

EFFECT OF PHOTOPERIOD ON THE REPRODUCTIVE TRAITS OF RABBIT DOES

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ABSTRACT

The authors investigated the changes of reproductive traits when, instead of the conventional (16L: 8D, light: dark /16L/) lighting program a new method is used (8L:4D:8L:4D /8+8L/) meaning a double change of the daily light period. Pannon White rabbits at 11 weeks of age were divided into two groups and were housed in two identical rooms, which only differed in the photoperiod. Rabbits were first inseminated at the age of 16.5 weeks (16L: doe number=99, AI number=251; 8+8L: doe number=154, AI number=311); 11 days after kindling does were inseminated again. Controlled nursing was applied, does were only allowed to nurse in the morning, for half an hour (between 8:00 and 8:30). The body weight of the 16L rabbits was slightly higher at the first AI (4049 and 3982 g, NS) and at the first kindling (4264 and 4187 g, $P<0.05$) than that of the 8+8L group. The number of AIs for one kindling was identical in the two groups (1.18 and 1.19). The litter size was slightly higher in the 8+8L group compared to the 16L group (total: 8.50 and 8.76, NS; alive: 8.13 and 8.40, nursed: 8.17 and 8.33, $P<0.05$). Due to the kit mortality being slightly higher in the 8+8L group compared to the 16L (5.9 and 8.7%, NS), the litter size in the two groups at the age of 3 weeks was identical (7.69 and 7.62). No difference was found either in the litter weight (2762 and 2772 g) or individual weight at the age of 3 weeks (362 and 368 g). According to the results the 8L:4D:8L:4D photoperiod does not crucially influence the reproduction of does under controlled nursing, though the between-group difference changed according the parity order. It is still not elucidated that the production of the two groups would differ in what manner using free nursing. According to preliminary results the litter weight at the age of 3 weeks is higher in the 8+8L group, indicating the higher milk production of these does.

Key words: rabbit does, photoperiod, reproduction.

INTRODUCTION

Photoperiod plays an important role in the reproduction of female animals. It is a well known fact that the reproduction period of wild rabbit starts with the elongation of the light period, in the spring, while it stops with the increase of the dark hours within the day (LEBAS *et al.*, 1986). ARVEUX and TROISLONCHES (1995) compared the production of does with 16 hours lighting (16L:8D, light:dark) and 8L:4D:8L:4D lighting, using natural mating. The conception rate in the experimental group increased, while the time elapsed between two kindlings decreased; moreover, the litter size increased

and the mortality decreased. These results led us to compare the production of artificially inseminated does kept under two photoperiods, 16L:8D and 8L:4D:8L:4D.

MATERIALS AND METHODS

The experiment was carried out at the University of Kaposvár, on Pannon White rabbits. Female rabbits of 11 weeks of age were housed in two identical rooms, in cages of 410x390mm. The building was climatized, therefore, in the summer (max. 23 °C) and in the winter (min. 18 °C) the temperature was only slightly different. The two rooms differed only in the photoperiod: in one of the rooms the light and dark periods changed in a 16L:8D rhythm, while in the other one 8L:4D:8L:4D lighting program was applied (doe number: 99 and 154; AI number: 251 and 311 in the 16L and the 8+8L groups, respectively).

Does were first inseminated at the age of 16.5 weeks, then, following a 42-day rhythm does were inseminated again 11 days after kindling. Oestrus synchronisation was not applied, at the AI event 1.5 µg GnRH was administered i.m. in the thigh. Controlled nursing was applied, does were allowed to enter the nest-box for a half an hour in the morning between 8:00 and 8:30. Fostering was only performed within group. The area of the breeding cage was 580x385 mm with the feeder; the attached nest-box was 260x385mm. A commercial pellet (11MJ DE/kg; crude protein=17%; crude fiber=15.5%) and water from nipple drinkers was offered *ad libitum*.

Productive and reproductive traits (doe body weight, number of AI for one kindling, litter size /total, alive, nursed/, litter and individual weight at the age of 3 weeks) were compared with one-way ANOVA and χ^2 method (mortality) using the SPSS 10.0 software package. The parity order was handled as a fix factor.

RESULTS AND DISCUSSION

Experimental results were summarized in Table 1.

The body weight of the 8+8L does at the first AI and kindling was 57 and 77 g lower, respectively, compared to the 16L group; this indicated that the lighting program could slightly influence the feed consumption of rabbits. In experiments on growing rabbits (SZENDRO *et al.*, 2004), however, no such effect was observed.

The number of AI for one kindling was identical in the two groups. This means that using AI and controlled nursing no such effect is obtained which was observed using natural mating (ARVEUX and TROISLONCHES, 1995). However, the conception rate of the 8+8L group was 7 and 4% higher in the 2nd and 3rd kindlings. The controlled nursing method may have some biostimulation effect. BONANNO *et al.* (2004) and EIBEN *et al.* (2004) reported similar results when free nursing was changed to controlled lactation some days before kindling.

In the litter size the 8+8L group showed slightly better results (by 0.2–0.3), but this difference was diminished at the age of 3 weeks, since the mortality was 2.8% higher in this group. It is hypothesized that the double dark-light change could disturb the does. This is supported by the results of HOY and SELZER (2003), proving that the

frequency of double nursing increases when applying a 6L:6D:6L:6D photoperiod. These does may be more nervous before allowing them to nurse, as it was described by MATICS *et al.* (2004) when the free nursing was changed to controlled one.

It may be interesting that the difference found in the litter size at the first kindling increased advantageously in the 8+8L group. In an other experiment (SZENDRO *et al.*, 2004) the litter size was also increased when the nursing was changed from free to controlled 3 days before AI. This finding is also supported by the results of BONANNO *et al.* (2004) and EIBEN *et al.* (2004).

The photoperiod affected neither the litter, nor the individual weight at 3 weeks of age, indicating identical milk production in the two groups.

It is still not elucidated in what manner the production and reproduction of the two groups would differ using free nursing. To get data in this regard, a new experiment has been prepared. Preliminary results (116 kindlings) indicate higher litter and individual weight at 3 weeks of age in the 8+8L group. It is thus hypothesized that the double dark-light change has an advantageous effect on the milk-supply of the kits.

CONCLUSIONS

Based on the experimental results it can be concluded that the 16L:8D or the 8L:4D:8L:4D photoperiod did not seriously affect the production of does, using controlled nursing. The double dark-light change might disturb the does, leading to slightly higher mortality in this group. It would be interesting to investigate the doe performance using free nursing; when does have the opportunity to nurse also twice or more times.

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Table 1. Effect of photoperiod (16L:8D or 8L:4D:8L:4D) on the reproductive traits of rabbit does.

Traits	Lighting (altogether)	Lighting program							SE	Effects			
		16L:8D			8L:4D:8L:4D			Light		Parity	Interact		
		Parity order											
16:8	8:4:8:4	1	2	3	1	2	3						
No. of litters	211	273	82	53	27	91	62	32	-	-	-	-	
AI/kindling	1.18	1.19	1.1	1.38	1.19	1.14	1.26	1.13	0.02	0.098	0.000	0.229	
Weight of does, g	at first AI	4049	3982	4049	-	-	3982	-	-	21	0.131	-	-
	at kindlings	4264 ^A	4187 ^B	4110	4302	4336	4099	4253	4200	17	0.022	0.000	0.894
Litter size	Total	8.50	8.76	8.00	8.66	8.52	7.52	9.18	9.16	0.13	0.205	0.000	0.174
	Alive	8.13	8.4	7.79	8.32	7.52	7.33	8.53	9.13	0.13	0.184	0.006	0.167
	Nursed	8.17	8.33	7.96	8.31	8.00	7.98	8.23	8.5	0.04	0.064	0.000	0.092
	at 3 weeks	7.69	7.62	7.44	7.82	7.84	7.21	7.53	8.09	0.06	0.914	0.006	0.258
Litter weight at 3 weeks, g	2762	2772	2480	2908	2754	2388	2908	2809	29	0.468	0.000	0.914	
Individual weight at 3 weeks, g	362	368	336	375	355	333	396	353	3.53	0.530	0.000	0.256	
Mortality (0-3 weeks), %	5.91	8.69	6.51	6.22	1.96	9.57	9.33	4.57	0.56	0.189	0.811	0.922	

^{A, B}: different superscripts indicate significant differences between groups at P<0.05 level.

16L:8D: conventional (light and dark) lighting conditions; 8L:4D:8L:4D: periodic lighting conditions

SE: standard error of mean