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(Original Article)

Impact of Partial Uropygialection at Different Ages on Carcass Criteria and Some Blood Parameters for Broilers

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Abstract

This study aimed to evaluate the effect of partial uropygialectomy (PU) on carcass criteria and some blood parameters of broilers (ross-308). Two hundred, day-old, broilers were randomly distributed into five experimental groups of 40 chicks in four replicates, 10 chicks each. First group used as control (without PU) while, PU was applied on chicks in the 2nd (T1), 3rd (T2), 4th (T3) and 5th (T4) groups at 14, 17, 21 and 24 days of age, respectively. On the last day of the experiment carcass characteristics and some blood parameters were studied. Results indicated that the partial uropygialectomy did not have significant effects on percentages of dressed carcass, breast, thigh, drumsticks, back, wings and spleen. The highest abdominal fat% ($P<0.05$) was recorded for T1 group. Chemical composition of meat was not significantly affected by PU at different ages. Studied blood parameters were not significantly affected by PU, except plasma albumin level which significantly ($P<0.05$) increased in T3, and cholesterol level which was significantly higher in T4 compared with other groups. From the results of this study, it could be concluded that partial uropygialectomy at 14 days of age for broiler chickens achieved the highest performance and carcass traits.

Keywords: *Broilers, Uropygialectomy, Blood parameters, Carcass traits.*

Introduction

Uropygial gland in birds has many names like preen gland, oil gland or oil sack, rump gland, and tail gland (Sadoon and Ilaa, 2011). Because of its location at the base of the tail, dorsally between the fourth caudal vertebra and the pygostyle, it is known as the uropygial gland (Johnston, 1988). The uropygial gland consists of two lobes, each lobe had a duct which is joined together by isthmus, it is holocrine gland enclosed in a connective tissue capsule made up of glandular acini that deposit their oil secretion into a common collecting duct ending in two pores (Sadoon and Ilaa, 2011). The function of uropygial glands (preen glands) has been subject to controversial debates, there are various recognized uses for gland secretions, such as giving the feather coat water-repellent qualities and keeping it flexible. Additionally, it is suggested to be connected to pheromone synthesis, plumage cleanliness regulation, thermal insulation, and predator defense (Vincze *et al*., 2013). According to Sandilands *et*

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al., (2004), the preen gland is the organ responsible for producing preen oil, a waxy substance consisting of a mixture of fatty acids and esters, which is distributed onto the plumage during preening. Tuttle *et al*., (2014) stated that secretion of uropygial gland play an important role in feather maintenance, water proofing feather, and may be associated with intraspecific communication and defense against the microbial. In poultry, secretions of uropygial gland have a role in physiology and behavior as their composition is affected by age and season, as well as by whether or not a bird has been feather pecked (Sandilands *et al*., 2004). Shafiian and Mobini, (2014) reported that oil gland secretion contains fatty acids, antibacterial agents and vitamin D precursors.

Regarding uropygialectomy (UP), Naji, (2007) revealed that UP application is used as improvement method to enhance the productive performance of broiler. Furthermore, the previous researchers recommended to apply the uropygialectomy at the earlier ages (first 6 weeks) of chicken age to give the body sufficient time to grow up and developed sexual activity (Sawad, 2006). Also, Naji *et al*., (2019) showed that uropygialectomy which was done at the second day of age in Japanese Quails cause significant ($P<0.05$) improvement in productive performance. Uropygialectomy led to an enhancement in activity and the change in body measurements (Abdul-Hassan, 2005).

The purpose of this study was to evaluate the effects applying partial uropygialectomy for broiler chickens on carcass criteria and some blood parameters.

Materials and Methods

The present study was carried out at Poultry Research Farm, Faculty of Agriculture, Assiut University, Egypt, to study the effect of partial ablation of preen gland of broilers on carcass characteristics and some blood parameters.

Birds and managements

Two hundred, one-day old broilers (Ross-308) were selected and randomly placed into equal five experimental groups of 40 chicks. Each group contains four replicates of 10 chicks each. The first group saved as control (without PU) while, partial ablation of preen gland was applied on chicks in the 2nd (T1), 3rd (T2), 4th (T3) and 5th (T4) groups at 14, 17, 21 and 24 days of age, respectively.

All birds were reared at the same space in floor pens (Length = 200cm, Width= 75cm, Height= 100cm per replicate), using the straw as litter at 5cm deepness, in opened house under similar hygienic and normal environmental conditions with natural ventilation. Feed and water were offered to the bird's ad-libitum during the whole experimental period. Temperature was set initially at 34oC, then gradually reduced at a rate of 2-4oC weekly till reach 24oC at the fourth week, afterword, at the 5th week, the temperature was kept at 24oC. Humidity was kept at 60-70% in the first week, then at about 50-60% till end of the experiment. Chicks were vaccinated according to the vaccination program recommended for broilers against several diseases. The composition and analysis of the starter, grower and finisher diets are presented in Table (1).

Table 1. The composition and proximate chemical analysis of the starter, grower and finisher diets

Ingredients	Starter (%)	Grower (%)	Finisher (%)
Yellow corn grains	50.55	57.23	62.59
Corn Gluten (60% CP)	5.20	4.90	4.60
Soybean meal (44% CP)	36	29.79	24.70
Limestone ($CaCO_3$)	1.35	1.10	1.08
Di-phosphate calcium	1.90	1.67	1.55
Salt (NaCL)	0.40	0.40	0.40
Soya oil	3.50	4.00	4.25
Vitamins minerals mixture[1]	0.30	0.30	0.30
DL – Methionin	0.31	0.25	0.21
Lysine-HCL	0.32	0.25	0.23
Total	100	100	100
Calculated analysis[2]			
Metabolizable energy kcal/kg diet	3046	3157	3238
Crude protein, %	23.01	21.03	19.04
Crude fiber, %	3.86	3.45	3.30
Crude fat, %	5.50	5.80	5.80
Calcium, %	1.07	0.90	0.85
Available phosphorus, %	0.51	0.45	0.42
Methionine & Cysteine %	0.69	0.60	0.55
Lysine %	1.45	1.25	1.10

[1]Each 3 Kg of premix contains: Vitamins: A: 12000000 IU; Vitamins; D3 2000000 IU; E: 10000 mg; K3: 2000 mg; B1:1000 mg; B2: 5000 mg; B6:1500 mg; B12: 10 mg; Biotin: 50 mg; Choline chloride: 250000 mg; Pantothenic acid: 10000 mg; Nicotinic acid: 30000 mg; Folic acid: 1000 mg; Minerals: Mn: 60000 mg; Zn: 50000 mg; Fe: 30000 mg; Cu: 10000 mg; I: 1000 mg; Se: 100 mg and Co: 100 mg.

[2]Calculated according to NRC (1994).

Operation of uropygialectomy

Partial uropygialectomy was applied as follows: the bird was restraint and the uropygial gland was partially removed (half lobes, half isthmus and papillae) by scalpel which was sterilized by 70% alcohol before use and then after removing the gland, the incision area was sterilized with iodine.

Studied traits

Carcass Criteria

At 6 weeks of age, 4 birds were randomly taken from each treatment within the average body weight of the group, birds weighted and slaughtered. After full bleeding, birds were scaled, and then feather were picked by hand and eviscerated. Dressed carcass percentage was calculated and carcass parts, giblets (liver, heart and gizzard) and spleen were weighed and expressed relatively to live body weight. Also, the abdominal fat was separated, weighed and expressed as a percentage of live body weight. The moisture, crude protein, ether extract and ash contents were determined according to the procedure described by AOAC (1984).

Blood constituents

During slaughter, two blood samples were collected from each bird in heparinized and un-heparinized tubes, thereafter, serum was separated. The following parameters were determined in serum:

Total protein according to Doumas *et al*., (1981), serum albumin according to Doumas *et al*., (1972), serum globulin by subtracting albumin values from total protein, serum glucose according to Trinder, (1969), serum cholesterol according to Watson, (1960), Serum aspartate aminotransferase (AST) and alanine transaminase (ALT) according to Reitman and Frankel, (1957), serum alkaline phosphatase (ALP) activity according to (Belfield and Goldberg, 1971). A circular reader was used to determine the PCV% measurements (Daice and Lewis, 1991).

Statistical analysis

The obtained data were statistically analyzed by ANOVA using General Liner Models (GLM) procedure of SAS software SAS procedure (Version 9.2, 2009). Duncan's multiple range test (Duncan, 1955) was used to determine differences among means when treatment effects were significant at level ($P<0.05$). The mathematical model used was: $Yik = \mu + Ti + eik$, Where: Yik = The individual observation, μ=The overall mean, Ti = Treatment effect, (i = 1,2,3,4 and 5) and eik = The experimental error.

Results and Discussion

Carcass characteristics

Carcass quantity

Data in Table (2) reveal that partial ablation of preen gland did not have significant effects on percentages of dressed carcass, carcass parts (breast, thigh, drumstick, back and wings), liver, heart and spleen. The results proved that the highest value ($P<0.05$) of gizzard% was obtained in T4 as compared with the other groups, while the lowest value ($P<0.05$) was recorded for T1 group. Data reveal that there were no significant differences in gizzard% among T1, T2, T3 and C groups, also, among T2, T3 and T4 groups. The highest value of abdominal fat% ($P<0.05$) was observed in T1 group as compared with the other groups, while C and T2 groups had the lowest ($P<0.05$) values. Data stated that the differences in abdominal fat% were not significant among T1, T3 and T4 groups, also, among T2, T3 and T4 groups.

Our findings are in agreement with the results obtained by Naji *et al*., (2019) showed that the weights of breast, thigh, drumsticks and neck were not significantly affected by uropygialctomy at second day of age for Japanese quails. As well as Hethm *et al*, (2007) revealed that there were no significant differences in relative weights of edible internal organs, thigh and neck by surgical removal of the uropygical gland at the age of 7 days.

Table 2. Effect of partial ablation of preen gland on carcass traits and abdominal fat percentage

Traits (%)	Treatments				
	(C)	(T1)	(T2)	(T3)	(T4)
Dressed carcass, (including giblets)	78.21± 0.92	77.35±1.28	78.59±2.90	76.50±0.74	77.53±0.34
Breast	34.01±1.71	37.19±0.93	34.78±0.88	34.86±0.31	35.96±1.51
Drumstick	10.53±0.67	11.69±0.88	10.94±0.25	12.13±0.44	11.24±0.52
Thigh	18.12± 0.80	18.44±1.36	17.64±0.86	17.99±0.48	16.89±0.17
Back	17.91±0.84	17.74±0.76	17.23±0.33	17.17±0.89	17.92±0.59
Wings	10.21±0.37	9.84±0.39	9.22±0.16	10.19±0.30	9.65±0.40
Spleen	0.12±0.02	0.10±0.01	0.10±0.02	0.14±0.03	0.12±0.01
Heart	0.40±0.03	0.380± 00	0.37±0.03	0.41±0.03	0.40±0.02
Liver	2.18±0.18	2.22±0.20	2.14±0.19	2.35±0.20	2.26±0.08
Gizzard	1.29 ± 0.10^{ab}	1.06 ± 0.04^{b}	1.15 ± 0.04^{ab}	1.24 ± 0.08^{ab}	1.41 ± 0.14^{a}
Abdominal fat	2.05 ± 0.17^{b}	3.04 ± 0.19^{a}	2.22 ± 0.15^{b}	2.51 ± 0.12^{ab}	2.54 ± 0.24^{ab}

a and b: Means with different superscripts in the columns are significantly different ($P \leq 0.05$). C= Control (without Partial Uropygialectomy operation), T1= PU was removed at 14 days of age, T2 = PU was removed at 17 days of age, T3= PU was removed at 21 days of age and T4= PU was removed at 24 days of age

The present study reported that uropygialctomy did not have significant effects on chemical composition of meat for broilers (Moisture, protein, fat and ash percentages).

Table 3. Effect of partial ablation of preen gland on carcass quality (chemical composition)

Chemical Composition (%)	Treatments				
	(C)	(T1)	(T2)	(T3)	(T4)
Moisture	77.56±0.24	77.50±0.22	77.47±0.25	77.29±0.18	77.14±0.15
Protein	23.40±0.48	22.71±0.55	23.35±0.52	22.60±0.59	22.87±0.50
Fat	1.94±0.12	2.13±0.08	1.82±0.09	1.96±0.12	1.79±0.16
Ash	1.68±0.14	1.73±0.14	1.55±0.09	1.72±0.13	1.54±0.08

C= Control (without Partial Uropygialectomy operation), T1= PU was removed at 14 days of age, T2 = PU was removed at 17 days of age, T3= PU was removed at 21 days of age and T4= PU was removed at 24 days of age.

Blood parameters

Results of this experiment indicated that the highest ($P<0.05$) value of plasma albumin was observed in T3 group, followed by T4 group, while the lowest values ($P<0.05$) noted in T1, T2 and C groups. Data showed that the differences in albumin level were not significant among T1, T2, T4 and C groups, also, between T3 and T4 treatments.

Our observations revealed that plasma cholesterol level was significantly ($P<0.05$) higher in T4 group, followed by T1, T2 and C groups, while the lowest

value obtained in T3 treatment. However, data proved that there were no significant differences in cholesterol level among T1, T2, T3 and C groups, also, among T1, T2 and T4 groups.

On the other hand, plasma levels of total protein, globulin, glucose, triglyceride, ALT, AST, ALP and PCV% were not significantly affected by partial ablation of preen gland at different ages.

Our findings are in harmony with those of Montalti *et al*., (2006) who reported that serum levels of cholesterol, total lipids and calcium were not significantly affected by partial ablation of preen gland after 32-120 days for the rock pigeon.

Table 4. Effect of partial ablation of preen gland on some blood parameters

Plasma Constituents	Treatments				
	(C)	(T1)	(T2)	(T3)	(T4)
Total Proteins (g/dl)	4.65±0.05	4.53±0.05	4.70±0.06	4.63±0.10	4.65±0.10
Albumin (g/dl)	1.63±0.06^{b}	1.70±0.09^{b}	1.70±0.06^{b}	1.90±0.04^{a}	1.78±0.03^{ab}
Globulin (g/dl)	3.03±0.09	2.83±0.12	3.00±0.08	2.73±0.13	2.88±0.08
Glucose (mg/dl)	186.40±6.78	208.20±11.73	219.35±12.79	191.85±7.15	212.82±14.37
Cholesterol (mg/dl)	165.70±2.54^{ab}	162.06±1.42^{ab}	166.81±1.93^{ab}	160.98±2.00^{b}	168.15±1.69^{a}
Triglyceride (mg/dl)	126.97±5.01	130.30±0.79	123.50±5.47	124.93±5.25	130.30±3.33
PCV %	29.00±1.00	30.00±1.00	28.00±1.00	30.00±1.00	30.00±1.00
ALT (U/L)	11.17±0.75	11.44±0.51	12.30±0.34	11.06±0.47	38.52±0.80
AST (U/L)	35.16±1.51	36.25±0.99	35.13±0.85	11.76±0.55	36.24±1.07
ALP (U/L)	236.75±2.48	236.85±3.78	237.68±3.20	235.33±3.37	240.50±0.78

a and b: Means with different superscripts in the columns are significantly different ($P \leq 0.05$), C= Control (without Partial Uropygialectomy operation), T1= PU was removed at 14 days of age, T2 = PU was removed at 17 days of age, T3= PU was removed at 21 days of age, T4= PU was removed at 24 days of age.

Conclusion

From the present results, it could be stated that the removal of preen gland at an early age, especially at 14 days of age achieved the highest carcass traits and lowest abdominal fat% in broiler chickens.

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تأثير استئصال الغدة الزيتية جزئياً في أعمار مختلفة على خصائص الذبيحة وبعض قياسات الدم لدجاج التسمين

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الملخص

هدفت هذه الدراسة إلى تقييم تأثير استئصال الغدة الزيتية الجزئي (PU) على خصائص الذبيحة وبعض قياسات الدم لدجاج التسمين (Ross-308). تم توزيع 200 كتكوت تسمين، عمر يوم واحد، بشكل عشوائي على خمس مجموعات تجريبية مكونة من 40 كتكوت، في أربع مكررات، كل منها 10 كتكوت. تم استخدام المجموعة الأولى كمجموعة مقارنة تحكم (بدون استئصال) بينما تم تطبيق استئصال الغدة الزيتية الجزئي على الكتاكيت في المجموعات الثانية (T1) والثالثة (T2) والرابعة (T3) والخامسة (T4) في عمر 14، 17، 21، 24 يومًا، على التوالي. في اليوم الأخير من التجربة تمت دراسة خصائص الذبيحة وبعض مقاييس الدم. أشارت النتائج إلى أن استئصال الغدة الزيتية الجزئي لم يكن له تأثير معنوي على النسب المئوية للذبيحة والصدر والفخذ والدبوس والظهر والأجنحة والطحال. ولوحظت أعلى نسبة دهون في البطن ($P < 0.05$) في مجموعة T1 مقارنة بالمجموعات الأخرى. لم يتأثر التركيب الكيميائي للحوم معنويا باستئصال الغدة الزيتية الجزئي في مختلف الأعمار. لم تتأثر قياسات الدم المدروسة معنويا بعملية الاستئصال، باستثناء مستوى الألبومين في البلازما الذي زاد معنويا ($P < 0.05$) في T3 ومستوى الكوليسترول الذي كان أعلى معنويا في T4 مقارنة بالمجموعات الأخرى. من ملاحظاتنا في هذه الدراسة، يمكننا أن نستنتج أن استئصال الغدة الزيتية الجزئي في الأعمار المبكرة وبالأخص في عمر 14 يومًا لدجاج اللحم حقق أعلى صفات للذبيحة مع انخفاض نسبة الدهون.