

COMPARISON OF BROILER PERFORMANCE UNDER TWO REARING SYSTEMS (FLOOR VS CAGES).

Rafh.M.T.Khuleel

Animal resources dept./ College of Agriculture and Forestry/ Mosul university/ Iraq

Received:16/2/2014

Accepted: 13/4/2015

Abstract: This study was conducted on two groups of broiler, the first consists of 4 replicates of 10 birds and the second of 10 birds as each bird is a replicate in individual cages. The first group were reared on floor during the entire period, while the second was reared in cages during the period from 2-7 weeks of age. All birds received the same ration with 2859 Kcal/kg ME and 22% CP as a starter ration, 2995 Kcal/kg ME and 19.19% CP as a finisher ration. The results showed that cage birds had a significantly ($P \leq 0.01$) higher body weight, total and daily weight gain at all ages, significantly ($P \leq 0.01$) higher total and daily feed and protein consumption, at 2-4, 0-4 weeks, feed and protein conversion ratio at 4-7, 0-7 weeks. Also cage birds showed a significantly better growth rate at 2-4, 0-7 weeks and less dressing percentage, higher wing percentage while other carcass parts did not differ significantly. The cage birds showed better economic efficiency by 27% comparing to floor birds.

المخلص: أجريت هذه الدراسة حول تأثير نوع التربية على مجموعتين من فروج اللحم تكونت الأولى من أربعة مكررات بمعدل عشرة طيور لكل مكرر والثانية من عشرة طيور باعتبار كل طير احد المكررات ربيت المجموعة الأولى على الأرضية طيلة فترة التربية والثانية في أقفاص خلال الفترة من 2-7 أسابيع على عليقة بادئة موحدة تحتوي على 2859 كيلو سعرة/كجم طاقة ممثلة و22% بروتين خام وعليقة ناهية تحتوي على 2995 كيلو سعرة/كجم و91.91% بروتين خام. أظهرت النتائج تفوق طيور الأقفاص معنويًا ($P \leq 0.01$) في وزن الجسم الحي والزيادة الوزنية الكلية واليومية على طيور التربية الأرضية في جميع الأعمار وفي استهلاك العلف واستهلاك البروتين الكلي واليومي خلال الفترتين 2-4 و 0-4 أسابيع وفي معامل التحويل الغذائي ومعامل تحويل البروتين في الفترتين 4-7 و 0-7 أسابيع وفي معدل النمو النسبي خلال الفترتين 2-4 و 0-7 أسابيع وفي نسبة الجناحين بينما كانت أقل معنويًا ($P \leq 0.01$) في نسبة النصافي ولم يكن الاختلاف معنويًا في بقية أجزاء الذبحة، كما أظهرت طيور الأقفاص كفاءة اقتصادية أفضل بمقدار 27% من طيور التربية الأرضية.

Key words: Broiler, Rearing system, Performance

كلمات مفتاحية: فروج اللحم، نظام التربية، الاداء

Introduction

The rearing system is an important factor affecting the comfort, health and performance of poultry. Broiler chickens through out the world are reared in a variety of production systems, which varies according to so many factors, like the environmental conditions, the target size of production, and the availability of finance aspects and there are two basic systems for rearing broilers include floor or cage system [1]. Floor system allows more freedom of movement for birds and cages are more economic of land and labor [2]. [3] reported many advantage of cage rearing as better utilization of space and mechanization, no need for litter, and decrease problems of contamination with feces and reduce cost of heating to about 60%. [4] indicated that broiler rearing in cages have begun since the twenties of the last century and one of the obstacles to the use of cages in broiler is increase of incidence of breast blisters and the short duration of rearing broiler which is difficult to putting in and bring out of birds from cages. [5] in a study on arbor acres broiler did not find any significant effect of rearing system on body weight or mortality at 41 days of age while cage birds showed significantly better feed conversion than floor birds. [6] did not find a significant effect of rearing system on body weight gain, feed intake or carcass traits. [7] found that cage broiler showed a significant ($p \leq 0.001$) less body weight at 28 and 42 days and significant decrease in feed conversion in all periods compared to floor treatment but there was no difference in mortality percentage during 1-42 days. [3] found no significantly difference on body weight and weight gain in males and females, feed conversion did not differ significantly in females but was best in males for floor birds, and mortality was significantly ($p \leq 0.05$) less in females for floor birds but

did not differ in males during 1- 42 days of rearing. [8] indicated that rearing system had no significant effect on percentage of carcass parts and components of these parts from muscle, bone, and skin. The aim of this experiment are to compare the performance of broiler under two types of rearing system which are floor and cages.

Material and methods

This study was conducted in the poultry unit of the animal resources department of the college of Agriculture and Forestry of Mosul University to compare the performance of two groups of Ross broilers reared under two rearing systems and were are floor and cages. The Ross broiler chicks one day old supplied by local hatchery reared during the first two weeks on floor in brooding room inside the poultry house. At two weeks age the chicks were divided to two treatments , the first consists of 4 replicates of 10 birds each and the second consists of 10 birds transformed to one wooden cage divided to individual boxes of 50×50×40cm each supplied with plastic feeder and waterer, and the box floor were of wire mesh under each a metal pan for feces. All birds were given a starter ration with 2859 Kcal/Kg ME and 22% CP and finisher ration with 2995 Kcal/Kg ME and 19.19% CP during 0-4 and 4-8 weeks respectively (Table 1). The health care include giving the chicks during the first 5 days of age an antibiotic, then at 5, 11,18, 44 days were vaccinated against Newcastle disease and at 14, 22 day against Gumboro disease. All birds were reared under continuous light system. The feed and water were provided to all birds ad libitum. The birds and feed were weighed weekly by an electric balance with 5gm sensitivity. At 7 weeks age, 3 birds of each replicate of floor treatment and 3 birds of cages treatment were selected randomly for slaughter and carcass traits after starving for 12 hours to empty the gastrointestinal tract ,then slaughtered and processed to calculate dressing percentage and percentages of main cuts and edible giblets. The studied traits were live body weight (gm),weight gain(gm),feed intake(gm),feed conversion ratio(gm feed/gm weight gain),protein intake(gm),protein conversion ratio(gm protein/ gm weight gain), growth rate% , dressing percentage(%), carcass parts percentage(%), economic efficiency(feed conversion ratio× cost of feed (ID/Kg)[9]. Data was analyzed statistically with SPSS 11 software by T test and the mathematic model was $Y_{ij} = \mu + T_i + e_{ij}$, were Y_{ij} is the observation j of treatment I , μ is the general average , T_i is the effect of treatment I , e_{ij} is the experimental error[10].

Table 1. Composition of starter and finisher rations*

Ingredients	Starter	Finisher	Nutrients	Starter	Finisher
Corn	57.60	67.65	ME Kcal/Kg	2859	2995
Soybean meal	34.32	26.00	CP %	22	19.19
Protein concentrate**	5.0	5.0	Lysine %	1.27	0.95
Lime	2.0	0.70	Meth+cys %	0.85	0.72
Dicalcium phosphate	0.73	0.30	Calcium %	1.36	0.75
Salt	0.25	0.25	Available. P %	0.40	0.31
Vitamin premix	0.1	0.1	Crude fiber %	3.77	3.41
			Ether extract %	2.71	3.03
			Cost (ID/Kg)	760	745

* Calculated nutrients according [11] and [12]

** Composition of protein concentrate as follow :

2100 Kcal/Kg ME, 40%CP , 5% Ether extract , 2% Crude fiber, 6.5% Ca, 2.5% Available P , 3.85% Lys, 3.7% Meth, 4% Meth+Cys , 2.2% Na, 200000 IU vit A , 40000 IU Vit D3, (Vit. B₁ 10 , B₂ 100 , B₆ 25 , B₁₂ 300 , Biotin 1000 , Nicotinic acid 600 , Folic acid 10 , Vit. K 30 , Pantothenic acid 150 , Choline chloride 5000 , Cu 100 , Mn 1200 , Zn 800 , Fe 1000 , I 15 , Co 13 , Se 2 , B.H.T 900 , Salinomycin 1000) mg / Kg.

Result and discussion

The results showed as in table (2) that rearing system had a significant effect on live body weight at all ages ($P \leq 0.05$) at 3 weeks and ($P \leq 0.001$) at other ages were cage birds was heavier than floor birds due to cage birds shows significantly greater body weight gain at all periods ($P \leq 0.01$) whether total or daily weight gain, this disagreement with [3], [6] who find that cage birds was significantly less in live body weight. Table (3) Shows the effect of rearing system on total and daily feed consumption were there was a significantly increment ($P \leq 0.001$) in quantities of feed consumed for cage birds comparing to floor birds during 2-4 and 0-4 weeks interval but it was not significant during 4-7 and 0-7 weeks although the feed consumed during 4-7 was less in cage treatment than floor one. It is appeared that because the two treatments was equal in protein level so the differences in protein consumption was as in feed consumption were there was a significantly ($P \leq 0.001$) increment in protein consumed by cage birds whether in total or daily consumption during 2-4 and 0-4 weeks but not significant in 4-7 and 0-7 weeks, The higher intake of feed may be attributed to better weight gain by cage birds than the floor birds as indicated by [13]. Increase of feed intake of floor broiler in finisher period although it is not significant may be due to an attempt to compensate as happen in compensatory growth.

Table (4) explain the effect of rearing system on feed conversion and protein conversion ratio were there was a significant difference during 4-7 and 0-7 weeks in feed and protein conversion ratio, the cage birds were significantly ($p \leq 0.001$) better than floor birds in feed and protein conversion ratio, but the difference during 2-4 and 0-4 week was not significant, and this is in agreement with [3] and [5] who found significantly improvement in feed and protein conversion ratio of cage birds. Improved feed conversion ratio may be due to the high weight gain as noted by [13]. Table (5) shows that there was a significant increase in growth rate ($P \leq 0.01$) during 2-4 weeks and ($P \leq 0.001$) during 0-7 weeks. The floor birds showed a significantly better dressing percentage ($P \leq 0.01$) than cage birds, this may be attributed to less movement of cage birds which may cause more accumulation of fat in abdomen that is lost during slaughter and processing then reduced carcass weight and dressing percentage, but cage birds had a significantly ($P \leq 0.01$) more wing percentage. There was no significant difference in thigh, back, breast, neck, heart, gizzard, liver, percentage among the two rearing systems and this in agreement with [8]. The cage birds had better economic efficiency by (27%) than floor birds (2939.95 vs 3738.75) which represents the cost of feed used to produce one Kg of body weight.

In conclusion, The results here indicates that rearing of broiler in individually cages had a positive effect in their performance, but a further studies are needed to generalize the hypothesis of this research findings as breed variations and rearing system.

Table.(2) Effect of rearing system on live body weight and Weight gain (gm)*

Traits	Floor	Cages
Live body weight		
2 week	219.38± 12.33	245.50 ± 29.86
3 week	b 404.00 ±48.39	a 516.60 ±76.91
4week	b 649.53 ±59.99	a 918.00 ±77.61
5 week	b 953.13 ±61.89	a 1417.0 ±106.59
6 week	b 1443.5 ±158.65	a 1977.5 ±161.66
7 Week	b1902.83 ±129.40	a 2588.5 ±282.69
Total weight gain		
2-4Week	b 430.15 ± 66.93	a 672.50 ±75.21
0-4 week	b 608.93 ± 59.99	a 77.61±875.60
4-7 week	b 1253.30 ± 103.5	245.10±1670.50 a
0-7 week	b 1862.23 ±129.4	a 2546.10±282.69
Daily weight gain		
2-4Week	b 30.73± 4.78	a 48.04 ± 5.37
0-4 week	b 21.75 ±2.14	a 2.77±31.27
4-7 week	b 4.93±59.68	a 11.67±79.55
0-7 week	2.64±38.00 b	a 5.77±51.96

*Values with different letters within row differs significantly ($P \leq 0.01$)

Table (3) Effect of rearing system on feed consumption and protein consumption (gm)*

Traits	Floor	Cages
Total feed consumption		
2-4Week	b 900.87 ±25.34	a 1276.40±103.96
0-4 week	b 1151.19± 25.34	a 103.96±1564.80
4-7 week	3823.75 ±361.03	3478.00±267.68
0-7 week	4974.94 ±353.36	5042.80±281.76
Daily feed consumption		
2-4Week	b 64.35 ±1.81	a 91.17 ± 7.43
0-4 week	b 41.12 ±0.90	55.89a ±3.71
4-7 week	182.08 ±17.19	165.62±12.75
0-7 week	101.53±7.21	102.91 ±5.75
Total protein consumption		
2-4Week	b 5.57±198.19	a 280.81±22.87
0-4 week	b 5.57±253.26	a 344.26 ± 22.87
4-7 week	688.28±64.99	48.18±626.04
0-7 week	941.54± 63.34	970.30 ± 52.18
daily protein consumption		
2-4Week	b 14.16± 0.40	a 20.06 ±1.63
0-4 week	b 9.05 ±0.20	a 12.29 ±0.82
4-7 week	32.78 ±3.09	29.81 ±2.29
0-7 week	20.91 ± 1.52	21.05 ±1.20

*Values with different letters within row differs significantly ($P \leq 0.001$)

Table (4) Effect of rearing system on feed and protein conversion ratio*

Traits	Floor	Cages
Feed conversion ratio		
2-4Week	2.14 ±0.41	1.91 ±0.22
0-4 week	1.91 ±0.22	1.80 ±0.18
4-7 week	a 3.07 ±0.37	b 2.11 ±0.20
0-7 week	2.68 a ±0.26	b 1.99 ±0.16
Protein conversion ratio		
2-4Week	0.47 ±0.09	0.42±0.05
0-4 week	0.42 ±0.05	0.04±0.40
4-7 week	a 0.55±0.07	b 0.04±0.38
0-7 week	a 0.51 ±0.05	b 0.03±0.38

*Values with different letters within row differs significantly (P≤0.001)

Table(5) Effect of rearing system on growth rate , carcass traits, and economic efficiency*

Traits	Floor	Cages
**Growth rate %		
2-4 week	b 10.22±98.61	a 8.47±115.55
4-7 week	98.25±5.50	6.97±94.97
0-7 week	b 191.62±0.57	a 0.72±193.48
Dressing percentage%	a 76.24 ±0.82	b 71.75 ±0.64
Thigh percentage %	1.65±26.74	27.05 ±0.21
Wing percentage %	b 10.21±0.26	a 12.15 ±0.21
Back percentage %	22.45 ±1.00	20.60 ±0.42
Breast percentage %	33.69 ±2.78	34.50 ±0.50
Neck percentage %	7.03±0.89	5.69 ±0.09
Heart percentage %	0.56 ±0.17	1.00 ±0.02
Gizzard percentage %	2.61 ±0.37	2.35 ±0.07
Liver percentage %	2.47 ±0.27	3.00 ±0.03
Economic efficiency	3738.75	2939.95

* Values with different letters within row differs significantly (P≤0.01)

** Growth rate% = $\{2^{nd} \text{ weight} - 1^{st} \text{ weight}\} / \{0.5(1^{st} \text{ weight} + 2^{nd} \text{ weight})\} \times 100[9]$

References

- [1] Fouad.M.A.; A.H.Abdel Razak; E.M. Badawy(2008). Broilers welfare and economics under two management alternatives on commercial scale. *International journal of poultry science*. Vol.7,pp. 1167-1173.
- [2] Awoniyi.T.A.M.(2003).The effect of housing on layer chickens productivity in the 3- tier cages. *International poultry science journal*. vol.2, pp.438-441.
- [3] W.A.Hypes;G.H. Carpenter ;R.A. Peterson ; and W.T. Jones. Production performance of conventional floor reared broilers vs high density cage brooded broilers. *Journal of Applied Poultry Research*. vol.3,pp. 238-243.
- [4] Reece.F.N; J.W. Deaton ; and J.D. May(1971). Cage versus floor rearing of broiler chickens. *Poultry science journal*.vol.50,pp.1786-1790.
- [5] Edens.F.W; C.R. Parkhurst. G.B.Havenstein(2001).Housing and selenium influences on feathering in broilers. *Journal of Applied Poultry Research*.vol.10,pp.128- 134.
- [6] Swain.B.K; R.N.S. Sundaram. S.B. Barbaudde ;and A.V.Nirmale(2002). Influence of cage and deep litter rearing systems on the performance of broilers. *Indian Journal of Animal science*. vol.79,pp.467-469.
- [7] Santos.F.B.O; A.A.Santos jr ;E.O.Oviedo-Rondon; and P.R. Ferket(2012). Influence of housing system on growth performance and intestinal health of salmonella challenged broiler chicken. *Current research in poultry science*, vol.2,pp.1-10.
- [8] Bogosavljevic.B.S; V.Kurcubic; M.D. Petrovic ; V.Radovic(2006). The effect of sex and rearing system on carcass composition and cut yields of broiler chickens. *Czech journal of animal science*. vol.51,pp31-38.
- [9] Ibrahim. I.KH. (1987), *Poultry nutrition*,1st Ed,Dar al-kotob press. Mosul university.
- [10] Alrawi.K.M; and A.M.Khalafulla(1980).*Design and analysis of agricultural experiments*. 1st ed, Dar al kotob press. Mosul university.
- [11] National research council(1994). *Nutrient requirement of poultry*. 9th edit. National Academy Press. Washington. DC.
- [12]Alkhwaga.A.K; E.A.Albaeati; S.A.Matti(1978). *Chemical composition and nutritive value of Iraqi feedstuffs*. 3rd ed,Iraqi Agriculture ministry.
- [13]AtharM.A; E.Pervez; M.N.Asghar; A.A.Mian; and V.Zoyfro(1990).Effect of cage and floor rearing and their mutual transfer on the performance of broiler chicken. *Pakistan journal of agriculture research*. vol.11,pp.192-196.