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# Choice of perch characteristics by laying hens in cages with different group size and perching behaviours☆

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ABSTRACT

Provision of perches in cages could improve behaviour and physical conditions of laying hens. This study was conducted to investigate the choice of perch characteristics (shape, width, material and height) by caged hens under different group size, and to understand the choice by the perching behaviours of hens. This study was consisted of four trials: perch shape (rectangular and round in cross section), width (3.0 cm and 5.0 cm), material (steel, wood and plastic) and height (10 cm, 20 cm, 30 cm and 40 cm) tests. In each trial, 390 Hyline Brown laying hens were used and randomly allocated to three treatments: individual group (G1), group of four hens (G4), and group of eight hens (G8), respectively. There were 30 replicates in each group. The hens in G1, G4 and G8 groups were put in the test cages in which designed perches were simultaneously provided and tested after four habituating days. Hens' behaviours were recorded using cameras at the following periods: 8:00–10:00; 14:00–16:00; 19:00–21:00 and 23:30–0:30 on the fifth and seventh day. The behaviours of the hens were analyzed, and the hens' positions on test perches during mid-night were recorded. The results showed that, the rectangular perches were chosen more than round perches in all groups ($p < 0.01$), and comforting behaviour was performed more ($p < 0.05$) on the rectangular perches than on the round ones. The 3.0 cm wide perches were highly preferred to 5.0 cm perches in G1 and G4 groups ($p < 0.05$). The hens on the 5.0 cm wide perches performed more pecking ($p < 0.01$). Besides, the wood perches were chosen more than steel or plastic perches in all groups ($p < 0.05$). The hens chose 20 cm high perches most in G1 group and G4 groups ($p < 0.05$), but 10 cm high most in G8 groups ($p < 0.01$). The perching behaviour was significantly affected by perch height ($p < 0.05$). Besides, the frequency of jumping, pecking and comforting were significantly affected by group size ($p < 0.05$). Consequently, we recommend that the rectangular wood perches of 3.0 cm wide and 20 cm high may be suitable for the commercial furnished cages that the height is not lower than 100 cm.



## 1. Introduction

Provision of perches in cages for laying hens may have important effects on their behaviour and physical conditions, which could increase behaviour expression, strengthen bone density and improve welfare of hens (Tauson, 1984; Hughes and Appleby, 1989; Appleby et al., 1992; Duncan et al., 1992). Various factors may influence perch use such as cage dimensions (Appleby et al.,

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1992), stocking densities (Tauson and Abrahamsson, 1994; Rosemary and Estevez, 2001) and the detailed designing characteristics of perches, including shape (Muiruri et al., 1990), width (Struelens et al., 2009), material (Appleby et al., 1992), height (Valkonen et al., 2004; Struelens et al., 2008b) and arrangement (Oden et al., 2002; Wall and Tauson, 2007; Struelens et al., 2008a). Many studies have been done to investigate perch preference of laying hens by counting the total number of hens on perches during night-time (Appleby et al., 1992; Muiruri et al., 1990; Struelens et al., 2009). Muiruri et al. (1990) suggested that to understand hens' preference for different perches can offer various perches simultaneously in the same environment.

Furthermore, studies of animals' preference for specific resources provided can usually be conducted by testing animals in isolation (Dawkins, 1983; Cooper and Appleby, 1997; Mason et al., 2001). However, single-housed animals are unrepresentative of social conditions that the most commercial domestic animals encounter in conventional farming systems (Albentosa and Cooper, 2005). Social factors include gregariousness, social facilitation, social competition and agonistic interactions (Mench and Keeling, 2001; Cooper and Albentosa, 2003) could inhibit or encourage partners' responses that can be used in preference tests to assess resource value (Albentosa and Cooper, 2005). In addition, when hens were group housed, the increasing group size means that the average resources available per hen were reduced, which would reduce access to and increase competition for these resources (Arnould et al., 2001; Collins et al., 2011), Consequently, when the group size was changed, the choice of resources may change, and behavioural responses should be associated with the choice (Nicol et al., 2009). Besides, Pickel et al. (2010) suggested particular perching behaviours can be used as an indicator for suitability of a particular perch design, and may therefore be used to assess and develop perch designs for the caged hens. So comparing perching behaviours on different characteristics of perch may give well understanding to hens' choice. In this study, we studied perch width, shape, material and height choice by hens in individual or different groups in the cage conditions. The aim was to investigate whether birds had an overall choice for specific perches, and whether the choice may change when the resources were reduced as the group size was increased, and to understand how the behaviour can be associated with the choice. We expected our finding will help to understand the choice changes according to perching behaviours with increasing group size, and find out the appropriate perch characteristics which can be applied to commercial cage systems.

## 2. Materials and methods

### 2.1. Animals and management

This study was consisted of four trials. In each trial, 390 Hyline Brown laying hens were used. The hens were housed commercially in conventional wire cages (192 cm width × 37 cm depth × 35 cm height) until the trial started. At 18 weeks of age, the hens were transferred to the test room which was environmentally controlled and accommodated 30 test cages equipped with the designed perches. Feed and water were available *ad libitum*. Ambient temperature was maintained at $20 \pm 1\,^{\circ}C$ and relative humidity was maintained at 65–70% during day. Light schedule was 16hL:8hD and light onset was at 4:30 am.

### 2.2. Experimental designs

Each trial was conducted in 30 test cages which were arranged in two-tiers across a broad central passage way in the test room. In order to avoid the communication among the hens of the adjacent cages, the lateral and back sides of the test cages were enclosed with black cloth. The feed troughs and water troughs were fixed in front of the test cages. 15 cameras with infrared light source were fixed on top of the opposite side cages and allowed to video-tape the two vertical cages. Perch shape, width, material and height tests were conducted one by one in order, and in each trial only one characteristic was tested for three weeks.

For perch shape test, the test cages were 100 cm × 80 cm × 65 cm (width × depth × height) in size equipped with two wooden perches of different shape: rectangular perches in a cross section of 3.5 cm × 3.5 cm and round perches in 3.5 cm of diameter. Each perch was 50 cm long and was positioned 25 cm high above the wire mesh floor and 30 cm away from the back side of the cage. They were positioned parallel to the feed troughs and arranged in a line across the cage. The arranging order of the perches was rotated weekly in test cages to avoid position effect. In perch width trial, the test cages were the same as the cages used in the shape trial. Two wooden rectangular perches with different width of 3.0 cm and 5.0 cm wide were designed in this study. The perches was positioned similarly as in the shape trial. In the perch shape and width trials, the space allowance for each hen was 8000 $cm^2$ in G1 group, 2000 $cm^2$ in G4 group and 1000 $cm^2$ in G8 group.

For perch material trial, the cage size was 120 cm × 80 cm × 65 cm (width × depth × height). The cages were equipped with three rectangular perches of different materials: steel, wood and plastic. Each perch was 3.5 cm wide, 40 cm long and was 25 cm high above the wire mesh floor and 30 cm away from the back side of the cage. In perch material trial, the space allowance for each hen was 9600 $cm^2$ in G1 group, 2400 $cm^2$ in G4 group and 1200 $cm^2$ in G8 group. In perch height trial, The cage size was 160 cm × 80 cm × 65 cm (width × depth × height) and the cages were equipped with four rectangular perches of different heights:10 cm, 20 cm, 30 cm and 40 cm. Each perch was 3.5 cm wide, 40 cm long and 30 cm away from the back side of the cage. They were positioned parallel to the feed troughs and arranged in a line across the cage. The stepwise perch had the lowest levels of 10 cm at the ends of the perch and gradually increased in height to the middle of the perch with a maximum of 40 cm (pour V-shaped) in half of the test cages, while the arranging order was opposite in the other test cages. In perch height trial, the space allowance for each hen was 12,800 $cm^2$ in G1 group, 3200 $cm^2$ in G4 group and 1600 $cm^2$ in G8 group. The perch