**Original Article (Short Communication)**

**Behaviour of Gifu Native Fowl and Commercial Laying Hens under Battery Cage Condition**

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**ABSTRACT**

This study investigated the behavioural characteristics of the Japanese native chicken, Gifu native fowl, under cage conditions. We studied both Gifu native fowl, which is one of the oldest and most famous traditional breeds in Japan and commercial hens (Dekalb XL). These birds were reared under battery cage conditions, a management system defined as a behavioural restricted environment. Ten birds each of Gifu native fowl and commercial hens were reared in individual battery cages (948 cm²/bird). Behavioural observations were performed from 06:00 to 16:00 using a 1-min-interval scan sampling method. Time ratios of feeding and sitting for commercial hens (38.1% and 9.6%, respectively) were significantly (P < 0.05) higher than those for Gifu native fowl (23.1% and 3.7%, respectively), while time ratios of stereotypic pacing and preening for Gifu native fowl (6.1% and 26.2%, respectively) were significantly (P < 0.05) higher than those for commercial hens (1.7% and 14.0%, respectively). There were no significant differences in other behaviours between the 2 breeds. These results indicate that Gifu native fowl may exhibit fewer instances of stereotypical behaviour under cage conditions.

**Key words**: behaviour, Gifu native fowl, laying hens, stress, animal welfare

**Introduction**

In-Cross-bred or hybrid breeds of fowl are now used in the mainstream poultry industry. However, the popularity of traditional breeds (Jidori) has increased in Japan. There are many kinds of traditional fowl in Japan, e.g. Ukokkei, Hinai-dori, Nagoya and Gifujidori (Gifu native fowl). Gifu native fowl is a popular old breed in central Honshu. It has the typical wild pattern of feather colour and similar morphological characteristics to those of the red junglefowl. It is reared as backyard hobby breed and has not been considered for increased production. Nishida et al. (1985a; 1985b) grouped Gifu native fowl, red junglefowl and grey junglefowl together by a principal components analysis for multivariate somatometrical comparisons in their studies. For Gifu native fowl, egg production rate under light management is about 100 per year (Kaneko et al. 1997b) and the body weight of the adult female is around 920 g (Kaneko et al. 1997a). Gifu native fowl are similar in appearance, weight and incubation behaviour to red junglefowl (Kuwayama et al. 1994).

On the other hand, some reports indicate that production traits in traditional breeds are affected by rearing conditions. Body weight gain in cross-bred traditional fowl is affected to a greater extent by rearing density than in broiler chickens (Watanabe et al. 1994). Shimazawa and Araki (1999) reported the effects of rearing conditions (floor rearing versus flock cage rearing) on meat colour and muscle fibre characteristics in cross-bred traditional fowl (Tsushima-Jidori) to be greater than those in commercially bred broilers. These reports suggest that both native fowl and traditional breeds of
chicken are affected by their rearing conditions. Hence, it is desirable to rear native fowl in environments with little restriction of movement. Therefore, the JAS stipulated that the native fowl reared for meat must be raised under free-range conditions. However, a similar legislation in Japan does not exist with regard to laying fowl. Furthermore, the Gifu native fowl is a basic breed of the Okumino-kidori, which is a commercial native fowl. The Gifu and other native fowls have been reared under the battery cage system to ensure better breeding. The battery cage system is a behavioural restriction management system designed for commercial laying hens (Hughes 1973; Baxter 1994). However, few reports investigating the behaviour of native fowl in a cage environment exist. Understanding the behaviour of Gifu native fowl within a cage environment is crucial with a view to facilitate animal welfare.

In this study, the behaviour of Gifu native fowl in a cage environment was compared with that of commercial laying hens.

**Materials and Methods**

**Animals and management**

We used 10 hens each of Gifu native fowl (0.9–1.1 kg BW, aged 19 months) and commercial laying hens (Dekalb XL, 1.7–1.8 kg BW, aged 20 months). Beaks of the commercial laying hens were trimmed. Gifu native fowl were obtained from the Gifu Prefectural Livestock Research Institute, Japan and commercial laying hens were obtained from a commercial breeder. Both breeds had been artificially hatched. Animals were individually reared in conventional cages (948 cm²/bird). Birds were randomly selected and housed at the rate of one per cage. Commercial mash feed and water were provided *ad libitum*. Water was provided in a drinker at the back of the cage. The feed trough was attached to the front of the cage. Lighting conditions were 14 h of light (5:00–19:00) and 10 h of darkness. All maintenance was performed daily from 8:00 to 9:00.

**Observation and statistical analysis**

The behaviour of both breeds was observed for a 30 min period at 1-h intervals from 06:00 to 16:00 and recorded on a videotape. Observations were performed using a 1-min-interval scan sampling method. All subjects were observed over a 3-day period. Behavioural data was averaged for each bird for statistical analysis. Behavioural categories, modified from Ito et al. (2002), are shown in Table 1. Each behaviour was analysed using the Mann-Whitney U-test (n = 10). All statistical analyses were conducted using Prism ver. 4.0 for Macintosh.

**Results**

Time ratios for each analysed behaviour of Gifu native fowl and commercial laying hens under cage conditions are shown in Figure 1. Time spent feeding was significantly greater (U = 11, P < 0.01, n = 10) in commercial laying hens (38.1 ± 11.5%) than in Gifu native fowl (23.1 ± 8.4%). In addition, time spent sitting was significantly greater (U = 20, P < 0.05, n = 10) in commercial laying hens (9.6 ± 7.4%) than in Gifu native fowl (3.7 ± 4.2%). However, stereotypic pacing was significantly greater (U = 11, P < 0.01, n = 10) in Gifu native fowl (6.1 ± 4.0%) than in commercial laying hens (1.7 ± 1.8%). Moreover, preening time was significantly greater (U = 11, P < 0.01, n = 10) in Gifu native fowl (26.2 ± 6.0%) than in commercial laying hens (14.0 ± 7.0%). The mean proportions of time spent feeding, drinking, floor-pecking, preening and feather-pecking, all of which are beak-use behaviours, were 56.4% in Gifu native fowl and 58.7% in commercial laying hens. No significant differences were observed in standing, drinking or floor-pecking behaviours between Gifu native fowl and commercial laying hens. Agonistic feather-pecking and vacuum dust-bathing were rarely observed and no significant difference was observed between the two breeds for those behaviours.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Behavioural categories</th>
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<td>Behaviour pattern</td>
<td>Description</td>
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<tr>
<td>Feeding</td>
<td>Head extended down into the feeder</td>
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<tr>
<td>Drinking</td>
<td>Drinking at the drinker</td>
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<tr>
<td>Standing</td>
<td>Standing on the feet with extended legs</td>
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<tr>
<td>Sitting</td>
<td>Sitting on the floor</td>
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<td>Floor pecking</td>
<td>Pecking on wire floor</td>
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<td>Preening</td>
<td>Self-manipulation of body feathers using the beak</td>
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<tr>
<td>Agonistic</td>
<td>Fighting and head to head contact behaviour with neighboring birds</td>
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<tr>
<td>Feather pecking</td>
<td>Pecking and pulling feathers of other birds</td>
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<tr>
<td>Stereotype pacing</td>
<td>Repeatedly walking in a cage</td>
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<td>Dustbathing</td>
<td>Ground scratch performed with fluffed feathers</td>
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Our results demonstrate that behavioural characteristics differ between Gifu native fowl and commercial laying hens in battery cage. Pacing and preening behaviours of Gifu native fowl were more developed than in commercial laying hens. Feeding and sitting behaviours of Gifu native fowl were less developed than in commercial laying hens.

Feeding behaviour in Gifu native fowl was observed half as often as in commercial laying hens under cage conditions. The proportion of time spent feeding was much lower for Gifu native fowl than for commercial laying hens. This difference affected not only the characteristics of feeding behaviour in commercial laying hens but also the body weight and food consumption in both breeds. The body weight and mean feed consumption of commercial laying hens was about twice as that of Gifu native fowl (Ito et al. 2003). In addition, caged commercial laying hens are reported to peck at their feed for leisure as well as for feed intake (Tanaka et al. 1983). This study did not investigate leisure pecking at feed for purposes other than feed intake in Gifu native fowl. There is a possibility that feed-pecking for leisure had an influence on differences between breeds with regard to the feeding behaviour. Therefore, studies with regard to feed-pecking for leisure are necessary to further understand such behaviours in the native fowl.

The time ratio of stereotypic pacing (repeated walking in cage) in Gifu native fowl was significantly higher than that in commercial laying hens. Stereotypic pacing means walking stereotypically within the cage and is used as an indicator of stress response (Tanaka and Hurnik 1992). And the time spent preening by Gifu native fowl was twice as that of commercial laying hens under cage conditions. Savory et al. (1992) reported that birds subjected to food restriction spent far less time resting and more time spot-pecking (at wall) than ad libitum-fed birds. Furthermore, food-restricted birds spent more time preening than control birds. Results from observations of stereotypic pacing and preening in Gifu native fowl indicate that cage conditions could act as a behaviourally-restricted environment for this breed, whereas commercial laying hens exhibited less pacing behaviour. These results suggest that Gifu native fowl might be affected by housing conditions to a greater extent than commercial laying hens.

In this study, the traditional breed showed stereotypic behaviour more frequently than domesticated hens under cage conditions. On the other hand, the time ratio of sitting for Gifu native fowl was significantly lesser than that for commercial laying hens. The resting behaviour of the junglefowl is different from that of medium-hybrid hens (Blokhuys 1984). Non-selected breeds were more active, more social and performed more intensive foraging behaviour compared with the White Leghorn (Schutz et al. 2001; Schutz and Jensen 2001). The activity level of Gifu native fowl are as high as those seen in red junglefowl and higher activity levels may lead to an increased expression of pacing behaviour. With a view to facilitate animal welfare, cage breeding should be avoided even in sole instances of laying or breeding. Use of cages with an enriched environment may be valid when considering
activity levels in instances where Gifu native fowl are reared under a cage system.

We conclude that Gifu native fowl do not have the ability to adjust to a cage environment more than commercial laying hens. Further experiments are needed to investigate differences in physiological responses between the two breeds in the battery cage environment.

References


