

## EFFECT OF THE REARING METHOD ON THE PERFORMANCE OF RABBIT DOES (PRELIMINARY RESULTS)

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### ABSTRACT

Using a 3x2x2x2 factorial design, the influence of nutrient supply in intrauterine life, during nursing and after weaning, as well as the effect of age at first artificial insemination (AI), on the performance of does was studied. New-born rabbits were divided into three groups on the basis of their birth weight (low = 35-45 g, medium = 53-58 g and high = 65-70 g). Half of the litters were nursed by one doe and the other half by two does. After weaning at 21 days of age, from day 28 half of the rabbits were fed *ad libitum*, while the other half were reared on a restricted feeding regime corresponding to 80-85% of the *ad libitum* feed intake level. All groups of young does were again divided and inseminated for the first time either at 15.5 or at 18.5 weeks of age. Altogether 2239 litters from 496 does are yet available for the analysis of the results. The birth weight significantly influenced the body weight of does at first AI and at first kindling as well as their average body weight, but had no effect on the kindling rate, litter size, suckling mortality and litter weight at 3 weeks of age. The effect of nursing by two does was significant on the body weight of does even after insemination. Rabbits nursed by two does kindled and reared larger litters. However, the nursing method had no influence on the kindling rate, on litter weight and individual body weight and on kits' mortality during nursing. *Ad libitum* feeding led to a significant increased body weight of does at the first AI but the weight of the restricted-fed group was higher ( $P < 0.05$ ) from the first kindling off. In the restricted-fed group, the first kindling took place later and the litter weight and individual kit body weight at 3 weeks of age increased significantly. Age at first AI significantly influenced the body weight of does. Females had higher weight when inseminated at 18.5 weeks of age but from kindling off females inseminated at 15.5 weeks of age had higher body weight. Litter size (total and alive) was significantly higher in females first inseminated at 15.5 weeks of age. However, the kindling rate, the litter size at 3 weeks of age and at weaning, and the litter weight and individual kit body weight were independent of age at first AI. From the combined evaluation of all traits studied, it can be concluded that nursing by two does followed by restricted feeding (80-85% of *ad libitum*) up to the time of the first AI exerts a beneficial effect on the subsequent performance of does.

**Key words:** rabbit does, birth weight, nursing method, feeding regime, age at first AI.

## INTRODUCTION

In rabbits, the maternal effect is especially important. Several researchers (SZENDRO *et al.*, 1989; TUDELA *et al.*, 1998) have studied the effect of litter size during the rearing period on their subsequent performance as adult. BABILE *et al.* (1982) reported that kits raised in small litters (5 compared with 11 kits) tended to produce larger litters with more kits born alive. According to POIGNER *et al.* (2000), high birth weight of the doe is favourable; however, they could not confirm the effect of litter size on subsequent performance. ROMMERS *et al.* (2001a) found that rearing in a litter of 12 resulted in smaller does at the end of the rearing period with reduced litter size when early inseminated.

For rabbit breeds of higher growth rate with the tendency to obesity, MAERTENS (1992) recommends the use of restricted feeding during rearing. According to the results of ROMMERS *et al.* (2001a,b), the prolificacy indices of does first inseminated at 14.5 weeks of age were inferior to those of rabbits first bred at 17.5 weeks of age.

In all the preceding mentioned experiments, individual effects were studied independently of one another, or sometimes by combining two or maximum three effects. In our experiment we intend to determine the most favourable rearing method, combined with the optimal age at first insemination. The aim was to determine how nutrient supply in intrauterine life (birth weight) and during nursing (nursing by one or two does) and the feeding regime applied after weaning (*ad libitum* or restricted feeding), as well as the age at first AI (15.5 or 18.5 weeks) influenced the performance of does.

## MATERIAL AND METHODS

The experiments were carried out on Pannon White rabbits. The animals were kept in flat-deck cages made of wire-net, in a closed rabbit house. The rabbitry was heated in the winter, and a temperature of minimum 16 °C was provided. In the summer there was no air conditioning and, thus, the temperature occasionally reached 28 °C. The lighting period was 16L:8D throughout the year.

The experiment was set-up using a 3x2x2 factorial design with 496 does in total. On the basis of the body weight measured before nursing, one-day-old female rabbits were divided into three groups low (L) = 35-45 g, medium (M) = 53-58 g, and high (H) = 65-70 g birth weight]. Each litter included 8 kits. All the three groups were divided into two subgroups, and half of the litters were nursed conventionally by one doe (O) while the other half by two does (T) according to the method described by SZENDRO *et al.* (2002). The own doe of the litter was allowed to enter the nest-box to nurse in the morning, while the foster-mother that had kindled on the same day was allowed access to the nest-box in the evening. On day 17 the creep-hole of the nest-box was opened, the foster-mother was removed, and subsequently only the own dam up to weaning nursed the litter.

After weaning at 21 days of age, the rabbits were transferred into fattening cages (330x500x300 mm) and housed per two. The six groups were again divided into two subgroups each, and from 28 days of age half of the rabbits were fed *ad libitum* /AL/ and the other half were kept on a restricted feeding regime (R) (10.3 MJ DE/kg; Crude protein = 16.0%; Crude fibre = 15.5%). In the group of the restricted feeding regime, rabbits were allowed access to the feed for 10, 9, 8 and 7 hours a day between 4-6, 6-9, 9-15 and 12-15 weeks of age, respectively, and then 6 hours a day until the first AI. Prior to the first AI, all the 12 groups were divided again, and half of the does were inseminated at 15.5 and the others at 18.5 weeks of age. Four days before the first AI, restricted-fed rabbits were switched over to *ad libitum* feeding (flushing). From the 3<sup>rd</sup> day before kindling, the does were fed a breeder diet *ad libitum* (11 MJ DE/kg; Crude protein = 17.0%; Crude fibre = 15.5%). Does were re-inseminated on day 18 after the first kindling and on day 11 after the subsequent kindlings. Rabbits failing to conceive were re-inseminated 3 weeks later. Does that were empty after three consecutive occasions were culled out.

The experiment was started in 2001 and it is still going on. Some does have kindled as many as 15 times. In this data processing, a total of 2239 kindlings of 496 does were analysed. The experimental data were processed by multivariate analysis of variance by the SPSS 10.0 programme package using birth weight, nursing method, feeding regime and age at first AI as fix effects. The mortality data of suckling rabbits were compared by the chi-squared test.

## RESULTS AND DISCUSSION

The performance indices of the does are summarised in Table 1.

The **body weight of does (BWD)** at the first kindling was significantly influenced by all factors. The effect of birth weight can be demonstrated even after the time of the first AI. The superior body weight of rabbits nursed by two does is maintained not only up to the slaughtering age (SZENDRO *et al.*, 2002) but also thereafter. The BWD of treatment AL exceeded that of R rabbits by 348 g at the first AI. However, already at the first kindling R rabbits weighed 156 g more, and that difference did not change markedly later on either. Numerous researchers (SCHLOLAUT and LANGE, 1979; ROMMERS *et al.*, 1999) have demonstrated that after restricted feeding the appetite of rabbits increases and, therefore, such animals achieve higher than average body weight gain. The BWD first inseminated at a younger age was consequently smaller than that of does first inseminated at 18.5 weeks of age. However, at kindling females inseminated at 15.5 weeks of age reached a comparable weight as those inseminated at 18.5 weeks.

The effect of birth weight number of nursing does and feeding regime were not significant on AI/kindling.

HARTMANN and PETERSEN (1995) observed a higher kindling rate in the *ad libitum* fed group at the first AI. However, at the 2<sup>nd</sup> and 3<sup>rd</sup> AI, already the group kept on a restricted feeding regime showed higher kindling rate (KR). COUDERT and LEBAS (1985),

as well as EIBEN *et al.* (2001) have also demonstrated the superior KR of restricted-fed does with increasing parity. These results are in line with those of ROMMERS *et al.* (2001a), who demonstrated that restricted fed does have a retardation of puberty of about 3 weeks. In our experiment, does first inseminated at 18.5 weeks of age showed a somewhat higher KR than the group inseminated first at 15.5 weeks of age. In contrast to the findings of COUDERT and LEBAS (1985) and ROMMERS *et al.* (2001b), this difference was not statistically significant. Interactions were not found for any of the traits.

The **litter size (LS)** was not influenced significantly in any of the cases. Does of Group T kindled larger litters than does of Group O. At 3 weeks of age this difference was significant. In contrast, the feeding regime used after weaning had no effect. HARTMANN and PETERSEN (1995) reported more favourable results for the restricted-fed does. In contrast with the results of ROMMERS *et al.* (2001a), does of the group first inseminated at 15.5 weeks of age delivered significantly larger litters than rabbits first inseminated at 18.5 weeks of age, but these differences were disappeared by 3 weeks of age. Significant **interactions** among the individual factors were obtained in several cases.

**Litter weight (LW)** at 3 and 5 weeks of age was higher for does of Group M and for Group L, but does of Group H did not differ significantly from either of the former two groups in this regard. The LW of Group T exceeded that of Group O but the difference was not significant. In Group R higher LW was recorded than in rabbits of Group AL. However, the effect of age at first AI could not be demonstrated. According to POIGNER *et al.* (2000), the larger BW represents an advantage. In conformity with our results, HARTMANN and PETERSEN (1995) observed higher milk production in does that have been reared on a restricted feeding regime. EIBEN *et al.* (2001) as well as COUDERT and LEBAS (1985) measured higher LW in the restricted-fed group.

**Individual body weight at three weeks of age** was influenced significantly only by the BW of does and the feeding regime applied. The effect of the BW was influenced by the smaller LS at 3 weeks in Group H, as a result of the nearly identical amount of milk to be shared among fewer kits. At the same time, the effect of feeding seems to be clearly evident, as Group R achieved better results than Group AL although the LS was the same in the two groups.

**The mortality of kits** up to 3 weeks of age was not affected significantly by any of the factors.

## CONCLUSIONS

As the experiment is still in progress, it would be premature to draw any final conclusions. However, some correlations are noteworthy. Studying the AI/kindling, none of the treatments seems to show pronounced favourable results. With regard to LS, it seemed to be favourable if the doe had been nursed by two mothers. The LW at 3 weeks (milk production) was found to be higher if young rabbits intended for breeding had been reared on a restricted feeding regime. Both the better milk supply during the

nursing period and subsequently *ad libitum* feeding following rearing on a restricted feeding regime exerted a beneficial effect on the performance of does. It can be stated that effects attributable to nutrition in foetal life and during the rearing period tend to diminish with the advancement of age.

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**Table 1. Effect of rearing methods on reproductive traits of does depending on their age at the first insemination**

Traits	Birth weight			Doe		Feeding		First AI, week		SE	BW	Effects		
	L	M	H	O	T	AL	R	15.5	18.5			Doe	Feed	AI
No. of does	139	182	175	259	237	256	240	235	261	-	496	496	496	496
Weight at 1 <sup>st</sup> AI, g	3310 <sup>A</sup>	3410 <sup>B</sup>	3572 <sup>C</sup>	3334 <sup>A</sup>	3557 <sup>B</sup>	3608 <sup>A</sup>	3260 <sup>B</sup>	3340 <sup>A</sup>	3531 <sup>B</sup>	18.6	***	***	***	***
No. of kindling	731	790	718	1197	1042	1122	1112	1088	1151	-	2239	2239	2239	2239
Weight at 1 <sup>st</sup> kindling, g	3661 <sup>A</sup>	3742 <sup>AB</sup>	3827 <sup>B</sup>	3670 <sup>A</sup>	3838 <sup>B</sup>	3673 <sup>A</sup>	3829 <sup>B</sup>	3758	3737	20.5	**	***	*	NS
Weight, average, g	3929 <sup>A</sup>	3983 <sup>B</sup>	4080 <sup>C</sup>	3921 <sup>A</sup>	4088 <sup>B</sup>	3929 <sup>A</sup>	4068 <sup>B</sup>	4047 <sup>A</sup>	3954 <sup>B</sup>	8.8	***	***	***	***
AI/kindling	1.27	1.3	1.29	1.28	1.29	1.28	1.29	1.31 <sup>A</sup>	1.26 <sup>B</sup>	0.01	NS	NS	NS	*
Litter size total	8.56	8.6	8.62	8.43	8.78	8.66	8.52	8.8 <sup>A</sup>	8.39 <sup>B</sup>	0.06	NS	NS	NS	*
alive	8.11	8.19	8.29	8.02	8.39	8.29	8.1	8.37 <sup>A</sup>	8.03 <sup>B</sup>	0.07	NS	NS	NS	**
at 3 weeks	7.5	7.39	7.42	7.33 <sup>A</sup>	7.55 <sup>B</sup>	7.43	7.44	7.45	7.42	0.03	NS	**	NS	NS
at weaning	7.13	7.02	7.04	6.92 <sup>A</sup>	7.23 <sup>B</sup>	7.05	7.07	7.04	7.09	0.05	NS	**	NS	NS
Litter weight, g at 3 weeks	2815	2884	2890	2834	2898	2813 <sup>A</sup>	2915 <sup>B</sup>	2874	2855	17.1	NS	NS	**	NS
at weaning	6002 <sup>A</sup>	6348 <sup>B</sup>	6150 <sup>AB</sup>	6109	6242	6083	6260	6109	6234	6.2	***	NS	NS	NS
Ind. weight at 3 weeks, g	385 <sup>A</sup>	399 <sup>B</sup>	391 <sup>AB</sup>	393	391	387 <sup>A</sup>	397 <sup>B</sup>	393	391	1.95	*	NS	***	NS
Mortality, %	6.45	7.08	7.47	7.48	6.44	7.37	6.64	7.07	6.94	0.3	NS	NS	NS	NS

\*\*\* p<0.001, \*\* p<0.01, \* p<0.05, <sup>A, B, C</sup> the difference between groups marked with different superscripts is statistically significant; NS = not significant

\* L = low, M = medium, H = high, O and T nursed by one or two does, AL = *ad libitum*, R = restricted