

# Behavior evaluation of Japanese quails (*Coturnix japonica*) submitted to forced molting

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Esta investigación tuvo como objetivo evaluar el efecto de dos métodos de muda forzada, el método de óxido de zinc y el de ayuno, sobre el bienestar de codornices japonesas (*Coturnix japonica*) observándose sus variables de comportamiento. Para ello fueron alojadas en jaulas convencionales 36 aves divididas en grupos de 12, siendo organizadas en los siguientes grupos: Control (C), Zinc (Z) y Ayuno (A). Las aves del grupo Z fueron sometidas a la muda forzada utilizando una oferta de pienso que contenía 25000 ppm de óxido de zinc y fueron inducidas a una pérdida de peso corporal del 25%. En el grupo A, las codornices fueron sometidas a restricción alimentaria de cinco días, período suficiente para que alcanzaran una pérdida de peso corporal de 30,8%. Las aves del grupo C recibieron pienso de postura *ad libitum* durante todo el período experimental. Para la evaluación del comportamiento fueron seleccionadas de forma aleatoria cuatro aves de cada tratamiento en los días 2 y 4 posteriores al inicio del experimento. Los patrones de comportamiento evaluados fueron clasificados de la siguiente forma: 1. Aves alimentándose: posición del pico fuera de la jaula para ingestión de alimento. 2. Aves en busca de alimento: posición del pico fuera de la jaula sin ingestión de alimento. 3. Aves bebiendo: posición del pico en el bebedero y picoteo. 4. Aves en situación de Confort: plumaje revuelto y levantamiento de las alas. 5. Aves en situación de inquietud: intento de salir de la jaula. 6. Exploración: desplazamiento de codornices en la jaula. 7. Paralización de las aves: aves en pie sin presentar movimiento. 8. Aves sentadas o tendidas sobre el suelo de la jaula. 9. Aves en situación de apatía: aves en pie o sentadas sin movilidad. Los registros fueron realizados durante 8 minutos por la mañana y 8 minutos por la tarde. Se pudo observar cómo las codornices del grupo C estuvieron la mayor parte del tiempo bajo los siguientes comportamientos: de apatía (32,8%), comiendo (26,1%) y sentadas (15,2%). Las codornices del grupo A estuvieron 33,8% del tiempo explorando el ambiente y 26,9% del tiempo con movimientos inquietantes de tentativa de escape para salir de la jaula. En el grupo Z se pudo observar que las aves manifestaron un comportamiento de apatía (78,2%) sin presentar ningún tipo de movimiento. Como resumen de esta investigación se puede concluir que los dos métodos de muda forzada señalados, óxido de zinc y ayuno, alteraron de forma negativa el comportamiento de las aves.

**Palabras clave:** muda forzada; codornices; bienestar; óxido de zinc; ayuno.

This study aimed to evaluate the effect of oxide zinc added feed and fasting on the animal welfare of Japanese quails (*Coturnix japonica*) with behavioral criteria. In order to do so, 36 birds were divided in groups of 12 individuals placed in conventional cages with the following distribution: Control (C), Zinc (Z) and Fasting (A). Birds from group Z were submitted to forced molting with a feed containing 25,000ppm of zinc oxide and induced to a body weight loss of 25%. Group A birds were submitted to a complete food deprivation for five days, which was a duration sufficient for a body weight loss of 30.8%. Birds from control group had free access to

layer feed during the experimental period. To evaluate behavior, four birds from each treatment were randomly selected at days two and four after the beginning of the experiment. Behavioral profiles were assessed with the following criteria: Eating (projecting beak and ingesting food); searching for food (projecting beak towards feeder looking for food without ingesting); drinking (close to nipple drinker and pecking it); comforting (shaking feathers, flapping and stretching wings); comforting (shaking feathers, flapping and stretching wings); unrest (attempting to escape from confinement); exploring (walking around the cage); stopped (bird standing still); sitting (bird sits on the bottom of the cage) and apathy (standing up or sitting down, without much movement). Behavior recordings were performed for eight minutes in the morning and the same duration in the afternoon. Quails from group C presented the following behaviors during most of the observation periods: stopped (32.8%), eating (26.1%) and sitting (15.2%). Quails from group A passed 33.8% of the time exploring and 26.9% with unrest, attempting to leave the cage. Group Z birds presented apathy for most of the time (78.2%), when quails did not presented any type of movement. In conclusion, both oxide zinc and fasting methods altered negatively the animal behavior.

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**Keywords:** Forced molting; quails; animal welfare; zinc oxide; fasting.

## Introduction

Forced molting have been a useful tool to improve the production potential for laying hens and, therefore, presents considerable economic interest. There are several induced molting programs and some methods present advantages over others besides economic aspects. Methods involving zinc based diets, for example, present better results considering the immune status of the individuals, when compared to fasting based methods (Sharma and Gupta, 2012).

Considering productive performance, a method that produce superior results than fasting has not been developed yet (Teixeira and Cardoso, 2009). However, groups that defend production animal welfare have been pushing for the end of fasting method for induced molting, stating that this practice is highly stressful for hens (Aygun and Yetişir, 2012). On the other hand, several studies have been performed in the last few decades with forced molting methods that may comply with animal welfare standards and this demonstrates an interest in researchers to seek alternative methods that attend to the various interests in society (Teixeira and Cardoso, 2009).

Currently, a clear change has occurred in human perspective towards animals and, as a consequence, laws have been created to allow production animals to have an optimal performance, however with no negative effects on their welfare status. This point is important and must be emphasized, because according to Vilanova (2008), not only health should be considered when an animal is analyzed from a welfare perspective, but also their emotional state within behavioral criteria. It is now a common knowledge, that a satisfactory performance in production does not imply necessarily that there is an adequate animal welfare condition. This may be explained by the fact that animals destined for production have been selected for optimal performance in production even in sub-optimal conditions from an animal welfare perspective.

Considering the effects of production systems on animal welfare, Hurnik and Lehman (1988) classified animal needs in three types: first, the needs that if not fulfilled will result in death; second, those that if not met will cause disease and, consequently, death; last, those that if not satisfied will lead to stereotypies. According to this classification, the effect of forced molting may affect all three levels of necessity, predisposing flocks to elevated mortality rates (Teixeira et al., 2007), increased susceptibility to infections by potentially pathogenic microorganisms, such as *Salmonella* (Holt, 2003;

Santos et al., 2015), in addition to stereotypies. According to Broom (1991), stereotypies may be observed in situations in which individuals lose control of their environment, are feeling threatened, frustrated or in monotonous environments.

Among the alternative forced molting methods, some researchers consider that the use of elevated zinc concentrations in feed is capable of fulfilling animal welfare standards (Teixeira and Cardoso, 2009), in addition to producing positive results similar to fasting methods (Park et al., 2004; Domingues et al. 2014). However, current methods involving the excessive use of some nutrients in feed have also been questioned due to the occurrence of intoxications in birds (Dalanezi, 2007) and possible environment contamination. Despite the inconclusive problems concerning both of these methods, fasting method is still frequently used in several parts of the world and studies evaluating the effect of both methods on the bird behavior are scarce in scientific literature. Therefore, this study aimed to evaluate the effect of zinc oxide based diet and fasting methods on the welfare of Japanese quails (*Coturnix japonica*) through behavior criteria.

## Material and Methods

The experiment was performed in the experimental facility of the Laboratory of Ornithological Studies in the Faculty of Veterinary, State University of Ceará. This study was approved by local Ethics Committee for use of Animals, State University of Ceará, with the protocol number: 11044625-9/33 and all the ethical principles of animal experimentation were followed.

In this study, 36 quails were housed in groups of four in wired cages with the following size: 25 x 25 x 20 cm. Treatment groups had 12 animals, organized as follows: Group C – Control; Group A – birds submitted to fasting method; Group Z – birds fed a diet with zinc oxide. Birds from group Z received a feed with 250000 ppm of zinc oxide to induce a weight loss of 25%. Birds from group A were submitted to total feed withdrawal up until a weight loss of 30%. Birds from control group received a layer feed *ad libitum* during the entire experimental period.

For the behavior evaluation, four birds from each treatment were randomly selected on days two and four after the beginning of the experiment. During observation, each bird was analyzed for sixteen minutes during two daily periods: morning (8min) and afternoon (8min). Most behavior criteria evaluated were based and adapted from the investigation by Schmid and Wechsler (1997) and Silva et al. (2006): 1. eating (projecting beak and ingesting food); 2. drinking (close to nipple drinker and pecking it); 3. comforting (shaking feathers, flapping and stretching wings); 4. exploring (walking around the cage); 5. stopped (bird standing still); 6. sitting (bird sits on the bottom of the cage). Some specific behaviors related to birds submitted to molting by fasting or fed with elevated zinc oxide levels were added: 7. searching for food (birds with head and beak projected towards feeder looking for food without ingesting); 8. unrest (trying to escape from confinement); 9. apathy (standing up or sitting down, without much movement). Each behavior described was recorded time and calculated the percentage of time for each observation.

## Results and discussion

According to the results obtained, quails from group C passed most of the time presenting the following behaviors: stopped (32.8%), eating (26.1%) and sitting (15.2%). Quails from group A passed 33.8% of the time exploring the environment and 25.9% of the time in unrest movements in attempt to leave the cage. Birds from group Z presented apathy (78.2%), where quails did not perform any type of movement (Table 1).

Birds submitted to fasting exhibited intense searching for food behavior, which may be explained by the attempt to satisfy a discomfort caused by the food deprivation. Exploring and unrest behaviors,

characterized by exaggerated movements from one side of the cage to the other, presented the highest percentages in this treatment. These observations are similar to a study, which reported that chickens deprived of food increase the search for food and exploring the environment behaviors (Nicol and Guilford, 1991). Hunger is the basic motivator and the insatiable desire for food may become exacerbated when hens are housed in high densities in cages, which limits the expression of normal behavior of these birds (Bertechini and Geraldo, 2005).

Several studies present the method that involves high concentrations of zinc in feed as an alternative to fasting concerning the animal welfare. However, despite the fact that this method promotes a better immune performance in birds and is less criticized by animal welfare defenders (Khan et al., 2011), the results found in this study show that the ingestion of high zinc concentrations may induce behaviors in birds that may be a reflection of a negatively affected physiological status, considering that during 78.2% of the time in observation, quails from this treatment presented apathy. Zinc oxide promotes a semi-fasting condition and intoxication in birds, demonstrated by the accumulation of zinc in kidneys, liver and pancreas, interfering in the secretion of insulin promoting an increment of glucose in urine and blood, leading to dehydration and inducing a catabolism of glucose and lipids (Garcia, 2004).

**Table 1. Percentage of time applied in each behavior performed by Japanese quails from groups C, A and Z during observation periods.**

Behavior	Treatments		
	Control group	Group A	Group Z
Eating	26.1	-	1.2
Drinking	3.1	0.7	0.1
Searching for food	-	10.4	-
Comforting	5.1	6.2	5.1
Unrest	5.0	25.9	1.0
Sitting	15.2	0.0	6.1
Stopped	32.8	23.0	6.0
Apathy	0.0	0.0	78.2
Exploring	12.7	33.8	2.4

- The searching for food behavior was unnecessary in control and zinc oxide treatments considering the methodology applied and, therefore, was not analyzed. The same occurred in the eating behavior with the fasting method.

In conclusion, the methods of fasting and feed with high concentration of zinc induced distinct manifestation patterns of behaviors, however both altered negatively the behavior of birds concerning the expected in welfare conditions.

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