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Vigilance and roosting behaviour of laying hens on different perch heights

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ABSTRACT

Laying hens prefer roosting on high compared to low perches during night time. According to the antipredator hypothesis, hens on high perches can afford to be less vigilant while roosting at night. A total of 120 LSL hens in groups of five were presented a single perch, which was varied in height throughout two subsequent experiments each. In experiment 1, an acoustic noise was played back in the middle of the night. Hens' latencies until reaction and their roosting behaviours shown before disturbance were analysed depending on perch height (30, 90, or 150 cm). In addition, roosting behaviours were recorded throughout the entire experimental nights and differences were analysed in relation to perch height. Experiment 2 focussed on night-time use of single perches offered at ten different heights ranging from 20 cm to 180 cm. In experiment 1, perch height and hens' body orientation towards the source of acoustic noise did not influence reaction latencies ($P > 0.05$). Surprisingly, hens resting with their head forward immediately before playbacks showed a slower reaction (LS-means = 1.27 s) to the acoustic noise than hens resting with their head under the wing (LS-means = 0.71 s, $P = 0.004$). In contrast, the percentage of hens perching with their head forward during the entire night was higher on low (LS-means = 55.48%) compared to high perches (LS-means = 33.44%, $P = 0.001$) in experiment 1. In both experiments, perch use increased with rising height up to 90 cm. In experiment 2, hens did not show a preference for roosting on the perch compared to resting on the floor at a perch height of 80 cm or lower. Although hens showed a clear preference to roost on perches higher than 90 cm, their reactions to an acoustic disturbance during night time did not clearly support the antipredator hypothesis. Possibly, perch height may be a crucial factor when hens are searching for an appropriate roosting place before the dark period but may have limited influence on roosting behaviour during the night.

1. Introduction

Like their natural ancestor, the red jungle fowl, domesticated laying hens prefer to roost on elevated structures such as branches of trees or perches (Blokhuis, 1984; Collias and Collias, 1967; Odén et al., 2002). The motivation to rest on an elevated perch is high and hens even work for access to a perch (Olsson and Keeling, 2002). When perches are offered at different heights, hens prefer to rest on

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the highest one (Olsson and Keeling, 2000). However, the height of a roosting place seems to be more important than the availability of a perch (Schrader and Mueller, 2009). Perch height influences on-farm perch use, for example in multi-tiered aviary systems, and is therefore important for the construction of housing systems. However, until now nothing has been known about an appropriate perch height, which allows hens to fulfil their behavioural priority of elevated night-time roosting. Struelens et al. (2008) tested the use of perches differing in height, but their study mainly focused on the use of perches with respect to the space between perches and the roof in furnished cages.

A biological explanation for the high motivation of hens to perch is provided by the antipredator hypothesis suggesting that hens will be better protected against ground predators and, consequently, are less vigilant when roosting on elevated structures (Newberry et al., 2001; Wood-Gush and Duncan, 1976). In accordance with predictions derived from this hypothesis, laying hens showed reduced fear reaction on high perches compared to low ones after presentation of a predator dummy during daytime (Keeling, 1997).

Antipredator behaviour is reflecting the alerting status of an animal which in turn is indicated by its vigilance behaviour. In birds, vigilance behaviour has been shown to depend on the spatial position of an individual within a group (mallard ducks (*Anas platyrhynchos*), Rattenborg et al., 1999), on the group size (barbary doves (*Streptopelia risoria*), Lendrem, 1984) or the alerting status of neighbours (gulls (*Larus* sp.), Beauchamp, 2009). In laying hens, Newberry and Shackleton (1997) tested effects of visual cover for concealment but did not find differences in vigilance between covered and non-covered areas. Odén et al. (2005) found that hens showed less and shorter vigilance behaviour in the presence of roosters. In another study by Newberry et al. (2001) vigilance of perching hens decreased with increasing group sizes, but only on the highest perch. However, in these studies experiments were done only at daytime.

The aim of the present study was to investigate the importance of perch height for night-time roosting in laying hens by comparing the reaction of hens on different perch heights to an experimental disturbance (playback of an acoustic noise) in the middle of the dark period. It was hypothesised that hens roosting on high perches would react more slowly to the acoustic noise and would show less behaviours indicating alertness compared to hens roosting on low perches. In a second experiment, the nocturnal use of perches depending on perch heights ranging from 20 cm to 180 cm was observed in groups of hens. Here we hypothesised that a sufficient perch height will be indicated by most hens using the given perch with no further increase in perch use with increasing heights.

2. Materials and methods

2.1. Animals and housing condition

A total of 120 adult Lohmann Selected Leghorn (LSL) hens were housed in 12 experimental compartments (2 m × 3.5 m × 2.5 m) over two runs in groups of five. Compartments were located in a parallel position distributed over three neighbouring rooms, connected by open doors. Adjacent compartments were additionally separated by a visual cover. Prior to the beginning of the experiments, hens were commercially reared with access to perches. At least two weeks before the experiment started they were transferred to experimental compartments and accustomed stepwise to different perch heights during an adaption phase up to an age of 30 weeks. Before the experiments started we examined the plumage condition of neck, breast, vent/cloaca, back, wings and tail using the scoring system of Tauson et al. (2004). Feather coverage of all hens was complete (except for some hens showing minor feather damage at the breast).

Experiments took place at an age of 31–42 weeks. Each compartment was equipped with one commercial, round steel perch of 2 m length and 3.4 cm diameter, variable in height and installed 55 cm apart from the back wall, providing 40 cm perching space per hen to guarantee sufficient space for each hen. Food and water were offered ad lib by a circular feed trough and a water dispenser with drinking nipples. Experimental compartments were additionally equipped with a nest box and floors were covered with chopped straw. The daily light cycle had a duration of 14 h with 5 min twilight in the morning and 15 min in the evening. As light sources we used light bulbs (60 W). Light intensity was measured using a luxmeter (LMT Pocket-Lux 2, Berlin, Germany) and dimmed to about 10 lux during the day because some of the hens started to show toe pecking.

2.2. Experimental design and data analysis

In each experimental compartment, a CCD-mini camera (Model C3172, ELV Elektronik AG, Leer, Germany) with a 3.6 mm objective was installed at a height of about 2 m directed to the perch and an additional infrared light (IR-12/65 LED) directed to the roof. Video recordings were stored on hard disc and later analysed using self-customised software.

Experiment 1 was done with 60 hens followed by experiment 2 five weeks after the end of experiment 1. Three months later both experiments were repeated in a second run with another 60 hens resulting in a total of 120 tested hens for both experiments.

2.2.1. Experiment 1

In experiment 1, in three consecutive trials lasting 9 days respectively, a single perch was provided in the 12 compartments either at 30 cm (low), 90 cm (medium), or 150 cm (high) height. Perch heights were distributed randomly across compartments but each height was tested once per compartment.

After an acclimatisation time of nine days, in the middle of the following night (5 h after light off) we played back an acoustic noise for 5 s using three loud speakers (Magnat Monitor Supreme 100). The loud speakers were installed in the middle of each of the three rooms 135 cm in front of the compartments at a height of 60 cm. To prevent that ventilator noise would mask the playbacks the ventilation system was switched off during the experimental night. Measures before start of experiments showed that the run of