Revista Brasileira de Ciência Avícola
ISSN: 1516-635X
revista@facta.org.br
Fundação APINCO de Ciência e Tecnologia Avícolas
Brasil

Pizzolante, CC; Garcia, EA; Saldanha, ESPB; Laganá, C; Faitarone, ABG; Souza, HBA; Pelicia, K
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Revista Brasileira de Ciência Avícola, vol. 9, núm. 1, enero-marzo, 2007, pp. 17-21
Fundação APINCO de Ciência e Tecnologia Avícolas
Campinas, SP, Brasil

Brazilian Journal of Poultry Science
Revista Brasileira de Ciência Avícola

ISSN 1516-635X Jan - Mar 2007 / v.9 / n.1 / 17 - 21

Beak Trimming Methods and Their Effect on the Performance and Egg Quality of Japanese Quails *(Coturnix japonica)* During Lay

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■ Keywords

Age, beak trimming, feathering, performance, quails.

Arrived: October / 2006
Approved: March / 2007

INTRODUCTION

A total number of 720 Japanese quail females, reared under identical management conditions, and receiving feed and water *ad libitum*, was used. Quails were housed and reared from 1-35 days of age in litter pens in a rearing house, and then were transferred to a quail layer house. This study aimed at verifying if different beak trimming method could optimize egg production and quality by reducing stress and cannibalism among birds. A completely randomized experimental design was used, with six treatments in a 2x3 factorial arrangement, with two beak trimming ages (14 and 21 days) and three beak trimming variants (non-trimmed, 1/3 of the beak trimmed, or ½ of the beak trimmed), with 6 replicates of 20 birds each. Performance was evaluated by feed intake, percentage of lay, egg mass, feed conversion ratio per dozen eggs and per kg eggs, and mortality. Performance was influenced by beak trimming variant, with the best results obtained by birds with intact beaks and those with 1/3 of the beak trimmed. Better specific gravity was observed in quails submitted to beak trimming at 21 days of age, whereas the other egg quality parameters did not present significant results. Based on the results obtained in the present study, it is recommended to submit quails to beak trimming either at 14 or 21 days of age.

INTRODUCTION

The expansion of quail production in Brazil, currently established at industrial level, must be highlighted due to the generation of jobs, the use of small areas, the need of low investments, the fast return on investments, as well as a animal protein source.

Beak trimming is considered as necessary as a routine management practice in commercial layer production, aiming at the prevention of cannibalism and at reducing social stress. According to Cloutier *et al.* (2000), beak trimming is the main method used to prevent feather pecking and cannibalism in the poultry industry. However, its use is still controversial in quail production. Beak trimming is condemned by environmentalists, which perceive it as a painful mutilation. In addition, feed intake is impaired during the days immediately after beak trimming (Gentle, 1986).

On the other hand, producers consider this practice an essential procedure in young birds, in order to reduce feather pecking and cannibalism later, thereby improving performance, and positively contributing to bird welfare.

According to Hughes & Gentle (1995), beak trimming is indicating in some cases, such as environmental factors (light intensity, environmental temperature, type of poultry house), social factors (flock size and density), and genetic lines (more or less aggressive birds). Cunningham (1992) adds that, although beak trimming is usually considered as a stressful

procedure, it promotes benefits, such as the reduction of feather pecking and cannibalism, demonstrating the importance of this procedure in layer production.

Economic losses caused by feather pecking are due to the fact that feather removal impairs the maintenance of body temperature, leading to an increase in feed intake (Leeson & Morrison, 1978), which can be more than 27% of the usual intake, according to Tauson & Svensson, 1980. One of the main losses caused by cannibalism is an increase in the incidence of egg pecking.

Literature reports a reduction in feed intake and an improvement of feed conversion ratio in layers submitted to beak trimming. Even when there are no cannibalism problems, beak trimming is beneficial, resulting in lower mortality and better feed efficiency and social status.

Araújo (1997) evaluated the performance and cannibalism frequency of layers not submitted to beak trimming or submitted to mild beak trimming (of 1/3 of the beak) or severe beak trimming (1/2 of the beak), and found cannibalism incidences of 13%, 4%, and 0%, respectively, in the period of up to 13 weeks of age. A second beak trimming was performed at 13 weeks of age, and the author observed lower feed intake and body weight at 17 weeks of age in birds submitted to severe beak trimming (5 mm from the nostril). Mild beak trimming was performed at 7 mm from the nostril. In birds submitted to severe and mild beak trimming, feed intake decreased 48 and 36%, and body weight loss was 19.5 and 12%, respectively.

Beak trimming reduces egg pecking, and therefore, the incidence of broken eggs (Buxadé Carbó, 1987). In addition, birds with intact beaks present higher stress and social tension levels as compared to beak-trimmed birds (North & Bell, 1993). An increase in stress levels induce an increase in adrenaline, oxytocin, and vasopressin levels, which may increase oviduct contraction, causing the egg undergoing calcification to be expelled, therefore increasing the incidence of eggs with no shells or with soft shells.

Oliveira (2002) observed that well-debeaked quails had better performance and easier access to nipple drinkers, as well as lower mortality and less incidence of aggressive behavior, as compared to those submitted to poor beak trimming practices.

There are recommendations on beak trimming practices in order to obtain the best results, but these are controversial due to the lack of accuracy in the description of the operation.

Due to the lack of information on quail beak trimming and on the necessary care to obtain good results, this study aimed at evaluating the effect of age and type of beak trimming on feathering, performance, and egg quality of quails during lay.

MATERIAL AND METHODS

A total number of 720 Japanese quail females, reared under identical management conditions, and receiving feed and water *ad libitum*, was used. Quails were housed and reared from 1 to 35 days of age on litter pens in a quail rearing house, after which birds were transferred to a quail masonry production house, being 4.0-m wide, and 12.0-m long. House sides had 0.50 m-high walls, and 1.50m-high wire mesh, closed ceilings, lateral curtains, and tile roof. Birds were housed in 100 cm-long, 34 cm-deep, and 16 cm-high cages, which contained four 25-cm internal compartments, which allowed housing 20 quails per cage. Each compartment was equipped with a nipple drinker and a trough feeder located at the front of the cage.

Natural and artificial light were provided 17 hours per day, and an automatic clock was used to control light period during the entire experiment. Maximal and minimal temperatures were daily recorded by a thermometer located in the central part of the house. Data collection started when quails were 49 days of age, and lasted for 112 days, divided into four periods of 28 days each.

Feeds were formulated on corn and soybean meal basis according to NRC (1994) recommendations, and considering raw material composition described by Rostagno *et al.* (2000). Feeds are shown in Table 1. Feed was manually offered three times per day *ad libitum*, and residues were weekly measured.

Eggs from each replicate were daily collected and counted to evaluate egg production. Eggs and feed residues were weekly measured for performance evaluation. The following parameters were evaluated: egg weight (g), lay percentage (% Lay), egg mass (EM), feed intake (FI), mortality (%), and feed conversion ratio (FCR) per dozen eggs and per kg eggs.

A completely randomized experimental design was used, with six treatments in a 2x3 factorial arrangement, with two beak trimming ages (14 and 21 days) and three beak trimming variants (non-trimmed, 1/3 of the beak trimmed, or ½ of the beak trimmed). There were six replicates per treatment and 20 birds per replicate (Table 2).

Table 1 - Ingredient and nutrient composition of the experimental feed.

Ingredient	*Experimental feed (kg)*
Ground corn	56,33
Soybean meal	33,32
Soapstock	2,86
Limestone	5,35
Dicalcium phosphate	1,31
Salt (NaCl)	0,35
Mineral(1) and vitamin(2) supplements	0,30
D-L Methionine	0,14
Choline	0,04
Total	100,00
Nutrients	
Crude protein (%)	20
Metabolizable energy (kcal/kg feed)	2900
Calcium (%)	2,5
Available phosphorus (%)	0,350
Methionine (%)	0,450
Methionine+cystine (%)	0,760
Lysine	1,070

1 - Mineral supplementation per kg feed: copper: 8 mg; iron: 50 mg; manganese: 70 mg; zinc: 50 mg; iodine: 1,2 mg; selenium: 0,2 mg. 2 - Vitamin supplementation per kg feed: vitamin A: 7,000 IU; vitamin D3: 2,000 IU; vitamin E: 5 mg; vitamin K3: 1.6 mg; vitamin B2: 3 mg; vitamin B12: 8 mcg; niacin: 20 mg; pantothenic acid: 5 mg; antioxidant: 15 mg.

Egg quality was checked at the end of each 28-d period. Two eggs per replicate were removed for three consecutive days, with a total 36 eggs per treatment. Eggs were identified according to treatment, and individually weighed in digital scale with a 0.001 precision. Egg were then submitted to the laboratory to determined specific gravity (SG), yolk (%Y), albumen (%A), and eggshell (%ES) percentages.

Specific gravity was determined according to the method of Padron (1991), in which eggs are immersed in saline solution with known densities, which vary from 1.065 to 1.100 g/cm^3 and a gradient of 0.005, as determined by densitometer. Eggs were successively immersed in recipients containing the saline solution with decreasing densities. Egg specific gravity was considered the lowest density solution in which the egg floated.

Eggs were broken, shell, albumen, and yolk components were separated and individually weight in a 0.001 precision scale.

After washed in water and dried in forced-circulation oven at 60 °C for 12 h, eggshell thickness was determined in three different regions using a Mituyoto caliper, with 0.01-mm precision, and according to the method described by Souza *et al.* (1984).

Yolk, albumen, and eggshell percentages were obtained by dividing the weight of each component by egg weight before it was broken.

Feathering was evaluated by the visual inspection of feather coverage on the back of the quails.

The experimental period lasted 112 days.

Data were submitted to analysis of variance (ANOVA) of the GLM procedure of SAS (1996) statistical package. Means were compared by the test of Tukey at a 5% significance level.

RESULTS AND DISCUSSION

Average minimal and maximal house temperatures during the experimental period were 18.6 and 28.4 °C, respectively.

Performance results are presented in Table 3.

There were no significant interactions between age at beak trimming and trimming variants ($p>0.05$). beak trimming variant had a significant effect on egg weight, lay percentage, egg mass, feed intake, feed conversion ratio per dozen eggs and per kg eggs ($p<0.01$), with the best results obtained in non-trimmed and 1/3 of the beak trimmed quails.

These results are consistent with those of Leandro *et al.* (2005), who observed that quails submitted to severe beak trimming obtained lower gains during the rearing phase. Araújo *et al.* (2005) and Sakomura *et al.* (1997) studied the effect of beak trimming in layer chickens, and found a reduction in weight gain in beak-trimmed birds as compared to those not submitted to beak trimming. The lower weight gains obtained by birds submitted to mild and severe beak trimming are justified by the stress produced by the procedure, which possibly caused pain and impairs feed ingestion, as reported by Kuo *et al.* (1991).

Table 2 - Treatments.

Treatments	*Quail age(days)*	*Beak trimming*	*Diameter* of trimmed orifice* (mm)*
1	14	No trimming	-
2	14	1/3 trimmed	(2.778 mm)
3	14	½ trimmed	(3.54 mm)
4	21	No trimming	-
5	21	1/3 trimmed	(3.54 mm)
6	21	½ trimmed	(3.90 mm)

*Beak trimming was performed with a Lyon trimmer, and both higher and lower beak parts were simultaneously trimmed.

Table 3 - Egg weight, lay percentage, egg mass, feed intake, feed conversion ratio per dozen eggs, feed conversion ratio per kg, and mortality means of Japanese quails.

	Age at beak trimming (days)		*Beak trimming variant*			*CV*
Parameters	***14***	***21***	***ND****	***1/3***	***1/2***	***(%)***
Egg weight (g)	9.98	9.99	10.10[a]	10.08[a]	9.77[b]	1.86
Lay (%)	83.48	84.39	85.35[a]	85.24[a]	81.21[b]	3.91
Egg mass (g)	8.36	8.46	8.65[a]	8.62[a]	7.97[b]	3.64
Feed intake (g)	22.40[b]	22.92[a]	23.40[a]	22.78[a]	21.80[b]	3.26
Feed conversion ratio (kg/dz)	0.35	0.35	0.35[ab]	0.34[b]	0.37[a]	3.34
Feed conversion ratio (kg/kg)	2.91	2.99	2.86[b]	2.85[b]	3.13[a]	5.89
Mortality (%)	0.41	0.37	0.52	0.33	0.34	89.83

Means followed by different letters in the same row, within each factor, are significantly different ($p<0.05$) by the test of Tukey. ND* not submitted to beak trimming.

The effects of beak trimming on egg production were studied by several authors, with controversial results. In many studies, an increase in lay is observed when birds are beak-trimmed, which may be the result of lower mortality and lower incidence of pecked eggs due to less aggressive behavior. In addition, this may also be due to a better feed conversion ratio in layers submitted to mild beak trimming, as they are not able to select ingredients in the feed, thereby preventing feed wastage. Sakomura *et al.* (1997) observed lower egg production in debeaked layer chickens as compared to those with intact beaks. According to Beane *et al.* (1967), beak trimming delays layer sexual maturity, and therefore, beak-trimmed layers would present lower egg production at the beginning of lay. On the other hand, Andrade & Carson (1975) and Lee (1980) did not observe significant differences in egg production between birds submitted or not to beak trimming. These results are different from those found in the present experiment, in which birds submitted to severe beak trimming (1/2 of the beak) showed lower egg production as compared to those that were not beak-trimmed and had only 1/3 of the beak trimmed.

There were significant effects of age at beak trimming on feed intake ($P<0.05$). Birds debeaked at 21 days of age had higher feed intake than those debeaked at 14 days of age.

Egg quality results are presented in Table 4.

Age at beak trimming influenced ($p<0.05$) egg specific gravity, with birds submitted to beak trimming at 21 days of age presenting higher egg specific gravity as compared to those submitted to this procedure at 14 days of age.

Beak trimming variant did not affect ($p>0.05$) eggshell quality. Therefore, the reduction in feed intake caused by this factor did not impair the ingestion of nutrients that determine eggshell quality.

At the end of the experimental period, birds submitted to different beak trimming variants at 14 or 21 days of age presented different feathering patterns on the back. Birds with intact beaks presented no feathers on the back, whereas those with 1/3 of the beak trimmed presented 90% of the back covered with feathers, and birds with ½ of the beak trimmed had the back completely covered with feathers. This indicated that quails with intact beaks pecks the feathers of their cage mates, leading to complete loss of feathers in the dorsal region, which may impair thermal regulation processes. These results are consistent with those of Leeson & Morrison (1978) and Tauson & Svensson (1980).

CONCLUSIONS

Based on the results obtained in the present study, it is recommended to submit quails to beak trimming either at 14 or 21 days of age.

REFERENCES

Andrade AN, Carson JR. The effect of age at and methods of debeaking on future performance of White Leghorn Pullets. Poultry Science 1975; 54:666-674.

Table 4 - Specific gravity, yolk, albumen, and eggshell percentages of eggs of Japanese quails.

	Age at beak trimming (days)		*Beak trimming variant*			*CV*
Parameters	***14***	***21***	***ND****	***1/3***	***1/2***	***(%)***
Specific gravity (g/mL)	1.074[b]	1.075[a]	1.075	1.074	1.074	0.14
Yolk (%)	29.06	28.81	29.03	28.97	28.81	4.32
Albumen (%)	60.98	61.06	60.83	60.96	61.27	2.20
Eggshell (%)	9.97	10.12	10.14	10.07	9.93	4.74

Means followed by different letters in the same row, within each factor, are significantly different ($p<0.05$) by the test of Tukey. ND* not submitted to beak trimming.

Araújo LF, Café MB, Leandro NSM *et al.* Performance of layer hens submitted or not to different methods of the beak trimming. Ciência Rural 2005; 35(1):169-173.

Araújo LF. Efeitos de diferentes tipos de debicagem sobre o desempenho de poedeiras comerciais nas fases de cria e recria [Monografia]. Goiás (GO):UFG; 1997.

Beane WL, Siegel PB, Dawson JS. *et al.* Size of debeak guide and cauterization time on the performance of Leghorn chickens. Poultry Science 1967; 46:1232.

Buxadé-Carbó C. La galina ponedora: sistemas de explotacion y tecnicas de produccion. Castelo: Mundi Prensa; 1987. 377p.

Cloutier S, Newberry RC, Forster CT, Girsberger KM. Does pecking at inanimate stimuli predict cannibalistic behaviour in domestic fowl? Applied Animal Behaviour Science 2000; 66:119-133.

Cunningham DL. Beak trimming effects on performance, behavior and welfare of chickens: a review. Journal Applied Poultry Research 1992; 1:129-134.

Gentle MJ. Beak trimming in poultry. Worlds Poultry Science Journal 1986; 42:268-275.

Hughes BO, Gentle MJ. Beak trimming of poultry: its implications for welfare. World's Poultry Science 1995; 51(1):51-61.

Kuo FL, Craig JV, Muir WM. Selection and beak trimming effects on behavior, cannibalism, and short term production traits in White Leghorn pullets. Poultry Science 1991; 70:1057-1068.

Leandro MSM, Vieira NS, Matos MS *et al.* Desempenho produtivo de codornas japonesas (*Coturnix coturnix japonica*) submetidas a diferentes densidades e tipos de debicagem. Acta Scientiarum. Animal Sciences 2005; 27(1):129-135.

Lee K. Long term effects of Marek's disease vaccination with cell-free Herpesvirus of turkey and age at debeaking on performance and mortality of WhiteLeghorns. Poultry Science 1980; 59:2002-2007.

Leeson S, Morrison WD. Effect of feather cover on feed efficiency in laying birds. Poultry Science 1978; 57:1094-1096.

NRC. National Research Council. Nutrient Requirements of Poultry. 8th rev. ed. Washington: National Academy Press; 1994.

North MO, Bell DD. Manual de producción avícola. 3nd ed. México: Editorial El Manual Moderno; 1993.

Oliveira BL. Manejo racional e produtividade das codornas. In: Simpósio Internacional de Coturnicultura, 1.; 2002; Lavras. MG. Anais... Lavras: UFLA; 2002. p.77-95.

Padron MEN. Calidad de cascarón em aves reproductoras pesadas. Avicultura Profesional 1991; 8:112-14.

Rostagno HS, Albino LFT, Donizete JL *et al.* Tabelas brasileiras para aves e suínos - Composição de alimentos e exigências nutricionais. Viçosa, MG: Universidade Federal de Viçosa; 2000. 141p.

Sakomura NK, Moreno S, Costa MJRP *et al.* Efeito da debicagem e do enriquecimento ambiental no desempenho de galinhas poedeiras. ARS Veterinária 1997; 13:59-67.

SAS Institute. User's guide: statistics. Cary, NC: SAS Institute; 1996.

Souza PA, Faleiros RRS, Souza HBA. Efeitos sobre a qualidade dos ovos. Avicultura Industrial 1984; 893:24-7.

Tauson R, Svensson SA. Influence of plumage condition on the hen's feed requirement. Swedish Journal Agricultural Research 1980; 10:35-39.