EFFECT OF FEEDING REGIME DURING REARING AND AGE AT FIRST MATING ON THE REPRODUCTIVE PERFORMANCE OF RABBIT DOES

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ABSTRACT

Effects of feeding restriction, associated to a later age at first artificial insemination (AI), on the reproductive performance of rabbit does were examined. Half of the Pannon White (PW n=222) and larger body size (LB n=197) does were fed *ad libitum* and inseminated at the age of 15.5 weeks (AD15, n=203). The remaining does were fed 130 g/day of a commercial pelletted diet from the age of 11 weeks till 8 days prior to the first AI and were inseminated at the age of 19.5 weeks (RES19, n=216). At the first AI the AD15 groups showed significantly ($P<0.05$) lower conception rate (PW: 81.3%; LB: 73.0%) than the does from the RES19 groups (PW: 90.1%; LB: 88.5%). Mortality of kits in the first litter of the LB-AD15 does was significantly higher than that of the kits of the LB-RES19 does (19.8% vs. 15.6%, $P<0.05$) or that of the kits born in latter parities regardless of the does' group (pooled average of the groups: 10.6%). Number of kits born alive, total number of kits born, litter size at day 21, litter and individual weight at day 21 were not significantly affected by the treatment (rearing method and age at first AI) in both genotypes. Number of kits born alive per 100 inseminations was higher in the RES19 group does in both genotypes (754 vs 718 for PW; 721 vs 688 for LB). It can be concluded that inseminating larger adult size does at the age of 15.5 weeks is not advisable even by *ad libitum* feeding. Regardless of the does' genotype feeding restriction during rearing and insemination at a later age are advantageous.

Key words: rabbit does, feeding regime, age at first insemination, Reproductive performance.

INTRODUCTION

Production and longevity of rabbit does were affected by feeding regime during rearing and by the age at first insemination (Rommers *et al*., 1999; Rommers, 2000). Especially breeds exhibiting intensive growth may become obese by the time of their first insemination, therefore feeding restriction was suggested by Maertens (1992).

Applying feeding restriction during rearing the does had lower reproductive performance than that of the does with *ad libitum* feeding (Coudert and Lebas, 1985). Hartmann and Petersen (1997) observed compensatory growth in does reared using restricted feeding and their body weight at the second parturition was larger than that of the does reared by *ad libitum* feeding. In the first litter the production of the two groups was not different while after the second and third parturition the individual and litter weight at 21 days of age was higher in the restricted doe group. Applying restricted feeding (9 hours feeding per day or 130-140 g/day pellet) Eiben *et al*. (2001) found favourable tendencies for pregnancy rate and litter weight at 21 days of age compared to the *ad libitum* groups although the results were not significant. In order to achieve appropriate condition by the time of the first parturition of the does, feeding restriction must be analysed related to the age at first insemination (Hulot *et al*., 1982; Rommers *et al*., 2001, 2004; Bonanno *et al*., 2004, Gyovai *et al*., 2004a).

In the present study production of Pannon White and larger adult size rabbit does were examined depending on the applied *ad libitum* or restricted (130 g/day pellet) feeding, associated to 15.5 or 19.5 weeks of age at the first insemination, respectively.

MATERIALS AND METHODS

The experiment was carried out at the University of Kaposvár in a closed rabbit house. Young females and rabbit does were kept in flat-deck wire net cages having a basic area of 50 x 27 cm, and 60 x 26 cm (with nest box), respectively. The lighting period was 16L/8D during the whole year. In winter the rabbit house was heated to a minimum temperature of 16°C, while -in the absence of air conditioning- in the summer the temperature occasionally reached 30°C in the afternoon.

Animals

The experiment was accomplished using two genotypes, the medium size Pannon White (PW, n=222) breed, and a larger adult size line (LB, n=197), with adult weight of 4.4-4.9 kg and 4.9-5.4 kg, respectively. The experiment is still being conducted by increasing the number of rabbit does to be examined and analysing further parities of the does already under production.

Feeding, first insemination

All rabbits received the same commercial pellet (from the age of 10 weeks until 8 days prior to the first insemination: 10.6 MJ DE/kg, 16.0% crude protein, 16.0% crude fibre; from the 8th day prior to the first insemination during the productive period: 10.6 MJ DE/kg, 18.0% crude protein, 14.3% crude fibre). One of the groups were fed *ad libitum* from the age of 11 weeks and inseminated first at the age of 15.5 weeks (AD15). Rabbits of the other group were fed 130 g/day from the age of 11 weeks until 8 days prior to the first insemination (RES19) and inseminated first at the age of 19.5 weeks. Apart from the period of feeding restriction all rabbits were fed *ad libitum*.

Insemination

Does were artificially inseminated (AI) applying a 56-day cycle. Diluted (1:10) fresh semen of individual bucks was used, simultaneously injecting the thigh muscle of the does with 1.5 µg GnRH analogue (Ovurelin, Reanal). Kits were weaned at 23 days, the does were inseminated 25 days subsequent to parturition. Does remained empty were re-inseminated 28 days after the previous insemination. At kindling cross-fostering was applied. From the larger litters some kits were placed to smaller litters thus all litters contained 8-9 kits.

Statistical analysis

Data were evaluated separately for the two genotypes by One-way ANOVA applying SPSS 10.0 software package. For the analysed traits (number of inseminations per kindling, litter size, individual and litter weight) the effect of parity (1, 2-3 and 4 or higher), was considered as random effect. The conception rate (calculated as number of parturitions/number of inseminations x 100) was analysed by chi square test.

RESULTS AND DISCUSSION

Body weight of the RES19 group significantly exceeded that of the AD15 group at the first insemination and first kindling (Figure 1). In comparison with a similar experiment of Gyovai (2006), it seems that postponing the first insemination by one week more and applying longer flushing period (8 vs. 3 days) resulted that the rabbits in the RES19 group became into better condition. Several trials

justified (Rommers, 2003; Bonanno *et al*., 2004; Gyovai, 2006) that applying feeding restriction and insemination at an older age prevents the rabbits from becoming obese.

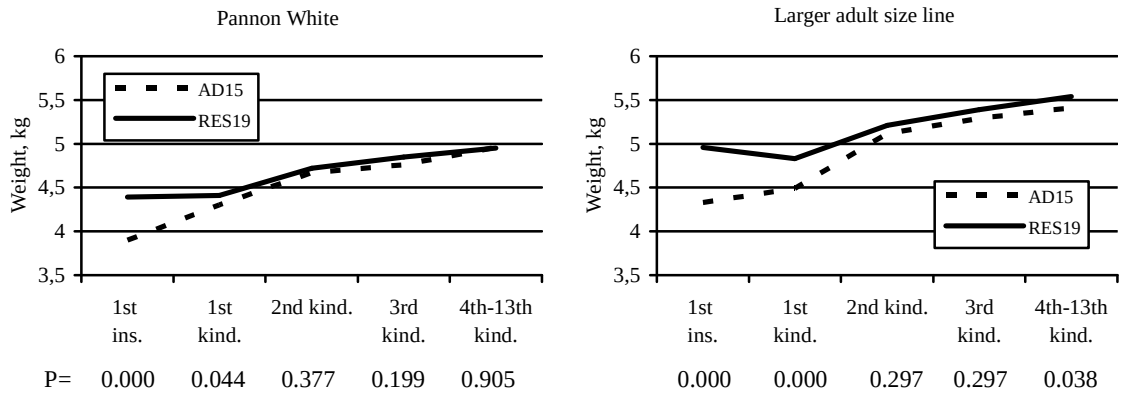

Figure 1: Body weight of Pannon White (PW) and larger adult size (LB) does depending on the feeding regime (*ad libitum* or restricted) during rearing and the age at first insemination (15.5 or 19.5 weeks of age). 1st ins.=first insemination, kind.=kindling

Reproductive and growth performance is summarized in Table 1. On the whole, the rabbit does had high pregnancy rate (80-90%), that may be caused by the time of insemination and weaning (biostimulation) on day 25 and 23, respectively. The number of AI per kindling showed a significant difference ($P<0.01$) in the LB line only at the first parturition where the pregnancy rates of the AD15 and RES19 groups were 73.0 and 88.5%, respectively. For the does having large adult body weight the insemination at the age of 15.5 weeks may be too early even in case of *ad libitum* feeding. Similar but smaller difference was observed in the PW breed (81.3 and 90.1% for AD15 and RES19, respectively, $P<0.05$). During later parities no substantial differences were found between the two groups in both genotypes.

Rommers (2003) and Bonanno *et al*. (2004) observed higher number of kits born alive in the restricted group. Our results showed similar tendencies although there were not significant differences. Litter size at 21 days showed no significant differences in either genotype. In the first litters of the LB does suckling mortality was higher in the AD15 group than that of the RES19 group. Similar findings were reported by Rommers (2003) for the number of stillborns and by Gyovai (2004b) for the suckling mortality, which suggest that early age at first insemination can be disadvantageous from the viewpoint of the does' rearing ability, especially in larger adult. In accordance with the findings of Bonanno *et al*. (2004) and Gyovai (2006), no difference was found between the AD15 and RES19 groups in their individual and litter weight at 21 days.

Number of rabbits per 100 insemination showed that the number of kits born total or alive in the RES19 group of the PW rabbits exceeded that of the AD15 group by 5.1% (817 and 777) and by 5.0% (754 and 718), respectively. Similar differences were observed in the LB genotype (born total – 5.9%: 810 and 765; born alive – 4.8%: 721 and 688). Results of both genotypes were strongly influenced by the low pregnancy rate of the AD15 does at the first insemination.

CONCLUSIONS

It can be concluded that in a medium size breeds the feeding restriction during the rearing period and inseminating the does at a later age did not have additional consequences. Moreover, the breeding schedule in which litter weaning occurs at day 23 and re-inseminating at day 25 *post partum* is less stressful than re-insemination of the does at the 11^{th} day. In larger adult size does however insemination at an early age (15.5 weeks) was disadvantageous even with the application of *ad libitum* feeding and resulted in lower pregnancy rate and higher kits mortality during suckling. Although no

differences were observed between the AD15 and RES19 does with higher parity, the lower pregnancy rate at the first parturition disadvantageously influenced the lifetime performance.

Table 1: Reproductive performance of Pannon White (PW) and larger adult size (LB) does depending on the feeding regime (*ad libitum* or restricted) during rearing and the age at first insemination (15.5 or 19.5 weeks of age)

Parity order	Pannon White				Larger adult size line			
	AD15	RES19	SE	P	AD15	RES19	SE	P
Number of litters								
1	108	114			95	102		
2-3	137	167			119	139		
4-13	117	168			122	108		
Number of AI per litter								
1	1.23	1.11	0.03	0.038	1.37	1.13	0.03	0.000
2-3	1.10	1.12	0.02	0.651	1.15	1.13	0.02	0.617
4-13	1.11	1.14	0.02	0.521	1.14	1.13	0.02	0.842
Total	1.14	1.12	0.01	0.458	1.21	1.13	0.02	0.009
Litter size total								
1	7.44	8.08	0.26	0.086	8.27	8.58	0.19	0.434
2-3	9.61	9.72	0.15	0.717	9.68	9.70	0.16	0.958
4-13	9.28	9.33	0.18	0.890	9.02	9.00	0.20	0.952
Total	8.86	9.16	0.10	0.144	9.04	9.15	0.11	0.613
Litter size, alive								
1	6.67	7.04	0.22	0.397	6.80	6.52	0.25	0.582
2-3	9.14	9.05	0.16	0.795	8.82	9.06	0.17	0.487
4-13	8.44	8.77	0.20	0.450	8.42	8.50	0.21	0.847
Total	8.19	8.44	0.11	0.274	8.10	8.15	0.13	0.868
Litter size, after equalization								
1	8.11	8.17	0.07	0.657	8.04	8.14	0.07	0.476
2-3	8.80	8.76	0.03	0.507	8.72	8.69	0.04	0.715
4-13	8.67	8.70	0.04	0.744	8.62	8.61	0.05	0.852
Total	8.56	8.59	0.03	0.566	8.50	8.52	0.03	0.788
Litter size at 21 days								
1	7.26	7.16	0.10	0.624	7.31	7.21	0.12	0.682
2-3	8.25	8.17	0.05	0.451	7.90	7.84	0.08	0.685
4-13	7.82	7.75	0.08	0.668	7.61	7.47	0.10	0.489
Total	7.83	7.77	0.05	0.494	7.64	7.56	0.06	0.441
Suckling mortality (%)								
1	15.1	16.6		0.427	19.8	15.6		0.043
2-3	8.4	8.5		0.926	10.9	11.1		0.881
4-13	11.3	10.9		0.714	11.8	13.2		0.359
Total	11.2	11.3		0.911	13.5	12.9		0.540
Litter weight at 21 days (g)								
1	2382	2298	34.0	0.216	2455	2495	42.8	0.636
2-3	2919	2960	26.8	0.453	2988	3023	36.6	0.635
4-13	2787	2836	31.5	0.439	2888	2945	39.6	0.475
Total	2728	2756	19.7	0.471	2819	2863	24.4	0.373
Individual weight at 21 days (g)								
1	333	327	6.30	0.430	340	349	4.66	0.347
2-3	355	364	4.31	0.135	381	388	3.85	0.359
4-13	360	369	3.25	0.150	386	397	4.22	0.194
Total	351	357	2.03	0.104	373	381	2.54	0.111

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