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Feeding from perches in an aviary system reduces aggression and mortality in laying hens

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ABSTRACT

Some commercial aviary systems for laying hens allow birds to access feed by standing on perches instead of platforms. Despite reports that providing laying hens with perches relates to reduced aggression and cannibalism, and increased prevalence of keel bone damage, the impact of feeding from perches on behaviour, health, and production has not been investigated. The current work studied the effects of feeding either from perches (Perch Treatment) or platforms (Platform Treatment) on behaviour, health, and production. The experiment was conducted in a quasi-commercial barn divided into 20 identical pens with 196 hens per pen to compare treatment (Perch vs. Platform) and hybrid (Nick Chick vs. Brown Nick) in a 2 × 2 factorial design. We analysed behaviour (from video recordings taken at 30, 37, and 51 weeks of age), health (at 29 and 65 weeks of age), feather condition (at 21, 44, and 65 weeks of age) and productivity parameters (collected daily from 18 to 65 weeks of age). Hens of the Perch Treatment showed less aggression at the feeder (z-value = − 1.942, p = 0.05), less jostling followed by feeding (at 30 weeks of age: z-value = − 4.191, p < 0.001; and 37 weeks of age: z-value = − 3.059, p = 0.022; but not at 51 weeks of age: p = 0.823) and followed by a behaviour other than feeding (z-value = − 7.075, p < 0.001), as well as more body instability (balance movements and falls combined) behaviours (Brown Nick: z-value = 4.338, p < 0.001, Nick Chick: z-value = 7.550, p < 0.001) than hens from the Platform Treatment. There was no difference in keel bone fractures between the treatments (p = 0.555). In the Perch Treatment, we recorded a tendency for lower overall mortality (t-value = − 1.807, d.f. = 17, p = 0.089) and the Brown Nick hybrid had lower mortality resulting from cannibalism (t-value = − 2.955, d.f. = 8, p = 0.021), laid more eggs (z-value = − 2.853, p = 0.022), and had a greater feed conversion ratio (z-value = 3.947, p < 0.001) than in the Platform Treatment. Due to reduced aggression and jostling, as well as a tendency for lower overall mortality, we conclude that the Perch Treatment is a superior alternative with improved welfare to the Platform

1. Introduction

Perches are important to laying hens (Olsson and Keeling, 2000) and their positioning in housing systems influence their utility and function. Specifically for aviaries, perches positioned between and/or running alongside the aviary tiers help hens to move between the tiers (Campbell et al., 2016a) while those at the top would normally be used for roosting (Brendler et al., 2014; Campbell et al., 2016b). Additionally, some aviary systems allow birds to access the feeder by standing on perches (hereafter referred to as perch feeders) (Odén et al., 2002; Fröhlich, 2010). In Switzerland, perch feeders are often used in the laying hen industry as more hens are allowed to be housed in such systems (Fröhlich, 2010).

In general, provision of perches in commercial settings has been associated with beneficial effects on behaviour and welfare. Aggression (Cordiner and Savory, 2001; Sandilands et al., 2009; Whay et al., 2007) and cannibalism (Fröhlich, 1990; Gunnarsson, 1999; Pötzsch et al., 2001) have been shown to decrease when perches are provided, while thwarting access to perches increased restlessness suggesting frustration (Olsson and Keeling, 2000). Despite these beneficial effects, perches can also be detrimental to hens. For example, individual hens might have difficulties using perches which would lead to increased floor laying (Appleby, 1984). The provision of perches has also been linked to keel bone damage (Appleby et al., 1993; Sandilands et al., 2009), though the nature of the effect may relate to factors such as perches' position (Banerjee et al., 2014), material (Stratmann et al., 2015), and/or shape

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(Tauson and Abrahamsson, 1994).

Given the prominent role perches have in hen behaviour and welfare and the feeder being a key resource, position of perches around the feeder is important to consider, though research on positioning perches at the feeder is lacking. Odén et al. (2002) compared aviary systems consisting predominantly of either platforms or perches, where birds could reach the feed from either a platform or perch, respectively, and reported more aggression at the feeder in the systems with platforms. However, the platform and perch systems differed in numerous ways, e.g. feeder types, and, thus prevented accurate comparison of the feeding systems in terms of behaviour, health, and productivity.

White and brown hybrids differ in behaviour and physiology and might have different space requirements. For instance, brown hybrids have wider torsos and greater body weight that white birds (Briese and Spindler, 2013; Giersberg et al., 2017) which could alter metabolic needs and feed consumption. Due to their wider torsos, brown hens likely need more feeder space than white hybrids and might benefit from providing extra usable space by elevating the feeding area above the platform.

The aim of this study was to assess the effects of feeding from either perches (Perch Treatment) or platforms (Platform Treatment) in an aviary system on behaviour, health, and productivity of laying hens of two hybrids (Brown Nick and Nick Chick hybrids). As the Perch Treatment provided additional usable area and required greater balancing ability while feeding, we hypothesised that, in comparison to the Platform Treatment, birds in the Perch Treatment would show: less jostling for access to the feeder, longer feeding bouts, and greater simultaneous feeding, less aggression and lower mortality, greater body weight, and better feather coverage. Additionally, easier access to the feed and reduced competition at the feeder were expected to improve production in the Perch Treatment, i.e., greater egg production, lower feed disappearance, and an increased feed conversion ratio. Besides these beneficial effects, we also hypothesised that the Perch Treatment would increase body balancing behaviours and falls leading to a greater prevalence of keel bone fractures. Additionally, while we hypothesised that both hybrids would show greater simultaneous feeding, reduced aggression, and increased body weight in the Perch Treatment than in the Platform Treatment, the effect would be more pronounced in the Brown Nick birds due to wider torsos.

2. Materials and methods

2.1. Ethical note

All procedures were approved by the Cantonal Veterinary Office of Bern, Switzerland, (Cantonal license number BE 85/13) and all corresponding ethical guidelines were followed. Before the study began, criteria were established as to when experimental animals would be euthanized if welfare was compromised. Criteria included inability to walk/perform natural motion and/or gross or open lesions. Four focal and several non-study animals within the overall flock were culled by the animal care staff for these reasons. Euthanasia was performed by a concussive blow to the animal's head followed by cervical dislocation, a procedure accepted as a legal form of killing for laying hens in Switzerland (animal protection guideline 800.116–3.01, BLV).

2.2. Animals, housing, and feeding

Laying hens of two hybrids, 1960 Nick Chick and 1960 Brown Nick (N = 3920), were used. Tips of the beaks of the Brown Nick birds were removed according to a standard production practice in Switzerland whereas the beaks of the Nick Chick hens remained intact. The average adult body weight of the Brown Nick hybrid is 300 g greater than the Nick Chick (H&N International, 2016, 2017) and were chosen to reflect a range a range of space requirements. From day one post-hatch until 18 weeks of age, animals were kept in eight pens of a rearing barn. The pens were identical in terms of size, lighting, and feeding regime etc. with the only difference being the type of furnishing (four pens equipped with the aviary Harmony 3 (Landmeco A/S, Denmark) and four pens with the aviary Natura 3 (R. Inauen AG – Big Dutchman – Natura Company AG, Switzerland). The potential effects of rearing systems were counterbalanced across hybrids; i.e. two randomly chosen pens with each type of furnishing housed the Nick Chick hens and the remaining pens the Brown Nick hens. All pens were equipped with automatic feeders accessible from platforms, nipple drinkers, metal perches with a circular cross-section and manure belts and had access to a covered veranda after five weeks of age. The Harmony 3 rearing system was equipped with a linear feeder only, while Natura 3 rearing system contained both a linear feeder and two round feeders. All rearing pens offered 7 cm feeder space per bird. No data was collected during rearing.

The remainder of the experiment was conducted in a quasi-commercial laying house with a three-tiered aviary system (Bolegg Terrace, Vencomatic Group) positioned in the middle of each pen. The laying house was divided into 20 identical pens (450 cm × 705 cm × 230 cm) separated with wire mesh nets (openings 1 cm × 2 cm) that allowed visual, olfactory, and auditory contact between adjacent pens. At 18 weeks of age, birds were relocated to this laying barn, whereby 196 hens were allocated to each pen and leg bands of a pen-specific colour were used for pen identification in case hens left their original pen. The pen floor was initially covered with approximately 10 cm of wood shavings that were resupplied above old bedding approximately every two weeks. Each pen had a separate veranda (9.32 m^2) that was accessible from 23 weeks of age for six hours daily (from 10:00 to 16:00), covered with wood shavings and sand, and equipped with perches and nipple drinkers.

Artificial light was provided from 02:00 to 17:00 with dawn/dusk periods of 10 min and 20 min in duration beginning at 02:00 and 16:40, respectively. Natural daylight was provided through windows on both sides of the barn using curtains that opened/closed automatically. The layer barn was ventilated through four fans that were positioned inside the pens on the corridor side and placed in a row in equal distance from each other, i.e. not more than one per pen. All perches were metal with a circular cross-section of an outer diameter of 3.2 cm. A straight feed trough was positioned above the lowest and the top tiers of the aviary for both treatments (Fig. 1A and B). Each pen had 8 cm/hen feeder space and hens were provided a corn, wheat and soy based feed *ad libitum* (Provimi Kliba SA, Kaiseraugs, Switzerland). Over the entire laying-cycle, three phase-specific diets were provided: pre-laying (in total, 1 kg/hen at 18 weeks of age), Phase 1 (from 19 to 45 weeks of age), and Phase 2 (from 45 to 65 weeks of age). During light hours, fresh feed was provided every 1.5 h via an automated chain system. Animal care personnel checked the feeder at least twice per day to ensure that feed was always in the feeder.

2.3. Experimental design

Half of the pens were designated the Platform Treatment (n = 10 pens) where the feeders were positioned 10 cm above the tiers and hens could reach the feed while standing on the platform beneath. In the Platform Treatment, perches mounted 10 cm above the feeder prevented hens from standing in the feeder. For the Perch Treatment (n = 10 pens), the feeders were raised 40 cm above the tiers and two perches with an outer diameter of 3.2 cm were placed on either side of the feeder (30 cm from each other) and 30 cm above the tier. As the distance between the lower feeder and the tier above it was only 10 cm, no perch was needed above it to prevent hens from standing in the feeder. A perch was mounted 10 cm above the feeder on the top tier for both treatments (Fig. 1A and B).

The two experimental factors — treatment and hybrid, each with two levels — were crossed resulting in four treatment combinations across the 20 pens (n = 5 pens per treatment combination). The