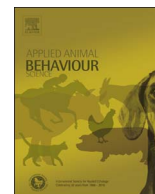




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Use of aerial perches and perches on aviary tiers by broiler breeders

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ABSTRACT

Perching, especially during the night, is an innate behaviour of chickens and the provision of perches is mandatory for laying hens in multiple countries. We examined whether broiler breeders of the fast (Ross 308) and relatively slow (Sasso) growing hybrids used aerial perches (P) and perches on aviary tiers (A) during rearing and production and how it affected welfare and production in comparison to controls without perches. Two hybrids and three treatments (control, aviary, perch) were employed in a cross-factorial arrangement. Control pens consisted of litter, raised slats, group nests, two feeder and one drinker lines. Perch-pens (P) included eight wooden perches in an A-frame configuration at 25, 50, 75, 100 cm above the slats and aviary-pens (A) included four aviary tiers with wooden bars and perches arranged as a platform (70 × 450 cm) at 55, 68, 115, and 138 cm above the slats. Each treatment combination was replicated three times resulting in a total of 18 pens. Welfare parameters of hens were assessed at 45 weeks and production was monitored continuously. Both hybrids used perches increasingly with age and predominantly at night (both tests $P < 0.0001$). Birds in control pens perched on the grill above the feeders and drinking lines more than birds in A or P ($P = 0.0002$) and perches were more used in A than P pens ($P = 0.002$). More brood eggs were collected in control pens than in the other treatments ($P = 0.02$) and A-pens yielded more floor eggs ($P = 0.007$) than control pens and P-pens. Keel bone fractures were less frequent than in laying hens but hens in A and P pens had more keel bone fractures than hens in control pens ($P = 0.02$) and Sasso had more than Ross ($P = 0.002$). In conclusion, our results suggest that broiler breeders are highly motivated to access aerial perches or perches on aviary tiers similar to laying hens with a similar welfare problem of keel bone fractures. Perches had no influence on hatching rates but measures should be taken against floor eggs to avoid a loss of brood eggs.

1. Introduction

Perching is a behaviour found in the wild ancestor as well as domesticated chickens, although the latter perch less (Eklund and Jensen, 2011). Night-time roosting on elevated perch-like structures can be observed in feral domesticated hens (Wood-Gush and Duncan, 1976), as well as modern commercial hybrids of laying hens in cages (Duncan et al., 1992; Struelens et al., 2008; Chen et al., 2014) and aviaries (Appleby et al., 1993; Brendler and Schrader, 2016; Campbell et al., 2016b). Chickens prefer the greatest height during nighttime roosting possibly because it offers the best protection from predators (predator avoidance hypothesis: Newberry et al., 2001; Schrader and Müller, 2009; Brendler and Schrader, 2016). Consistent with that, provision of perches reduces fearfulness in pullets (Brantsaeter et al., 2016), adult laying hens (Donaldson and O'Connell, 2012), and broiler breeders (Brake et al., 1994). Supplying perches can have additional multiple benefits like a qualitatively better resting behaviour at night (Olsson

and Keeling, 2000), less aggression during the day (Cordiner and Savory, 2001; Donaldson and O'Connell, 2012), and less feather-pecking (Huber-Eicher and Audigé, 1999; Lambton et al., 2010). The importance of this resource to the hens is shown by the willingness of laying hens to work for access to perches (Olsson and Keeling, 2002).

The evidence summarized above has led the European Union as well as other countries to require the provision of perches for laying hens (CEC, 1999). In Switzerland, all pullets, layers, and breeding stock, including broiler breeders, must have access to perches (TSchV, 2008). In the EU, the provision of perches for parent stock is not regulated though some regions/nations do have requirements for broiler breeders (e.g. Sweden, Lower Saxony) (EFSA Panel on Animal Health and Welfare (AHAW), 2010; RdErl, 2015). Regardless of regulations, broiler breeders are commonly kept without perches and hatch egg producers claim that these animals do not use perches but rather sit on the slats above the manure pit even when perches are offered (Wachenfelt and Berndtson, 2014).

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While the need to provide aerial (raised) perches in a welfare friendly housing system for hens of egg-laying lines is well established (Duncan et al., 1992; Mol et al., 2006; Sandilands et al., 2009), little has been published on the perching behaviour of adult breeders, especially broiler breeders (Riber et al., 2017; but see Pearson, 1983; Muiruri et al., 1989), and depending on their arrangement, negative effects on welfare may occur. For instance, in one study on broilers the presence of perches was associated with enhanced stress, which the authors suggested resulted from decreased availability of floor space (Heckert et al., 2002) but not from the perches directly. As modern broiler breeders differ greatly from the egg laying lines (Eitan et al., 2014), true breeds (Muiruri et al., 1989), or older lines of broiler breeders (Brake, 1987; Brake et al., 1994), earlier studies have only limited applicability to modern broiler lines. The response to selection for meat gain in broiler lines has not only been substantial in terms of weight gain and feed conversion rate in the broilers but also led to profound changes in the weight gain, final body mass, body conformation, and the musculoskeletal system in the breeders (Zuidhof et al., 2014). Despite severe feed restriction, the fast growing strains of broiler breeders are much heavier than laying hens during the production phase.

The objective of this study was therefore to assess if broiler breeders of a fast and a slow growing hybrid use aerial perches and how housing systems with perches affect welfare, behaviour, and production of broiler breeders compared with a system without perches.

2. Material, animals and methods

The experiment was approved by the cantonal Food Safety and Veterinary Office Fribourg (2013_26_FR+) and met all cantonal and federal regulations for the ethical treatment of laboratory animals.

2.1. General housing

Parent stock of the fast growing Ross 308 (<http://en.aviagen.com/ross-308/>, accessed on 2-25-2016) and the relatively slower growing Sasso (female: SA31A, male: T44, www.sasso.fr, accessed on 2-25-2016) were obtained as one-day-old chicks in the middle of October 2013. They were kept in the same barn for the entire production cycle. The two hybrids required different amounts of feed, a feature our feed delivery system would not allow, and therefore had to be kept in separate barns. The two semi-detached barns had been converted from broiler to broiler breeder barns for this study. Automatic nest boxes (Volito BV, 3902HP Veenendaal, The Netherlands, 230 × 50 cm) with a sloped bottom where eggs rolled onto a collecting belt covered by a wooden plate (25 cm) ran along the length of the middle of each of two barns. Sloping down from the nestboxes were plastic slats (length: 248 cm). They were 88.5 cm above the floor at the wooden plate in front of the nestboxes and 50 cm high adjacent to a 178 cm wide litter area (Fig. 1). Two feeder lines for females were present: one on the litter and one on the slats. Feeders which only males could utilize were present above the litter. A drinking line with nipples was on the litter

from day 1 for approximately six weeks. Afterwards, this drinking line was disconnected from the water source, raised to 30 cm below the ceiling, and the drinking line in front of the nests was provided. Litter consisted of ca. 1 cm deep wood shavings and was replenished as needed. Each barn was divided lengthwise by the centrally located nestboxes; each row was then further divided into five, 5-m wide pens for a total of ten pens per barn. For rearing, seven pens were used for females and three for males but, after mating at 18 weeks of age (WOA), only nine pens per barn were used to maintain a balanced experimental design with three replicates of three treatments: control pens, perch-pens (P) and aviary-pens (A). The pen on the right side of the barn farthest away from the entrance was not used. Newly hatched chicks were randomly assigned to pens according to sex and hybrid. In P-pens (n = 3 pens), eight wooden perches (6 × 5.5 cm, 230 cm long) were arranged in an A-shaped formation at 25, 50, 75, and 100 cm above the slats (Fig. 1). In A-pens, four staggered aviary tiers (4.5 m × 0.7 m, Natura aviary system from Vencomatic, 5520 AD Eersel, The Netherlands) were mounted on the slats. Each tier consisted of wooden beams with incorporated perches (6 × 5.5 cm). The tiers were 55, 68, 115, and 138 cm above the slats. Control pens were equipped as described above, but without the perch furnishings. Treatments were assigned to pens in the order of: control, A, and P, in a design starting with a control pen on the left side of the barn in the pen closest to the entrance. Each pen housed 119 females and 12 males at mating and the density followed Swiss regulations.

2.2. Management

Management during rearing and production followed the recommendations of the breeding companies and are described in more detail elsewhere (Gebhardt-Henrich et al., 2017a). A haphazard sample of five birds from each pen (100 in total) was weighed weekly and the feed amount was adjusted to maintain body mass within the recommended allowance separately for the two hybrids. Whereas Ross 308 hens are restrictively fed during rearing and production the dwarfed Sasso hens are fed ad libitum during production (Decuyper et al., 2010). Grading within treatments (i.e. minimizing the variation of body mass within pens by allocating birds into pens according to their body mass) took place at the age of 13 weeks. Samples of feed from consecutive deliveries were collected and analyzed by LUFÄ, Oldenburg, Germany (Table 1). The feed composition met the standard recommended by the breeding company (Aviagen™, 2012). Water was provided ad libitum at all times. Following recommendations for the Ross 308 (Aviagen™, 2012), the lighting schedule for both hybrids was as follows: 22 h of day length during the first day, gradual reduction to 8 h until 3 WOA, 8 h until 19 WOA, gradual increase to 14 h. From population until mating, sexes were housed in separate pens. In broiler breeders, the male and the female breeders represent different genetic lines. Occasional sexing errors will and did occur leading to a few males of the female genetic line being present. Therefore, immediately before mating at 17 WOA, the mistakenly placed males of the female line were

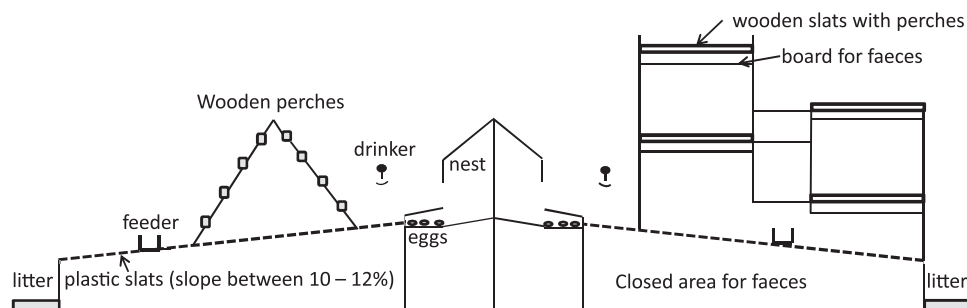


Fig. 1. Equipment of a pen with perches (left) and a pen with an aviary (right). Figure is not drawn to scale, masses and heights are given in the text. Control pens contained neither perches nor an aviary.

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