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EFFECT OF MALES PECKING BEHAVIOR ON PRODUCTIVE AND PHYSIOLOGICAL PERFORMANCE OF JAPANESE QUAIL AND USING SOME WAYS TO REDUCE THIS BEHAVIOR

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ABSTRACT: This experiment aimed to study the effects of pecking behavior among males on productive and physiological performance of laying Japanese quail. Debeaking of males as an artificial method and sand or straw as a semi-natural method were used to reduce this behavior. A total of 180 Japanese quails five-wk-old were individually weighed and randomly assigned to four experimental groups. All birds were housed in galvanized metal cages (100 x 50 x 50cm^3), the floor of the cage consist of galvanized wire. The 1st group used as a control group. Males of the 2nd group were debeaked at 6 and 10 weeks of age. In the 3rd and 4th groups, a wooden box (50 x 45 x 7cm^3) were used at the end of each cage, which containing a sand (sand group) or a rice straw (straw group), respectively. Head banging, eyelids injuries, eye closed, eye lost, plumage conditions, normal behavioral activities, body weight, egg production, fertility, hatchability, egg quality and mortality rate were recorded during the experimental period. Also, serum concentration of corticosterone, testosterone and estradiol-17β were determined at 18-wk-old.

The results can be summarized as follows: 1) Pecking behavior had a negative impact on all productive and physiological traits of laying Japanese quail. 2) Using semi-natural environment (sand or straw) were the worst treatments especially straw on the most traits compared to other groups. 3) Debeaked group was significantly reduced in head banging, eyelids injuries, eye closed, eye lost, plumage deterioration scores, mortality rate compared with control and other experimental groups. 4) Laying rate, fertility and hatchability percentage were improved in debeaked group compared with other experimental groups. 5) The highest level of serum testosterone was recorded in males of straw group, while the lowest levels were detected in debeaked and sand groups. Females of straw group had significantly higher serum corticosterone and lower serum estradiol-17β levels than other groups. From this study, it could be concluded that using beak trimming of males at 6 and 10 weeks of age leads to reduced aggressive pecking behavior, mortality rates and improved productive and physiological performance of laying Japanese quail.

Key words: Pecking, debeaking, productive, reproductive performance and Japanese quail

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INTRODUCTION

Pecking behavior is one of the problems faced poultry producers in the world (Van Krimpen et al., 2005). Also, feather pecking is a serious problem in poultry housing, as it may lead to feather damage, injuries and even mortality. Feather pecking, especially the severe type, negatively affects the welfare of laying hens (Blokhuis and Arkes, 1984). This damaging behavior is painful for hens, can lead to cannibalism and death, and is, therefore, a significant animal welfare issue. Moreover, feather pecking is thought to be a redirected foraging behavior rather than a form of aggression, and may be due to the hens mistaken perception of feathers as an appropriate foraging substrate (Riber et al., 2007).

On the other hand, aggressive pecking behavior and head injuries in male Japanese quail are an important welfare problem in quail farming. Aggressive pecking behavior especially in head area among males of Japanese quail leads to several problems such as injuries, cannibalism, mortality and economic loss for producers of quails (Wechsler and Schmid, 1998).

The previous findings indicated that the testosterone hormone play an important role in aggressive behavior among males of Japanese quail (Delville et al., 1984). It is already maximally elevated during the breeding season (Wingfield et al., 1990). Masaru (1986) reported that testosterone is essential for the induction of crowing and for the enhancement of locomotors activity of Japanese quail. Moreover, Hau et al. (2004) hypothesized that one mode of action of testosterone is to reduce pain sensitivity, perhaps as a way of promoting aggressive behavior during competitive interactions. Decreased pain sensitivity during aggressive encounters may promote the immediate and future willingness of males to engage in high-intensity fights.

Therefore, this experiment was conducted to study the following objectives: 1) to determine the harmful effects of aggressive pecking behavior among males on quail performance, 2) an attempt to minimize the rates of aggressive pecking behavior among males, 3) and to improve productive and reproductive performance of Japanese quail breeders.

MATERIALS AND METHODS

Birds and husbandry

This experiment was conducted between November, 2013 to January, 2014 at Japanese quail Farm, Department of Animal Production, Faculty of Agriculture, Suez Canal University, Ismailia, Egypt. After hatching, all quail chicks were kept under normal brooding conditions in brooding floor pens until they were five weeks of age. Lighting program was continuous from hatching to five weeks of age, after that reduced to 16hr light and 8hr dark/day. Natural day light (10-11 hr/day) was used and completed with artificial tungsten light for all experimental groups. The light intensity during rearing phase ranged from 50-60 lux, and during experimental period ranged from 35-50 lux at the head of birds as measured by luxmeter. Room temperature was gradually decreased from 37°C at hatching to 25°C at five weeks of age. Ambient temperature and relative humidity inside experimental cages were recorded daily during the experimental period by using thermometer and hygrometer. Ambient temperature mean was 22.72±2.53°C, and relative humidity average was 60.28±3.45%. All birds were fed a conventional corn and soybean meal basal diet, formulated to meet all the nutritional requirements of quail birds according to specifications of the NRC (1994). The rations contained

24% CP (growing period) and 20% CP (laying period) with 3000 Kcl (ME)/Kg in both periods. Both feed and water were provided *ad libitum* in all experimental groups.

Experimental design and treatments

At five weeks of age, 180 males and females of Japanese quail birds were individually weighed and randomly assigned to four experimental groups (three replicate each) according to treatments. All treatments distributed into 12 housing cages from galvanized metal (100 x 50 x 50 cm^3), 15 birds/cage, with sex ratio 1:2. The floor of the all cages consists of galvanized wire mesh. First group not treated (as a control group), while, males of the 2^{nd} group were debeaked (beak trimming) by electrical heated blade at six and ten weeks of age (as a debeaked group). Partial removal of both top and bottom beaks, reducing approximately 1/3 of the beak's length (Glatz, 2005). The 3^{rd} and 4^{th} treatment groups were used a wooden box (50 x 45 x 7 cm^3) at the end of each cage, which containing sand (as a sand group) or rice straw (as a straw group), sand and rice straw were used as natural environment substance. Sand used as a dustbathing substrate and rice straw used as a foraging substrate and cutting into small pieces (25 cm). At the front of each cage, there were a feeder and a waterer. All of the feed, water, sand and straw were available *ad libitum*, and both sand and straw were daily changed, as shown in Plate 1.

Studied traits

Aggressive pecking behavior

Aggressive pecking behavior and all injuries related to it (head banging, eyelid injuries, eye closed and eye lost) were visually examined for each bird of all experimental groups at 6, 7, 8, 10, 14 and 18 weeks of age. Head banging score (from 1 to 5), using a scale from 1 (normal head) to 5 (damage head) as shown in Plate 1. Eyelid injuries score (from 1 to 5), using a scale from 1 (normal 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).

Normal behavioral activities

The normal behavior traits of all groups were determined at 7, 9, 11 and 13 weeks of age using a video camera. The behavioral activities traits were recorded for one hour/day, from 9 to 12 a.m. The following traits were determined for each 5 min (sampling time) interval. Distribution of birds in the cage was recorded (number of birds in front or behind of the cage). Basic activities were expressed as a number of birds standing, sitting or walking. Additional activities were recorded as a number of birds feeding, drinking or preening. Numbers of observations were calculated as a percentage of birds observed for each trait (Khalil et al., 2012).

Plumage conditions

Plumage deterioration scores of males and females of all experimental groups were visually investigated at 6, 8, 10, 14 and 18 weeks of age. Three areas of the body were measured (head, neck and back) using a scale from 1 (completely feathered) to 5 (featherless) as shown in Plate 1. The sum of the values for all three areas was calculated for each bird, with values ranging from 3 (completely feathered) to 15 (featherless) according to Khalil et al. (2011).

Productive, reproduction and physiological traits

Birds were individually weighed at the beginning of experiment (6-wks) and at 8, 10, 14 and 18 weeks of age. Mortality rate was recorded during the entire period of the experiment. The daily egg numbers and weekly egg weight were recorded up to 18 weeks of age. Hen-day and hen-housed egg

production and egg mass (g) were calculated. A total of 1050 eggs from all experimental groups were used to determine fertility and hatchability percentages at 10, 13 and 16 weeks of age. Fertile eggs were daily collected and stored at 18 ^{o}C and 65 RH up to five days before they were placed in the incubator. At hatching, all live and dead chicks were counted. The unhatched eggs were opened and classified either as being infertile or embryonic dead according to Khalil (2009). The cloacal gland areas (height and width per mm) were measured for males by using a calliper at 8, 10, 14 and 18 weeks of age (Khalil et al., 2011). A total of 200 fresh eggs from all experimental groups were used to measure egg quality traits for two consecutive days at 14 and 18 weeks of age. Egg shape index, internal quality unit, yolk shape index and shell thickness were calculated (Kondaiah et al., 1983). At the end of experiment, 24 birds from all experimental groups (12 males and 12 females) were slaughtered by slitting the jugular vein. The blood samples were collected and centrifuged at 3000 rpm for 15 minutes and serum obtained were stored at -20^{o}C for further analysis. Serum testosterone and estradiol-17β levels were determined by ELISA kits manufactured by DiaMetra, Spello-Perugia, Italy. Also, corticosterone ELISA kits were purchased from IBL, Hamburg, Germany. The sensitivity of the assay was 1.631 ng/mL, 8.7 pg/mL and 70 pg/mL and the percentage of recovery was 95-103%, 95-100% and 100-105% for testosterone, estradiol-17β and corticosterone, respectively. The intra- and interassay coefficients of variation were 4.08 and 5.54%, 9 and 10% and 5.8 and 10.5% for testosterone, estradiol-17β and corticosterone, respectively.

Statistical analysis

Data were analysed using the General Linear Model (GLM) procedure of SAS (SAS Institute Inc., 2001). Differences among means were detected using Duncan's new multiple test (Duncan, 1955). Correlation coefficients among traits were estimated.

RESULTS

Pecking behavior

Results showed that pecking behavior among Japanese quail males started in early time from 6 to 8 weeks of age. Head banging increased with advanced age to reach the maximum at week 8 and 10 with significant differences and then dropped to reach the minimum at 18-wks-old. The lowest value of head banging was recorded in debeaked males compared to other treated and control groups. In contrast, males kept on sand and straw had significantly higher head banging at 10 week of age than other groups. Control and sand groups had significantly higher head banging at 8 weeks of age than other groups (Figure 1). Also, the males kept under sand and straw had significantly higher eyelids injuries than control and debeaked groups at 8-wks-old. Moreover, control and sand groups had significantly higher values than other groups at 10 and 14 weeks of age. The highest eyes closed were recorded in males kept under sand and straw at 8 weeks of age, but at 10 weeks of age, control group had the highest value compared to other groups. Lastly, males kept under straw had significantly higher eyes lost at 8 week than other treated and control groups. However, the debeaked group had the lowest values of all aggressive pecking behavior traits compared to other treated groups throughout the experimental period. On the other hand, no significant differences were found among treatments in female aggressive pecking behavior.

Normal behavioral activities traits

Results revealed that birds in control group spent more time in the front cage and lower time in the behind cage ($P<0.01$) than other treated groups (Table 1). In

relation to basic behavior, debeaked birds spent more time sitting and lower time standing and walking ($P<0.01$) than control and semi-natural environmental groups. In this respect, there were no significant differences between control and semi-natural environmental conditions in distribution of birds, also between debeaked group and semi-natural environmental conditions in basic behavioral activities traits. However, additional behavioral activities were not statistically affected by different treatments.

Plumage conditions

Results showed that the higher plumage deterioration scores were obtained in males kept under semi-natural environmental conditions (sand and straw) than these recorded in debeaked and control groups at 8 weeks of age (Figure 2). In contrast, debeaked males had significantly lower plumage deterioration than other groups at 10 weeks of age. Also, males kept under straw had significantly lower plumage deterioration score than other groups at 14 and 18 weeks of age. In relation to the females, debeaked group had significantly lower values than other treated and control groups at 8 and 10 weeks of age.

Live body weight

Results indicated that the debeaked males had significantly heavier body weight compared to that kept under semi-natural environment at 8 weeks of age, but not significant with control group. Moreover, males kept under sand had significantly lower body weight than the debeaked and straw groups at 10 weeks of age, but not significant with control group. However, there were no significant differences in females body weight among treatments throughout the experimental period (Figure 2).

Mortality rate

Results revealed that males had higher mortality rates than the females from week 6 to week 14 of age, irrespective of treatments. Also, significant differences ($P<0.05$) were found among treatments in total mortality rates from 6 to 18 weeks of age. Both males and females quail kept under straw had significantly higher total mortality rates compared to other treated or control group. Moreover, from week 9 up to the end of experiment, the lowest mortality rate of males was recorded in debeaked group compared to other treated or control groups (Figure 2).

Productive and reproductive traits

Results recorded that the highest hen-housed egg production was obtained from debeaked group, while the lowest value was obtained from straw group (Table 2). Moreover, there was no statistically difference between control and sand group in the same trait. However, eggs produced from debeaked group were insignificantly lower egg weight than other different groups. Straw group had significantly lower egg mass than other treated and control groups. Also, sand group showed insignificantly higher egg mass than those obtained in control and debeaked groups.

Maximum percentage of fertility and hatchability were obtained in eggs laid from control and debeaked groups, while the lowest fertility were obtained in eggs laid from sand and straw groups. On the other hand, the highest cloacal gland area was recorded in the debeaked males, while the lowest value was recorded in males of straw group. Generally, there were no significant differences between the control and all treated groups.

Analysis of variance revealed that no significant differences due to treatments in all egg quality parameters. However, the highest values of yolk index, internal quality unit and shell thickness were recorded in eggs laid from control group

compared to those recorded from other treated groups (Table 2).

Serum concentrations of corticosterone, testosterone and estradiol-17β

The results revealed that the highest level of male serum corticosterone was obtained in control group, while the lowest value was obtained in debeaked group (Table 3). However, females of straw group had significantly higher serum corticosterone level than the treated and control groups. Irrespective of sex, the highest level of serum corticosterone was obtained in birds of straw group, while the lowest levels were obtained in serum of debeaked and sand groups. On the other hand, the highest level of testosterone was recorded in males of straw group, while the lowest levels were recorded in serum of debeaked and sand groups. Moreover, females of straw group had significantly lower estradiol-17β than other treated and control groups.

Correlation coefficients among studied traits

The results showed that there were various relationships among studied traits, but we focused only on the most important relationships (Table 4). There were prevalent significant ($P<0.05$) negative correlation between head banging among males and each of body weight of males, hen-day egg production, fertility, hatchability, cloacal gland area and estradiol-17β. Also, between serum concentration of testosterone hormone and each of males body weight, hen-day egg production, fertility, hatchability and concentration of estradiol-17β. Also, between serum corticosterone level of females and each of hen-housed egg production, fertility and hatchability percentage.

In contrast, significant ($P<0.05$) positive correlations were found among males head banging and each of plumage deterioration, activity of birds, and total mortality rates. Also, between serum concentration of testosterone hormone and each of head banging, plumage deterioration, activity of birds, cloacal gland area, total mortality rates and serum corticosterone level of females. Also, between serum corticosterone level of females and total mortality rates.

DISCUSSION

The results of this study clearly confirmed that the aggressive pecking behavior among males of Japanese quail is one of important welfare problems in the intensive and semi-intensive of quail production. Our result are in agreement with those obtained by Wechsler and Schmid (1998), who reported that one of the important welfare problems in the quail farming is pecking behavior among males. Moreover, Gerken and Mills (1993) found that aggressive pecking behavior among males occurred in breeding groups of Japanese quail when 15 to 20 birds kept in battery cages Also, Schmid and Wechsler (1997) recorded that aggressive pecking occurred under intensive housing conditions and also in small groups of quails (8 to 9 birds) which kept in semi-natural outdoor aviaries.

In fact, this problem may be due to several reasons; aggressive behavior among males, frequency copulation behavior of males and force copulations with unreceptive females (Yang et al., 1998; Stephanie et al., 2011). Also, aggressive pecking behavior among males leads to several problems such as; injuries in different area (head, neck, eye), cannibalism, mortality and economic loss (Gerken and Mills, 1993; Wechsler and Schmid, 1998).

In this context, our results confirmed that there were significant harmful and adverse effects of aggressive pecking behavior among males on the most studied traits. Aggressive pecking behavior caused increased head banging, injured eyelids, closed eyes, lost eyes, plumage

deterioration and mortality rates, and decreased body weight of males, hen-day and housed egg production, fertility, hatchability percentage, and cloacal gland area.

These results were confirmed by correlation coefficient between aggressive pecking behavior and studied traits. The results showed significant ($P<0.05$) negative correlation between head banging and body weight of males, hen-day egg production, fertility, hatchability percentage and cloacal gland area. In contrast, significant ($P<0.05$) positive correlations were found between males head banging and plumage deterioration, and total mortality rate.

Previous results indicated that the testosterone hormone play an important role in male behavior of Japanese quail (Wingfield et al., 1990). It is already maximally elevated during the breeding season. Masaru (1986) reported that testosterone is essential for the induction of crowing and for the enhancement of locomotors activity of Japanese quail. Our results recorded that the highest level of testosterone was recorded in males of straw group, while the lowest levels were recorded in serum of debeaked and sand groups. These results indicated the role of testosterone in male aggressive behavior. In this regard, positive correlations were found between serum concentration of testosterone hormone and each of head banging, plumage deterioration, activity of birds, cloacal gland area, total mortality rates.

In this study, we attempt to reduce aggressive pecking behavior among males by two methods; the 1st one by using semi-natural environment (sand and rice straw) and the 2nd was artificial method by debeaking of males at 6 and 10 weeks of age. The results showed the opposite of the theoretical hypothesis, when using semi-natural environment to minimize aggressive pecking behavior. In contrast, using debeaking of males was improved most productive and reproductive performance compared to the control group.

Birds of sand group showed deterioration in most studied traits when compared to the control group. In this group, head banging started early (8-wks-old) and significantly increased compared to the control group. This increment of head banging resulted in increasing plumage deterioration, mortality rates and decreased male body weights, fertility, and hatchability percentage compared to control group. However, birds of sand group showed slightly improvement in egg production. Hen-day and hen-housed egg production, egg mass were insignificantly higher in sand group than in control group.

This improvement in egg production may be due to changing in the levels of adrenal and reproductive hormones. Females of sand group had insignificantly lower concentrations of corticosterone and insignificantly higher estradiol -17β than those recorded in females of control group. Hence, using sand may be reduced the stress on females which resulted from aggressive pecking behavior among males. Also, birds in straw group showed deterioration in most the studied traits when compared to control group. Aggressive pecking behavior and all injuries related to it (head banging, eyelids injures, eyes closed and eyes lost) started at earlier age than other groups. Moreover, increasing head banging among males caused significantly higher plumage deterioration, mortality rates, and significantly lower hen-housed egg production, egg mass, male body weights, fertility and hatchability percentage than those recorded in control group. This reduction in productive and reproductive performance when using straw may be due to decrease of sexual hormones and increased in anti-stress hormones. Blood analysis showed that the females of straw group had significantly higher concentrations of corticosterone and

significantly lower estradiol-17β than those recorded in females of control group. These increments of corticosterone hormone reflect the occurrence of females under stress physiology. This stress may be resulted from increasing the aggressive pecking behavior among males in this group. It is widely accepted that, corticosterone directly inhibit GnRH, LH and FSH secretion and gonadal hormones synthesis (Van Hout et al., 2010), and this is thought to be the primary route for reproductive suppression during stressful events (Hassan et al., 2015; Hanafy and Khalil 2015). Treatment of quail or chickens with corticosterone can reduce weights of the oviduct (Petitte and Etches, 1991) and ovary (Etches et al., 1984), and decrease plasma concentration of LH, progesterone and estradiol (Petitte and Etches, 1989). Also, treatment of quail with corticosterone decreased ovary and oviduct weights in female birds and reduced testes weights and sperm production in male Bobwhite birds (Cain and Lien, 1985). In free-living adult male Rufous-winged sparrows, as corticosterone rises following handling stress, circulating testosterone levels are reduced by up to 50 percent via the direct action of corticosterone on testicular hormone production (Deviche et al., 2010). Also, these results are in accordance with the recently finding of Hanafy and Khalil (2015), who found that significant negative correlation between corticosterone level and each of concentration of testosterone, cloacal gland area, foam production and semen characteristics in male Japanese quail when exposed to chronic artificial stress.

In fact, the increasing of aggressive pecking behavior increased in rice straw treatment birds is not clear exactly. May be birds consumed rice straw, which leads to an imbalance of nutritional elements and/or increased competition birds on straw place. Furthermore, rice straw is a part from natural environment, which caused increasing in locomotor activity and aggressive behavior of males. In contrast, the results revealed that debeaked group showed markedly significant reduction aggressive pecking behavior, plumage deterioration and total mortality rates. Also, significant improvement in hen-day egg production, and in males body weight was observed. Moreover, insignificant improvement was recorded in egg mass, fertility, hatchability percentage, and cloacal gland area when compared to control group.

Some of previous studies tried to minimize aggressive pecking behavior among males of Japanese quail. Wechsler and Schmid (1998) used different sex ratio and different light intensity to reduce aggressive pecking behavior. They found that neither number of males nor light intensity had a significant influence on pecking behavior among males of Japanese quail. Also, they added that for welfare reasons multi-male breeding groups of Japanese quail cannot be recommended. Also, Oliveira (2002) found that well debeaked quails had better performance and lower mortality rate and less aggressive behavior than those submitted to poor beak trimming practices. Pizzolante et al. (2007) recommended a process of beak trimming of quail at 14 or 21 days in order to improve performance and lower mortality rate.

From this study, it could be concluded that using beak trimming of males in the commercial Japanese quail farming lead to minimize aggressive pecking behavior, mortality rates and maximize productive and reproductive performance of Japanese quail breeders.

Table (1): Normal behavioral activities of male and female quails as affected by treatments

Activates	Treatment groups				*P - value*
	Control	Debeaking	Sand	Straw	
Distribution					
Front	64.01±1.71[a]	51.59±1.26[b]	49.39±1.63[b]	49.07±2.04[b]	0.000
Behind	35.98±1.71[b]	48.40±1.71[a]	50.60±1.63[a]	50.92±2.04[a]	0.000
Basic behavior					
Standing	43.78±2.18[a]	34.20±1.91[b]	47.36±2.41[a]	46.11±2.29[a]	0.000
Walking	22.78±2.63[a]	12.57±1.43[b]	22.51±2.19[a]	23.09±2.11[a]	0.001
Sitting	33.42±3.30[b]	53.21±2.33[a]	30.11±3.28[b]	30.78±3.53[b]	0.000
Additional behavior					
Drinking	7.25±1.12	8.83±0.94	6.82±1.17	9.16±1.37	0.425
Feeding	14.45±1.35	13.99±1.16	16.54±1.95	15.84±1.61	0.612
Preening	12.31±1.24	10.23±1.07	10.55±1.78	12.08±1.44	0.583

[a,b] Means within a row not sharing a common superscript differed significantly (*P<0.05*)

Table (2): Productive and reproductive traits of male and female quails as affected by treatments

Parameters	Treatment groups				*P-value*
	Control	Debeaking	Sand	Straw	
Hen-housed egg production (%)	48.59±1.48[b]	53.64±1.51[a]	51.37±1.66[ab]	33.79±1.71[c]	0.000
Hen-day egg production (%)	58.39±1.88[ab]	60.71±1.71[a]	61.04±2.15[a]	52.93±2.46[b]	0.021
Egg weight (g)	12.66 ±0.14	11.92±0.11	12.53±0.28	12.01±0.17	0.129
Egg mass/hen (g)	671.54±39.2[a]	660.54±30.2[a]	700.35±38.2[a]	578.29±33.1[b]	0.041
Fertility %	92.58±2.18[a]	92.67±1.86[a]	81.63±4.43[b]	68.29±6.32[c]	0.001
Hatchability %	63.92±4.05[a]	67.57±4.67[a]	55.21±4.26[b]	52.98±5.78[b]	0.023
Cloacal gland area (mm^2)	440.83±22.3[ab]	473.71±13.1[a]	442.62±15.3[ab]	404.36±21.2[b]	0.041
Egg shape index	79.56±0.38	79.05±0.47	79.80±0.51	79.04±0.49	0.572
Yolk index	45.76±0.38	44.95±0.46	44.32±0.65	44.99±0.41	0.223
Internal quality unit	98.16±0.39	96.83±0.56	96.99±0.54	97.16±0.58	0.263
Shell thickness (µ)	18.10±0.67	17.47±0.644	17.46±0.56	17.28±0.52	0.309

[a,b] Means within a row not sharing a common superscript differed significantly (*P<0.05*)

Table (3): Serum hormonal profiles of male and female quails as affected by treatments

Hormones	Treatment groups				*P - value*
	Control	Debeaking	Sand	Straw	
Corticosterone (ng/mL)					
Male	14.86±0.36[a]	5.41±0.75[c]	8.03±1.91[bc]	11.53±2.86[ab]	0.002
Female	7.86±1.19[b]	8.92±0.45[b]	8.33±1.14[b]	23.21±3.66[a]	0.021
Overall	11.31±0.56[b]	7.15±0.56[c]	8.17±1.54[c]	17.37±2.67[a]	0.034
Testosterone (ng/mL)	8.23±0.21[b]	6.51±0.19[c]	6.31±0.56[c]	13.46±0.64[a]	0.027
Estradiol-17β (pg/mL)	119.42±15.24[a]	120.22±13.42[a]	129.61±10.36[a]	94.37±11.25[b]	0.037

[a,b] Means within a row not sharing a common superscript differed significantly (*P<0.05*)

Table (4): Correlation coefficients among some studied traits

	PD	Act	MBW	TMR	HHEP	F%	H%	CGA	Test	MCorti	E_2	FCorti
MHB	.981**	.595*	-.749**	.717**	-.438	-.625*	-.783**	-.528	.381	.116	-.192	.469
PD	1.000	.700*	-.739**	.752**	-.505	-.604*	-.782**	-601*	.453	.279	-.229	.485
Act		1.000	-.721**	.498	-.526	-.502	-.711**	-747**	.469	.594*	-.169	.319
MBW			1.000	-.538	.561	.838**	.971**	.786**	-.413	-.079	.141	-.481
TMR				1.000	-.891**	-.785**	-.716**	-777**	.874**	.274	-.571	.909**
HHEP					1.000	.852**	.727**	.922**	-.953**	-.320	.599	-.934**
F%						1.000	.923**	.877**	-.736**	.009	.420	-.840**
H%							1.000	.874**	-.597*	-.118	.285	-.665*
CGA								1.000	.830**	-.387	.450	-.781**
Test									1.000	.465	-.580*	.901**
MCorti										1.000	-.129	.082
E_2											1.000	-.554

MHB= Male head banging, PD= Plumage deterioration, Act= Activities, MBW = Males body weight, TMR= Total mortality rates, HHEP= Hen-housed egg production, F%= Fertility %, H%= Hatchability %, CGA= Cloacal gland area, Test= Testosterone, MCorti= Male corticosterone, E_2= estradiol-17β, FCorti= Female corticosterone, *= (*P<0.05*), **= (*P<0.01*)

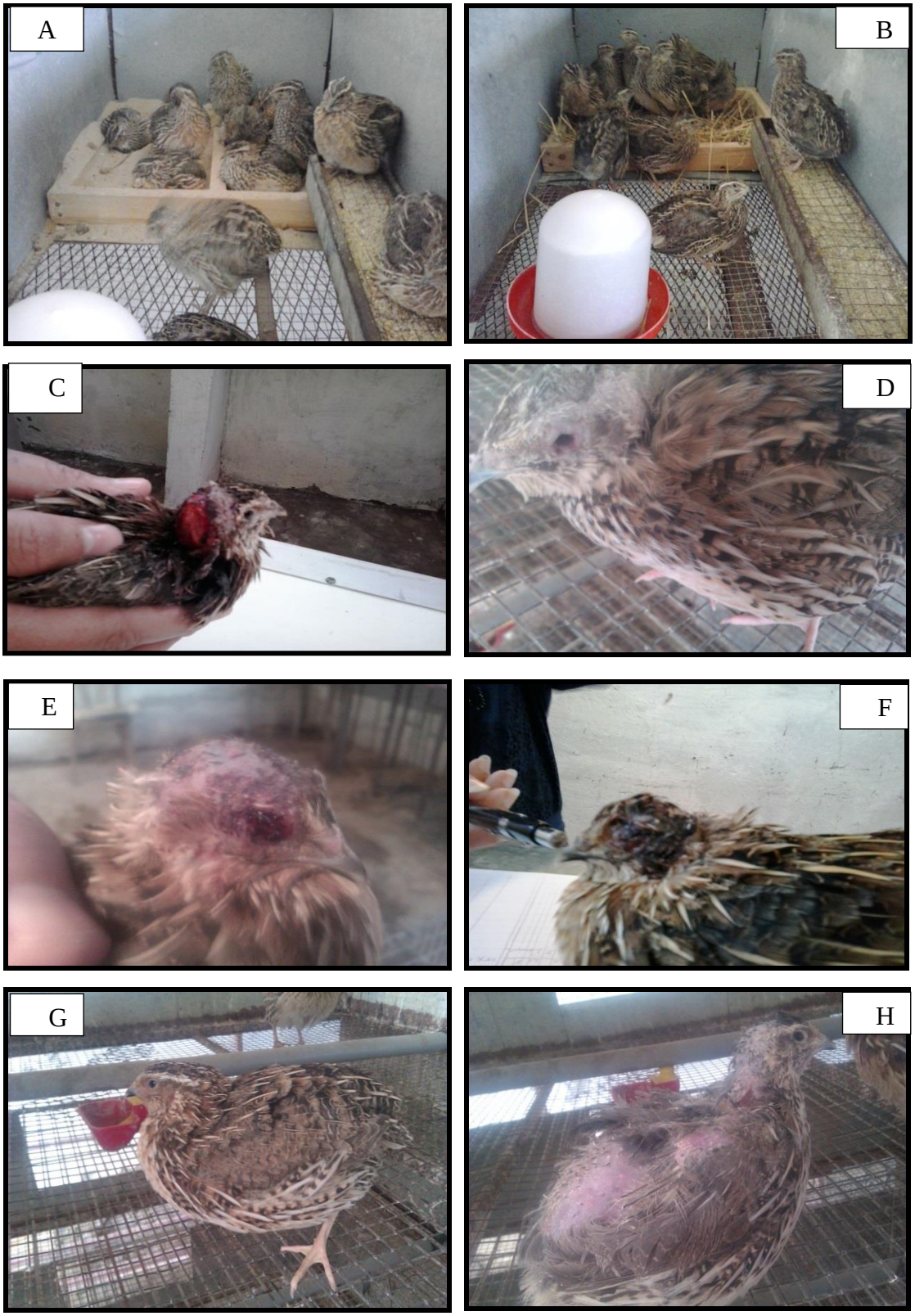

Plate 1. A) Sand group, B) Straw group, C) Head banging, D) Eyelid injures, E) Eye closed, F) Eye lost, G) Normal plumage, H) Deteriorated plumage

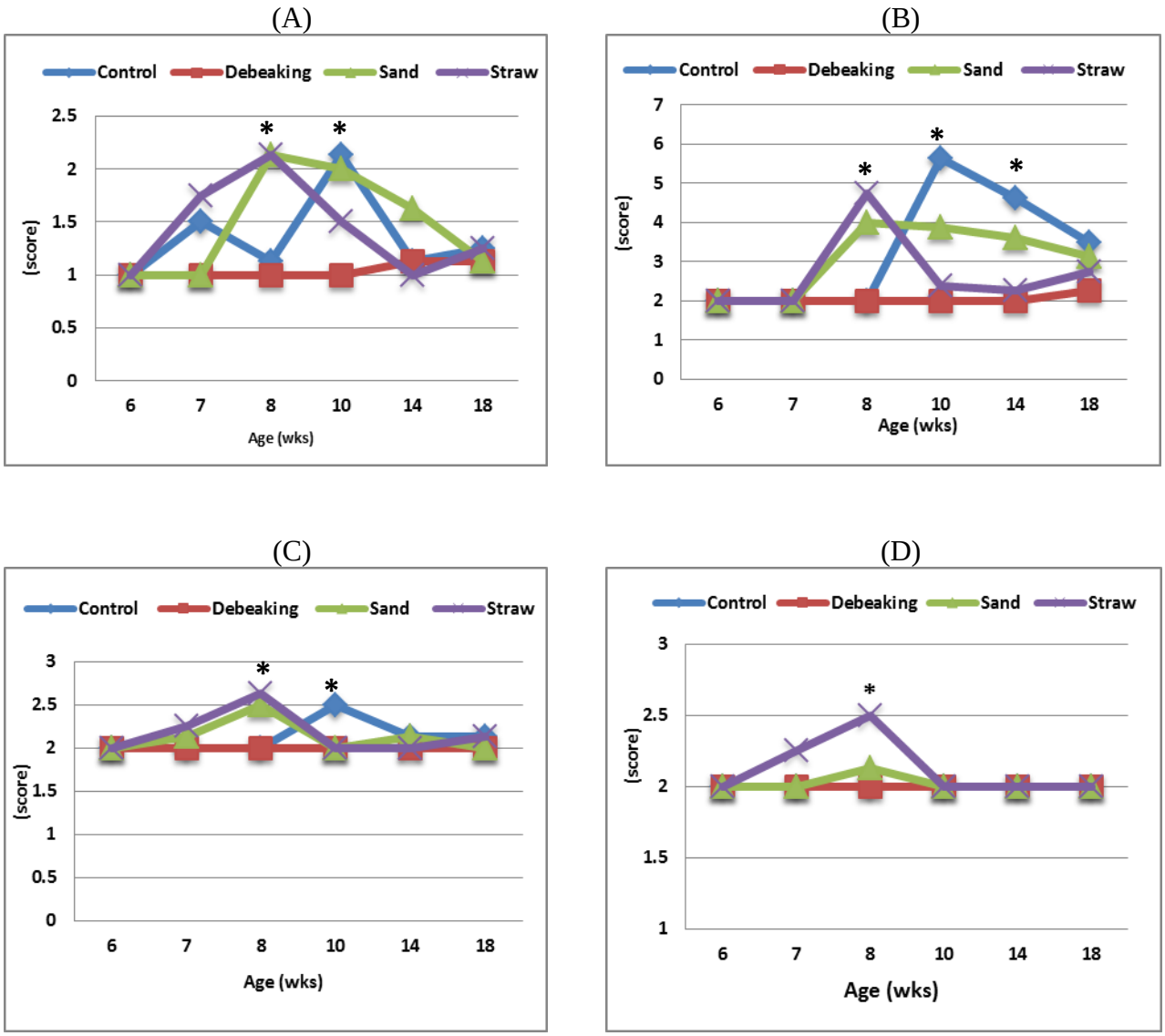

Figure 1. Effect of different treatments on aggressive pecking behavior among males; (A) Head banging, (B) Eyelids injuries, (C) Eye closed, (D) Eye lost

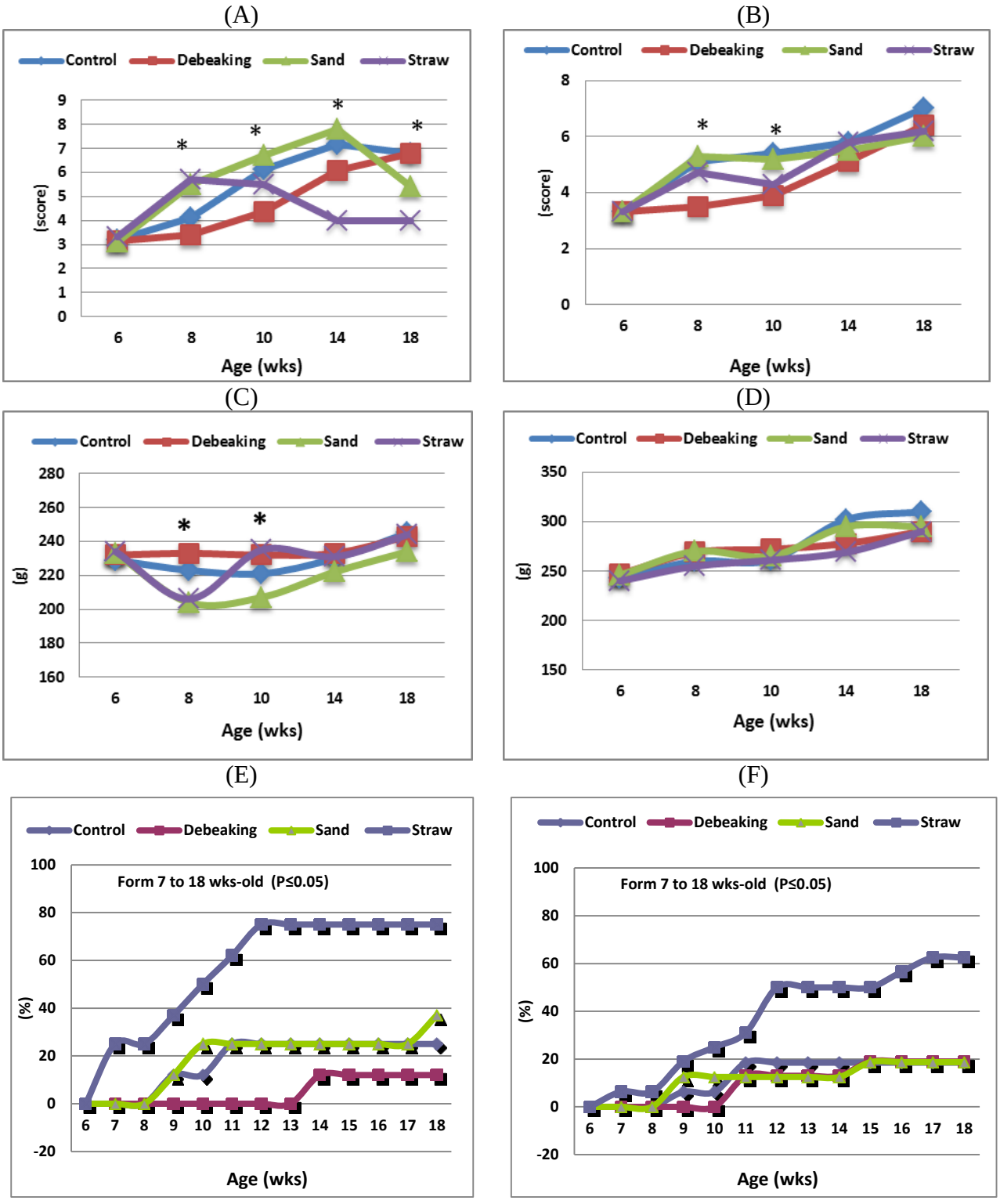

Figure 2. Effect of different treatments on some studied traits; (A) Plumage conditions of males, (B) Plumage conditions of females, (C) Body weight of males, (D) Body weight of females, (E) Mortality rates of males, (F) Mortality rates of females

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الملخص العربى

تأثير سلوك النقر بين الذكورعلى الأداء الإنتاجى والفسيولوجى للسمان اليابانى واستخدام بعض الطرق لتقليل هذا السلوك

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أجريت هذه الدراسة بمزرعة الدواجن التجريبية بكلية الزراعة، جامعة قناة السويس، محافظة، الإسماعيلية من شهر نوفمبر ٢٠١٣ الى شهر يناير ٢٠١٤. واستهدفت هذه التجربة دراسة تأثير سلوك النقر بين الذكور على الأداء الانتاجى والفسيولوجى للسمان اليابانى، وكذلك استخدام بعض الطرق كمحاولة تقليل هذا السلوك (والتى تتضمن: تقليم المنقار كطريقة صناعية واستخدام الرمل أوالقش كطريقة شبة طبيعية).

تم استخدم عدد ١٨٠ طائرا (٦٠ ذكر و ١٢٠ أنثى) من طيور السمان اليابانى عند عمر خمسة أسابيع حيث تم تقسيمهم عشوائيا الى أربعة مجاميع تجريبية (٤٥ طائر/ مجموعة: ١٥ ذكر و٣٠ أنثى)، وزعت كل مجموعة على ثلاث مكررات. حيث تم تسكين الطيور فى اقفاص (١٠٠ ×٥٠ ×٥٠ سم^{٣})، كانت أرضية الأقفاص من السلك المجلفن.

المجموعة الأولى: مجموعة المقارنة.

المجموعة الثانى: تم تقليم المنقار للذكور عند عمر ٦ و١٠ اسبوع (طريقة صناعية للحد من سلوك النقر).

المجموعة الثالثة: مجموعة الرمل. (طريقة شبه طبيعية للحد من سلوك النقر).

المجموعة الرابعة: مجموعة القش. (طريقة شبه طبيعية للحد من سلوك النقر). حيث تم وضع صندوق خشبى فى اقفاص المجوعة الثالثة والرابعة (٥٠×٤٥ ×٧سم^{٣}) فى نهاية القفص ووضع به إما رمل أو قش مقطع حسب المعاملة.

تم قياس كل من معدلات نقر الرأس، إصابات الجفون وقفل وفقد العيون، حالة الريش، الصفات السلوكيه الطبيعية، وزن الجسم، إنتاج البيض، الخصوبة والفقس، جودة البيض وبعض هرمونات الدم وكذلك معدلات النفوق لكل المجاميع التجريبيه خلال فترة الدراسة التى استمرت حتى ١٨ أسبوع من العمر.

وخلاصة هذه النتائج توضح أن:

- سلوك النقر بين الذكور لها تأثيرا سلبيا على كل الصفات المدروسة.
- استخدام البيئة شبة الطبيعية (رمل أو قش) كانت الأسوأ خاصة مجموعة القش على معظم الصفات المدروسة مقارنة بمجموعتى الضابطة وتقليم المنقار.
- أقل معدلات لقيم ضربات الرأس وإصابات الجفون وقفل وفقد العيون ومعدلات النفوق كانت فى مجموعة تقليم المنقار وعلى العكس فقد سجلت مجموعة الطيور التى تم تربيتها تحت ظروف شبه طبيعية (قش – رمل) أعلى القيم.
- هناك تحسن واضح فى معدلات إنتاج البيض وكذلك نسبتى الخصوبة والفقس لمجموعة تقليم المنقار مقارنة بباقى المجاميع التجريبية.
- أعلى تركيز لهرمون الكورتيكوستيرون وجد فى دم ذكور مجموعة الكنترول بينما كانت مجموعة تقليم المنقار الأقل تركيزا، بينما كان أعلى تركيز لهرمون التستستيرون فى دم ذكور مجموعة القش بينما كانت مجموعة تقليم المنقار الأقل تركيزا.
- أظهرت إناث مجموعة القش إرتفاعا معنويا فى مستوى هرمون الكورتيكوستيرون وانخفاضا فى مستوى هرمون الاستروجين مقارنة بباقى المجاميع التجريبية.

ونستنتج من هذه الدراسة أن إجراء عملية تقليم المنقار لذكور السمان اليابانى عند ٦و١٠ أسبوع من العمر يؤدى إلى تقليل السلوك العدوانى بين الذكور مما يقلل من معدلات النفوق فى الطيور ويساعد على تحسين الأداء الإنتاجى والتناسلى والفسيولوجى للسمان اليابانى.