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The Effect of Feed Restriction on Performance and Abdominal Fat Content of Broilers

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Abstract. An experiment was conducted to evaluate early feed restriction on performance and abdominal fat of Hybro and Hypeco broiler chickens. The design consisted of 3 dietary treatments; (1) the ad libitum fed controls (ALC); (2) 1wk feed restriction of approximately 50% of feed consumed by ALC during the second week of age (1WR); (3) identical to treatment 2 except that the restriction period was during the second and third week of age. Data of this trial showed that feed restriction had a highly significant ($p \leq .01$) effect on body weight, feed intake and feed : gain ratio (weeks 4,6 and 7).The 2WR birds showed the lowest body weights and feed intake while their feed : gain ratios were superior to other groups. At 7 wks of age, body weights of the 1WR birds were not significantly different from those of the full fed controls. Hybro chickens restricted in feed intake for one week were able to overcome the induced growth retardation at 6wk of age and significantly ($p \leq .05$) exceeded that of the full fed controls by 7 wks of age. On the other hand, the 6 and 7 wk body weights of the Hypeco restricted fed birds, regardless of the duration of the restriction period, were significantly ($p \leq .05$) inferior to the full fed controls. There was a significant trend toward lower feed consumption in restricted fed birds which was more pronounced in the 2WR treatment. This reduction in feed intake may have an impact on production costs. Feed : gain ratio was significantly ($p \leq .05$) better for the 2WR birds than those of the other treatments. Abdominal fat percentages, at 6wk of age, were significantly ($p \leq .05$) lower in 1WR than in ALC and 2WR birds. Females of both strains had higher abdominal fat percentages than males. Overall, the mortality was relatively low, averaging 2.2 and 2.7% for Hybro and Hypeco birds, respectively. In conclusion, it must be cautioned that commercial broiler strains may not respond to feed restriction programs in the same manner. Most likely, restriction for short periods will have to be designed to reduce abdominal fat and feed costs.

Introduction

Excessive abdominal and visceral fat deposition is becoming of major concern to the broiler industry. Unfortunately, selection for increased body weight in broilers results in the increased deposition of abdominal fat at juvenille ages, [1 - 3]. Lin [4] reported that broilers are fat because of intensive selection at a fixed age under ad libitum feeding. Abdominal fat has been shown to be an indicator of carcass lipid in commercial broilers [5]. Leeson and Summers [6] reported that abdominal fat comprises 3 to 5% of the total body weight. In both males and females abdominal fat represents 22% of total body fat [5]. However within sex and age groups, abdominal fat in proportion to broiler body weight is highly variable; in contrast, there is less variability in body weight and total percentage of fat in the broiler chicken [7]. Problems associated with increased body fat in broiler chickens have led to the need to develop methods that reduce both abdominal and carcass fat. Attempts to control the fat content of broilers by nutrient restriction showed controversial results. Compensatory growth may be obtained after short periods of restriction and may result in a delay in achieving normal weights or even cause permanent stunting of the animal [8]. An increased number of reports indicated that the nutritional status of broilers early in life might have an influence on subsequent abdominal fat deposition, with inconsistent effect on body weight. This concept is based on the assumption that early feed restriction will reduce the subsequent deposition of fat by delaying hyperplasia, hypertrophy of adipocytes, or both [9].

According to Jensen *et al.* [10] fat cell is subjected to biochemical regulatory mechanism and it is possible that what is fed during the first few days of life might program the animal in such a way as to increase or decrease the rate of fat deposition in the cell. The effect of diet on abdominal fat content was found to be greater than its effect on the total amount of carcass fat [11].

Plavnik and Hurwitz [12, 13], and Plavnik et al.[14] applied a new approach of early feed restriction which renewed interest in the benefits of restricted feeding. They reported that broilers subjected to nutrient restriction for 6 days, starting at one week of age, showed a reduction in abdominal fat with complete recovery of body weights at 56 days of age. More recently, Plavnik and Hurwitz [15] indicated that body weights of chicks subjected to mild early feed restriction can even exceed those of the ad libitum fed controls.

Several reports showed that feed restriction regimens improve feed efficiency [14, 16-19]. Conversely, other reports showed that the net result of feed restriction for conversion was not different between ad libitum fed and restricted fed birds [20, 21, 22, 23].

Materials and Methods

Hybro and Hypeco broiler chicks were used in this study. On the day of hatch, 180 non - sexed chicks from each strain were wing banded, individually weighed and randomly allotted to 12 electrically heated battery pens of 15 chicks each. Four replicates of each of the following dietary treatments were used : Treatment 1 was based on ad-libitum feeding for the whole experimental period and was considered as ad libitum fed control (ALC); Treatment 2 was based on one week feed restriction of approximately 50% of feed consumed by ALC during the second week of age (1WR), according to the company recommendations. Treatment 3) was indentical to treatment 2 except that the restriction period was during the second and third week of age (2WR).

Feeding consisted of a commercial starter crumble diet containing 22.6% crude protein and providing 3146 Kcal ME/Kg for the first 4 weeks and a pelleted finisher diet containing 21% crude protein and providing 3190 Kcal ME/Kg for the remaining 3 weeks (Table 1). At 3 weeks of age all different experimental groups were placed in 24 floor pens of an environmentally controlled house. Individual body weights (BW) and feed intake (FI) by pen were measured weekly. Weight gain (WG) and feed to gain ratio (F : G) were determined. Any mortality was recorded.

Table 1. Composition of the starter and finisher diets[1]

Ingredient	Starter	Finisher
	% of diets	
Ground corn	20.00	20.00
Soybean meal (48%CP)	26.30	18.00
Fish meal	2.50	3.50
Ground wheat	42.58	48.74
Wheat mill run	2.31	3.01
Fat	3.00	3.60
Limestone	1.20	1.50
Broiler permix[2]	0.60	0.50
DL-Methionine	0.18	0.10
Dicalcium phosphate	1.08	0.80
NaCl	0.20	0.20
Stenerol[3]	0.50	0.50
Total	**100.00**	**100.00**
Calculated analysis %		
Protein %	22.00	20.00
Fat %	5.30	5.30
Fiber %	3.00	3.00
Ca %	0.90	0.90
P %	0.70	0.62
NaCl %	0.35	0.35
ME Kcal / Kg	3146	3190
Laboratory analysis %		
Moisture %	6.00	5.28
Protein %	22.66	21.00
Fat %	4.25	5.24
Fiber %	4.40	3.04
Ash %	6.08	5.80
Ca %	0.80	1.00
P %	0.60	0.50

[1] Manufactured by Grain Silos and Flour Mills Organization, Riyadh

[2] Provided the following per kilogram of the diet: vitamin A, 18,00 IU; vitamin D3, 7,200 ICU; vitamin E, 30 Mg; vitamin C, 120 Mg; vitamin K3, 6 Mg; thiamin, 3 Mg; riboflavin, 15 Mg; pyridoxine, 6; vitamin B12, 0.018 Mg; niacin, 42 Mg; pantothenic acid, 18 Mg; folic acid, 2.4 Mg; biotin, 0.24 Mg; choline, 600 mg; copper, 18 Mg; iron, 60 Mg; manganese, 120 Mg; zinc, 72 Mg; cobalt, 0.6 Mg; iodine, 1.2 Mg.

[3] Coccidiostat.

At 6 and 7 weeks of age 20 birds / treatment / strain were randomly selected and feed was withdrawn from them overnight. The birds were slaughtered and their sex was determined by organ examination. Each bird was eviscerated manually and abdominal fat excised and weighed. Abdominal fat is the fat surrounding the gizzard, extending to the ischium and surrounding the bursa of fabricus, cloaca and adjacent abdominal muscles. Carcass weight (CW) was defined as the weight of the fresh dressed carcass without the neck, giblets and abdominal fat.

Data for all response variables were subjected to statistical analysis, King Saud University Computer Center, using general linear model procedure [42].

Results and Discussion

Body weight

Treatment had a highly significant ($p \leq .01$) effect on body weight (Table 2).The one wk body weights were similar for the different treatment groups, therefore they were excluded from the data shown in Table 2. As was expected , the 4 wk body weights were significantly ($p \leq .05$) lower in the restricted fed birds. The 6 wk body weights showed the same pattern. The reduction occurred stepwise with the increase in the restriction period. This finding clearly demonstrates that growth rate of the restricted fed birds, regardless of the duration of the restriction period, were insufficient to compensate fully for growth loss by 6 wks of age.

By 7 wks of age, the body weights of the 1WR birds were not significantly ($p \leq .05$) different from those of ALC birds. The 2WR birds showed the lowest ($p \leq .05$) values. Reid and White [25] noted that compensatory growth may be delayed and some experiments that failed to show any compensatory growth might have not been sufficiently long for that purpose. Similarly, Washburn and Bondari [16] and Plavnik and Hurwitz [12] noted that final body weights were lower in broilers restricted for 2 or 4 wk than in the fully fed controls. Recently, Summers et al. [26] reported that broilers feed restricted from 7 to 14 days of age had lower body weights than unrestricted controls at 41 days of age in one experiment and similar at 42 days of age in a second experiment. Plavnik *et al.* [14] indicated that in poultry compensatory growth is not immediately expressed. Their results suggested that the sex of the bird, the duration and severity of nutrient restriction are determinants to the timing and degree of compensatory growth following realimentation.

Strain had a significant effect ($p \leq .05$) on body weight at 7wk of age. Seven week body weights of the Hybro birds were significantly ($p \leq .05$) greater than those of the Hypeco birds.

Treatment x strain interactions for body weights at 6 and 7 weeks of age were significant (p≤.05). The 6wk body weight of the HB x 1WR was similar to that of the HB x ALC birds. By 7 wk of age, the 7wk body weight of the HB x 1WR birds significantly (p≤.05) exceeded that of the HB x ALC, whereas the HB x 2WR was similar to the HB x ALC birds. The HP x 2WR birds were affected more severely and also had the least values. The HP restricted fed birds, regardless of the restriction period, were unable to overcome the growth retardation by 6 or 7 wks of age. However by 7 wks of age, body weight of HP x 1WR was similar to that of HB x ALC and HB x 2WR birds. Hypeco data agree with the results reported by several researchers [16, 21, 26-29] who failed to demonstrate complete compensation after feed restriction.

Under the conditions of this study, Hypeco strain did not seem to respond favourably to feed restriction. These findings confirm the differential strain responses to early feed restriction. Similarly, Cherry *et al.* [30] found variations between strains in relation to compensatory growth.

To explain the phenomenon of compensatory growth Mosier [31] hypothesized that the body has a set - point for body size appropriate for age. According to Yu *et al.*[23] it is unknown how the body senses a deficit in size or how the system fails in the case of permanent stunting or delayed growth.

Weight gain

Effect of dietary treatment on weight gain mirrored that reported above for body weights. The present data showed that the smaller weight gains of the restricted fed birds paralleled the reduction in feed intake during the same time as compared to the ALC birds. Osbourn and Wilson [32] concluded that increased appetite following refeeding is largely responsible for improved growth and feed efficiency associated with compensatory growth. Ashworth [33] noted that compensatory growth was associated with hyperphagia.

Strain had a significant (P≤.05) effect on body weight gain during the 1-6 and 1-7 wk periods. Hypeco birds exhibited significantly (p≤.05) reduced weight gains in comparison to Hybro birds.

Treatment x strain interactions for weight gains during the 1-4 and 1-6 wk periods were significant (p≤.05) and highly significant (p≤.01) for the 1-7 wk period.

Feed intake

Treatment had a highly significant (p≤.01) effect on feed intake (Table 2). During the 3 observation periods, both groups of restricted fed birds showed significantly (p≤.05) lower feed consumption compared with the controls. This reduction in feed consumption was more pronounced in the 2WR birds.

During the 1-4 wk period, 1WR and 2WR regimens employed in this study reduced feed intake of the starter diets by 11.8 and 29.92%, respectively, in comparison to the ALC birds. This would have an impact on production costs because the starter diets are generally the most expensive. By 6 wks of age, the 1WR and 2WR birds consumed 6.91 and 21.3% less feed relative to the ALC birds, whereas the corresponding figures during the 1-7 wk period were 3.7 and 17%, respectively. Under the conditions of this study total feed intake was affected by the duration of feed restriction. Similarly several reports [12, 14, 18, 34] suggested that by severe feed restriction for a short period early in life is possible to take advantage of the phenomenon of compensatory growth to reduce total feed intake without comprising final body weight in broilers. The present data showed that cumulative feed intake of restricted fed birds never exceeded that of the controls.

Strain had a highly significant ($p \leq .01$) effect on feed intake during the 1-6 and 1-7 wk period. Hybro birds consumed significantly ($p \leq .05$) more feed than that of the Hypeco birds.

Treatment x strain interactions on feed intake were highly significant ($p \leq .01$) at all periods. During the 1-4wk period, feed intake was significantly ($p \leq .05$) higher in HP x ALC than HB x ALC birds. HB x 1WR was significantly ($p \leq .05$) higher than in HP x 1WR birds, however,HB x 2WR and HP x 2WR birds consumed similar amounts of feed. During the 1-6 wk period, feed intake was similar for HB x ALC and HP x ALC. Also feed intake of the 2WR birds from both strains were not significantly different. However, feed intake of the HB x 1WR was significantly ($p \leq .05$) higher than that of HP x 1WR birds. During 1-7 wk period, feed intake of the HB x 1WR was similar to that of HB x ALC bird. Feed intake of HP x ALC was similar to the HB x 1WR. The HP x 2WR birds showed the lowest ($p \leq .05$) values. There was a trend toward lower feed consumption in the 2WR birds, indicating that total feed intake was affected by the duration of feed restriction.

Feed : gain ratio

Treatment had a highly significant ($p \leq .01$) effect on feed : gain ratio during the 1-6 and1-7 wk period , and a significant ($p \leq .05$) effect during the 1-4 wk period (Table2). During the 3 observation periods, feed : gain ratios of the 2WR birds were superior ($p \leq .05$) to those of ALC and 1WR birds. According to [35] changes in the efficiency of feed utilization as measured by the ratio of feed consumed to gain in body weight can be accomplished by changes in the consumption of feed, the rate of growth or a combination of both. In the present study the reduced feed intake with the 2WR birds appeared to be associated with the significant ($p \leq .05$) improvement in feed : gain ratio. These results suggest that the 2WR birds utilized feed more efficiently than other treatments.

Ballay *et al.* [36] reported that restriction for more than 6 days improved feed efficiency. Also the reduction in maintenance requirements may partly explain the observed improvement in the feed : gain ratio among the 2WR birds. Several reports [37-39] noted that feed restriction will lower maintenance requirements by reducing the loss of metabolic energy (total heat production), the basal metabolic rate and the specific dynamic action.

Although compensatory adjustment occurred in Hybro 1WR birds, at 6 wks of age, a statistically improved feed : gain ratio, typical of this activity was not observed. Similar patterns had been reported by Marks [20] and Mollison *et al.* [21] who found that the net result of feed restriction for relatively short periods, was that overall feed conversion did not differ between restricted and unrestricted birds. However, the current data for the 1WR birds are not in agreement with those reported by a number of researchers [12, 14, 18, 34, 40] who noticed a reduction in feed conversion of broilers subjected to early feed restriction. Strain showed no significant effect on feed : gain ratio.

Treatment x strain interactions were only significant ($p \leq .05$) during the 1-6 wk period. Feed : gain ratios of Hypeco birds during the 1-6 wk period were not significantly affected by treatment, whereas Hybro birds were affected. This might indicate strain effect.

Body characteristics

Treatment had a highly significant ($p \leq .01$) effect on body and carcass weights (Weeks 6 and 7) and abdominal fat percentage at 6 weeks of age. The 6 wk body and carcass weights of the restricted fed birds, regardless of the duration of restriction period, were inferior ($p \leq .05$) to the controls. The 2WR birds showed the lowest ($p \leq .05$) values (Table 3).

By 7 wks of age, body and carcass weights of the 1WR birds were not significantly different from those of ALC birds, whereas the 2WR birds showed the lowest ($p \leq .05$) values. This is in agreement with Fontana *et al.* [29] who noted that male broilers subjected to 6 or 7 days feed restriction achieved market body weights at 7 week of age comparable to ad libitum fed males. Within each age period, strain had no effect on body and carcass weights.

Treatment x strain and treatment x strain x sex interactions were not significant. Sex showed a highly significant ($p \leq .01$) effect on body and carcass weights. Males showed significantly ($p \leq .05$) greater body and carcass weights than those of females. This is in agreement with Leenstra and Pit [41] and Alsobayel *et al.* [22].

Table2. Least squares means for performance data of non-sexed Hybro and Hypeco broiler chickens at 4,6 and 7 weeks of age

	Body weight(g)			Weight gain(g)			Feed intake(g)			Feed : gain ratio		
	week											
	4	6	7	1-4	1-6	1-7	1-4	1-6	1-7	1-4	1-6	1-7
Treatment (T)	**	**	**	**	**	**	**	**	**	**	**	**
ALC[1]	747^{a}	1502^{a}	1794^{a}	631^{a}	1368^{a}	1678^{a}	1173^{a}	2952^{a}	3948^{a}	1.90^{a}	2.18	2.40
1WR	689^{b}	1446^{b}	1799^{a}	572^{b}	1199^{b}	1685^{a}	1034^{b}	2748^{b}	3802^{b}	1.84^{ab}	2.11^{a}	2.30^{a}
2WR	586^{c}	1313^{c}	1666^{b}	472^{c}	1329^{c}	1553^{b}	822^{c}	2324^{c}	3261^{c}	1.78^{b}	1.98^{b}	2.13^{b}
Strain(B)	NS	NS	*	NS	*	*	NS	**	**	NS	NS	NS
Hybro(HB)	677	1439	1787^{a}	563	1325^{a}	1675^{a}	1008	2709^{a}	3757^{a}	1.82	2.09	2.29
Hypeco(HP)	671	1402	1719^{b}	554	1285^{b}	1603^{b}	1011	2640^{b}	3583^{b}	1.86	2.09	2.27
SEM	±4.60	±10.27	±14.33	±4.37	±10.15	±14.27	±1.77	±6.94	±11.76	±0.02	±0.02	±0.02
Interaction(T×B)[2]	NS	*	*	*	*	**	**	**	**	NS	*	NS
HB×ALC		1484^{a}	1769^{ac}	621^{a}	1368^{a}	1652^{ac}	1160^{a}	2974^{a}	4003^{a}		2.24^{a}	
HP×ALC		1520^{a}	1819^{ab}	642^{a}	1405^{a}	1705^{ab}	1186^{b}	2931^{a}	3893^{b}		2.12^{ab}	
HB×1WR		1480^{a}	1879^{b}	585^{b}	1367^{a}	1770^{b}	1041^{c}	2834^{b}	3966^{ab}		2.12^{ab}	
HPx1WR		1413^{b}	1720^{c}	559^{b}	1292^{b}	1599^{c}	1028^{e}	2663^{c}	3639^{c}		2.10^{b}	
HB×2WR		1354^{b}	1714^{c}	483^{c}	1241^{b}	1602^{c}	825^{d}	2320^{d}	3304^{d}		1.92^{c}	
HPx2WR		1272^{c}	1618^{d}	461^{c}	1157^{c}	1505^{d}	818^{d}	2328^{d}	3219^{e}		2.05^{b}	

a-e Within a given factor, means in a column followed by different letters are significantly different(P≤.05).

1 ALC=Ad libtum controls;1WR=50% restriction of the controls during the 2nd week; 2WR=50% restriction of the controls during the second and 3rd week.

2 least squares means are presented only when interactions are significant.

NS = Not significant;

*(P≤ 0.05)

**(P≤0.01).

Abdominal fat percentages at 6 wks of age were significantly (p≤.05) lower in 1WR birds than in ALC and 2WR birds. This observation support the findings of Plavnik and Hurwitz [13] who noted that early feed restriction reduced abdominal fat.

Abdominal fat

By 7 wks of age, AF/BW for the different treatments were statistically indistinguishable. This is in agreement with Deaton *et al.* [42] who noticed comparable abdominal fat percentages for broilers weighing 1580 or 2300g. Similarly, Cabel and Waldroup [28] reported that feed restriction for 6 or 12 days had no effect on the abdominal fat at 49 days. However, Cherry *et al.* [30] found that early feed restriction increased abdominal fat deposition in two of four broiler strains studied and decreased it in the other two. Conflicting results of this kind could result from differences in the experimental procedures used (level and duration of restriction, strain, etc......).

Table 3. Least squares means for body characteristics of male Hybro and Hypeco broiler chickens slaughtered at 6 and 7 weeks of age

	Body weight(g)		Carcass weight(g)		AF/BW[1](%)	
	Week					
	6	7	6	7	6	7
Treatment(T)	**	**	**	**	**	NS
ALC[2]	1613[a]	1816[a]	1135[a]	1267[a]	2.45[a]	2.80
1WR	1536[b]	1797[a]	1071[b]	1241[a]	2.08[b]	2.59
2WR	1403[c]	1680[b]	967[c]	1137[b]	2.42[a]	2.53
Strain(B)	NS	NS	NS	NS	*	NS
Hybro(HB)	1542	1775	1069	1226	2.19[a]	2.66
Hypeco(HP)	1492	1753	1046	1204	2.44[b]	2.63
Sex(S)	**	**	**	**	**	**
Male(M)	1575[a]	1847[a]	1105[a]	1279[a]	2.14[a]	2.39[a]
Female(F)	1460[b]	1682[b]	1010[b]	1151[b]	2.49[b]	2.91[b]
SEM	±13.58	±16.24	±11.02	±12.12	±0.05	±0.66

[a-c] Within a given factor, means in a column followed by different letters are significantly different(P≤.05).

[1] AF/BW= Abdominal fat/body weight.

[2] ALC=Ad libtum controls;1WR=50% restriction of the controls during the 2nd week; 2WR=50% restriction of the controls during the 2nd and 3rd week.

NS = Not significant.

*(P≤0.05).

** (P≤0.01).

The insignificant effect of feed restriction of AF/BW at 7 wks of age, might suggest that the degree or the duration of feed restriction used in this trial was insufficient to reduce adipocyte proliferation or that if such effect did occur was nillified by adipocyte hypertrophy when adequate amounts of feed were offered during the realimentation period. Cartwright *et al.* [43] noted that the problem of fat deposition in broilers was apparently related to factors which affected adipocyte hypertrophy or body composition and not adipocyte hyperplasia.

A significant ($p \leq .05$) strain effect was observed on AF/BW only at 6 wks of age. Hypeco birds had a significantly ($p \leq .05$) higher percentage of abdominal fat than that of the Hybro birds. In line with these findings, several reports [7, 44, 45, 46] showed significant differences between commercial broiler strains in total and abdominal fat contents, independent of body weights. On the other hand, Summers and Leeson [47] found no significant differences in visceral and abdominal fat between four strains in 8 wk old broilers. Also, Alsobayel *et al.* [22] found no significant ($p \leq .05$) differences between Hubbard and Shaver broilers for AF/BW.

Sex showed a highly significant ($p \leq .01$) effect on body and carcass weights and AF/BW at 6 and 7 wks of age. Within each age period, males had the highest ($p \leq .05$) body and carcass weights and the lowest ($p \leq .05$) abdominal fat percentages compared to females. Similar results have been documented [22, 41, 48]. According to Cabel and Waldroup [36] the response difference between male and female broilers subjected to different nutrient restriction programs might be due partly to differences in physical capacity.

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تأثير تحديد الغذاء على أداء كتاكيت اللحم ومحتواها من دهن الأحشاء

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ملخص البحث: أجريت الدراسة لتقييم تأثير تحديد الغذاء المبكر على كفاءة النمو ونسبة دهن الأحشاء لسلالتين من هجن اللاحم (Hypco,Hybro) والتي أخضعت للمعاملات التالية: ١-)تغذية تقليدية،مجموعة المشاهدة (ALC)، ٢-)تحديد الغذاء خلال الأسبوع الثاني من العمر بحوالي ٥٠%من العلف المستهلك بواسطة مجموعة المشاهدة (1WR)، وتحديد الغذاء إلى ٥٠٪ من المستهلك من قبل طيور المشاهدة وذلك خلال الأسبوعيه الأول والثاني من العمر (2WR).

دلت النتائج على أن تحديد الغذاء له تأثير معنوي جدًا (P≤.01) على وزن الجسم، استهلاك العلف وكفاءة تحويل الغذاء عند عمر ٧،٦،٤ أسابيع وكانت مجموعة الطيور التي أخضعت لمعاملة تحديد الغذاء خلال الأسبوعيه الأول والثاني من العمر (2WR) هي الأقل معنوياً فيما يخص استهلاك العلف والوزن بينما كفاءة تحويلها الغذاء كانت الأفضل معنوياً بالمقارنة مع طيور المشاهدة والمجموعة الاخرى، بينما أوزان مجموعة الطيور التي عرضت لتحديد الغذاء فقط خلال الأسبوع الأول من العمر (1WR) لم تختلف معنوياً عن أوزان طيور مجموعة المشاهدة (ALC).

كذلك تشير النتائج إلى أن طيور الهيبرو (Hybro) التي عرضت لتحديد الغذاء فقط خلال الأسبوع الأول من العمر استطاعت تعويض التأخر في النمو عند عمر ستة أسابيع وزيادة على ذلك فاقت مجموعة المشاهدة عند عمر سبعة أسابيع ، وعلى العكس من ذلك فإن طيور الهيبكو (Hypco) وبغض النظر عن مدة تحديد الغذاء كانت أقل في كفاءة نموها معنوياً (P≤.05) بالمقارنة مع طيور المشاهدة، وقد اتضح أن تحديد الغذاء له تأثير معنوي على استهلاك العلف وقد كان ذلك أكثر وضوحاً فيما يخص الطيور التي أخضعت لتحديد الغذاء خلال الأسبوعيه الأول والثاني من العمر، وقد يكون لذلك تأثير على تكاليف الإنتاج، كفاءة تحويل الغذاء كانت أفضل معنوياً (P≤.05) للطيور التي تعرضت لتحديد الغذاء خلال الأسبوعيه الأول والثاني من العمر (2WR) بالمقارنة مع طيور المشاهدة والمجموعة الأخرى.

أما فيما يخص نسبة دهن الأحشاء فقد كانت أقل معنوياً (P≤.05) بالنسبة للمجموعة التي اخضعت لتحديد الغذاء خلال الأسبوع الأول من العمر (1WR) بالمقارنة مع مجموعة المشاهدة والمجموعة الاخرى عند عمر ستة أسابيع، كذلك أوضحت النتائج أن نسبة دهن الأحشاء في الإناث لكلا السلالتين كانت أعلى معنوياً منها فيالذكور، أما فيما يتعلق بالهلاكات فكانت منخفضة نسبياً حيث كانت في المتوسط ٢,٢ و٢,٧ ٪ لكلٍ من طيور الهيبرو والهيبكو على التوالي، وفي الختام يتضح أن التجاوب مع تحديد الغذاء يختلف من سلالة لأخرى ومن شبه المؤكد أن الغذاء لفترات قصيرة يعمل على خفض نسبة دهن الأحشاء وكذلك تكاليف الإنتاج.