EFFECT OF COLOUR OF LIGHT ON THE REPRODUCTIVE PERFORMANCE OF RABBIT DOES

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ABSTRACT

The effect of light colour on the rabbits' production has not yet been analyzed. According to the literature the rabbits perceive the red light (its wavelength) less compared to other light colours. The objective of our experiment was to analyze the effect of the blue light on the rabbits' production. The experiment was carried out at the University of Kaposvár using Pannon White rabbit does. The does were housed in two identical rooms. The rooms only differed in the applied light colour. In the first room white colour was applied (W group, n=59), in the second group blue colour was used (B group, n=63). In both rooms a 16L/8D lighting regime was used throughout the experiment. Luminous intensity, independently of the light colour, measured at the middle of the cages ranged between 40-70 lux. The blue light significantly reduced the feed consumption of rabbit does during the third week of pregnancy and through their whole period of first pregnancy, and their body weight measured at parturition and day 23 *post partum*. Individual and litter weight measured at 23 days of age was significantly higher in the B group (3498 vs. 3611g and 435 vs. 451 g; $P<0.05$). Number of rabbits born per insemination and litter weight measured at 23 days of age showed a 6.4% and 7.9% difference (W: 7.37, B: 7.84; W: 2.91 kg, B: 3.14 kg) respectively. Results suggest that evaluation of the light colour's effect on the rabbit production can be perspective.

Key words: Rabbit does, Reproductive performance, Colour of light.

INTRODUCTION

The effect of light on the rabbits' production was analyzed by several authors (Depres *et al*., 1996; Rafay, 1992; Vodermayer, 1989; Maertens and Luzi, 1995; Mirabito *et al*., 1994; Theau-Clément *et al*., 1990; Arveux and Troislonches, 1995; Hoy and Selzer, 2003; Virág *et al*., 2000). However, according our best understanding no author analyzed so far the effect of light colour on the rabbits' production. According to the literature the rabbits perceive the red light (its wavelength) less compared to other light colours. In poultry the effect of light colour on the egg production, egg size and weight gain is well established (Rodenboog, 2001). Scarce literate can be found describing this topic for other domestic animals (cattle: Ádám *et al*., 1990; sheep: Casamassima *et al*., 1994; horse: Stachurska *et al*., 2002). The objective of our experiment was to analyze the effect of the blue light on the rabbits' production.

MATERIALS AND METHODS

The experiment was carried out at the University of Kaposvár using Pannon White rabbit does. The does were housed in cages with a basic area of 580x385 mm, the size of the nest-box was 260x385 mm. The rabbits were fed a commercial diet *ad libitum* (11 MJ DE/kg, 17% crude protein, 15.5% crude fibre). Drinking water was available from nipple drinkers.

The does were housed in two identical rooms. The rooms only differed in the applied light colour. In the first room white colour was applied (W group, n=59, 288 inseminations) in the second group blue colour was used (B group, n=63, 304 inseminations). Characteristics of the fluorescent light were the

following: White: FW 36 W, colour code: 830, wavelength: 300-650 nm; Blue Narva, LT 36W, colour code: 018, wavelength: 450 nm. In both rooms a 16L/8D lighting regime was used throughout the experiment. Luminous intensity – independently of the light colour - measured at the middle of the cages ranged between 40-70 lux. Within both rooms two groups were formed. In the first group the does were inseminated 11 days postpartum (reproductive rhythm of 42 days: 42 D group), in the second group the does were inseminated 25 days after parturition (reproductive rhythm of 56 days: 56 D group). Different biostimulations were used in the two groups: in the 42 D group the does could freely nurse their kits but during the last three days prior to the insemination controlled nursing was applied (kits were weaned at the age of 35 days). In the 56 D group the kits were weaned from their does 2 days prior to insemination (at the age of 23 days, effect of kits wearing is similar to biostimulation). Rabbits were first inseminated at the age of 16.5 weeks. After the first parturition 8 kits were left in the litter. In the following kindling the number of reared kits was set according to the number of kits born alive. Cross fostering was only used within the rooms. Does were culled due to conditional problems or if they remained empty after two successive inseminations.

In the statistical analysis the effects of the light colour, reproductive rhythm (fix effects) and age of the does (random effect) – first kindling, two 168 day long period (42 D group had 4 kindling, 56 D group had 3 kindling during the 168 day long period) - were considered. Production of the does (number of inseminations per parturition, litter size, litter weight, individual weight) was evaluated by means of a multiple analysis of variance using SPSS 10.0 software package. The comparison of the two reproductive rhythm is discussed by Szendrő *et al*. (2008).

RESULTS AND DISCUSSION

Significant differences were found between insemination and first kindling for the feed consumption measured weekly (Table 1). Feed consumption of the third week and that of the 1-4th weeks was higher in the W group (P=0.003 and P=0.037). No significant differences were found for the feed consumption of the first, second and fourth week, although higher consumption was observed in the W group.

Production parameters of the 168 day long period can bee seen in Table 2. No difference was found between the groups for the number of inseminations necessary for kindling (P=0.131). Converted to pregnancy rate the values were 82.0% and 87.0% in the W and B groups, respectively.

Table 1: Feed consumption (g) from insemination till first parturition depending on the light colour

Pregnancy	Colour of lighting		SE	P
	White	Blue		
1st week	221	217	4.03	0.609
2nd week	183	171	6.69	0.390
3rd week	157	116	7.04	0.003
4th week	88.9	75.0	5.59	0.217
1-4th week	162	145	4.24	0.037

At kindling the W group does were significantly larger that the does of the B group (P=0.002), but the difference decreased by the 23rd day of lactation (P=0.235). In the litter size (total, born alive, alive at day 23) no significant differences were observed between the two groups. Similarly, no significant differences were detected in litter and individual weight (total, born alive). On the contrary individual weight at day 23 was larger in the B group (P=0.009).

Results of the second 168 day long production can be seen in Table 3. Compared to the first (168 day long) period the number of inseminations necessary for successful kindling was the same for the two groups (P=0.889). Pregnancy rates were 86.2% and 87.0%. Body weight of the does was larger in the W group not only at kindling (P=0.002) but also 23 days postpartum (P<0.001). No significant differences were found for litter size (total, born alive, alive at day 23) between the groups. Body

weight of rabbits left for rearing and at the age of 23 days was significantly larger in the B group (P=0.005 and P=0.020).

Table 2: Production of rabbit does: first 168 day long period from the first kindling

Trait	Colour of lighting		SE	P
	White	Blue		
Number of inseminations/kindling	1.22	1.15	0.02	0.131
Weight of doe at kindling (g)	4398	4302	22.4	0.002
Weight of doe 23 days postpartum (g)	4765	4715	20.5	0.235
Litter size:				
total	9.16	9.34	0.15	0.507
born alive	8.87	8.99	0.15	0.683
reared	8.58	8.63	0.03	0.585
23 day of age	8.32	8.19	0.05	0.198
Litter weight (g):				
born alive	567	569	8.10	0.790
reared	580	575	4.21	0.522
23 day of age	3592	3651	27.5	0.243
Individual weight (g):				
born alive	65.2	65.2	0.57	0.898
reared	67.7	66.7	0.48	0.336
23 day of age	433	450	3.33	0.009

Table 3: Production of rabbit does: second 168 day long period from the first kindling

Trait	Colour of lighting		SE	P
	White	Blue		
Number of inseminations/kindling	1.16	1.15	0.03	0.889
Weight of doe at kindling (g)	4654	4496	30.5	0.002
Weight of doe 23 days postpartum (g)	4999	4841	24.5	0.001
Litter size:				
total	8.61	9.05	0.22	0.299
born alive	8.69	8.55	0.22	0.780
reared	8.52	8.41	0.08	0.516
23 day of age	8.20	8.11	0.09	0.663
Litter weight (g):				
born alive	576	578	12.5	0.889
reared	579	604	7.38	0.101
23 day of age	3727	3863	43.2	0.102
Individual weight (g):				
born alive	67.4	69.9	0.82	0.132
reared	68.2	72.1	0.68	0.005
23 day of age	460	479	4.25	0.020

Production parameters for the whole (336 day long) period is provided in Table 4. Pregnancy rate (number of inseminations per successful kindling) was favourable in both groups (56D group: 89.3%; 42D group: 82.0%) that may be explained by the successful biostimulation (Szendrő *et al*., 2008). The body weight of the W group does was higher than that of the B group does at kindling and at the 23rd day of lactation (P<0.001 and P=0.002). This result may be caused primarily by the increased consumption (not measured) rather than rearing smaller weight litters.

Litter size (total, number of born alive, alive at day 23) was similar in both groups. Light colour does not seem to modify the reproductive performance. No significant differences were found in the individual and litter weight at birth (Table 4) but at the age of 23 days significantly higher individual and litter weights were measured in the B group than in the W group (P=0.036 and P=0.002). As the litter size of the groups was the same the higher milk production of the B group does can be presumed.

Table 4: The effect of light colour in the 336 day long production of rabbit does

Trait	Colour of lighting		SE	P
	White	Blue		
Number of inseminations/kindling	1.20	1.15	0.02	0.170
Weight of doe at kindling (g)	4371	4282	18.3	<0.001
Weight of doe 23 days postpartum (g)	4769	4698	15.7	0.002
Litter size:				
total	8.84	9.02	0.11	0.344
born alive	8.62	8.68	0.11	0.782
reared	8.46	8.46	0.03	0.882
23 day of age	8.08	8.05	0.05	0.586
Litter weight (g):				
born alive	543	550	6.39	0.713
reared	562	569	3.65	0.534
23 day of age	3498	3611	24.5	0.036
Individual weight (g):				
born alive	64.3	65.5	0.46	0.332
reared	66.6	67.4	0.38	0.222
23 day of age	435	451	2.53	0.002

Using other domesticated farm animals, the effects of several light colours were investigated. Evaluating the growth performance of beef cattle Ádám *et al*. (1990) did not found any improvement applying blue colour. Weight gain, feed conversion ratio, dressing out percentage and behaviour of Merinos Precoce lambs were not modified by blue colour (Casamassima *et al*., 1994). Applying a lighting system of blue colour the egg weight was not changed in the experiment of El-Husseiny *et al.* (2000), on the contrary Arockiam *et al*. (2001) found that the feeding behaviour of broilers was substantially modified by the blue light. Rodenboog (2001) observed that weight gain of broilers was favourably affected by the blue light especially during the latter part of the fattening period.

The comparison of these above mentioned results with that of the present study and their adaptation to rabbit breeding would be difficult. The active period of the rabbits (contrary to other species) is the dark period. The European wild rabbit only experience under light prior during the periods leaving and returning their holes. Consequently the recognition of colours can also be different than that of the other species (Kelber and Roth, 2006). The examined traits (reproduction of rabbits on growth traits of other mammals) are also different.

CONCLUSIONS

Light colour had no effect on the reproductive performance. Blue light significantly decreased the feed consumption of does prior to pregnancy and the body weight of the does measured at kindling and 23 days postpartum. Although the does body weight was lower the individual and litter weight of the kits measured at the age of 23 days was significantly larger in the B group. Significant differences were found for the number of kits per insemination (6.4%) (W: 7.37, B: 7.84) and for the litter weight 23 days postpartum (7.9%) (W: 2.91 kg, B: 3.14 kg). Results suggest that evaluation of the light colour's effect on the rabbit production can be perspective.

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