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PHYSIOLOGICAL AND PRODUCTIVE IMPACTS OF BEAK TRIMMING AND FEED FORM IN JAPANESE QUAIL

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SUMMARY

A total number of 288 eight weeks old Japanese quail were chosen in this study for evaluating the impacts of beak trimming (BT) and feed physical forms (F) on physiological, productive performance and aggressive behavior parameters, in a 2 x 2 factorial experimental design. The birds were allocated into two main groups according to beak form [Intact beak (NB) and beak trimming (BT)], then each main group was divided in to two subgroups corresponded to feed form [mash (M) and pellet (P) feed], respectively. The obtained results indicated that beak forms and feed forms significantly changed the final body weight, egg production, feed conversion, fertility %, plumage conditions, aggressive pecking behavior, mortality rate, H/L ratio, plasma testosterone, progesterone and corticosterone concentration. However, there were insignificant differences among the groups in feed intake, hatchability, ovary and testes percentages. Interactions between beak trimming and feed forms factors had significant differences in the plumage conditions, aggressive pecking behavior, mortality rate and hematological parameters. In conclusion: using the beak trimming did not have an adverse effect on quail ability of feeding (mash or pellet) and beak trimming was consider suitable solution to minimize aggressive behavior, mortality rates and maximize productive and reproductive performance of Japanese quail.

Keywords: Beak trimming, feed form, egg production, hematological, aggressive behavior, quail

INTRODUCTION

Despite of the undeniable technological advances achieved in the poultry industry, the domestication has not substantially altered the quail's aggressive behavior. Aggressive behavior is a serious problem faced the productivity of quail in the world and may lead to feathers picking, skin damage, cannibalism, which causes severe injuries even death and economic loss for producers of quails (Van Krimpen*et al*., 2005 and FAWC, 2007). The aggressive behavior of quail increased when sexual puberty is reached and during mating for competition male over females.

Beak trimming has become standard practice in the egg industry to reduce aggressive behavior but there is a global criticism to severe beak trimming of birds that is incompatible with bird welfare caused by chronic pain due to tissue damage and nerve injury, loss of normal function due to reduced ability to sense materials with the beak and loss of integrity of a living animal (Glatz, 2005;Glatz and Bourke, 2006;Kuenzel, 2007;CIVF, 2011 and Dennis and Cheng, 2012). In Egypt, the beak trimming is done as a last resort where alternatives are considered not to be acceptable or appropriate and was considered an appropriate economic solution and most efficient to minimize the risk of welfare problems caused by feather pecking, cannibalism, pain, injuries and social stress due to aggression behavior of the quails and thus reduce mortality (Cloutier*et al*., 2000 and Cheng, 2007). In addition, beak trimmed quails lower feed waste and improve productive performance (Oliveira, 2002).

The advantages of beak trimming are evident in mature birds, as reflected by reduced pecking damage and cannibalism and the increased production characteristics Glatz(2005). Severe beak trimming in laying quails may result in inadequate feed intake because the bird cannot easily pick up feed, especially small size (Campos, 1993 and Shunmura*et al*., 2006). The moderate beak trimming in laying hens has only a short term effect on feed intake and performance traits. Successful quail production is dependent on optimal feed intake and feed efficiency (Martinec*et al*., 2002).

The physical form of feed (mash, pellet and crumble), feed particle size and the diet nutrient composition are considered the most a crucial factors to optimal feed intake and affect behavior and welfare of the birds (Scott, 2002; Behnke and Beyer, 2004 and Amerah*et al*., 2007). The question is whether there has been adapted to feeding behavior with the new beak and what is the best form of feed (mash *vs.* pellet) with quail beak trimming that can yield high productivity performance remains unanswered.

Therefore, the objectives of present study were to investigate the effect of the beak trimming and feed physical form on aggression behavior, physiological and productive performance, especially the feed intake in its different forms (mash and pellet).

MATERIALS AND METHODS

Experimental design:

This study was carried out at the poultry research farm of Poultry Production Department, Faculty of Agriculture, Assiut University, Assiut, Egypt. A total number of 288 eight weeks old, sexed Japanese quail birds were used in this study (in a 2×2 factorial experimental arrangement in a completely randomized design). The birds were wing banded, individually weighed (Initial weight) and randomly distributed into four equal groups each with six replicates of 12 birds (eight females+ four males). The birds were allocated into two main groups according to beak form [Intact beak (NB) and beak trimming (BT)] and then, each main group was divided into two subgroups corresponded to feed physical form [mash (M) and pellet (P)] as shown in Table1. First group birds (G1) were kept without any beak trimming (non-beak trimming) with feeding mash, while second (G2) quails were non-beak trimming with feeding pellets diet. The third group (G3) birds were beak trimmed (debeaked) with feeding mash while, fourth group (G4) were beak trimmed and feeding pellets diet. The beak trimming process was practised at 15 days of age and re-trimmed at 56 days of age. Beak trimming was conducted according to industry standards for beak trimmer accreditation (Bourke *et al*., 2002).Beak trimming (BT) treatments were applied using a hot blade Lyon Debeaker® (Lyon Electric Company, Inc., Chula Vista, CA, USA), cut one-third length the upper and lower beak and wound was cauterized for two seconds (Glatz, 2005).At six weeks birds was housed in production pens for two weeks for the purpose of acclimatization. At eight week of age, all groups were distributed into 24 breeding housing pens from galvanized iron mesh with dimensions (57 length × 50 width × 30 height cm), 12 birds/pen (8females + 4males), with sex ratio 2:1. Each pen was equipped with automatic nipple drinkers, and feed was provided via trough feederswhich located at the pen front. All birds were raised under standard environmental and hygienic conditions. Vaccination and medical programmes were performed according to the different stages of age under supervision of a licensed veterinarian.

Table1.Groups description

Groups	Beak form (B)	Feed form (F)
G1	Intact beak (NB)	Mash (M)
G2	Intact beak (NB)	Pellets (P)
G3	Beak Trimming(BT)	Mash (M)
G4	Beak Trimming(BT)	Pellets (P)

Environmental conditions:

The newly hatched quail chicks were kept under similar recommended hygienic management conditions in brooding floor pens until they were 6 weeks of age and then transferred to the breeding house. Lighting program was 23hours light:1hour dark during the first 3 days, which was gradually decreased (one hr/week) to reach 16 hours light/day at 8 weeks of age and this regime was lasted constant till the end of the study (20 weeks of age). An automatic clock was used to control light period during the entire experiment. Light intensity during rearing period was 50 lux and 40-50 lux during study period at the head of birds as measured by luxmeter. Temperature and relative humidity were daily recorded during the experimental period by using thermometer and hygrometer located in the central part of the house. The quail chicks' brood room temperature was gradually decreased from 35-37°C at hatching to 20-23°C at five weeks of age and relative humidity average was 60-65% up to the end experiment. Water and feed were continuously provided during the study period. The Birds were fed mash and pellets diet based on corn and soybean meal, and formulated to meet the nutritional requirements of quail birds according to the (NRC, 1994) recommendations. The rations contained 24% crude protein (CP) and 2800 ME Kcal/kg metabolizable energy (growing period) and 20% (CP) (laying period) with 3000 Kcl (ME)/Kg.

Studied traits:

Body weight and egg production:

The initial and final body weights (BW, g) were recorded at 8 and 20 weeks of age, respectively. Overall means of feed intake (FI, g/day) and feed conversion ratio as (FCR, g feed: g egg) were calculated during egg production period. The age at 50% production was accepted as the beginning of collected egg production data, as described previously (North and Bell, 1990). Eggs from each replicate were daily collected, counted and weighed to evaluate average eggs laying rate (ELR %) and egg weight (EW, g) while, egg mass (EM, g egg/hen/day). At 20 weeks of age the cloacal gland areas dimensions (height and width per mm) were measured for males by using a caliper. Mortality attributable to cannibalism and other death causes were recorded daily and expressed as percentage throughout the experimental period.

Egg quality parameters:

One hundred and twenty fresh eggs (30 eggs /group) were used to evaluate the external and internal egg quality parameters on 12^{th} week of age corresponding to the maximum production peak. Eggs were identified according to treatment, and individually weighed in 0.01 precision digital scales. Egg long and short axes were determined by caliper to calculated egg shape index. Internal eggs quality was assessed by measuring albumen, yolk height and yolk diameter along the chalazae line by using the caliper (mm). Thereafter, yolk was separated and weighted, also eggshell was dried and weighted and then the albumen was calculated by differences to the nearest 0.5 gram. Shell thickness was measured by using eggshell micrometer a Mituyoto caliper, with sensitivity to 0.01 as described by (Souza *et al*., 1984).Haugh unit, shape index (%), yolk index (%) and shell percentage (%) were estimated by following equationsaccording to (Carter 1975 and Kul and Seker, 2004).

Shape index (%) = [egg width (cm) / egg height (cm)] ×100

Yolk index (%) [Yolk height / yolk diameter)] ×100

Shell percentage (%) = [Shell weight (g)/ Egg weight (g)] ×100.

Haugh unit (HU) =100 × log (Thick albumen height – 1.7 egg weight$^{0.37}$ + 7.6)

Incubation traits:

A total of 6600 eggs were used to determine fertility and hatchability percentages from all experimental groups throughout the experimental period. Eggs laid were collected daily for 5 successive days and stored at 18 C° and 65% relative humidity before placed it in the incubator from each group. The incubator conditions were 37.8C° with 55-60% relative humidity up to 14 days of incubation period, while the relative humidity from 15-17days of incubation was 60 to 65%. At hatching, all live and dead chicks were counted while, the un-hatched eggs were opened and classified to eggs with embryonic development were considered fertile, while the remainder eggs were considered infertile according to (Khalil, 2009).

Fertility (%) = (fertile eggs number) ×100 / (total incubated eggs).

Hatchability of fertile eggs (%) = (chicks hatched number) ×100 / (fertile eggs number).

Embryonic mortality (%) = (dead embryos number) ×100 / (total incubated eggs).

Feather score:

Feather score was used to visually assess the quality of feather coverage and feather pecking degree of each bird at 20 weeks of age. The feather scoring system of five body regions on the bird (neck, back, rump, wing and tail) were assessed using the method described by (Tauson*et al*., 1984, 2005 and Bright *et al*. 2006) as shown in Table 2. This method gives feather score of 1 to 5, with1 being the best condition (good full feathering and no damage) and 5 the worst plumage condition (severe feathers damage, large bare spots, broken skin, bloody or wounded areas) (Dennis *et al*., 2009). Feather scores were averaged to give a mean feather score for each body region and the total average feather score for five areas was calculated with values ranging from 5 (completely feathered) to 25 points (featherless) according to (Gerken, 1991, Tauson*et al*., 2005 and Khalil *et al*., 2011, 2012 and 2015).

Table 2. Feather damage score

Score	Score Description
1	Smooth, complete plumage with no or little damage
2	Slight damage to any area of the body with feathers ruffled, body completely or almost completely covered
3	Sever damage to feathers and small bare spots
4	Sever damage to feathers and large bare spots
5	Sever damage to feathers, area completely bare with injury to skin or broken skin

Aggressive pecking behavior:

Aggressive pecking behavior was defined as bleeding injuries, as a result of pecking by other birds. Aggressive pecking behaviors were visually evaluated as follows: head injures score from 1 (intact head) to 5 (injured head). Eyelid injuries score were assessed using a scale from 1 (intact eyelid) to 5 (all eyelid injuries), two eyelids injuries 2 to 10). Eye closed score (1 or 2), 1= open eye, 2= closed eye, two eyes closed score (from 2 to 4). Eye lost score (1 or 2), 1= present eye, 2= absent eye, two eyes lost score (from 2 to 4) according to (Khalil *et al*. (2015).

Blood constituents:

At 20 weeks of age, six random birds from each groups were slaughtered, weighed and scarified by severing the jugular vein and blood was allowed to flow freely into labeled bottle contained a speck of EDTA. Non-coagulated blood was tested shortly after collection for the count of red blood cells (RBCs, 10^6), white blood cells (WBCs, 10^3), differential count of WBC's subclasses (lymphocyte, heterophils, monocytes, eosinophils, and basophils percentages), hemoglobin (Hb, g/dl) concentration and packed cell volume (PCV %) according to (Drew *et al*., 2004). Therefore, blood plasma were separated by centrifugation at 3000 rpm for 15 minutes and stored at (-20°C) for further analysis. The plasma sex hormones (testosterone and progesterone) and corticosterone hormones were determined according to the manufacture recommendations of commercial kits.

Genital organs of female and male quails:

Testis, ovaries, ovarian yellow follicles percentages and numbers were also estimated, left and right testis dimensions and oviducts lengths were recorded.

Statistical analysis:

Data were analyzed using a two way analysis of variance (ANOVA)with beak trimming and feed form effects by applying the general linear model procedure to analyze the differences between treatment groups using SAS software (SAS Institute, version 9.2, 2009). Duncan's multiple range test

(Duncan, 1955) was used to detect differences among means of different groups. All values expressed in percentages were transformed to arcsine before analysis, according to (Steel and Torrie, 1980).

Statisticalmodel: $Y_{ijk} = \mu + B_i + F_j + BF_{ij} + E_{ijK}$

Where: Y_{ik} = observed value of the concerned trait. μ = observed mean for the concerned trait.

B_i = the fixed effect due to beak trimming (i= 1, 2) F_j = the fixed effect due to feed form (j= 1, 2)

BF_{ij} = the fixed effect due to beak form and feed form. E_{ijk} = the random errors.

RESULTS AND DISCUSSION

Body weight:

Although the initial body weight of the birds did not significantly differ, the results indicated that the BT birds had significantly heavier final body weight than the NB groups (Table 3). Initial and final body weights of birds fed mash and pellets groups showed no differences. These results were supported by Farghly (2012) who reported no differences in body weight and gain due to feed forms. In contrast to the present results, Preston *et al.* (2000) reported that birds fed pellets had better growth performances than those fed mash form. Feed physical form may contribute to improve the growth performance of chicken by effects on physiological functions of the digestive tract and enhanced protein efficiency (Greenwood *et al.*, 2004 and Lv*et al.*, 2015). There were no interactions between beak form andfeed physical form on initial and final body weights.

Table 3. Effect of beak trimming (BT) and feed form (F) on productive traits in Japanese quail

Traits→	Female body weight (g)		Male body weight (g)		Egg production				
Treatment ↓	Initial	Final	Initial	Final	ELR (%)	EW (g)	EM (g egg/hen/d)	FI (g/d)	FCR (g feed: g egg)
Beak form (B)									
Beak trimming (BT)	269.61[a]	273.01[a]	254.89[a]	240.62[a]	75.39[a]	12.27[a]	9.25[a]	31.93[b]	2.60[b]
Intact beak (NB)	271.38[a]	259.82[b]	254.62[a]	231.7[b]	67.36[b]	12.15[a]	8.19[b]	37.41[a]	3.10[a]
SEM	1.25	1.62	2.27	1.598	1.02	0.06	014	0.56	0.04
Significance	0.32	<.0001	0.93	0.0002	<.0001	01.94	<.0001	<.0001	<.0001
Feed form (F)									
Mash (M)	269.92[a]	268.26[a]	255.75[a]	235.67[a]	69.81[b]	12.15[a]	8.49[b]	35.37[a]	2.92[a]
Pellets (P)	271.07[a]	264.56[a]	253.76[a]	236.66[a]	72.94[a]	12.27[a]	8.95[a]	33.95[a]	2.78[b]
SEM	1.25	1.62	2.27	1.598	1.02	0.06	0.14	0.56	0.04
Significance	0.51	0.11	0.54	0.66	0.05	0.22	0.03	0.10	0.03
Interaction (B×F)									
BT × M	269.88	276.84	255.31	242.11	74.30	12.18	9.04	32.23	2.64
BT × P	269.36	268.18	254.47	239.14	76.48	12.36	9.45	31.62	2.56
NB × M	269.97	259.69	256.19	229.25	65.32	12.12	7.93	38.51	3.20
NB × P	272.80	259.96	253.06	234.18	69.40	12.18	8.46	36.30	3.00
SEM	1.77	2.29	3.21	2.26	1.11	0.09	0.20	0.80	0.06
Significance	0.34	0.09	0.72	0.08	0.52	0.52	0.76	0.33	0.35

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Egg production traits:

Regarding egg production traits, the egg laying rate (%) of the trimmed bids was significantly superior over the (NB) groups. However, no significance differences were observed between (BT) and (NB) groups in egg weight during egg production period. The improved body weight and egg production traits for (BT) birds groups may be due to the improved feed conversion ratio in birds submitted to mild beak trimming, since they cannot choose ingredients in the feed, thereby preventing loss of feed (Pizzolante*et al.*, 2007). In addition, this improvement in the production of eggs can be associated with changes in the levels of the adrenal and reproductive hormones. Also, this may be due to a lower incidence of pecked eggs due to less aggressive behavior, lower peaking feather incidence and lower mortality rate.

The increased egg mass for quails in the (BT) groups could be attributed to improving feed intake, feed conversion and egg number as compared with the quails with (NB) groups. Quails fed pelleted feed produced more eggs and eggs mass as compared to those fed mash. The current results agree with the findings of Murakami *et al.* (2008) and Farghly (2012) who reported that the egg production and egg mass of pellets groups significantly ($P \leq 0.05$) exceeded than of mash groups. The improved egg production obtained with pelleted feed may be attributed to improved diet digestibility caused by the process of pelletization, which changes the diet structure of proteins, favoring their digestion, and increasing amino acid availability for egg production (Frikha, *et al.*, 2009). Moreover, there was no difference between beak form and feed form interaction in all egg production traits.

Feed Intake (FI) and feed conversion (FCR):

The trimmed birds clearly consumed less feed than the (NB) group which resulted in improving (FCR). The reduction feeding ability after beak trimmed in the quails may be due to recurring pain at the trimming site and reduced birds' mechanical ability and desire to pick up food (GLATZ, 1987).In addition, the higher (FI) by the (NB) birds could have been caused by the combination of a higher metabolic energy requirement, as a result of more body movement and of the feather condition deteriorated (Mertens*et al*., 2009). The improvement in the (FCR) of (BT) birds is agreed with those of (Marchant-Forde and Cheng, 2010), who stated that the (BT) improved (FCR) due to less feed waste. Conversely, (Leandro *et al*., 2005) found worse feed (FCR) in quails submitted to 1/3 and 2/3 trimming and cauterization of the beak than that of the (NB) birds. Similarly, Maizama and Adams, (1994) reported that FCR was better in layers (NB) groups than trimmed groups during the period from 20 to 40 week of age. The feed Intake was insignificantly affected by feed form these results may be due to low quality of pellets (Moran, 1990). These results are consistent with those of (Farghly, 2012) who found that feed form had no effect on birds (FI). In contrast, to our results, (Rajput *et al*., 2016) was reported that the (FI) of Japanese quail fed on mash feed was higher than fed on pellet feed.

In the present study, birds fed pellets had better (FCR) than those fed mash feed. The superiority of birds fed pellet feed may be attributed to the improved nutritive value of pellet through increased feed flow ability, nutritional physical density, an enhancement of feed palatability, appetite and promoting nutrient digestibility. The improves nutrient utilization of thepellet resulting from chemical action during pellet thermo-mechanical process, processing increased nutrient digestibility also, pelleted feeds had less feed wastage (Dozier *et al*., 2010 and Moritz *et al*., 2005). In addition, pellets particles with suitable dimension for the oral cavity of the bird require less physical efforts to ingest them with allowed a reduction in the energy for food and, therefore, a higher net energy (NE) value. (Cerrate*et al*., 2009 and Mingbin, 2015). Otherwise Mash feed tends to stick to the inside of the birds beak, resulting in a fall in food intake and consequently reduced performance (McDonald, 1987). furthermore, feeding pellets uniform feed particle improves (FCR) by prevents birds to choose feeds particle as pelleting promotes better aggregation of the diet components, avoiding nutrient imbalance and feedstuff segregation during feed transportation and handling (López and Baião, 2004). However, interaction of (B x F) showed insignificant effects on (FC) and (FCR) values.These results agree withTanaka *et al*., (1983) who examined the effect of (BT) and feed form (pellet and mash), and reported that the time spent eating was shorter in cages with mashed food, though feed intake did not change. Therefore, before beak trimming, it may be difficult for laying hens to maintain feeding for a long time because aggression occurred frequently, resulting in a high frequency of birds eating and feed wastage. Hence, aggression decreased after beak trimming, resulting in a decreasing proportion of birds eating. The feeding behavior had an impact on amount of waste feed which was associated with the anatomy of the beak (Adeola, 2006).

Egg quality traits:

Egg quality results are displayed in Table 4. It could be noted that the egg shape index, egg shell thickness and shell percentages for quails were not affected by the (BT). Similar results were obtained by EbruOnbaşılar*et al*. (2009) who found that the egg weight and shape index for eggs produced from laying hens were insignificantly affected in the (NT) groups, a trim at one day, 10 days and 10 weeks of age. However, the higher values of yolk index, albumen percentage and Haugh unit were recorded in eggs laid from (NB) groups compared to record from the (BT) groups Table 4. The yolk percentage of eggs produced from quails in (BT) groups significantly ($P \leq 0.05$) increased than of the (NB) groups. These findings agree with those of (Hassanien and Abdel-Wareth, 2012), who found that the percentage of yolk was significantly higher in the trimming hens in the treated groups. Referring to feed physical form effect the results showed that the birds feed pellets diet had higher egg shape index, shell percentages and Haugh unit than of the quails fed mash diet. These results are consistent with those of (Farghly, 2012) who reported the results showed that treatments birds fed pellets and wet diets had superior shell thickness, Haugh units compared with mash feed. Moreover, there were no significant interactions between (BT) and feed form in all egg quality traits except egg shell index and shell percentages.

Feather score:

The feather scores of each part of the body are shown in Tables 5 and 6. The present results indicate that the plumage deterioration was significantly reduced by beak trimming because aggression decreased and the force of pecking was weakened by the beak trimming compared to (NB). These results sre in agreement with (Mertens*et al*., 2009). Based on the results, more feather damage was observed in the neck and back than to other regions of the body in all groups. Also, the best plumage quality of the body in each group was measured for the tail and wing region. The neck and back areas pecked frequently resulted in more feather damage than other regions of the body in all groups. Generally, the results show that the areas of the body that are constantly exposed to feather aggressive pecking are related to the feather structure as well as the parts that can be touched during male mating, namely neck and back and aggressive behavior was prevented by beak trimming (Mertens*et al*., 2009). The plumage deterioration in quails with (NB) groups could be attributed to pecking the feathers during mating in the cage, leading to loss of feathers in the dorsal region, which may impair thermal regulation processes (Pizzolanteet *al*., 2007). Data presented in Tables 5 and 6, show insignificant differences (P>0.05) in total feather score between the experimental four groups for males and females as affected by the feed physical form. These results are in agreement with Farghly and Abou-Kassem (2014) and Farghlyet *al*. (2014) who reported insignificant differences in plumage conditions between birds fed mash and pellets diet. The physical form of the diet and the distribution of particle size in mash diets can affect feather pecking behavior, possibly due to differences in time spending on feed intake (Walser and Pfirter, 2001). Interaction B x F did not have any effect on total feather score of females. However, it can also be derived that the males beak trimmed were fed mash diet had a better plumage score than groups with (NB) fed pellets diet.

Table4. Effect of beak trimming (BT) and feed form on egg quality traits in Japanese quail

Traits→ Treatment↓	Shape index (%)	Yolk index (%)	Haugh units	Shell thickness (mm)	Yolk %	Albumen (%)	Shell (%)
Beak form (B)							
Beak trimming (BT)	78.50[a]	45.34[b]	88.63[b]	22.5[a]	32.18[a]	58.75[b]	9.07[a]
Intact beak (NB)	79.72[a]	47.14[a]	91.98[a]	22.38[a]	31.52[b]	59.51[a]	8.97[a]
SEM	0.81	0.25	0.39	0.20	0.12	0.217	0.07
Significance	0.29	0.004	<.0001	0.66	0.02	0.01	0.31
Feed form (F)							
Mash (M)	77.83[b]	46.32[a]	89.49[b]	22.28[a]	31.85[a]	59.23[a]	8.92[b]
Pellets (P)	80.39[a]	46.15[a]	91.13[a]	22.60[a]	31.86[a]	59.03[a]	9.12[a]
SEM	0.81	0.25	0.39	0.20	0.12	0.21	0.07
Significance	0.003	0.76	0.04	0.26	0.99	0.51	0.05
Interaction (B×F)							
BT × M	77.30	46.22[a]	88.02	22.60	32.18	50.04	9.13[a]
BT × P	79.71	44.46[b]	89.24	22.40	32.18	58.80	9.02[a]
NB × M	78.36	46.43[a]	90.95	21.95	31.52	59.76	8.72[b]
NB × P	81.08	47.84[a]	93.02	22.80	31.52	59.26	9.22[a]
SEM	0.54	0.35	0.56	0.288	0.17	0.179	0.100
Significance	0.40	0.01	0.45	0.07	0.98	0.32	0.003

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Table5. Effect of beak trimming and feed form on plumage conditions score for body regions of the female quail

Traits→ Treatment↓	Neck	Back	Rump	Tail	wing	Total
Beak form (B)						
Beak trimming (BT)	1.52[b]	1.56[b]	1.39[b]	1.47[b]	1.53[b]	7.47[b]
Intact beak (NB)	3.28[a]	3.25[a]	2.94[a]	2.95[a]	2.88[a]	15.30[a]
SEM	0.08	0.08	0.07	0.77	0.084	0.31
Significance	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Feed form (F)						
Mash (M)	2.45[a]	2.41[a]	2.03[b]	2.10[b]	2.14[a]	11.13[a]
Pellets (P)	2.35[a]	2.40[a]	2.30[a]	2.32[a]	2.27[a]	11.64[a]
SEM	0.08	0.08	0.07	0.077	0.084	0.31
Significance	0.38	0.93	0.01	0.05	0.28	0.25
Interaction (B×F)						
BT × M	1.34[d]	1.44[c]	1.32	1.46	1.54	7.10
BT × P	1.70[c]	1.68[b]	1.46	1.48	1.52	7.84
NB × M	3.56[a]	3.38[a]	2.74	2.75	2.73	15.16
NB × P	3.00[b]	3.12[a]	3.14	3.16	3.02	15.44
SEM	0.11	0.11	0.11	0.11	0.12	0.44
Significance	<.0001	0.03	0.23	0.07	0.21	0.61

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Table6. Effect of beak trimming and feed form on plumage conditions score for body regions of the male quail

Traits→ Treatment↓	Neck	Back	Rump	Tail	wing	Total
Beak form (B)						
Beak trimming (BT)	1.66[b]	1.50[b]	1.46[b]	1.42[b]	1.46[b]	7.50[b]
Intact beak (NB)	3.08[a]	2.9[a]	2.92[a]	2.86[a]	2.86[a]	14.68[a]
SEM	0.14	0.146	0.141	0.145	0.143	0.67
Significance	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Feed form (F)						
Mash (M)	2.28[a]	2.14[a]	2.12[a]	2.08[a]	2.08[a]	10.70[a]
Pellets (P)	2.46[a]	2.32[a]	2.26[a]	2.20[a]	2.24[a]	11.48[a]
SEM	0.145	0.146	0.141	0.145	0.143	0.671
Significance	0.38	0.386	0.48	0.56	0.43	0.41
Interaction (B×F)						
BT × M	1.40	1.20[d]	1.16[d]	1.16	1.16[d]	6.08[d]
BT × P	1.92	1.80[c]	1.76[c]	1.68	1.76[c]	8.92[c]
NB × M	3.16	3.08[a]	3.08[a]	3	3[a]	14.04[b]
NB × P	3.00	2.84[b]	2.76b	2.72	2.71[b]	15.32[a]
SEM	0.20	0.21	0.20	0.21	0.20	0.95
Significance	0.10	0.05	0.02	0.06	0.03	0.03

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Aggressive pecking behavior

Aggressive pecking behavior among Japanese quail males as affected by beak form are shown in Table 7. The lowest value of head injuries was recorded in (BT) males compared to (NB) groups. Also, the males with (NB) had significantly higher eyelids injuries than (BT) groups. Moreover, the higher eyes closed values were recorded in males in (NB) groups compared to (BT) groups. Lastly, males of (BT) groups had significantly higher eyes lost than (NB) groups. However, the (BT) groups had the lowest values of all aggressive pecking behavior traits compared to (NB) groups. Ultimately, feather pecking will lead to cannibalism, resulting in reduced production in the injured birds and eventually mortality. All aggressive pecking behavior traits significant affected by feed form and interaction (B x F) except head injuries traits. Birds fed mash were more attacked than birds fed pellet feed may be attributed to birds fed on pellets consumed their feed in a shorter time have less chance of being attacked (Savory and Hetherington, 1997). Generally, the injuries responses could be attributed to several reasons as aggressive behavior between males and the frequency copulation behavior of the males as well as force copulations for quail males with unreceptive females (Stephanie *et al*., 2011). Feather pecking and cannibalism are partly influenced by hormonal factors that can result in increases in these behaviors around the onset of lay (Keeling, 1995).

Table7. Effect of beak trimming and feed form on aggressive pecking behavior among males and mortality rate

Traits→ Treatment ↓	Head injuries	Eyelid injuries	Eye closed	Eye lost	Total	Mortality (%)	
						Males	Females
Beak form (B)							
Beak trimming (BT)	1.08^{b}	2.05^{b}	2.00b	2.00^{b}	7.108^{b}	1.25^{b}	8.31^{b}
Intact beak (NB)	3.16^{a}	3.33^{a}	2.16^{a}	2.16^{a}	10.83^{a}	8.35^{a}	20.86^{a}
SEM	0.261	0.16	0.02	0.02	0.28	0.64	0.36
Significance	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001	<.0001
Feed form (F)							
Mash (M)	2.16^{a}	3.38^{a}	2.16^{a}	2.17^{a}	9.88^{a}	6.11^{a}	15.27^{a}
Pellets (P)	2.08^{a}	2.00^{b}	2.00^{b}	2.00^{b}	8.08^{b}	3.50^{b}	13.9^{b}
SEM	0.26	0.15	0.02	0.019	0.28	0.64	0.36
Significance	0.82	<.0001	<.0001	<.0001	0.0004	0.01	0.01
Interaction (B×F)							
BT × M	1.17	2.10^{b}	2.00^{b}	2.00^{b}	7.27^{c}	1.38^{c}	9.71^{c}
BT × P	1.00	2.00^{b}	2.00^{b}	2.00^{b}	7.00^{c}	1.12^{c}	6.92^{d}
NB × M	3.20	4.67^{a}	2.33^{a}	2.33^{a}	12.50^{a}	11.11^{a}	23.63^{a}
NB × P	3.17	2.00^{b}	2.00^{b}	2.00^{b}	9.17^{b}	5.6^{b}	18.10^{b}
SEM	0.37	0.22	0.03	0.03	0.39	0.91	0.51
Significance	0.82	<.0001	<.0001	<.0001	0.001	0.002	<.0001

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Mortality rate:

The males and females with (NB) groups had significantly higher total mortality rates compared to (BT) groups (Table 7). The higher mortality rate of (NB) birds could be attributed to the aggressive behavior among males occurs frequently, which leads to increased injuries responses in the different area, cannibalism and consequently increased mortality rate. These results agree with those of Oliveira, (2002), who found that the better performance as well as lower mortality rate for (BT) quails than those of quails submitted to poor (BT) practices. Similarly, Pizzolante*et al.* (2007) recommended using the (BT) of quails especially at 14 or 21 days to improve the performance as well as reducing the mortality rate. In regard to feed forms, there was a positive effect of birds fed pellet feed on cannibalistic mortality in the trimmed groups and females' (NB) fed mash diet groups recorded higher significant mortality this is consistent with (Ghazi *et al*., 2012 and Amer*et al*., 2015) Table (7). Comparing beak form and feed physical form interaction, trimmed birds fed pellet feed showed lower cannibalistic mortality than the group of (NB) birds.

Fertility and hatchability:

The better percentage of fertility was recorded for the quails in (BT) groups compared to (NB) groups (Table 8). These results were consistent with those of Khalil *et al*. (2015), who found that the fertility and hatchability percentages were improved in (BT) Japanese quail group than those of the (NB) group. Moreover, there was insignificant difference between (NB) and (BT) groups in hatchability of fertile eggs percentage. Rodenburg*et al*. (2004) proved that high incidence of feather pecking leads to more fearful and stressed hens in a flock and reduced production and fertility. The hatchability percentage was not affected by feed form, but fertility was significantly higher in birds fed pelleted diet vs. those fed mash diet. While, there was no affect of interaction of feed physical form × beak treatment on fertility and hatchability.

Table 8. Effect of beak trimming (BT) and feed form on ovarian, fertility and hatchability of Japanese quails

Traits→ Treatment ↓	Ovary (%)	Oviduct length (cm)	Ovarian yellow follicle number	Ovarian yellow follicle (%)	Fertility (%)	Hatchability (%)
			Beak form (B)			
Beak trimming (BT)	3.09[a]	38.188[a]	3.62[a]	2.91[a]	86.97[a]	69.77[a]
Intact beak (NB)	2.69[b]	35.813[a]	3.62[a]	2.28[b]	85.00[b]	68.20[a]
SEM	0.12	0.99	0.242	0.131	0.700	1.31
Significance	0.03	0.11	1.00	0.004	0.02	0.39
			Feed form (F)			
Mash (M)	3.00[a]	35.50[b]	3.68[a]	2.78[a]	83.01[b]	68.51[a]
Pellets (P)	2.77[a]	38.50[a]	3.56[a]	2.40[b]	88.97[a]	69.46[a]
SEM	0.12	1.00	0.24	0.13	0.700	1.31
Significance	0.17	0.05	0.72	0.05	<.0001	0.61
			Interaction (B×F)			
BT × M	3.09	34.75	3.63	82.18[b]	69.32	3.03
BT × P	3.08	36.88	3.63	91.77[a]	70.21	2.78
NB × M	2.92	36.25	3.75	83.84[b]	67.70	2.53
NB × P	2.47	40.13	3.50	86.17[b]	68.70	2.03
SEM	0.17	1.40	0.34	0.83	1.15	0.18
Significance	0.21	0.54	0.71	0.001	0.94	0.43

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Genital organs of female and male quails:

In relation to females, results revealed that the (BT) and interactions between factors did not significantly affect ovarian yellow follicle number and length of oviduct but, significant differences were found among groups on ovary and ovarian yellow follicle percentages (Table 8). The higher relative ovary and ovarian yellow follicle percentages were recorded in females' (BT), while the lower value was recorded in (NB) groups. Moreover, there was no difference among experimental groups in testicular growth traits except in left testis width was significant wider than (NB) groups (Table 9). In respect of feed physical form and B x F interaction, no significant differences were found between the two feed forms in most genital organs of females and males. Relative percentages of ovary, oviduct, oviduct length and right testis width were significantly higher in pellets diet than mash diet. Moreover, (BT) males had the higher cloacal gland area than the males with (NB) groups.

Testosterone concentration of male Japanese quails:

Sex hormones are related to both sexual and aggressive behavior in a multifaceted way (Leshner, 1987). Likewise, Wingfield*et al.* (1990) reported that the testosterone hormone of male quails plays an important role in the behavior of Japanese quails, which reached maximum level during the breeding season. The effect of (BT) on testosterone concentration of male is shown in Table (10). The results revealed that the testosterone concentrations as affected by beak trimming showed that (BT) groups was significantly lower than thoe of the quails with (NB) groups. These results perfectly consistent with(Khalil *et al.*, 2015).The decrease in testosterone levels in the (BT) groups could be attributed to reducing aggressive behavior effects which leads to improving quail productivity. These results are in harmony with Knol and Egberink-Alink, (1989) who reported that the dominant or aggressive individuals tend to show higher plasma testosterone levels than submissive or less aggressive animals. Khalil *et al.* (2015) reported positive correlations between serum concentration of testosterone hormone and each of feather deterioration, head injuries, cloacae gland area, total mortality rates. Moreover, Hau*et al.* (2004) hypothesized that one mode of action of testosterone is to reduce pain sensitivity, possibly as a way of enhance aggressive behavior during aggressive facing this reduction in pain may promote the immediate and future willingness of males to engage in high intensity fights. Moreover, there were significantly higher testosterone levels in groups fed mash diet than those fed pelleted diet as reflecting effect of feed form. This result can be explained by the recorded higher aggressive behavior when quails were fed mash was higher than when fed pellets. In the same way, there was significant interaction effect of beak trimming × feed form on testosterone levels.

Table 9: Effects of beak trimming and feed form on testes development and cloacae gland size (mm^2)

Traits→ Treatment ↓	Right testis (%)	Left testis (%)	Testes (%)	Right testis length (cm)	Left testis length (cm)	Cloacal gland (mm^2)
			Beak form (B)			
Beak trimming (BT)	1.67^a	1.62^a	3.30^a	2.61^a	2.42^a	398.80^a
Intact beak (NB)	1.61^a	1.48^a	3.10^a	2.58^a	2.43^a	331.20^b
SEM	0.07	0.09	0.15	0.07	0.08	2.62
Significance	0.59	0.33	0.38	0.74	0.93	<.0001
			Feed form (F)			
Mash (M)	1.59^a	1.51^a	3.11^a	2.60^a	2.37^a	365.83^a
Pellets (P)	1.69^a	1.58^a	3.28^a	2.59^a	2.48^a	364.18^a
SEM	0.15	0.22	0.24	0.07	0.08	2.62
Significance	0.33	0.62	0.46	0.94	0.34	0.66
			Interaction (B×F)			
BT × M	1.65	1.48	3.13	2.64	2.49	396.78
BT × P	1.74	1.70	3.43	2.56	2.49	400.83
NB × M	1.61	1.55	3.16	2.61	2.36	334.88
NB × P	1.58	1.48	3.06	2.60	2.39	327.53
SEM	0.22	0.31	0.34	0.10	0.11	3.71
Significance	0.91	0.69	0.74	0.63	0.93	0.13

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Table10. Effect of beak trimming and feed form on the hormonal profiles of Japanese quails

Traits→ Treatment ↓	Testosterone (ng/mL)	Progesterone (ng/mL)	Corticosterone(ng/mL)	
			Female	**Male**
		Effect of beak trimming (T)		
Beak trimming (BT)	2.65^b	3.22^a	5.512^b	5.53^b
Intact beak (NB)	3.36^a	2.74^b	8.300^a	11.8^a
SEM	0.04	0.07	0.25	0.32
Significance	<.0001	0.0001	<.0001	<.0001
		Feed form (F)		
Mash (M)	3.15^a	2.92^a	6.812^a	8.52^a
Pellets (P)	2.85^b	3.05^a	7.00^a	8.81^a
SEM	0.04	0.07	0.25	0.33
Significance	<.0001	0.21	0.61	0.55
		Interaction (B×F)		
BT × M	2.70^b	3.06	5.45	5.25
BT × P	2.60^b	3.39	5.58	5.83
NB × M	3.61^a	2.78	8.18	11.80
NB × P	3.11^a	2.71	8.43	11.81
SEM	0.06	0.10	0.35	0.46
Significance	0.004	0.07	0.86	0.55

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Progesterone concentration of females Japanese quails:

Females of (NB) groups had significantly lower progesterone concentration than (BT) groups (Table 10). Progesterone implanted in the hypothalamus of male doves suppressed courtship behavior and aggressiveness, demonstrating antagonism between progesterone and testosterone at a central level (Manning, 1981). Progesterone appeared to physiologically act as antagonists of androgens and behavioral effects of testosterone and progesterone on the brain are accomplished by the metabolites of these hormones (Knol and Egberink-Alink, 1989). Progesterone concentration was not affected by feed form when diets were fed in mash or pellet form. Moreover, there was insignificant effect of interaction of B × F groups on progesterone concentration.

Plasma corticosterone concentration

It was observed that the higher level of male plasma corticosterone was obtained in (NB) groups, while the lower value was obtained in (BT) groups (Table 10). However, females of (NB) had significantly higher plasma corticosterone level than the trimmed groups. Beak trimming may had reduced the stress of birds which resulted from aggressive pecking behavior and led to improved overall production and reproduction performance this improving may be attributed to increase of sexual hormones and decreased in anti-stress hormones. Females of (NB) groups had significantly higher corticosterone and significantly lower progesterone concentration. This means that they are under the influence of stresses. These results are in agreement with those of Khalil *et al*., (2005). This stress may be due to aggressive behavior of (NB) males towards females during mating. Corticosterone plays role of inhibition gonadal hormones synthesis, (LH), (FSH) and (GnRH) this is believed to be the main pathway to inhibiting reproduction during stress time (Van Hout*et al*., 2010; Hassan *et al*., 2015 and Hanafy and Khalil 2015). From our experimental data, it was observed (NB) quails with higher corticosterone reduced ovary and ovarian yellow follicle percentage and decreased plasma progesterone concentration. These results are consistent with those of Petitte and Etches (1991). Also, (NB) quails with higher corticosterone reduced cloacal gland area, testosterone concentration, testes, fertilely percentages in male. Hanafy and Khalil (2015) also found negative correlation between corticosterone concentration and each of testes weights, cloacal gland area, foam production, semen characteristics and testosterone level in Japanese quail male when exposed to chronic artificial stress. Both feed form an interaction B x F had insignificant effects on corticosterone concentration.

Hematological parameters:

The blood profiles of female quail were shown in Tables 11 and 12. The female quails WBC ($\times10^3$), PCV (%), Hb (g/dl) and lymphocytes (%) were significantly (P≤0.01) increased in the (BT) groups, while the heterophils (%) and monocytes (%) were significantly (P≤0.01) decreased than those of the (NB) groups. The means of RBC, PCV, eosinophils and basophils were not affected by the (BT). Increase in (Hb) may be accompanied by a rise in the RBC and PCV% indicating absence of anemia (Waugh *et al*., 2001). The increased lymphocyte and decreased heterophils percentages could reflect the immunity response of (BT) quails. All hematology female values were not affected by feed form. These results agreed with the findings of ShahinReshadi, (2015) who reported that feed form (msh and pellets) had no significant effects on H/L ratio and lymphoid organs weight. The beak trimming had insignificant interaction effect with feed form for all of the female hematology parameters studied except that RBC and Hb were significantly affected. Regarding the effect of (BT) on the hematological parameters on males, the WBC (10^3), PCV (%), Hb (g/dl) and lymphocytes (%) in the (BT) groups were significantly increased than that of the (NB) groups, while, heterophils (%), monocytes (%), basophils (%) and eosinophils (%) were significantly decreased (Tables 13 and 14). The means of RBC ($\times10^6$) were not affected by the trimming of the beak. The significant improvement in the Hb, PCV and RBC contents of the birds on (BT) groups could have been an indication of an increment in the oxygen carrying capacity of the animal's blood (Fasuyi andArire, 2015). The H/L ratio is considered as a reliable indicator of long term stress condition in birds (Al-Murrani*et al*., 1997; Altan*et al*., 2003;Fathi*et al*. 2008 and AberraMelesse, 2011).The (NB) groups significantly (P≤0.01) reduces lymphocytes and increased the heterophills leading to an increased H/L ratio than that of the (NB) groups this increase it may be attributed to the negative effects of aggressive behavior that reduces feed intake, which thereby providing fewer nutrients for the proper development of lymphoid organs which were significantly reduced by aggression stressors (Bartlett and Smith, 2003).It could be stated that the birds with (NB) were more stressful than (BT) counterparts birds. The RBC, WBC, Hb, lymphocytes and basophiles percentages were insignificantly affected by feed form, but PCV, heteophils, eosinophils percentages and H/L ratio were significantly higher in birds fed mash diet vs. those fed pelleted diet while monocytes was found to be less in birds fed mash than that in those fed pellet diet.Although mash diet resulted in increase of H/L ratio compared with pellets groups, but (B x F) interaction ineffective on H/ L ratio and there were significant difference among diet forms. Our results showed that form of feeds significantly affected blood hematological traits. Interaction (B x F) of hematological parameters shown that RBC, WBC, lymphocytes and H/L ratio didn't have any effect. However, there are several interactions between (BT) and form of feed on hematological traits (PCV, hemoglobin, lymphocyte, eosinophils, basophiles monocytes and heterophils). In general, the effects varied for the different evaluated criteria and it is not easy to have a general conclusion about this. However, it is clear that the effect of (BT) depends on type of diet (pellet *vs.* mash).

Table11. Effect of Beak trimming and feed form on the hematological parameters of female Japanese quails

Traits→ Treatment ↓	RBCs ($\times10^6$/µl)	WBCs ($\times10^3$/µl)	PCV (%)	Hemoglobin (g/dl)
Beak form (B)				
Beak trimming (BT)	3.51^a	23.25^a	44.00^a	14.33^a
Intact beak (NB)	3.26^a	17.67^b	41.33^b	12.17^b
SEM	0.11	0.67	0.74	0.57
Significance	0.14	<.0001	0.02	0.02
Feed form (F)				
Mash (M)	3.26^a	19.83^a	43.33^a	13.67^a
Pellets (P)	3.51^a	21.08^a	42.00^a	12.83^a
SEM	0.11	0.67	0.74	0.57
Significance	0.12	0.21	0.22	0.32
Interaction (B×F)				
BT × M	3.75	21.67	44.67	15.67
BT × P	3.26	24.83	43.33	13.00
NB × M	2.76	18.00	42.00	11.67
NB × P	3.77	17.77	40.67	12.67
SEM	0.16	0.95	1.04	0.81
Significance	0.0003	0.06	1.00	0.04

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Table12. Effect of Beak trimming and feed form on the WBCs deferential of female Japanese quails

Traits→ Treatment ↓	Heterophils (%)	Lymphocytes (%)	Eosinophils (%)	Monocytes (%)	Basophils (%)	H/L ratio
Beak form (B)						
Beak trimming (BT)	21.08[b]	69.25[a]	4.73[a]	2.75[b]	2.17[a]	0.30[b]
Intact beak (NB)	25.16[a]	62.83[b]	4.75[a]	4.66[a]	2.50[a]	0.40[a]
SEM	0.50	0.66	0.64	0.60	0.16	0.01
Significance	<.0001	<.0001	0.92	0.03	0.16	<.0001
Feed form (F)						
Mash (M)	23.83[a]	66.25[a]	4.08[a]	3.50[a]	2.33[a]	0.36[a]
Pellets (P)	22.42[a]	65.83[a]	5.50[a]	3.91[a]	2.33[a]	0.34[a]
SEM	0.50	0.66	0.64	0.60	0.16	0.01
Significance	0.06	0.72	0.10	0.61	1.00	0.18
Interaction (B×F)						
BT × M	22.00	70.00	3.67	2.33	0.31	2.00
BT × P	20.17	71.67	5.00	2.33	0.28	2.33
NB × M	25.67	64.33	3.67	3.67	0.40	2.67
NB × P	24.67	63.33	5.00	4.67	0.39	2.33
SEM	0.71	0.93	0.90	0.85	0.01	0.23
Significance	0.56	0.83	0.92	0.75	0.16	0.64

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Table13. Beak form (B) and feed form on the hematological parameters of males Japanese quails

Traits→ Treatment ↓	RBCs ($\times10^6/\mu l$)	WBCs ($\times10^3/\mu l$)	PCV (%)	Hemoglobin (g/dl)	Heterophils (%)
Beak form (B)					
Beak trimming (BT)	3.69[a]	22.83[a]	43.67[a]	14.17[a]	19.50[b]
Intact beak (NB)	3.42[a]	19.08[b]	41.83[b]	12.83[b]	25.17[a]
SEM	0.10	0.52	0.54	0.33	0.25
Significance	0.09	0.0001	0.03	0.01	<.0001
Feed form (F)					
Mash (M)	3.61[a]	20.33[a]	43.83[a]	13.16[a]	24.5[a]
Pellets (P)	3.49[a]	21.58[a]	41.66[b]	13.83[a]	20.17[b]
SEM	0.10	0.52	0.53	0.33	0.24
Significance	0.42	0.11	0.01	0.17	<.0001
Interaction (B×F)					
BT × M	3.80	22.00	45.67	13.33	21.00
BT × P	3.58	23.67	41.67	15.00	18.00
NB × M	3.44	18.67	42.00	13.00	28.00
NB × P	3.41	19.50	41.67	12.67	22.33
SEM	0.14	0.74	0.76	0.47	0.35
Significance	0.52	0.58	0.03	0.05	0.00

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

Table14. Beak form (B) and feed form on the WBCs deferential of males Japanese quails

Traits→ Treatment ↓	Lymphocytes (%)	Eosinophils (%)	Monocytes (%)	Basophils (%)	H/L ratio
Beak form (B)					
Beak trimming (BT)	73.00[a]	4.25[b]	2.08[b]	1.50[b]	0.27[b]
Intact beak (NB)	63.00[b]	5.08[a]	3.17[a]	2.00[a]	0.40[a]
SEM	0.79	0.23	0.27	0.16	0.01
Significance	<.0001	0.02	0.01	0.04	<.0001
Feed form (F)					
Mash (M)	68.33[a]	5.50[a]	1.91[b]	1.58[a]	0.37[a]
Pellets (P)	67.66[a]	3.83[b]	3.33[a]	1.92[a]	0.30[b]
SEM	0.78	0.23	0.27	0.16	0.01
Significance	0.56	0.0001	0.002	0.16	<.0001
Interaction (B×F)					
BT × M	73.67	3.00	1.50	0.29	1.17
BT × P	72.33	5.50	2.67	0.25	1.83
NB × M	63.00	4.67	2.33	0.45	2.00
NB × P	63.00	5.50	4.00	0.36	2.00
SEM	1.11	0.32	0.37	0.01	0.23
Significance	0.56	0.02	0.01	0.012	0.16

Means within each column for each division with no common superscript letters are significantly different ($p \leq .05$).

CONCLUSIONS:

The (BT) of birds had positive effects on physiological and productive characteristics of the laying quails, in order to reduce stress resulting from aggressive behavior, feather picking. Feed intake was not affected by the beak trimming, in both feed form (mash or pellets) but beak trimming improved feed efficiency by reducing the loss of feed.

RECOMMENDATION

Provide feed for beak trimming birds in the form of pellets to improve the productivity of laying quail and reduce stress.

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التأثيرات الفسيولوجية والإنتاجية لقص المنقار وشكل العلف في السمان الياباني

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أستخدمت في هذه الدراسة عدد ٢٨٨ طائر سمان ياباني عمر ٨ أسابيع لتقييم تأثيرات قص المنقار و شكل العلف علي الأداء الانتاجي و الفسيولوجي و السلوك العدواني للطيور في تجربة ذات تصميم عاملي ٢×٢ . قسمت الطيور إلي مجموعتين علي حسب شكل المنقار (سليم بدون قص – منقار مقصوص) و كل مجموعه منها قسمت تحتها إلي مجموعتين علي حسب شكل العلف المأكول (كريات – حبيبات).

أوضحت النتائج أن شكل المنقار و شكل العلف غيرت بعض الصفات معنوياً مثل وزن الجسم النهائي للطيور- إنتاج البيض – كفاءة التحويل الغذائي – نسبة الخصوبة – حالة الريش – السلوك العدواني للطيور. و لم يكن هناك تأثير معنوي علي بعض الصفات مثل كمية العلف المأكول – نسب الفقس و الخصية و المبيض. أثر التفاعل بين عامل قص المنقار و شكل العلف بشكل معنوي علي حالة الريش – و السلوك العدواني و نسبة النفوق و بعض صفات الدم.

الخلاصة: نستخلص من هذه الدراسة أن قص المنقار لم يؤثر بشكل سلبي علي قدرة الطيور في تناول الغذاء سواء في صورة كريات أو حبيبات . يعتبر عملية قص المنقار الحل المناسب لتقليل السلوك العدواني ومعدل النفوق و حسن أداء الصفات الإنتاجية و الفسيولوجية للسمان.