Weight gain, g day ⁻¹ (2)	34.8	36.1	38.1a	32.7b	0.71	NS	0.001	37.1	32.8	38.9	32.5
Feed conversion, g g ⁻¹ (2)	2.25	2.23	2.25	2.23	0.03	NS	NS	2.32	2.19	2.19	2.27
Body weight at 6 weeks of age, g	969	1019	1018	970	14.4	NS	NS	989	950	1042	992
9. week (n)	63	57	60	60	-	120	120	29	34	31	26
Feed intake, g day ⁻¹ (3)	121	127	129a	119b	1.64	NS	0.038	128	115	130	123
Weight gain, g day ⁻¹ (3)	38.4	37.9	39.1	38.9	0.48	NS	NS	38.9	37.9	39.2	38.9
Feed conversion, g g ⁻¹ (3)	2.99a	3.29b	3.19	3.08	0.05	0.006	NS	3.03	2.97	3.34	3.24
Body weight at 9 weeks of age, g	1791	1857	1849	1795	20.6	NS	NS	1821	1763	1875	1835
12. week (n)	62	57	60	59	-	119	119	29	33	31	26
Feed intake, g day ⁻¹ (4)	171	172	181a	162b	2.06	NS	0.000	182	161	180	164
Weight gain, g day ⁻¹ (4)	36.3	36.7	37.7a	35.3b	0.53	NS	0.024	37.4	35.5	38.1	35.0
Feed conversion, g g ⁻¹ (4)	4.74	4.86	4.95a	4.64b	0.07	NS	0.039	4.91	4.60	4.90	4.70
Body weight at 12 weeks of age, g	2542	2622	2634a	2528b	23.0	NS	0.03	2591	2502	2671	2562
16. week (n)	61	57	59	59	-	118	118	28	33	31	26
Feed intake, g day ⁻¹ (5)	164	166	169a	161b	1.66	NS	0.021	167	161	170	161
Weight gain, g day ⁻¹ (5)	25.6	27.9	29.7	23.6	0.75	NS	0.000	28.0	23.5	31.3	23.7
Feed conversion, g g ⁻¹ (5)	4.62	4.42	4.22a	4.82b	0.07	NS	0.000	4.34	4.84	4.11	4.80
Body weight at 16 weeks of age, g	3253	3390	3474a	3164b	31.8	NS	0.000	3392	3135	3549	3200

xxx P<0.001, xx P<0.01, x P<0.05; the different subscripts in the same line mark a significant different at P<0.05 level. NS= not significant; (1) = between 3–4 weeks, (2) = between 4–6 weeks, (3) = between 6–9 weeks, (4) = between 9–12 weeks, (5) = between 12–16 weeks

Nursing method

The effect of nursing method was significant on feed intake only between weeks 3 and 4. Although kids nursed by two does consumed more pellet during the whole experimental period but it was not proved statistically. These results are opposite to our previous study. According to that observation, rabbits nursed by two does had more voracious appetite after weaning than those reared by a single doe (Szendrő *et al.*, 2001a). The weight gain of both groups was similar after 6 weeks of age. There was no clear tendency between groups in the case of feed conversion.

Breeds and hybrids selected for higher reproductive performance are not able to produce sufficient amount of milk for the kids in larger litters which could be a limitation of the growth rate of kids in the third week of life (Szendrő, 1986; Maertens and De Groote, 1990). This is why these kids are underfed, they are hungry, so they begin to eat solid feed sooner and faster. Spencer and Hull (1984) modelled the overfeeding of infants by rearing rabbit kids by two does. According to their results that rabbits grow faster and their adult weight and the fat content of the body was higher than that of the animals nursed by one doe. In the present experiment the difference in body weight between the group nursed by one or two does were 11.7, 6, 5, 3.7, 3.1 and 4.1% at the age of 3, 4, 6, 9, 12 and 16 weeks, respectively, which were smaller than of published by McNitt and Moody (1988), Szendrő *et al.* (2001a) and Gyovai *et al.* (in press). The difference among the experiments can be explained by the method of nursing by two does. In the literature both does kindled at the same day but in the present experiment one of the nursing does was weaned at 3 weeks and only the second half of their lactation was used. Previous results showed, that the fat content of body of rabbits nursed by two does was higher (slaughter rabbits: Szendrő *et al.*, 2001b, adult animals: Spencer and Hull, 1984) than those of reared by one doe. But if the difference in body weight between groups is smaller the difference in fat content could be smaller as well. Using the new method of double nursing is not as effective to improve the body condition of does at the time of first mating as the former one.

Feeding scheme

The effect of feeding scheme on feed intake was significant ($P < 0.05$) during the whole experimental period. The daily consumption of rabbits fed restricted was about 87–95% of the *ad libitum* group.

Planning the daily eating time, it has to be taken into account, that the speed of consumption increases with age (Szendrő *et al.*, 1989). This is why the daily eating period decreased from 10 to 7 hours between 4–6 and 12–16 weeks of age. In the previous experiment (Gyovai *et al.*, in press) using similar restriction, rabbits could consume 80–85% of *ad libitum*, while in the present study in spite of the similar restriction time the rabbits in the restricted group ate 87, 92, 89 and 95% of the *ad libitum* limit between 4–6, 6–9, 9–12 and 12–16 weeks. We have no explanation why the restriction was different between the former and present experiments (80–85 and 87–95% of *ad libitum*, resp.) because the daily eating time was the same. According to the literature (Szendrő *et al.*, 1988; Mirabito *et al.*, 1994; Jerome *et al.*, 1998) using about 10% restriction the growth of kids is slightly limited. Maertens (1992) recommended a 35g pellet kg^{-1} of body weight for young does during rearing. It seems the present restriction is not effective enough to modify the body weight and condition of does for the time of first mating. The differences between the AL and RF groups were 48, 54, 106 and 310g at the age of 6, 9, 12 and 16 weeks of age which are lower than that of the results in our former experiment (Gyovai *et al.*, in press).

Combined effect

Interactions were not detected in any case.

Comparing the four groups (Table 1), one of them was in favourable position for growth (nursed by two does and fed *ad libitum*) and another one was unfavourable for growth (nursed by one doe and fed restrictive). The differences in feed intake were 21.7, 11.6, 10.6 and 5.3% and that of in weight gain were 15.7, 3.4, 6.9 and 24.9% between ages of 4–6, 6–9, 9–12 and 12–16 weeks, respectively, while the differences in body weight were 92, 112, 169 and 414g at the age of 6, 9, 12 and 16 weeks.

CONCLUSION

According to the results of this experiment, the nutrient supply of kids before and after weaning was slightly modified by the applied nursing methods and feeding scheme. The double nursing works well in the practice at our university but we have to use a stronger restriction during rearing the young does for modifying their body condition to influence the reproductive performances, the life span and life production.

ACKNOWLEDGEMENT

The experiment was supported by OTKA TS 044743.

REFERENCES

- Guerder, F. RENALP: de moins bons résultats économiques. *Cunicultura*, 28(2001)4, 171–175.
- Gyovai, M./ Szendrő, Zs./ Biró-Németh, E./ Radnai, I./ Matics, Zs.. The effect of different rearing methods on the performance of does (in Hung.). 16th Hungarian Conference on Rabbit Production, Kaposvár, May 26, 2004, 59–64.
- Gyovai, M./ Szendrő, Zs./ Biró-Németh, E./ Radnai, I./ Matics, Zs./ Gerencsér, Zs./ Horn, P. The effect of different rearing methods on the performance of does till the first AI. *Livestock Production Science* (in press)
- Jerome, N./ Mousset, J.L./ Messager, B./ Deglaire, I./ Marie, P.. Influence de différentes méthodes de rationnement sur les performances de croissance et d'abattage du lapin. *7^{èmes} Journ. Rech. Cunicole*, Lyon, mai 13–14, 1998, 175–178.
- Maertens, L./ De Groote, G. Feed intake of rabbit kids before weaning attempts to increase it. *J. Appl. Rabbit Res.*, 12(1990), 151–158.
- Maertens, L. Rabbit nutrition and feeding: a review of some recent developments. *J. Appl. Rabbit Res.*, 15(1992), 889–913.
- McNitt, J.I./ Moody, G.L. Jr. Milk intake and growth rates of sucking rabbits. *J. Appl. Rabbit Res.*, 11(1988), 117–119.
- Mirabito, L./ Galliot, P./ Souchet, C./ Bollengier, J. Engraissement: programme lumineux et limitation du temps d'accès à la mangeoire. *Cuniculture*, 120(1994), 267–273.
- Spencer, S.A./ Hull, D. The effect of over-feeding newborn rabbits on somatic and visceral growth, body composition and long-term growth potential. *British J. Nutrition*, 51(1984)3, 389–402.
- Szendrő, Zs. Examination of production and reproductive traits of rabbits in point of view of breeding (in Hung.). Theses. Gödöllő, Agricultural University, 1986.
- Szendrő, Zs./ Szabó, S./ Hullár, I. Effect of reduction of eating time on production of growing rabbits. In: 4th World Rabbit Congress, Vol. 3, Budapest, Oct. 10–14, 1988, 104–114.
- Szendrő, Zs./ Láng, M./ Szabó, J. Performance of does in dependence of litter size in which they were born (in Hung.). *Állattenyésztés és Takarmányozás*, 38(1989), 159–164.
- Szendrő, Zs./ Gyovai, M./ Biróné Németh, E./ Radnai, I./ Nagy, I./ Matics, Zs. Effect of nutritional status of foetus, suckling and growing rabbits on their production between 3 and 13 weeks of age (in Hung.). *Állattenyésztés és Takarmányozás*, 50(2001a)6, 549–554.
- Szendrő, Zs./ Mihálovics, Gy./ Milisits, G./ Biróné Németh, E./ Radnai, I. Effect of reduction of feeding time on production in growing rabbits (in Hung.). *Állattenyésztés és Takarmányozás*, 50(2001b)3, 257–263.
- Szendrő, Zs./ Gyarmati, T./ Maertens, L./ Biró-Németh, E./ Radnai, I./ Milisits, G./ Matics, Zs. Effect of nursing by two does on the performance of suckling and growing rabbits. *Anim. Sci.*, 74(2002), 117–126.