

Evaluation of beak trimming methods during rearing phase on commercial lots of laying hens pullets

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Abstract: The aim of this study is to analyze the coefficients that represent the energy partition ingested by Japanese quails for maintenance and egg production. A trial will be conducted to evaluate egg mass (MO) and body weight (PC) responses of Japanese quails submitted to different metabolizable energy intakes (IEM). It will be utilized a total of 70 Japanese quails, randomly distributed with seven treatments and ten replicates, composed of one bird each, for individual control. The trial will begin at 16 weeks of age and data will be collected for eight weeks. Two diets will be formulated, one with high energy content (3,600 kcal / kg - N7) and the other with low energy content (2,100 kcal / kg - N1). Intermediate levels will be obtained by dilution. The analyzed variables will be IEM, PC and MO. The models available in the literature that predict IEM based on the nutritional constants that represent the energy requirement kcal per g of MO and kcal per kg of PC will be evaluated through the linear decomposition of the error (observed - predicted), in scalar error and bias of predicted by linear regression between predicted errors and values. The decision rule will be based on the impartiality of the model, obtained when the R² approaches 0. If necessary, parameter adjustments can be made to recommend a model that allows the user to predict metabolizable energy intake according to the mass production of eggs and body weight of each farm.

Keywords: beak treatment, growing phase, poultry production

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Introduction

The egg is a source of essential nutrients of the human food. Besides this characteristic, it is the most accessible protein source to populations and for this reason the Food and Agriculture of United Nations (FAO) has stimulated its daily consumption to improve human nutrition and also, in some countries, as a strategy to combat malnutrition. Since the post-war period, it has been stimulated the increase of egg production in a growing population demand. Currently, production systems rely on technological development, in the areas of genetic, nutrition and ambience, which allowed producing quality, safe and low cost food, increasing access to people.

Nowadays, unlike in the post-war period, there has been another society demand, which aims to produce food using management practices that are close to the natural behavior of animals. One of the management interventions that have been asked on industrial poultry is the partial removal of the beak, called beak trimming from laying hens. From the perspective of simply banning this practice in the current production systems, negative effects are expected, such as the appearance of lesions, cannibalism, impaired productive performance, egg picking and mortality (Dennis and Cheng, 2012), since the intact beak favors these behaviors, generating significant economic losses.

Among the methodologies used in the farms to remove part of the beak from the birds, the most known is to cutting and the immediate cauterization of the area, using hot-blade, heated by electrical system. This method has been carried out on the farm and for greater efficiency, it must be executed by trained and experienced operators, otherwise, it can lead to problems in the seizure of feed and compromise the development of the bird, interfering negatively with the economic viability of the lot. In order to meet the new demands of society, researchers have sought alternative methods that are less invasive to birds. The use of infrared radiation has been an alternative with great potential, due to the possibility of process automation, precision in the area to be removed and, consequently, to provide better uniformity of the beak trimming and lower operational error (Angevaere et al., 2012). This procedure is still realized at the hatchery, where a particular area of the beak of the bird is exposed to the defined amount of infrared radiation, promoting the softening and drop in up at two weeks after exposure (Gentle, 2011).

However, there are situations where birds are transported for long periods and in these circumstances the stress caused by the action of infrared radiation can be intensified. In theory, this can lead to late recovery, compromise bird development and generate economic losses. Despite this, it was not found in the literature, research results that evaluated these methods in situations where birds are submitted to housing intervals higher to 48 hours, a commonly situation in the northern and northeastern regions of Brazil, due to the absence of multiplied genetic material in these regions. Considering the above, the purpose of this study was to evaluate the effect of the hot blade and infrared radiation methods on growth variables of laying hens pullets, in commercial lots conditions.

Material and Methods

The experiment was conducted in a commercial farm, located in the city of Princesa Isabel, Pernambuco state, with duration of 30 days, including the rearing phase of the birds. It was utilized two treatments and ten replications randomly distributed in 20 experimental units. The experimental unit was composed of 56 birds, totaling 1.120 chickens of the Lohmann Brown strain. The chicks were acquired from the hatchery located in the São Paulo state and transported in air conditioned trucks, to the final destination, traveling the distance of 2.444 km, around 48 hours of transfer.

The treatments consisted of: 1st - hot blade (HB) and 2nd - infrared radiation (IR). At the first, the birds were beak trimming on the farm on the eighth day of age by trained personnel using a Lyon® 50/60 hertz and 70-210 watts at a temperature of 420° C, with cut precision containing standard measurement blade orifices, respecting a distance of 2 mm from the nostril. At the second, the birds were beak trimming by infrared radiation during the processing of the bird in the hatchery, using the Poultry Service Processor (PSP), receiving 52 nm of infrared radiation as a treatment for the removal of part of the beak, at the limit of the 2 mm from nostril.

The chicks were housed in cages with dimensions of 100 cm × 80 cm × 30 cm, with two lines of feeders, and nipple drinkers. The study was developed in environmentally controlled room, with water and feed *ad libitum* throughout the experimental period. Management specifications, such as light program and nutritional levels of diets, were based on the Lohmann do Brasil® management guide (2011). Daily, all birds of the replicates were weighed together to obtain the mean body weight. Weekly, all birds were individually weighed to calculate the uniformity in body weight, established by a range of ± 10% of the average weight, after, it was calculated the percentage of birds within the given weight range; The occurrence or absence of cannibalism and mortality was recorded and the result was expressed as percentage.

It was evaluated the body weight (g), body weight gain (g) and uniformity (%). The data were analyzed using the NLIN procedure to adjust the non-linear model of the statistical package SAS version 9.1 (SAS, 2003). The Gompertz function was used to determine the growth curve: $P = P_m \cdot \exp \{ - \exp [- B \cdot (t - t_{max})] \}$, generating the parameters and coefficients of determination of the equations for each debeaking method, where: P = estimated animal weight (kg) at time t (days); P_m = weight at maturity (kg) of animal; B = growth rate (g/day); t_{max} = age at the maximum rate (days).

Results and Discussion

During the trial there was no mortality or cannibalism. In the table 1 are presented the mean values for body weight, weight gain and uniformity at day zero, seven, 14, 21 and 29 days of age. According to test F, only for weight gain at 29 days of age was found a significant difference between treatments, HB and IR. At 29 days of age, the chicks of the HB beak treatment reached the body weight of 339.15g with uniformity of 86.9% and body weight gain of 305.74g. At the same age, in relation to the HB, the birds of the IR beak treatment, presented -3 g/bird, -6 g/bird and -1% for the body weight, body weight gain and uniformity, respectively.

Table 1 - Productive performance indicators on rearing phase (4 weeks)

Variables	Treatments		Statistic	
	Hot blade (HB)	Infrared radiation (IR)	p-value	CV(%)
Day 0				
Body Weight (g)	33.42±0.48	33.58±0.26	0.261	1.09
Body gain (g)	-	-	-	-
Uniformity (%)	93.80±2.16	91.78±2.81	0.188	3.46
Day +7				
Body Weight (g)	59.32±1.13	58.91±1.51	0.498	2.15
Body gain (g)	25.91±1.09	25.24±1.49	0.273	5.05
Unif (%)	84.9±2.52	82.2±3.44	0.145	4.74
Day +14				
Body Weight (g)	133.47±3.22	133.32±2.17	0.904	2.06
Body gain (g)	100.05±3.03	99.58±2.17	0.422	8.16
Uniformity (%)	82.8±3.84	83.3±3.10	0.813	5.62
Day +21				
Body Weight (g)	225.42±16.90	224.71±16.71	0.693	6.25
Body gain (g)	192.00±16.93	196.11±3.79	0.668	6.60
Uniformity (%)	86.9±3.5	86.4±2.72	0.773	4.41
Day +29				
Body Weight (g)	339.15±16.01	342.44±19.24	0.682	5.19
Body gain (g)	305.74±16.22	289.37±6.67	0.013	6.09
Uniformity (%)	86.9±4.32	88.4±3.60	0.512	5.73

Teste F (p<0,05).

Although there was no significant difference detected at day zero, it was expected that the action of IR would be potentiated the stress due to transport, mainly because the other birds had not yet received any type of intervention. Based on the statistics, there was no difference in any of the variables analyzed at the day zero. Despite the simplicity of the measures taken in this study, it is reasonable to attribute to stress transport a greater stress agent than IR treatment itself. In the literature, no similar description was found to make possible a positioning herein in relation to other findings.

The similarity of body weight to seven days of age, among the treatments, portrays the condition of adaptation to the facilities, management and in some way indifference to the action of the IR, in front of the other birds, that only received the treatment with HB at the eighth day of age. The measures taken at 14, 21 and 29 days refer to the effects of HB and IR beak treatments, due to the experimental conditions proposed to evaluate the treatments to the nearest reality of the commercial farms.

In general, regardless of the beak treatment method, the feed consumption is reduced after beak trimming (Gentle, 2011), which can be attributed to the increased discomfort caused by the process

(Cheng, 2005), which may justify the indifference of the results in the ages 14 and 21, where the treated part of the beak of the birds by IR had fallen, *i.e.*, the beak trimming process was completed, and at this moment, the birds of the HB treatment were in the process of healing the cut.

However, at 29 days of age, birds treated with HB presented higher body weight gain than those submitted to IR. This difference may be associated to the impairment of feed intake due to anatomical changes in beak shape, resulting in mechanical difficulties to seize the food (Workman and Rogers, 1990), and consequently reduction in feed intake and weight gain. This may indicate that the impact of the adaptation to the new beak shape may have had a greater effect than the act of removing part of the beak itself, considering that the birds of both treatments were indifferent in the following periods of the beak trimming act.

The difference in body weight gain observed at 29 days of age can be projected until the maturity, if there are no adequate interventions in the management. In the table 2, it is presented the estimated parameters of the Gompertz model, by function for HB and IR, differing ($p < 0.05$). For chickens treated by HB, the maturity weight of 2.163 ± 0.381 kg was estimated, and, 1.039 ± 0.390 kg for IR, expressing different growth projections, making a difference of approximately 48% of the RI in relation to the HB. Both results presented discrepancy in comparison to the Lohmann do Brasil® lineage guide (2011), where weight at maturity is 1.905 kg with a variation of 1.810 to 2.000 kg, thus, HB presented close to that described.

Table 2 - Parameters adjusted for growth curve

Parameters	Mean	Inferior	Superior	Mean	Inferior	Superior
	Hot blade (HB)			Infrared radiation (IR)		
Maturity weight (kg)	2.163±0.381	1.415	2.91	1.039±0.390	0.476	2.553
Growth rate (g/d)	0.029±0.002	0.025	0.033	0.041±0.003	0.030	0.050
tmax ¹	51±5	42	60	33±5	13	52

¹tmax= age of the maximum growth rate (days).

The results showed greater amplitude of weight at maturity for IR, with 2.077 kg and 1.495 Kg for HB, indicating lower uniformity of body weight. The extension of weight to maturity implies greater uniformity in the posture rate at the beginning of production, since the improvements in parameters during the production phase can be attributed to better uniformity of the lot, obtained by performing deboning. The estimated growth rates (B) for the two curves were 0.029 ± 0.002 and 0.041 ± 0.003 g / day respectively for the HB and IR methods. The age at which birds presented maximum growth rate was 51 ± 5 days for birds receiving HB treatment and 33 ± 5 days for days for birds treated with IR, in which the lowest maturity rates resulted in time higher for these birds to reach their maximum rate of body growth.

The estimated growth curve for IR beak trimming birds may have been influenced by the lower body weight achieved in the first weeks of life. The adaptation to the new beak shape may have compromised the development of the birds, reaching lower body weight at maturity, with projection for weight uniformity below 85% when compared to the lineage manual. Therefore, the observed results suggest the interference between methods, in order to avoid discrepancies in maturity weight, reflecting better productive parameters.

Conclusion

Based on the above, it is reasonable to conclude that poultry management should be different when is opted for the different beak trimming methods; hot blade and infrared radiation, providing better recovery conditions to meet the goals of the posture phase.

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