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Night-time roosting in the domestic fowl: The height matters

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ABSTRACT

For night-time roosting domestic fowl show a strong priority for high perches. Following the anti-predator hypothesis the height of a resting site should however be more important for the fowl than roosting on a perch. Here we tested whether laying hens prefer high resting areas without perches compared to low resting areas with perches. In three trials a total of 36 groups with 9 laying hens balanced for two strains (Lohmann Brown, Lohmann Selected Leghorn) were kept in compartments (1.6 m × 3.8 m) in which they were offered two different resting areas each. Resting areas consisted of elements with an area of 90 cm × 65 cm of two heights (*L*: 15 cm or *H*: 60 cm) with either a plastic grid (G) or perches (P) on top of the elements. Preferences for perches vs. grid were tested with the combinations HP/HG and LP/LG, preferences for high vs. low resting area with the combinations LP/HP and LG/HG, and preferences for the height vs. perch with the combination LP/HG. The combination LG/HP served as a control. Video-recordings were done in week 20, 22, 24, 26, 28, and 30 of life after the hens were housed in the experimental compartments at an age of 20 weeks. From these recordings the number of hens on the resting areas was counted in 1 h-intervals throughout two consecutive nights for 8 h each. From the 28th to the 30th week of life the hens did not significantly change their preference for the resting area and, thus, data from the 30th week of life were subjected to a detailed statistical analysis. The LSQ-means of the differences between the proportions of hens on the different elements were estimated with an ANOVA, and *t*-values were used to test whether these differences were unequal 0. At an age of 30 weeks the hens significantly preferred the high vs. low resting areas (ΔH-L: 74%, $t = 4.1$, $P < 0.001$) and the perches vs. grid (ΔP-G: 38%, $t = 2.1$, $P < 0.05$) during night. In the control treatment the perches on high resting areas were preferred vs. the grid on low resting areas (ΔHP-LG: 57%, $t = 2.8$, $P < 0.01$). When high resting areas with grid were offered in combination with low resting areas with perches, the hens significantly preferred the high resting areas with grid (ΔHG-LP: 87%, $t = 4.3$, $P < 0.001$). Our results are in line with the anti-predator hypothesis by demonstrating that the height of a resting area for night-time roosting is more important for laying hens than access to perches. With respect to animal welfare the results suggest that in order to improve the welfare of laying hens not only should perches be offered, but perches should be elevated.

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1. Introduction

Like its ancestor, the jungle fowl, the domestic fowl prefer to roost at night on branches in trees or on perches if available (Blokhuis, 1984; Wood-Gush et al., 1978). This behaviour is interpreted in terms of the anti-predator hypothesis since a raised resting site reduces the risk of being caught by a ground predator (Newberry et al., 2001; Wood-Gush and Duncan, 1976). Accordingly the domestic fowl reacts less fearful towards an approaching stuffed predator when positioned on high perches compared to subjects on low perches (Keeling, 1997) and tend in

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general to be less fearfully when kept with access to perches than when kept in housing systems without access to perches (Brake et al., 1994). Moreover, domestic fowl prefer high perches compared to low perches during the daytime (Appleby and Duncan, 1989; Keeling, 1997; Newberry et al., 2001) and night-time (Oden et al., 2002; Struelens et al., 2008; Wichman et al., 2007).

The importance of perching for the domestic fowl has been addressed by studies demonstrating that laying hens show signs of frustration such as agitation and increased locomotor behaviour when access to a perch is denied after light has been switched off (Olsson and Keeling, 2000). In addition, they are willing to work in order to gain access to perches for night-time roosting (Olsson and Keeling, 2002). Although in commercial indoor housing systems laying hens are not threatened by any predators these results indicate that laying hens are still strongly motivated to perch particularly at night and that roosting at night seems to be a behavioural priority (Weeks and Nicol, 2006). Correspondingly, from 2012 on, the EC directive requires perches in all housing systems for laying hens (CEC, 1999). The height of perches, however, is not addressed in the EC directive. Following the anti-predator hypothesis the height of a resting site should be more important for the hens than access to a perch, per se, at night. However, until now the importance of the height of a resting site in comparison to access to a perch has not been tested. Here we separated the preferences of laying hens for the height of the resting site and the access to perches at night by offering them resting areas of two different heights which were either equipped with perches or with a grid. We expected that hens would prefer a high resting area with a grid compared to a low resting area with perches. Further we hypothesised that hens would prefer a resting area with perches compared to resting areas with a grid when both resting areas were offered at the same height. In order to enhance the validity of our study we additionally included two different strains and two rearing conditions in our experimental design.

2. Material and methods

2.1. Subjects and housing

The experiments were conducted in three trials at different times. In each trial groups of 9 laying hens were kept in 12 experimental compartments (1.6 m × 3.8 m) from an age of 20 weeks on. Thus, a total of 324 hens in 36 groups were used. In each trial six of the groups consisted of White Leghorn laying hens (Lohmann Selected Line, LSL), the other six groups of Medium Heavy laying hens (Lohmann Brown, LB). The compartments were equipped with chopped straw, a nest box at the floor, a feeding trough and drinking nipples. Hens were fed with commercial feed for layers and water was provided ad libitum. Compartments were artificially lighted and light duration increased from 9 h to 15 h per day at the end of experiments according to the age of hens. In trial 1 and trial 3 the hens were bought from a commercial breeder where they were reared in cages, i.e. they neither had experience with high resting areas nor with perches. Subjects of trial 2 were raised at the experimental station of our institute in compartments which were already equipped with the same resting areas as during the experiments. At an age of 20 weeks they also were transferred to the stable in which the experiments of trial 1 and 3 were done. After the experiment the hens were used for egg production and, as common in farming practice, slaughtered after the laying period of about one year.

As resting areas two elements of different heights (15 or 60 cm) and with two different tops were offered to each group. The tops of one type of element consisted of a plastic grid (mesh size 2.2 cm × 3.9 cm, thickness of the grids 0.8 cm). The top of the other elements were equipped with the same plastic grid but on each of these elements three wooden perches (width 4.5 cm, height 2.5 cm, length 90 cm) with a distance of 30 cm between perches were installed additionally. The lower sides of elements were built from wood. With a size of 90 cm × 65 cm each element offered enough space for all hens of a group simultaneously (650 cm^2 or 30 cm perch per hen). Each group of laying hens was offered two resting areas at a distance of 65 cm in between. In order to test whether the hens would prefer high versus low resting areas, we offered them resting areas with the same top but different heights: either the combination low grid/high grid (LG/HG) or the combination low perches/high perches (LP/HP). In order to test whether they prefer a grid or perches for resting we offered them resting areas of the same height but different tops: either the combination low perches/low grid (LP/LG) or the combination high perches/high grid (HP/HG). In order to test whether they preferred high resting areas or perches we offered them the combination low perches/high grid (LP/HG). For control we offered them the combination high perches/low grid (HP/LG). In each trial these six combinations of resting areas were assigned randomly to the 12 compartments, but each combination was offered to both layer strains. In trial 3, however, the most interesting combinations LP/HG and HP/LG were offered in two compartments for each layer strain. Across all three trials this resulted in 5 replications for the combinations LG/HG, LP/HP, LP/LG, HP/HG and in 8 replications for the combinations HP/LG and LP/HG, respectively.

2.2. Data recording and analysis

At an interval of two weeks each compartment was continuously video recorded for 48 h using a CCD-mini camera (Model C3172-62A1, Aakash Enterprise, Rajkot, India) with additional IR-LEDs connected to a commercial PC with self customised recording software. Observations started when the hens were 20 weeks old. A pilot study has revealed that about 6 weeks after offering different resting areas the hens did not show any substantial changes in their choice of roosting site. Thus, we limited the observations to the first 10 weeks after housing the hens in the experimental compartment, i.e. until their 30th week of life. This resulted in 6 video recordings of 48 h each. From these recordings the number of hens on the resting areas was counted at intervals of one hour during the dark phase of 8 h each. On the resting areas with

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