

EFFECT OF DIFFERENT LIGHTING SCHEDULES (16L:8D OR 12L:6D) ON REPRODUCTIVE PERFORMANCE OF RABBIT DOES

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ABSTRACT

The objective of the experiment was to compare the reproductive performance of rabbit does in a routine (16L:8D) and in proportionally shorter (18 hours) 12L:6D lighting regime. The experiment was conducted at the experimental rabbit farm of the Kaposvár University. Crossbred rabbit does were randomly housed in two identical rooms. Drinking water (from nipple drinkers) and commercial pellet were available *ad libitum*. The temperature varied between 14-28 °C, depending on the season. The two rooms only differed in the lighting regime: 24h group = 16 hours light and 8 hours dark (n=54 does); 18h group = 12 hours light and 6 hours dark (n=54 does). Rabbit does were first inseminated at 16.5 weeks of age. AI was applied 11 d *post partum* (42 d reproductive rhythm, single batch system). Cross-fostering was applied within groups with max. 8 kits/litter at first kindling and max. 10 kits/litter at subsequent parities. Rabbit does could nurse their kits freely. Data of the first 5 consecutive reproductive cycles were evaluated. Body weight of the does at kindling, kindling rate, litter size at birth, at day 21 and 35 showed no significant differences among the groups. Mortality of the kits for the periods of 0-21 and 0-35 days were independent of the lighting schedule. Litter weight at day 21 and 35 was 4% lower in 18h group compared to the 24h group (P<0.05). Calculating the productivity index, the number of kits born alive and number of kits at day 35, per 100 AI, were 7.5% (813 vs. 757 kits) and 5.2% (714 vs. 679) higher in the 18h group compared to the 24h group. Considering the opposite tendencies of the kits' body weight, the two groups did not differ for the total weight of the weaned rabbits per 100 AI (18h: 630 kg; 24h: 632 kg). Does survival did not differ significantly during the experimental period (83% and 81% in groups 18h and 24h, respectively, P=0.735). Reproductive performance of rabbit does housed in a routine (16L:8D = 24 hours) or proportionally shorter (12L:6D = 18 hours) lighting regime was similar.

Key words: rabbit does, lighting schedule, reproductive performance.

INTRODUCTION

The European wild rabbit is active during the dark period, yet the change of length of the light period has an effect on cyclical rhythm of the reproduction. During spring, by increasing day length, fecundity is improved; on the contrary, during winter it is suspended. In large rabbit farms, in order to eliminate the effects of seasonality, 16 h lighting schedule is applied during the whole year. The effects of the length of the lighting period and intermitted lighting on the rabbit does' production were analyzed in several experiments. Increasing the daily lighting period from 8 h to 16 h prior to artificial insemination (AI) improves the does' reproductive performance (Theau-Clément *et al.*, 1990; Mirabito *et al.*, 1994; Gerencsér *et al.*, 2010). According to several authors intermitted lighting schedule improves kindling rate (Uzcategui and Johnston, 1992; Arveux and Troislouches, 1995), increases litter size (Arveux and Troislouches, 1995), decreases suckling mortality (Arveux and Troislouches, 1995), improves milk yield of the does, and individual and litter weight at day 21 (Virág *et al.*, 2000). Szendrő *et al.* (2004) found that the reproductive performances of the does kept under 16L:8D or 8L:4D:8L:4D lighting regimes were not different. Most of the authors compared 24 h repeated cycles. Shorter periods were examined by a few authors. According to Hoy and Selzer (2003) the 6L:6D:6L:6D lighting schedule increased the frequency of twice-a-day nursing, while Gerencsér *et al.*

(2007) noted that the 8L:4D:8L:4D lighting schedule disturbs the does' nursing behaviour. Using a 16L:8D lighting schedule 15-35% of the does nursed their kits twice or three times a day (Selzer and Hoy, 1999; Selzer *et al.*, 2004; Matics *et al.*, 2004). Selzer *et al.* (2004) found that the changing period (from light to dark) acts as a "zeitgeber" (timer) towards nursing.

Our hypothesis is that the shortened "18 h day" (12L:6D) increases the number of nursing events per 24 h. This can affect the milk yield of the does and the litter weight at day 21. The experiment was set according to this supposition. The objective of the experiment was to compare the reproductive performance of rabbit does in a routine (16L:8D) and in a proportional shorter (18h, 12L:6D) lighting regime.

MATERIALS AND METHODS

Animals and housing

The experiment was conducted at the experimental rabbit farm of the Kaposvár University. Thirteen week old crossbred female rabbits were randomly housed in two identical rooms. In both rooms rabbits were housed in two types of cages: flat deck cages (86 x 38 x 30 cm, included the nest box /28.5 x 38 cm/, n=30/room), and cages with elevated platform (102.5 x 52.5 x 97 cm included the nest box /21.5 x 52.5 cm/; plastic platform 41.5 x 52.5 cm, 25 cm above the cage floor, n=24/room). Drinking water from nipple drinkers and commercial pellet were available *ad libitum*. The temperature varied between 14-28 °C, depending on the season.

The two rooms only differed in the lighting regime:

24h group: 16 h light and 8 h dark (n=54 does, 240 inseminations, 190 kindlings),

18h group: 12 h light and 6 h dark (n=54 does, 255 inseminations, 210 kindlings).

Three lighting cycles of 24h group and 4 cycles of 18h group take place during a 72 hours long period of time, when the beginning of the first light period and the end of the last dark period coincided (Figure 1). Rabbit does were first inseminated at 16.5 weeks of age. AI was applied 11 d *post partum* (42 d reproductive rhythm, single batch system). Cross-fostering was applied within groups with a max. 8 kits/litter at first kindling and max. 10 kits/litter at following parities. Rabbit does could nurse their kits freely.

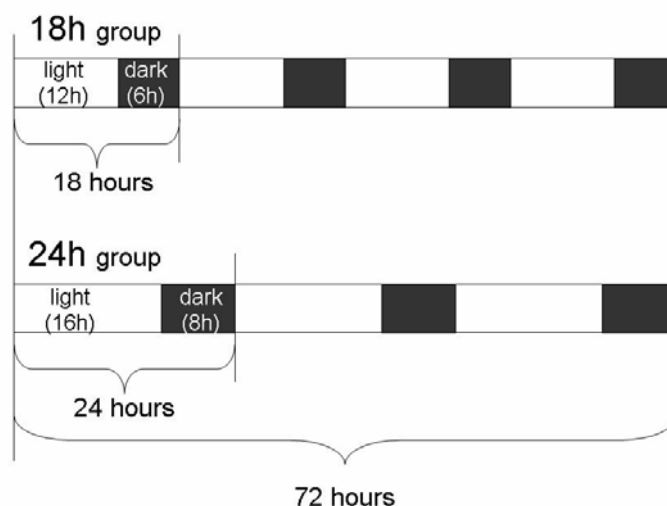


Figure 1: Lighting regime in the two experimental groups

Data of the first 5 consecutive reproductive cycles were evaluated. Body weight of does at kindling and reproductive performance (kindling rate, litter size /total, alive, after equalization, at 21 and 35 days of age/, litter weight at 21 and 35 days of age, individual body weight of kits at 21 and 35 days of age, suckling mortality between 0-21 and 0-35 days, and survival of the does) were examined.

Productivity index based on the 5 parturitions were calculated on the basis of recommendation of IRRG (2005).

Statistical analysis

The reproductive traits were compared by T-test, the kindling rate and mortality by chi-square test and the survival of the does by survival analysis using SPSS 10.0 software package.

RESULTS AND DISCUSSION

Productive performances are shown in Table 1.

Body weight of the does at kindling, kindling rate, litter size at birth, at day 21 and 35 showed no significant differences among the groups. Applying the 12L:6D lighting schedule, our results were less favourable than that of other authors (Uzcategui and Johnston, 1992; lighting regime: 1L:4.5D:1L:4.5D:12L, pregnancy rate: +21.5%, litter size: +23%; Arveux and Troislouches, 1995; lighting regime: 8L:4D:8L:4D, pregnancy rate: +15%, litter size: +6%). Mortality of kits for the periods of 0-21 and 0-35 days were independent of the lighting schedule.

Compared to the continuous lighting schedule (12L:12D), when applying an intermitted lighting schedule (1.5L:4D:1.5L:4D:1L:12D) milk yield of the does and weight gain of the litters (0-21 days) improved (milk: 4.67 and 3.80 kg, respectively; gain of litter: 1.78 and 1.43 kg, respectively; Virág *et al.*, 2000). Contrary to these results, using the 12L:6D lighting schedule resulted smaller litter weights at days 21 and 35 (by 4%) compared to the routinely applied 16L:8D schedule ($P < 0.05$). This result was not in accordance to our supposition. The reason could be that, contrary to Hoy and Selzer (2003), in our experiment the number of nursing events per 24 h was not increased in the 18h group (Matics *et al.*, 2012).

Table 1: Reproductive performance of rabbit does housed in different lighting schedules.

	Groups		SE	P
	18h	24h		
n (kindled doe/AI)	210 / 255	190 / 240		
Kindling rate (%)	82.4	79.2	---	0.369
Body weight of does at kindling (kg)	4.10	4.12	0.02	0.552
<i>Litter size</i>				
total born	10.28	9.99	0.16	0.373
born alive	9.87	9.56	0.16	0.320
stillborn	0.41	0.44	0.06	0.826
at 21 d	8.79	8.67	0.06	0.312
at 35 d	8.67	8.58	0.06	0.470
<i>Individual weight (g)</i>				
at 21 d	351	371	2.27	<0.001
at 35 d	883	931	2.10	<0.001
<i>Litter weight (kg)</i>				
at 21 d	3.08	3.21	0.03	0.008
at 35 d	7.66	7.99	0.05	0.003
<i>Mortality (%)</i>				
0 - 21d	7.06	6.89	---	0.836
0 - 35d	8.37	7.82	---	0.545

24h = 16 hours light and 8 hours dark
18h = 12 hours light and 6 hours dark

Calculating the productivity index, the number of kits born alive and number of kits at day 35 per 100 AI was 7.5% (813 vs. 757 kits) and 5.2% (714 vs. 679 kits) higher in the 18h group compared to the

24h group. Considering the opposite tendencies of the kits' body weight, the two groups did not differ for the total weight of the weaned rabbits per 100 AI (18h: 630 kg; 24h: 632 kg).

Survival of the does (Figure 2) did not differ during the experimental period (83% and 81% in groups 18h and 24h respectively, $P=0.735$).

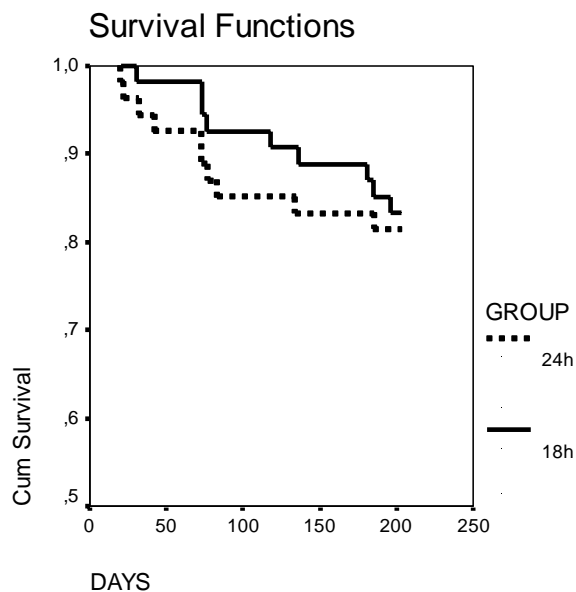


Figure 2: Rabbit does survival

CONCLUSIONS

Reproductive performance of rabbit does housed in a routine (16L:8D = 24 hours) and in a proportional shorter (12L:6D = 18hours) lighting schedule was similar. Contrary to our hypothesis, the “reduced day” to 18h had no positive effect on the does' production.

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