The off feeding intervals effect on some performance traits of broilers

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Summary

This study was conducted to evaluate the effect of feed restricted (off-feeding intervals) on feed intake, water intake, body weight gain, growth rate, feed conversion ratio, mortality, and dressing percentage of broilers. Two hundred fourty, one day old unsexed, (Ross 308) broiler chicks were randomly distributed into four treatment groups. Each group included three replicates each one had 20 birds. Those assigned as; Control group (T1): birds were fed *ad libtium*, T2 group feed removed from 8 Am. to 4 Pm., T3 group feed removed from 4 Pm. to 8 Am., T4 group feed removed 8 Am. to 8Am. (skip-a day) all birds were allowed to access feed for above intervals for 8-21 days of age, and re-full fed for the remaining of experiment period 42 days. The results indicated that feed restriction system did significantly ($P<0.05$) affect live body weight, body weight gain, and feed conversion ratio on starter diet period. Feed restriction significantly $P<0.05$ reduced feed consumption accompanied with water consumption positively correlated, decreases mortality in restriction period and at marketing, and increase dressing percentage, improved characteristics of carcasses at marketing age, the compensatory growth may be appeared after re-full free feeding for restricted groups to reach a close the market weight as control group., that was indicated by an increase in growth rate post feed restriction period especially at week (6^{th}) as compared with the control group.

Keywords: Off feeding, Broilers, Feed intake, Compensatory growth.

Introduction

Poultry production can play an important role in poverty alleviation and in the supply of quality protein to rural people (1). The high demand for chickens meat, low capital input required, early market age, rapid return over invested capital and the small space required for poultry production have increased awareness that chicken farming is a profitable venture in the ever, high fat deposition in broiler does affect the industry(2). Excessive fat is one of the main problems faced by the broilers industry nowadays, since it not only reduces carcass yield and feed efficiency, but also causes a rejection of the meat by the consumers and causes difficulties in processing (3). Broilers meat is an important source of high quality protein, it is easily digested and contains all essential amino acids. It is also an excellent source of vitamin A, thiamin, riboflavin and niacin (4). Feed restriction has been adopted in broiler production to avoid rapid growth rate (5). In addition, feed restriction in the early stage is beneficial for improving the feed efficiency and decreasing the rearing cost (6). Although early feed restriction reduces growth performance, compensatory growth in the re-full free feeding period will be attained to accelerate chick's growth to catch the market weight of birds (7). Some studies have shown that feed restriction could decrease fat content and increase protein deposition in carcasses, thus resulting in the improved carcass composition (8). Plavnik *et al.*, (9) reported that the increase in growth rate of modern chickens has been associated with an increase fat deposition. This problem most commonly occurs in broilers those are fed *ad-libitum* (10). The high growth rate which results in stress on those birds can result in metabolic diseases and skeletal disorders that lead to economic losses due to reduced birds performance, high mortality rates and carcass condemnation at slaughter houses (11). Jones and Farrell, (12) reported that during the period of feed restriction, growth rate is slower than that of birds fed *ad-libtium*, but when access to feed is again unrestricted, the previously-restricted birds exhibit an accelerated rate of weight gain. When feed restriction is severe, compensatory growth is not sufficient to

'catch- up' to market weight (13). The previously restricted birds apparently utilize feed more efficiently following the period of restricted feeding because their overall feed intake and feed conversion ratio are lower than those of full fed birds (14). The aim of the present study focused on growth characteristics of chicks subjected to a different treated off feeding intervals those affects broilers performance.

Materials and Methods

This experiment was carried out at poultry farm College of Veterinary Medicine, University of Baghdad, Iraq, which lasted for 42 days from (20 Feb. 2012 up to 1st April 2012), using two hundred forty one day old unsexed (Rose) chicks, which are provided by a commercial private sector hatchery (AL-Karma) at AL-Fallujah town.

In pre-treatment period house was fully cleaned from manure offal and wastes of a previous batch, and carefully washed by a mixture of water and disinfectant using a strong pump water, after was left to dry and kept wood shaving litter followed by a fumigation with formaldehyde gas produced from reaction of these chemical substances (formalin 35ml + pot. Permanganate 17.5gm) for full disinfection, then left for 3-7 days.

Windows and air-vacuums (exhausts fan) were opened for good ventilation in broiler house. Chicks were reared for 4 weeks using gases brooders, and reared on clean and good quality wood shaving litter as bedding material with approximately 10 cm depth. Waterers and feeders were thoroughly washed and disinfected, all windows and air vacuums were checked for a good ventilation, house was provided with a continuous lighting, thermometers are hanged for checking and fixing the optimal temperature for chicks during the experimental period, hygrometers were installed for humidity measurement, all electrics required in the house including heaters were checked, and (spare generator) was supplied for emergency cases. All biosecurity programs for house and farm were applied.

The experimental period extended for 42 days. When arrival of chicks by means of vehicles from hatchery ,chicks were weighted and averaged with initial weight 40-45 grams for each; chicks were sprayed with Newcastle disease (ND) vaccine type (B_1) strain , and allowed to drink sugar solution (50gm sugar in each liter of drink water) for (12) hr. chicks were under supervision in different aspects (such as: perfect temperature ,lighting ,ventilation ….etc).

Chicks were randomly distributed at the beginning of the second week into four treatment groups T1, T2, T3 and T4 each group contained 60 chicks with three replicates of [(1.25)×(1.25) m^2] pen surface area for each (20) chicks, and housed in a conventional broiler house with a galvanized wire netting walls partitioned into 12 pen. As in the following underlined:-

Chicks were assigned into four groups feeding treatments, 8-21 days of age, first group is control (T1): *ad-libitum* (full fed) daily along the entire 42 days of the experimental period. Second group (T2) off-feeding for 8 hr. from (8am-16pm) daily, up to at age of 21 days and re-full feeding for the remaining of the 42 days of experimental period.

Third group (T3) off- feeding for (16) hr. (16pm-8am), daily, up to at age of 21 days and re-full feeding for the remaining of the 42 days of experimental period. Fourth group (T4) off-feeding for 24 hr. (8am-8am) every other day (skip-a day) up to age of 21 days, and re-full feeding for the remaining of the 42 days of experimental period.

All treated chicks groups were received the same basal diets (starter and finisher) (23.07% CP and 3003 Kcal/Kg feed ME) and (21.04% CP and 3197.80 Kcal/ Kg feed ME) during the experimental period for 0-3 and 4-6 weeks respectively (NRC, 1994)-(Table, 1).

All chicks received continuous clean water along with experimental period of 42 day. Chicks, feed, water were weekly weighted using a sensitive balance for weight gain, feed intake estimation and in turn feed efficiency ratio and growth rate were calculation, mortality rate, also estimated from the number of dead birds daily recorded. Firstly all treated groups chicks received the same basal diets for the first week, then groups

(T2,T3 and T4) chicks have off fed just for 8,16 and 24 hr. daily for second and third weeks of an experiment respectively, then all treated groups chicks were re-full free fed normal diet as in control group (T1) for the remaining last 3 weeks of the experimental period cone-shaped feeders, water was provided by automatic bell-shaped waterier.

All chicks were fed a crumbled starter diets for the first three weeks from (day one - 21), and on day 22 a finishing pelted diet were fed up to the end of experimental period, all groups were fed once daily using a hanging.

Vaccination and protection and hygienic programs against diseases were used during the experimental period.

Table, 1: Diets composition that used in the study and calculated chemical analysis for feedstuffs.

Feedstuffs	Starter (%)	Finisher (%)
Yellow corn	38	46
Soya been meal (45% CP)	30	23
Wheat	15	18
Protein concentrate **	10	10
Oil	2	2
CaCo3	0.7	0.7
Na Cl	0.3	0.3
Total	100	100
Crud protein (CP)	23.07	21.04
Metabolizable energy(ME)	3008 Kcal/Kg feed	319.80 Kcal/Kg feed
Calorie/Protein Ratio (C/P)	130.38 :1	151.98 :1

The chemical composition value of the feedstuffs included in the above diets composition was calculated with the chemical composition according to (NRC ,1994) (15). **Each(Kg) of protein concentrate contain:- (43% CP, 2200Kcal ME), 8%Fat, 3%CF, 6%Ca, 3%P, 3%Lysine, 2%Methionine, 2.5%Cystin+Methionine, 1.5%Na , 1.7%Cl, 50mg Vit.E , 130000IUVit. D_3, 30mgVit.K, 75mgVit.B_1, 120mgVit.B_2, 60mg niacin, 400mg pantothenic acid, 200mg Vit.B_6, 15mg Vit.B_{12}, 1500mg folic acid, 100mg Biotin, 500mgVit.C, 450mg Fe, 70mg Cu,600mg Zn, 5mg I2, 1mg Co, 1mg Se. (Provemini Company for rations concentrates industry / Jordan).

Data were analyzed by using one way analysis of variance(ANOVA) to study the effect of different treatments in the studied traits using complete randomized design (CRD), significant differences were compared between means using (Duncan test) with utilization of computer and prepared program SAS(2000) (16).

Results and Discussion

All birds of restricted feeding groups (T2, T3 and T4) revealed significant (P<0.05) decrease in the mean of feed intake during the (2^{nd} and 3^{rd}) weeks of the experimental period as compared with T1 (Table,2). Generally total feed intake of treated birds groups showed a significant (P<0.05) decrease in comparison with the T1 these results are in agreement with researchers (17 -20) who indicated that early feed restriction causes a significant (P<0.05) decrease in total feed intake.

Table ,2 :Effect off feed intervals on mean SE± of weekly feed intake (g) of broilers.

Treat	1wk	2wk	3wk	4wk	5wk	6wk	Total
T1	92.23±2.57 A	353.33±8.9 a	528.85±8.27 a	993.10±25.53 a	1061.96±55.2 a	1395.13±17.6 a	4424.60±24.5 a
T2	86.56±1.31 A	328.33±8.9 b	481.67±21.5 b	937.76±57.04 b	843.56±73.34 c	1323.27±24.7 b	4001.15±36.7 b
T3	88.33±1.01 A	273.33±8.9 c	453.33±6.76 c	930.95±13.17 b	883.81±106.6 b	1324.29±11.4 b	3954.04±30.6 c
T4	91.66±0.38 A	243.66±8.5 d	391.49±12.7 d	905.80±30.72 c	887.03±121.1 b	1171.83±16.2 c	3691.47± 31.6 b

Mean with different subscript of with small letters vertically differ significant (P<0.05).

All chicks were allowed to access water continuously along with experimental period. (Table, 3) showed the mean of water intake for (T2,T3 and T4) and (T1) during (2^{nd} and

3rd) weeks of the experimental period., and revealed a significant (P<0.05) decrease in water intake of treated groups as compared with (T1). As it is known water is required for feed swallowing since birds usually drink water directly after feeding, and water is necessary for many vital activities such as (feed swallowing, digestion, absorption and feed metabolism) so any decrease in feed intake (Table, 2) is reflected on water intake, and that it appeared a decrease in water intake as a result of lowered feed intake is accompanied with time of feed restriction. Also water intake is affected with many factors, such as age, environmental condition, diet constituents, although it reduce per unit of body weight., so drinking behavior is closely associated with feed intake, and so most factors affecting feed intake will indirectly influence water intake, at moderate temperatures, birds will consume almost twice as much water by weight as they eat as feed (21).

Table, 3: Effect off feed intervals on mean SE± of water consumption (milliter) for (2nd and 3rd) weeks of broilers.

Treatments	periods		Total consumption
	2nd week	3rd week	
T1	349.3 ± 22 a	466.1 ± 10 a	815.4 ± 21 a
T2	285.6 ± 10 b	365.4 ± 32 b	651.0 ± 32 b
T3	233.5 ± 20 c	346.5 ± 21 bc	580.0 ± 34 c
T4	227.5 ± 10 c	301.0 ± 19 cd	528.5 ± 26 d

Mean with different subscript small letter vertically differ significant (P<0.05).

Table, 4 shows that means of weekly gain for all treated groups during six weeks of the experimental period, and showed a highly significant differences (P<0.05) in weekly gain significant differences between treated groups and (T1). This decrease in weekly gain for treated groups for above two weeks may be due to limiting time of feed amounts which in turn affects the growth and gain, at (4th) week of birds age table showed decrease in weekly gain for treated groups may be due to extension of (2nd and 3rd) weeks decrease in weekly gain, and unable of birds to catch up and recover growth, were as at age of (5th and 6th) weeks, birds showed an improvement in comparison with T1.

This improvement may be attributed to re-full free feeding of birds. Which is positively reflected on increasing feed intake hyperphagialy, and this led to a growth improvement mainly in term compensatory growth phenomena. Many researchers, (22 and 18) indicated that the gains in early feeding restricted treatments were faster and higher than that control group after restriction period. The results of (23 and 24) emphasized that hyperphagial phenomena in feeding after end of the restriction period partially contributed in occurring compensatory growth. It's noticed that feed intake improved after re-full free feeding of chicks post restriction period and had played an important role in occurring compensatory growth. The above improvement in weekly gain for treated groups mainly for the (5th and 6th) weeks is not significant as compared with the control group. However, the total weekly gain for the experimental period had not recorded a significant variations between treated groups and T1. These results are in agreement with (18 and 20) who indicated the absence of significant differences in total weekly gain between early restricted feeding and the (T1).

Table, 4: Effect of feed restriction on mean SE± and weekly gain (g) of broilers.

Treat	1 wk	2 wk	3 wk	4 wk	5 wk	6 wk	Total
T1	72.31±0.6a	245.63±0.3a	351.12±0.4a	668.78±2.40a	544.60±1.1b	617.33±4.1c	409.64±0.6a
T2	69.16±0.8a	233.80±0.6b	227.60±0.6d	614.32±2.32b	446.32±2.8d	645.47±1.0b	381.7±0.5bc
T3	72.80±0.6a	217.98±3.7c	333.27±4.9b	585.5±2.28bc	502.11±3.2c	686.14±3.2a	392.63±1.1b
T4	72.52±0.3a	185.22±1.7d	269.99±2.8c	559.18±1.96c	601.33±3.1a	610.33±4.1c	358.89±0.3c

Mean with different subscript small letter vertically differ significant (P<0.05).

(Table, 5) appears the growth rate (GR) of different groups dose not significantly differ during the first week of the experimental period, while during the (2^{nd} and 3^{rd}) weeks of age, the treated birds groups revealed rather lower (GR) as compared with (T1), as with re-full free fed of birds, treated groups showed an improvement in (GR) in comparison with (T1), specially (T4) recorded a highest value of (GR) among other treated groups and T1 (69.22, 37.12, 32.38) for (4^{th},5^{th},6^{th}) weeks respectively, these may refer to the compensatory growth that had happened post restriction period., also they (Table, 5) revealed a significant (P< 0.05) increase in (GR) for the (T3) as compared with T2 and T1 for the (5^{th} and 6^{th}) weeks of age, these results are in agreement with (25) who indicated that the most noticeable difference in growth was that up to (14) days of age, when restricted birds had reduced in their growth (13, 17, and 19%), respectively. These findings, may be attributed to the fact that proportionally more nutrients are used for growth than for maintenance.

Table ,5: Effect off feed intervals on mean SE± of growth rate of broilers.

Treat	1wk	2wk	3wk	4wk	5wk	6wk
T1	92.52±1.23a	94.65±1.84a	71.21±1.3 2b	66.52±3.40b	33.88±2.40b	28.06±3.06b
T2	90.31±0.60b	92.58±1.90b	70.14±2.26b	65.11±4.06b	30.38±1.65c	32.23±4.43ab
T3	92.85±0.45a	86.75±0.79c	74.34±2.26a	63.85±0.14c	34.19±3.11b	33.32±1.88a
T4	92.66±0.21a	76.86±1.83d	68.75±2.45c	69.22±1.77a	37.12±4.20a	32.38±4.72ab

Mean with different subscript small letter vertically differ significant (P<0.05).

(Table, 6) shows highly significant differences (P<0.05) in means of feed conversion ratio (FCR) between treated groups (T2,T3 and T4); and (T1) for the (2^{nd} and 3^{rd}) weeks of age., mainly (T3) group which recorded the highest value (1.25,1.36) for above two (T4,T2 and T1), (1.31,1.40 and 1.44), (1.45,1.47 and 1.50) respectively. However treated groups showed rather growth retardation at (4^{th}) week as compared with control group, also treated groups appeared a highly significant (P<0.05) increase in (FCR) for the last (5^{th} and 6^{th}) weeks of age in comparison with other groups, mainly (T3 and T4) which established highest values (1.78,1.76), (1.91,1.92) for the above mentioned (2) weeks as compared with (T2 and T1) (1.88,1.96), (2.04,2.24) respectively. These may be explained that feed intake for control group cannot represent the actual value as a results of feed loss caused by chicks during feeding, and that taken into account for (FCR), where other treated groups; feed intake is actually a real value and that reflected on (FCR) values, since birds consume all offered feed without any losses as a result of time feeding restriction, and also due to compensatory growth that had occurred during post restriction period, these were indicated by Mazzuco *et al.*, (26), who cleared that (FCR) for treated groups were significantly better than those in control group, and these may be attributed to a high feed conversion to meat in a maximum at this age as a result of a high growth rate as given in (Table, 6) during the above last (2) weeks. These results are in agreement with Su *et al.*,(27) whom noticed a significant (P< 0.05) increase in (FCR) for treated groups as compared with control group. However, (Table, 6) showed that (FCR) for treated groups generally achieved a highest values in comparison with control group for the whole experimental period, and these results are in agreement with (18, 20 and 22) whom indicated that early restricted feeding caused a significant improvement in total feed conversion ratio (FCR).

Table , 6: Effect off feed intervals on mean SE± of weekly feed conversion ratio of broilers.

Treat	1wk	2wk	3wk	4wk	5wk	6wk	Total
T1	1.27±0.03a	1.44±0.04a	1.50±0.05a	1.48±0.02c	1.96±0.04a	2.25±0.03a	1.80±0.03a
T2	1.25±0.06a	1.40±0.05b	1.47±0.04b	1.53±0.05b	1.88±0.03b	2.04±0.06b	1.74±0.02b
T3	1.21±0.03b	1.25±0.06d	1.36±0.03d	1.59±0.04ab	1.76±0.03c	1.92±0.07c	1.67± 0.03c
T4	1.26±0.04a	1.31±0.03c	1.45±0.05c	1.62±0.03a	1.78±0.04c	1.91±0.03c	1.71± 0.03bc

Mean with different small letter vertically differ significant (P<0.05).

(Table, 7) showed lowered mortality percentage for the treated groups (T2,T3 and T4) in comparison with control group (T1) that revealed a highest mortality percentage over a (6) weeks of chicks age of the experimental period, the mortality rate for the treated groups are (1.68,3.33 and 1.67%) while for the control (6.67%) from these results indicate that off- feeding intervals reduced the opportunity diseases susceptibility such as ascitis, sudden death syndrome (SDS), skeletal abnormalities…etc) and enhances the immunity of the birds, so that lead to decrease the mortality percentage in treated groups in comparison with the control group. This result agreed with the finding of (18, 20, 22 and 28**)** who referred to an early feed restriction lead to decrease in mortality percentage in comparison with control group. It is known that early feed restriction reduces the incidence of ascites, mortality, and death due to ascites **(**29). A similar result was obtained in the present study. Although the birds in the group (T3) followed a similar trend, there were no significant differences as compared to the control group. In the present study, (8) birds only died out of (240) birds that used in the study between (7- 42) days of age. A total of (6) birds died due to ascites in all treatments groups.

Table, 7: Effect off feed intervals on mortality percentages on (42) days (market age) of broilers.

Treatment	Mortality %
T1 (Control)	6.67c
T2	1.67a
T3	3.33b
T4	1.68a

Mean with different subscript small letter vertically differ significant (P<0.05).

(Table, 8) reveals that the highest dressing percentage in group (T3) (76.10) followed by (T0, T1 and T3), (73.66, 72.70 and 71.56) % respectively. No significant differences had shown between groups; this could be due to the compensatory growth after re-full restricted feeding groups to allow market body weight., as it was found by Payewal, (30) and Saleh*et al.*,(31) who noticed that the feed removal during the day had no effect on dressing percentage. Benschop, (32) indicated, that the restricted birds had higher rates of protein deposition during real mentation would have a significant impact on the overall growth rate, and less abdominal fat % at time of processing.

Table, 8: Effect off feed intervals on means SE± of dressing percentage of broilers.

Group	Dressing%
T1	73.66 ± 2.38ab
T2	72.70 ± 1.98ab
T3	76.10 ± 0.56a
T4	71.56 ± 2.40ab

Mean with different subscript small letter vertically differ significant (P<0.05).

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تأثير التقنين الغذائي على بعض الصفات الإنتاجية في دجاج اللحم

ستار خضير احمد وغسان يوسف بطرس
فرع الصحة العامة البيطرية - كلية الطب البيطري - جامعة بغداد - العراق

الخلاصة

اجريت هذه الدراسة لتقييم تأثير التقنين الغذائي في كمية العلف المستهلك , استهلاك الماء, الزيادة الوزنيةللجسم, معدل النمو, نسبة التحويل الغذائي, نسبة الهلاكات, ونسبة التصافي في دجاج اللحم. وزعت (240) فرخ لحم غير مجنس نوع (Ross308) عمر يوم واحد عشوائيا على اربع مجاميع (معاملات). كل معاملة شملت على ثلاثة مكررات كل مكرر وضع فيه (20) طير. وهذه المجاميع الاربعة هي :- (T1) تمثل مجموعة السيطرة : ذات التغذية الحرة , و (T2) قطع العلف من الساعة 8صباحا-4مساء, و (T3) قطع العلف من الساعة 4 مساءا- 8 صباحا, و(T4) قطع العلف بين يوم واخر اي كل 24ساعة, باليوم. للفترة من (8-21) يوم من فترة التربية.أشارت النتائج الى ان نظام التقنين الغذائي اثر معنويا ($P<0.05$) في وزن الجسم الحي, الزيادة الوزنية, ومعدل التحويل الغذائي في مرحلة تغذية البادئ. اذ ان التقنين الغذائي أثر معنويا في خفض استهلاك العلف والماء في فترة التقنين الغذائي, وخفض نسبة الهلاكات, والزيادة في نسبة التصافي والتحسين في مواصفات الذبائح في عمر التسويق, ان النمو التعويضي ظهر بعد اعادة التغذية الحرة للطيور للمجاميع المقننة للحصول على وزن التسويق المناسب مقارنة بمجموعة السيطرة. وهذا ظهر من خلال الزيادة في معدل النمو بعد فترة التقنين الغذائي و بخاصة في الاسبوع السادس مقارنة بمجموعة السيطرة.

الكلمات المفتاحية: التقنين الغذائي، الصفات الانتاجية، دجاج اللحم.