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EFFECT OF REPLACING YELLOW CORN BY BAKERY BY-PRODUCT ON BROILER PERFORMANCE

BY

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Abstract: *This study was conducted to investigate the effect of replacing yellow corn (YC) by bakery by-product (BBP) on growth performance, carcass traits, blood constituents and economical efficiency of broiler chicks. Three hundred un-sexed Arbor-Acres broiler chicks at one-week of age were divided into ten treatments (30 bird each), each treatment contained 3 replicates of 10 birds each. The experimental treatments were as follows:*

Treatment 1 (T_1) A corn soybean diet and taken as a control (NRC requirements).

Treatment 2 (T_2) 25% of YC in $T_1$was replaced by BBP (adjusted to NRC energy requirements).

Treatment 3 (T_3) 25% of YC in $T_1$was replaced by BBP (non adjusted to NRC energy requirements).

Treatment 4 (T_4) T_3 plus .0.05 % Xylam (B-xylanase and α-amylase).

Treatment 5 (T_5) 50% of YC in $T_1$was replaced by BBP (adjusted to NRC energy requirements).

Treatment 6 (T_6) 50 % of YC in $T_1$was replaced by BBP (non adjusted to NRC energy requirements).

Treatment 7 (T_7) T_6 plus .0.05 % Xylam.

Treatment 8 (T_8) 75% of YC in $T_1$was replaced by BB (adjusted to NRC energy requirements).

Treatment 9 (T_9) 75 % of YC in $T_1$was replaced by BBP (non adjusted to NRC energy requirements).

Treatment10 (T_{10}) T_9 plus .0.05 % Xylam.

Live body weight (LBW): *Chicks fed diet 10 had the highest values of LBW at 14 and 21 days of age, and. Chicks fed diet 7 had the highest values of LBW at 28, 36 and 42 days of age.* ***Live body weight gain (LBWG)****: Chicks fed diet 7 had the heaviest LBWG during the periods from 7 to 28 and 7 to 42 days of age, while chicks fed diet 10 had the heavier*

LBWG during the period from 29 to 42 days of age as compared with the control (diet 1) and the other diets at the some periods. ***Feed intake (FI)****: Chicks fed the control diet had the lowest FI during the periods from 7 to 28, 29 to 42 and 7 to 42 days of age.* ***Feed Conversion(FC), crude protein conversion (CPC) and caloric conversion ratio (CCR)****: Chicks fed diet 2 had the best FC and CPC during the periods from 29 to 42 and 7 to 42 days of age. Whereas, chicks fed diet 10 had the best CCR during the periods from 29 to 42 and 7 to 42 days of age.* ***Growth rate (GR):*** *Chicks fed diet 7 had higher GR values at the two periods(7 to 28 and 7 to 42 days).* ***Carcass characteristics:*** *Chicks fed the control diet had the highest value of abdominal fat whereas, chick fed diet 10 had the lowest value of abdominal fat as compared with the control or the other groups****. Serum constituents:*** *Chicks fed diet 7 had the highest value of GOT, total protein and albumin.* ***Chemical composition of broiler meat:*** *The highest fat% value was observed for the group fed diet 4, while the lowest fat % value was observed for the group fed diet 10. Carcass part significantly affects ($P\leq0.01$ and $P\leq0.05$) protein, fat, ash and NFE %. Front part had higher protein, ash and NFE % than rear part, while, rear part had a higher fat % than front part.* ***Mortality%:*** *Obtained results indicated that the percentage of mortality was 3.33 % in chicks fed diet 1,5 and, 8 as compared with the other groups during the starting period. Whereas, chicks fed diets 3 and 6 had the highest mortality % during the finishing and total periods.* ***Economical efficiency (EEF):*** *Chicks fed diet 9 gave the best economical and relative efficiency then chicks fed diet 6 when compared with the other treatments or the control. Whereas, the birds fed the control diet had the worst values. It can be concluded that BBP can be replaced from YC at level 75% in broiler diets to get best performance and highest income per chicken.*

INTRODUCTION

Poultry production in Egypt has become one of the biggest agriculture industries and its improvement is one of the main objectives of both private and public sectors.

Feeding cost represents the major parts of total cost in poultry production. Yellow corn (YC) is the main source of energy in formulating poultry rations. Its price is increasing because of the limited world yield in covering the demands for both humans and livestock. So, it is important to search for other alternative cheap energy sources which can solve this problem. Minimizing the feed cost could be achieved through the use of untraditional cheaper feed ingredients or improving utilization of common feeds by using some feed additives (i.e., enzymes) . Attention, therefore, should be drawn towards the use of some local by-products (especially, after the fluctuations in local market prices of corn due to the last world problems) available in certain areas of Egypt.

In the last few years, bakery by-product (BBP) had been used as an alternative energy source to substitute YC in poultry diets. The BBP could replace corn for its relatively lower cost in poultry feeding. The BBP is a popular feed ingredient and its nutritive value varies widely (Dale and Duke,1987). Some of these by-products thrown in the garbage fermented and cause an environmental pollution. Several investigatores analyzed BBP and found that it contains suitable amounts of nutrients (Table 1). Radwan (1995) found that incorporating of 25 % BBP into Baladi chick diets at level 10, 20, 30 or 40 % had no detrimental effect on body weight or dressing %, while, feed intake was increased, feed conversion was impaired. On the other hand, inclusion of BBP into Baladi chick diets resulted in a higher economical efficiency as compared to the control diet. El-Yamny, *et al.*(2003) reported that incorporating 25 % BBP in Japanese quail diet as un-traditional ingredients enhanced ($P<0.05$) body weight, body gain, feed intake and feed conversion efficiency at the market age (6 weeks old) compared with other dietary treatments.

Poultry diet is predominantly composed of plant ingredients, mainly cereals and vegetable proteins plus a little amount of animal proteins. Most of feed ingredients contain non-digested parts (*Cellulose, xylose, arabinose, galactonic acid)* which inhibit feed utilization and birds performance (Alam, *et al*., 2003). At high dietary concentrations, the feeding value of cereals, particularly those with low apparent metabolizable energy (AME), are reduced and result in a poor bird performance (Choct, *et al.,*1996).

A series of studies by Annison and Choct (1991) and Choct and Annison (1990, 1992a) demonstrated that pentosans affect the metabolizable energy value of wheat. Pentosans are comprised principally of arabinoxlans, which are linked to other cell wall components. Soluble arabinoxylans can absorb up to 10 times their own weight of water, forming highly viscous solutions. Choct and Annison (1992b) confirmed that it is the viscosity of arabinoxylans which exerts their anti-nutritive activity. The anti-nutritive effect is manifested by depressed nutrients utilization accompanied by a poor growth. These adverse effect could be overcome by supplementation of exogenous carbohydrate splitting enzyme (Xylanase), which have shown to decrease viscosity of intestinal contents and improve digestibility of starch, protein, fat and AME in diets containing wheat (Annison and Choct,1991 and Bedford, 1995). The use of enzymes in the bird's diet has been successful in reducing the viscosity of the digesta and has led to an improvement in feed conversion efficiency (Bedford, 1997).

The present study was conducted to evaluate the effect of incorporating different levels of 0, 25, 50 and 75 % BBP(with reference to enzyme supplementation) into Arbor-Acre broiler chick diets as replacement of corn on the performance, digestibility of nutrients responses and the economical efficiency.

MATERIALS AND METHODS

This work was carried out at El Takamoly Poultry Project, Fayoum, Egypt, to study the effect of replacing yellow corn by BBP in starter and finisher diets of broiler chicks. Chemical analyses were performed in the laboratories of the Poultry Production Department, Faculty of Agriculture, Fayoum University, according to the procedures outlined by A.O.A.C (1990).

Three hundred un-sexed Arbor-Acres broiler chicks at one-week of age were divided into ten treatments (30 birds each), each treatment contained 3 replicates of 10 birds. The experimental treatments were as follows:

Treatment1 (T_1)A corn-soybean diet was taken as a control (NRC requirements).

Treatment2 (T_2)25% of YC in $T_1$was replaced by BBP(adjusted to NRC energy requirements).

Treatment 3(T_3)25% of YC in $T_1$was replaced by BBP (non adjusted to NRC energy requirements).

Treatment 4 (T_4) T_3 plus .0.05 % Xylam (*B*-xylanase and α-amylase)

Treatment 5 (T_5) 50% of YC in $T_1$was replaced by BBP (adjusted to NRC energy requirements).

Treatment 6 (T_6)50 % of YC in $T_1$was replaced by BBP(non adjusted to NRC energy requirements).

Treatment 7(T_7) T_6 plus .0.05 % Xylam

Treatment 8 (T_8)75% of YC in $T_1$was replaced by BBP (adjusted to NRC energy requirements).

Treatment 9 (T_9)75 % of YC in $T_1$was replaced by BBP(non adjusted to NRC energy requirements).

Treatment 10 (T_{10}) T_9 plus .0.05 % Xylam.

The BBP was available in sufficient amounts from local bakeries. It is a mixture of mainly scattered wheat flour plus wheat bran. The chemical analysis of the BBP as compared to wheat flour and corn is presented in Table 1. After collecting, the BBP was screened to eliminate any harmful materials and then weighed and mixed with the other ingredients. Table (2) illustrates the composition of the experimental diets used in this trial. Diets 4, 7 and 10 were supplemented with a commercial enzyme ($Xylam^{500}$) mixture of B-xylanase and α-amylase (the recommended level of manufacturer is 0.05%), while the other remaining diets had no enzyme supplementation.

The experimental diets (starter and finisher) were supplemented with a minerals and vitamins mixture and DL-methionine to cover the recommended requirements according to (NRC, 1994) and were formulated to be iso-nitrogenous. Chicks were individually weighed, wing-banded and randomly allotted to the dietary treatments. Chicks were raised in electrically heated batteries with raised wire mesh floors and had free access to feed and water. Batteries were placed into a room provided with a continuous light and fans for ventilation. The birds were reared under similar managerial conditions, and were given the experimental diets (Table 2) from the end of the first week until 28 days (starter diets) and from 29 to 42 days of age (finisher diets).

Birds were individually weighed to the nearest gram at weekly intervals during the experimental period. At the same time, feed consumption was recorded and feed conversion (g feed / g gain) and body weight gain were calculated. Growth rate (GR), was calculated using the following formula according to the equation of Larner and Asundson (1932):

$$GR = (LBW_2 - LBW_1) / 0.5 (LBW_2 + LBW_1)$$

Where: LBW_1 and LBW_2 are body weights at initial and final ages studied.

Cumulative mortality % was calculated during the starting and finishing periods.

At the end of the experiment (42 days), a slaughter test was performed using four chicks (2 males and 2 females) around the average LBW from each treatment. Birds were individually weighed to the nearest gram, and slaughtered by severing the carotid artery and jugular veins (Islamic method). After four minutes of bleeding, each bird was dipped in a hot water bath for two minutes and feathers were removed by hand. After the removal of head, carcass were manually eviscerated to determine some carcass traits, i.e, dressing % (eviscerated carcass without head, neck and legs) and total giblets % (gizzard, liver, spleen and heart). The eviscerated weight included the front part with wing and hind part. The abdominal fat was removed from the parts around the viscera and gizzard, and was weighed to the nearest gram. The weight of these organs and dressing weight were expressed as a percentage of live body weight. The bone of the front and the rear parts were separated and weighed to calculate meat percentage. The meat from each part was weighed and blended using a kitchen blender. Chemical analyses of representative samples of the experimental diets and carcass meat (including the skin) were carried out to determine percentages of DM, CP (N x 6.25), EE, CF and ash contents according to the methods of A.O.A.C (1990). Nitrogen-free extract (NFE) was calculated by difference.

Individual blood samples were collected during exsanguinations, immediately centrifuged at 3500 rpm for 15 min. Serum were harvest after centrifugation of the clotted blood, stored at–20Ċ in the deep freezer until the time of chemical determinations. The biochemical characteristics of blood were determined colorimetrically, using commercial Kits as previously described by Ragab (2001).

To determine the economical efficiency for meat production (as shown in table 7), the amount of feed consumed during the entire experimental period was obtained and multiplied by the price of one Kg of each experimental diet which was estimated based upon local current prices at the experimental time (April, 2003). Analysis of variance was conducted on the data according to Steel and Torrie (1980). Significant differences among treatment means were determined using Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Productive performance:

Live body weight (LBW):-

Data presented in Table 3 showed that BBP significantly affected LBW ($P \leq 0.05$ or $P \leq 0.01$) at 14,21,28,36 and 42 days of age. Chicks fed diet 10 had the highest values of LBW at 14 and 21 days of age (242.57 and 459.63 g, respectively). Chicks fed diet 7 had the highest values of LBW at 28, 36 and 42 days of age (810.97, 1241.13 and 1627.23 g, respectively). However, insignificant differences were observed in LBW at 7 days of age. These results are in agreement with those reported by Greenwood, et al. (2002) who reported that supplementation corn-soybean meal broiler diets with enzyme preparation containing a mixture of protease, amylase and xylanase resulted in improved body weight.

Live body weight gain (LBWG) :-

Data presented in Table 3 showed that BBP significantly affected LBWG ($P \leq 0.01$) during all periods studied. Chicks fed diet 7 had the heaviest LBWG during the periods from 7 to 28 and 7 to 42 days of age (718.35 and 1540.5 g, respectively), while chicks fed diet 10 had the heaviest LBWG during the period from 29 to 42 days of age (822.91g) as compared with the control (diet 1) and the other diets at the same periods. This is in accordance with the previous data on LBW. This improvement may be due to the use of enzyme which play a critical role in improving poultry performance. These results are in agreement with Rose (1996) who reported that enzyme supplementation increased gain and improved FC ratio. He explained this result to the improvement in the digestibility of all nutrients and not simply to starch alone. Bakery by-product contains yeast (used in processing) which contains some nutrients (i.e. vitamins and enzymes) and have been necessary for increasing body weight gain for growing Japanese quail (Ali, et al., 2000). El Yamny, et al.(2003) reported that incorporating of 25 % BBP in Japanese quail diets as un-traditional ingredients enhanced ($P<0.05$) body weight and body gain at the market age (6 weeks old) compared with other dietary treatments, they used in their study.

Feed intake (FI):

Data presented in Table 3 showed that BBP significantly affected FI ($P \leq 0.01$) during all periods studied. Chicks fed the control diet had the lowest FI during the periods from 7 to 28, 29 to 42 and 7 to 42 days of age (1188.0, 1679.6 and 2867.6 g, respectively). The data also indicated that there was no effect of adding enzyme preparations to broiler diets on FI (diets 4, 7 and 10). These results are in agreement with those reported by Ouhida et al. (2000) and Ghazalah, et al.(2005). While, Radwan (1995) found that incorporating of 25 % BBP into Baladi chick diets at 10, 20, 30 or 40 % levels had increased feed intake and feed conversion was impaired.

Feed conversion, crude protein conversion and caloric conversion ratio (FC, CPC and CCR):

Results presented in Table 3 indicated that BBP significantly ($P \leq 0.01$) affected FC, CPC and CCR during the periods from 29 to 42 and 7 to 42 days of age. Chicks fed diet 2 had the best FC (2.254 and 2.086 g, respectively) and CPC (0.908 and 0.391 g, respectively) during the periods from 29 to 42 and 7 to 42 days of age. Whereas, chicks fed diet 10 had the best CCR during the periods from 29 to 42 and 7 to 42 days of age (14.03 and 5.671 g, respectively). However, insignificant effect were observed in FC, CPC and CCR during the period from 7 to 28 days of age. These results agreed with those reported by **El-Yamny, *et al.*(2003)** who reported that incorporating of 25 % BBP in Japanese quail diets as un-traditional ingredients enhanced ($P<0.05$) feed conversion at the market age (6 weeks old) compared with the other dietary treatments. **Wyatt *et al.* (1999)** reported that the addition of multicomponent enzyme into corn-soy broiler diets enhanced the energy utilization by 3.3% and hence improved body weight gain and feed conversion. **Zanella *et al.* (1999)** also reported that enzyme supplementation improved overall crude protein digestibility in corn/soybean-based broiler diets by 2.9% (80% ± 0.7 vs. 82.9% ± 0.7). Performance studies by the same research group demonstrated that the enzyme supplementation improved body weight and feed conversion ratio by 1.9 and 2.2%, respectively. Because of its effect on nutrient digestibility improvement, Avizyme 1500 application focuses either on a diet cost reduction, through reduced diet energy content, or over-the-top (OTT) addition to improve overall poultry performance. **Greenwood *et al.* (2002)** reported that addition of Avizyme 1502 into low ME diets (2, 3 and 4% in starter, grower and finisher, respectively) improved performance in terms of 42-day body weight and FCR.

Growth rate (GR): -

Data presented in Table 4 showed that BBP significantly affected GR during the starting and total periods. Chicks fed diet 7 had higher GR values at the two studied periods (being 1.569 and 1.774, respectively). However, insignificant effects were observed in GR during the finishing period.

Mortality percentage:

Cumulative mortality % are presented in Table 4. Obtained results indicated that the percentage of mortality was 3.333 % in chicks fed diets 1, 5 and 8 as compared with the other groups during the starting period. Whereas, chicks fed diets 3 and 6 had the higher mortality % during the finishing and for the total period.

Carcass characteristics:

Results presented in Table 5 revealed no significant difference among dietary treatments in the carcass traits except for abdominal fat %. Chicks fed the control diet had the highest value of abdominal fat being

1.702 % whereas, chicks fed diet 10 had the lowest corresponding value of abdominal fat being 0.492 % as compared with the control or the other groups. These results agreed with those reported by Radwan (1995) who found that incorporating of 25 % BBP into Baladi chick diets at 10, 20, 30 or 40 % levels had no detrimental effect on dressing %. On the other hand, these results disagreed with El-Yamny, *et al.* (2003) who reported that replacing corn by 25 % BBP resulted in the greatest values of carcass and liver as absolute weights compared with the other dietary treatments. Increasing BBP up to 50% replacement decreased the values of carcass weight and dressing percentage compared with the other dietary treatments.

Serum constituents: -

Data of serum constituents are summarized in Table 5. The results indicated significant effects of BBP on GOT, total protein and albumin. Chicks fed diet 7 had the highest values of GOT, total protein and albumin (36.75, 5.030 and 3.867, respectively). In general, the results in Table 5 indicated that birds fed BBP showed higher serum globulin values compared with the control diet (the differences were not significant). These results may providing further evidence for the improved performance since, globulin is mainly involved in antibody formation as well as cell membrane activities and cell division and cell proliferation **(Kwak, *et al.*, 1999).** This finding may be further indicate the beneficial effect of using BBP. However, insignificant effects were observed in other serum constituents (calcium, phosphorus, triglycerides and cholesterol) due to incorporating the un-traditional ingredient at any level in broiler diets.

Chemical composition of broiler meat : -

Data presented in Table 6 showed that the BBP significantly affected fat ($P \leq 0.05$) % of broiler meat. The highest fat % value was observed for the group fed diet 4, while the lowest fat % value was observed for the group fed diet 10. However, insignificant differences were observed in moisture, protein, ash and NFE% of meat. Carcass parts significantly influenced ($P \leq 0.01$ and $P \leq 0.05$) protein, fat, ash and NFE%. Front part had higher protein, ash and NFE % than rear part (60.04, 2.915, 1.955 vs 48.90, 2.448 and 1.692%), rear part had higher fat % than front part (42.51 vs 30.65%). However, moisture% of meat was insignificantly affected by carcass parts.

Economical efficiency (EEf) :-

Results in Table 7 showed that EEf values at 7 weeks of age were improved in chicks fed BBP as compared with the control diet. Chicks fed diet 9 gave the best economical and relative efficiency being 5.333 and 132.73%, respectively then chicks fed diet 6 (5.016 and 124.85%, respectively) when compared with the other BBP treatments or the control diet. Whereas, the birds fed the control diet had the worst values, being 4.018 and 100%, respectively. The relative efficiency values varied between 3.19 to 32.73% which are of minor importance considering the other factors of production. In general, the diets of un-traditional ingredient resulted in the highest economical efficiency (expressed % of net revenue/feed cost) compared with the control diet. These results agreed with **El-Yamny, *et al.* (2003)** who reported that the greatest economical efficiency values were obtained for diets contained 25% BBP. It can be concluded that BBP can be used as untraditional source of energy in broiler diets to get best performance and highest income per chicken .

Table 1: Analysis of dried bakery by-product.

Item	The present study	Dale *et al.* (1990)	Radwan (1995)	Saleh *et al.* (1996)	El-Afifi *et al.* (2004)	Al-Talaihan *et al.* (2004)	Corn(NRC) 1994	Wheat flour by-product, less than 7% fiber
Moisture, %	9.65	10.2	12	8.11	10.0	8.43	11	12
Crude protein,%	11.95	10.6	10.2	12.53	10.7	12.22	8.5	16.5
Ether extract,%	6.45	11.1	1.5	11.04	11.9	1.32	3.8	4.6
Crude fiber, %	4.7	2.5	6.4	2.25	3.8	0.18	2.2	6.8
Ash, %	7	4.8	4.6	4.48	7.7	1.83	NA	NA
NFE %	60.25	NA	65.3	NA	55.9	76.02	NA	NA
Calcium, %	NA	NA	NA	0.28	NA	0.18	0.02	0.09
$Phosphorus_{total}$ %	NA	NA	NA	0.52	NA	0.15	0.28	0.81
Sodium, %	NA	NA	NA	0.93	NA	3.2	0.02	0.02
Potassium, %	NA	NA	NA	NA	NA	0.45	0.3	0.93
Magnesium, %	NA	NA	NA	1.37	NA	0.08	0.12	0.25
Chloride, %	NA	NA	NA	NA	NA	0.12	0.04	0.07
TMEn, kcal/kg	NA	3630	NA	3670	NA	3895.4*	3470	2061
ME, kcal/kg	3296	NA	2680	NA	NA	NA	3350	2162
GE, kcal/kg	NA	NA	NA	NA	3416	NA	NA	NA

*Calculated from the following equation. TMEn (Kcal/g) = 4.34- 10.10 (% CF)-0.04 (% Ash)-0.03(% CP)+0.01(%EE)

NA = Non-analysed

Table 2: Composition and analyses of the experimental diets.

Item, %	Control		25% BBP				50% BBP				75% BBP			
	Starter	Finisher	Starter		Finisher		Starter		Finisher		Starter		Finisher	
	NRC	NRC	NRC	NON	NRC	NON	NRC	NON	NRC	NON	NRC	NON	NRC	NON
Yellow corn, ground	56.00	64.80	42.00	42.00	48.60	48.60	28.00	28.00	32.40	32.40	14.00	14.00	16.20	16.20
Bakery by-product	0.00	0.00	14.00	14.00	16.20	16.20	28.00	28.00	32.40	32.40	42.00	42.00	48.60	48.60
Soybean meal (44%CP)	29.00	23.65	29.00	31.70	24.10	27.40	29.10	34.65	23.77	28.00	29.45	35.00	24.65	29.03
Corn glutein meal	8.20	5.80	7.50	5.50	4.90	2.25	6.70	2.50	4.90	1.50	5.85	2.15	3.00	0.00
Veg. Oil	3.40	2.40	4.00	3.30	3.10	2.40	4.60	3.30	3.60	2.40	5.20	3.30	4.55	2.40
Ground limestone	0.90	1.30	1.40	1.40	1.50	1.40	1.50	1.40	1.60	1.30	2.00	1.40	1.30	1.80
Sodium chloride	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Di Ca Ph	1.80	1.30	1.40	1.40	0.95	1.10	1.40	1.40	0.70	1.30	0.80	1.40	1.00	1.30
Vit. and Min. premix *	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
DL – methionine	0.10	0.05	0.10	0.10	0.05	0.05	0.10	0.10	0.03	0.10	0.10	0.10	0.05	0.07
L- lysine	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.05	0.05	0.00
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Calculated analysis :														
CP	22.51	19.53	22.57	22.56	19.65	19.51	22.62	22.56	20.05	19.91	22.75	22.98	19.87	19.99
EE	2.62	2.80	2.98	2.95	3.25	3.22	3.33	3.28	3.68	3.64	3.68	3.64	4.07	4.04
CF	2.47	2.42	2.81	2.89	3.83	2.93	3.15	3.31	3.22	3.35	3.50	3.67	3.64	3.77
Ca	0.896	0.906	1.00	1.00	0.917	0.913	1.06	1.02	0.915	0.943	1.12	1.04	0.926	1.15
Available P	0.44	0.35	0.44	0.45	0.37	0.40	0.52	0.52	0.40	0.52	0.48	0.59	0.54	0.60
Methionine	0.51	0.41	0.51	0.49	0.40	0.38	0.49	0.52	0.38	0.42	0.48	0.51	0.37	0.38
Lysine	1.09	1.01	1.13	1.19	0.99	1.59	1.17	1.29	1.04	1.13	1.22	1.35	1.13	1.19
ME, K cal./Kg**	3159	3151	3155	3074	3151	3058	3151	2995	3150	3005	3150	2955	3151	2931
Cost (L.E./ton) ***	108.37	100.23	103.22	99.93	92.88	89.11	98.05	92.43	87.02	82.09	93.01	86.05	82.25	72.92
Relative cost ****	100	92.49	95.25	92.21	85.71	82.23	90.48	85.29	80.29	75.75	85.83	79.40	75.59	67.29

*Each 3.0 Kg of the Vit. and Min. premix contains : Vit. A, 12000000 IU ; Vit. D_3 2500000 IU ; Vit. E, 10 g ; Vit. K_3, 2.5 g ; Vit. B1, 1.5 g ; Vit. B2, 5 g ; Vit. B6, 1.5 g; Vit. B12,10 mg ; Choline chloride, 1050 g ; Biotin, 50 mg ; Folic acid, 1 g ; Nicotinic acid , 30 g ; Ca pantothenate, 10 g ; Zn, 55 g ; Cu,10 g ; Fe, 35 g ; Co, 250 mg ; Se, 150 mg ; I, 1 g ; Mn, 60 g and anti-oxidant, 10 g.

** According to NRC, 1994

*** According to the local market price at the experimental time.

**** Assuming economical efficiency of the control group equals 100.

Table (3): Growth performance (Mean ± SE) of broiler chicks as affected by replacing yellow corn by bakery by-product.

Item	Treatments									
	Control(T1)	25% BBP			50% BBP			75% BBP		
		T2	T3	T4	T5	T6	T7	T8	T9	T10
Body Weight (g) :										
' days	96.50 ±2.18	96.43±2.18	96.33±2.18	95.33±2.18	95.83±2.18	91.97±2.18	97.07±2.18	94.57±2.18	95.57±2.18	96.47±2.18
4 days	216.90 ±6.19^{BC}	221.5±6.19^{BC}	219.9±6.19^{BC}	215.33±6.19^{BC}	210.93±6.19^{CD}	223.37±6.19^{BC}	230.97±6.19^{AB}	195.17±6.19^{D}	218.87±6.19^{BC}	242.57±6.19^{A}
.1 days	427 37 ±13.3 ^{abc}	428.6±13.3 ^{abc}	429.07±13.3 ^{abc}	433.83±13.3 ^{ab}	414.0±13.3 ^{bc}	416.63±13.3^{abc}	456.07±13.3^{ab}	388.45±13.3 ^{c}	436.5±13.3 ^{ab}	459.63±13.3^{a}
8 days	749.45 ±20.9^{AB}	754±20.5^{AB}	760.67±20.5^{AB}	757.5±20.5^{AB}	741.10±20.9^{B}	765±20.5^{AB}	810.97±20.5^{A}	669.38±20.9^{C}	777.30±20.5^{AB}	776.77±20.5^{AB}
6 days	1144.28±29.9 ^{BC}	1173.73±29.4^{AB}	1185.67±29.4^{AB}	1212.73±29.4^{AB}	1154.65±29.9^{ABC}	1196.38±29.9^{AB}	1241.13±29.4 ^{A}	1072.31±29.9 ^{C}	1225.83±29.4^{AB}	1232.07±29.4^{AB}
:2 days	1472.48 ±36.47 ^{BC}	1516.33±35.9^{AB}	1531.76±37.1^{AB}	1555.5±35.9^{AB}	1464.31±36.5^{BC}	1559.39±37.1^{AB}	1627.23±35.9^{A}	1393.07±36.5^{C}	1564.3±35.9^{AB}	1604.30±35.9^{A}
Body Weight gain (g) :										
(7 to 28)	636.99 ±20.3^{B}	657.57±19.8^{AB}	664.33±19.9^{AB}	643.82±22.5^{AB}	627.13±19.8^{B}	665.90±21.1^{AB}	718.35±19.9^{A}	556.64±19.9^{C}	684.62±20.6^{AB}	676.70±19.9^{AB}
(29 to 42)	707.99 ±21.1^{C}	762.33±20.1^{BC}	753.13±20.1^{BC}	777.40±22.8^{AB}	720.73±20.5^{C}	761.66±22.1^{AB}	822.14±20.2^{AB}	722.10±20.6^{C}	784.26±20.9^{AB}	822.91±20.2^{A}
(7 to 42)	1354.88±34.5^{CD}	1419.9±31.5 ^{BC}	1431.8±32.7 ^{ABC}	1421.2±35.6 ^{ABC}	1364.1±32.1 ^{CD}	1443.4±36.1 ^{ABC}	1540.5±31.6 ^{A}	1295.9±32.2 ^{D}	1468.9±32.7 ^{ABC}	1499.6±31.6 ^{AB}
intake (g) :										
ring 7-28 days	1188.0±6.9 ^{F}	1223.4±6.81 ^{E}	1254.4±6.81^{D}	1259.3±7.70^{D}	1254.9±6.81^{D}	1290.8±7.22 ^{C}	1348.5±6.83 ^{B}	1196.8±6.83 ^{F}	1344.3±7.07 ^{B}	1412.3±6.83 ^{A}
ing 29-42 days	1679.6±10.4^{F}	1693.7±10.2^{F}	1804.7±10.2^{D}	1843.3±11.5^{C}	1936.8±10.4^{A}	1762.6±10.8^{E}	1881.9±10.2^{BC}	1863.1±10.2^{C}	1912.4±10.6^{AB}	1911.4±10.2^{AB}
ring 7-42 days	2867.6±11.5^{E}	2917.1±11.3^{F}	3059.1±11.3^{E}	3102.6±12.7 ^{D}	3196.6±11.3 ^{C}	3053.4±11.9 ^{E}	3230.4±11.3 ^{B}	3059.9±11.3 ^{E}	3256.7±11.7 ^{B}	3323.7±11.3 ^{A}
conversion :										
ring 7-28 days	1.943±0.183	1.913±0.179	1.930±0.179	2.009±0.203	2.360±0.179	1.971±0.190	1.931±0.180	2.606±0.180	2.010±0.186	2.124±0.180
ing 29-42 days	2.428±0.079^{CD}	2.254±0.075^{D}	2.503±0.075^{BC}	2.419±0.085^{CD}	2.760±0.076^{A}	2.395±0.082^{CD}	2.349±0.075^{CD}	2.645±0.077^{AB}	2.507±0.078^{BC}	2.358±0.075^{CD}
ring 7-42 days	2.161±0.055 ^{BC}	2.086±0.052 ^{C}	2.162±0.054 ^{BC}	2.218±0.059 ^{BC}	2.408±0.053 ^{A}	2.151±0.060 ^{BC}	2.137±0.052 ^{BC}	2.398±0.054 ^{A}	2.254±0.054 ^{AB}	2.245±0.052 ^{BC}
e protein conversion :										
ring 7-28 days	1.070±0.046	1.046±0.045	1.073±0.045	1.103±0.051	1.166±0.046	1.111±0.048	1.054±0.045	1.122±0.45	1.103±0.047	1.114±0.045
ing 29-42 days	0.971±0.040 ^{BC}	0.908±0.038 ^{C}	0.964±0.040 ^{BC}	0.987±0.043 ^{BC}	1.153±0.039 ^{A}	0.942±0.044 ^{BC}	0.945±0.039 ^{BC}	1.116±0.039 ^{A}	1.057±0.040 ^{AB}	0.957±0.039 ^{BC}
ring 7-42 days	0.412±0.013 ^{BC}	0.391±0.012 ^{C}	0.410±0.013 ^{BC}	0.418±0.014 ^{BC}	0.464±0.013 ^{A}	0.409±0.014 ^{BC}	0.400±0.012 ^{BC}	0.452±0.013 ^{A}	0.432±0.013 ^{AB}	0.414±0.012 ^{BC}
ric conversion ratio :										
ring 7-28 days	15.017±0.624	14.63±0.612	14.62±0.612	15.03±0.692	16.24±0.623	14.74±0.649	13.99±0.613	15.54±0.613	14.17±0.635	14.33±0.613
ing 29-42 days	16.657±0.630^{AB}	14.55±0.601^{BC}	15.11±0.624^{BC}	15.48±0.679^{BC}	18.11±0.612^{A}	14.22±0.688^{C}	14.27±0.602^{C}	17.70±0.614^{A}	15.50±0.623^{BC}	14.03±0.602^{C}
ring 7-42 days	6.386 ±0.187 ^{BC}	5.836±0.179 ^{CD}	5.979±0.185 ^{CD}	6.101±0.202 ^{CD}	6.871±0.182 ^{A}	5.770±0.205 ^{CD}	5.652±0.179 ^{D}	6.713±0.183 ^{BC}	5.934±0.185 ^{CD}	5.671±0.179 ^{D}

a, …c, and A,… F, values in the same row within the same item followed by different superscripts are significantly different (at $P \le 0.05$ for a to c ; $P \le 0.01$ for A to F).

Table (4): Growth rate and mortality % of broiler chicks as affected by replacing yellow corn by bakery by-product.

Treat / Item	Control (T1)	25% BBP			50% BBP			75% BBP		
		T2	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**	**T9**	**T10**
Growth rate										
From (7 to 28 days of age)	$1.53{\pm}0.011^{A}$	$1.542{\pm}0.1^{A}$	$1.55{\pm}0.01^{A}$	$1.54{\pm}0.01^{A}$	$1.53{\pm}0.01^{A}$	$1.56{\pm}0.01^{A}$	$1.57{\pm}0.01^{A}$	$1.50{\pm}0.011^{B}$	$1.56{\pm}0.01^{A}$	$1.55{\pm}0.01^{A}$
From (27 to 42 days of age)	0.25±0.01	0.26±0.009	0.26±0.009	0.25±0.01	0.24±0.009	0.26±0.010	0.27±0.009	0.26±0.009	0.24±0.009	0.26±0.009
Total (7 to 42 days of age)	$1.75{\pm}0.006^{BC}$	$1.76{\pm}0.006^{AB}$	$1.76{\pm}0.006^{AB}$	$1.76{\pm}0.006^{AB}$	$1.75{\pm}0.006^{BC}$	$1.77{\pm}0.007^{A}$	$1.77{\pm}0.006^{A}$	$1.74{\pm}0.006^{C}$	$1.77{\pm}0.006^{AB}$	$1.77{\pm}0.006^{A}$
Mortality %										
Starter (7 to 28 days of age)	3.333	0.000	0.000	0.000	3.333	0.000	0.000	3.333	0.000	0.000
Finisher (27 to 42 days of age)	0.000	0.000	6.667	0.000	0.000	6.667	0.000	0.000	0.000	0.000
Total (7 to 42 days of age)	3.333	0.000	6.667	0.000	3.333	6.667	0.000	0.000	0.000	0.000

[1] Mean ± standard error of the mean.

a, and b, values in the same row followed by different superscripts are significantly different (at $P \leq 0.05$ for a and b and $P \leq 0.01$ for A,B, and C)A.

Table (5): Carcass characteristics and serum constituents (Mean ± SE) of broiler chicks as affected by replacing yellow corn by bakery by-product.

Item	Treatments									
	Control T1	25% BBP			50% BBP			75% BBP		
		T2	T3	T4	T5	T6	T7	T8	T9	T10
Carcass traits										
Dressing %	70.42±1.74	71.76±1.74	72.55±1.74	72.89±1.74	72.86±1.74	73.24±1.74	72.76±1.74	66.16±1.74	73.05±1.74	71.82±1.74
Liver %	2.12±0.146	2.36±0.146	2.30±0.146	2.24±0.146	2.33±0.146	2.45±0.146	2.30±0.146	2.59±0.146	2.35±0.146	2.26±0.146
Gizzard %	2.43±0.210	2.49±0.210	2.30±0.210	2.13±0.210	1.91±0.210	2.07±0.210	2.00±0.210	1.46±0.210	1.94±0.210	1.85±0.210
Spleen %	0.136±0.023	0.128±0.023	0.130±0.023	0.109±0.023	0.137±0.023	0.128±0.023	0.145±0.023	0.144±0.023	0.130±0.023	0.169±0.023
Heart %	0.588±0.036	0.511±0.036	0.559±0.036	0.592±0.036	0.570±0.036	0.485±0.036	0.483±0.036	0.626±0.036	0.497±0.036	0.494±0.036
Total giblets %	5.275±0.213	5.493±0.213	5.292±0.213	5.069±0.213	4.946±0.213	5.142±0.213	4.933±0.213	4.823±0.213	4.926±0.213	4.878±0.213
Abdominal fat%	1.702±0.28^{a}	1.214±0.28^{ab}	0.506±0.28^{b}	1.670±0.28^{a}	1.420±0.28^{ab}	1.283±0.28^{ab}	0.981±0.28^{ab}	0.718±0.28^{b}	0.923±0.28^{ab}	0.492±0.28^{b}
ole front %	15.97±1.02	17.64±1.02	18.38±1.02	14.83±1.02	17.64±1.02	17.61±1.02	19.28±1.02	16.37±1.02	18.85±1.02	19.22±1.02
Whole rear %	14.15±0.56	14.09±0.56	15.04±0.56	14.80±0.56	14.86±0.56	15.16±0.56	14.91±0.56	13.86±0.56	15.46±0.56	14.56±0.56
Front Meat %	75.35±1.58	73.75±1.58	75.48±1.58	72.25±1.58	75.82±1.58	75.77±1.58	76.57±1.58	75.16±1.58	74.12±1.58	73.96±1.58
Rear Meat %	75.90±1.40	75.17±1.40	75.67±1.40	70.71±1.40	75.18±1.40	73.25±1.40	75.69±1.40	73.41±1.40	74.40±1.40	71.37±1.40
Serum constituents										
Calcium mg/dl	9.80±1.02	7.15±1.86	9.35±1.86	9.53±1.86	10.41±1.86	13.94±1.86	10.18±1.86	7.85±1.86	5.32±1.86	9.76±1.86
Phosphorus mg/dl	90.91±49.8	87.27±49.8	85.45±49.8	107.27±49.8	176.36±49.8	78.18±49.8	316.36±49.8	70.91±49.8	16.36±49.8	100±49.8
Triglycerides mg/dl	89.02±25.3	131.71±25.3	92.99±20.7	64.02±25.3	74.69±20.7	73.78±25.3	99.39±25.3	74.39±20.7	104.27±25.3	70.73±25.3
Cholesterol g/l	163.50±63.3	75.5±63.3	94.00±63.3	83.33±51.7	137.00±63.3	228.50±63.3	225.50±63.3	68.50±63.3	141.00±63.3	103.50±63.3
GOT mmol/L	28.75±0.717^{b}	29.15±0.717^{b}	29.10±0.717^{b}	30.25±0.717^{b}	29.10±0.717^{b}	29.95±0.717^{b}	36.75±0.717^{a}	28.20±0.717^{b}	28.50±0.717^{b}	28.80±0.717^{b}
GPT mmol/L	47.75±2.88	45.15±2.88	45.45±2.88	45.45±2.88	45.30±2.88	47.50±2.88	55.30±2.88	41.75±2.88	42.50±2.88	41.70±2.88
Total protein g/dl	2.246±0.462^{b}	2.784±0.462^{b}	2.814±0.462^{b}	2.605±0.462^{b}	2.425±0.462^{b}	2.695±0.462^{b}	5.030±0.462^{a}	2.186±0.462^{b}	2.545±0.462^{b}	2.395±0.462^{b}
Albumin g/dl	1.734±0.458^{b}	1.411±0.458^{b}	1.544±0.458^{b}	1.089±0.458^{b}	1.444±0.458^{b}	1.556±0.458^{b}	3.867±0.458^{a}	0.778±0.458^{b}	1.689±0.458^{b}	1.733±0.458^{b}
Globulin g/dl	0.512±0.387	1.373±0.387	1.270±0.387	1.516±0.387	0.981±0.387	1.139±0.387	1.163±0.387	1.408±0.387	0.856±0.387	0.662±0.387
Albumin/Globulin ratio	6.099±2.74	1.028±2.74	1.244±2.74	0.977±2.74	1.527±2.74	1.355±2.74	4.229±2.74	0.457±2.74	7.493±2.74	3.750±2.74
Glucose mg/dl	60.07±31.07	34.53±31.07	85.61±31.07	64.53±31.07	45.32±31.07	65.47±31.07	33.45±31.07	66.19±31.07	30.22±31.07	93.52±31.07

a, …b, values in the same row within the same item followed by different superscripts are significantly different (at $P \leq 0.05$ for a to b).

Table (6): Chemical analysis of carcass meat % (Mean ± SE) of broiler chicks (on dry matter basis) as affected by replacing yellow corn by bakery by-product.

Item	Moisture	Protein	Fat	Ash	NFE
Control T1	3.88±0.55	53.32±1.35	$38.79±1.3^{a}$	2.450±0.193	1.56±0.15
25% BBP T2	4.93±0.55	53.57±1.35	$37.50±1.3^{ab}$	2.275±0.193	1.725±0.15
25% BBP T3	4.93±0.55	53.16±1.35	$37.75±1.3^{ab}$	2.687±0.193	1.473±0.15
25% BBP T4	3.50±0.55	53.55±1.35	$38.94±1.3^{a}$	2.350±0.193	1.66±0.15
50% BBP T5	3.60±0.55	53.47±1.35	$38.06±1.3^{a}$	2.812±0.193	2.058±0.15
50% BBP T6	4.75±0.55	52.99±1.35	$37.97±1.3^{a}$	2.663±0.193	1.627±0.15
50% BBP T7	4.72±0.55	55.29±1.35	$34.80±1.3^{abc}$	2.975±0.193	2.215±0.15
75% BBP T8	4.22±0.55	55.16±1.35	$35.95±1.3^{ab}$	2.938±0.193	1.732±0.15
75% BBP T9	4.65±0.55	56.54±1.35	$33.86±1.3^{bc}$	2.887±0.193	2.063±0.15
75% BBP T10	5.27±0.55	57.85±1.35	$32.17±1.3^{c}$	2.675±0.193	2.035±0.15
Carcass parts :					
ont part	4.44±0.25	$60.04±0.60^{A}$	$30.65±0.58^{b}$	$2.915±0.09^{A}$	$1.955±0.07^{a}$
Rear part	4.45±0.25	$48.90±0.60^{B}$	$42.51±0.58^{a}$	$2.448±0.09^{B}$	$1.692±0.07^{b}$

a, b, c, A and B values in the same column within the same item followed by different superscripts are significantly different at ($P \leq 0.05$ for a, b and c ; $P \leq 0.01$ for A and B)

Table (7) : Economical efficiency of broiler chicks as affected by replacing yellow corn by bakery by-product.

Treat / Item	Control TI	25%			50%			75%		
		T2	T3	T4	T5	T6	T7	T8	T9	T10
Average feed intake (Kg/bird)starter a_1	1.188	1.223	1.254	1.259	1.255	1.29	1.348	1.196	1.3444	1.412
Price / Kg feed (P.T.)* starter b_1	108.38	103.22	99.93	102.93	98.05	92.43	95.43	93.01	86.05	86.05
Total feed cost (P.T.) starter = $a_1 \times b_1 = c_1$	128.75	126.24	125.31	129.59	123.05	119.24	128.64	111.24	115.68	121.50
Average feed intake (Kg/bird) finisher a_2	1.679	1.693	1.805	1.8433	1.9368	1.7626	1.8819	1.863	1.9124	1.9114
Price / Kg feed (P.T.) * finisher b_2	100.23	92.89	89.12	92.12	87.03	82.09	85.09	82.25	72.93	75.93
Total feed cost (P.T.) finisher = $a_2 \times b_2 = c_2$	168.28	157.25	160.85	169.80	168.55	144.69	160.13	153.23	139.47	145.13
Total feed cost (P.T.) =$(c_1 + c_2) /2 = C_{total}$	148.52	141.75	143.08	149.69	145.80	131.96	144.38	132.23	127.58	133.32
Average LBWG (Kg/ bird) d	1.355	1.420	1.432	1.421	1.364	1.443	1.541	1.296	1.469	1.500
Price / Kg live weight (P.T.) ** e	550	550	550	550	550	550	550	550	550	550
Total revenue (P.T.) = d x e = f	745.20	780.95	787.49	781.66	750.26	793.87	847.28	712.75	807.90	824.78
Net revenue (P.T.) = f - C_{total} = g	596.68	639.2	644.41	631.97	604.45	661.91	702.89	580.51	680.32	691.47
Economical efficiency =(g / C_{total}) ***	4.018	4.510	4.504	4.222	4.146	5.016	4.868	4.390	5.333	5.187
Relative efficiency ****	100	112.24	112.10	105.08	103.19	124.85	121.17	109.27	132.73	115.02

*Based on average price of both starter and finisher diets during the experimental time. ** According to the local market price at the experimental time.

*** Net revenue per unit feed cost. **** Assuming economical efficiency of control group equals 100.

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الملخص العربي

تأثير أستبدل الذرة الصفراء بمخلفات المخابز علي أداء بداري التسمين

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أجريت هذه الدراسة لبحث تأثير استبدال الذرة بمخلفات المخابز علي معدل النمو وصفات الذبيحة ومكونات الدم والكفاءة الاقتصادية لبداري التسمين. استخدم عدد ٣٠٠ كتكوت أربور أيكرز غير مجنس عمر أسبوع ، قسمت الكتاكيت إلي عشر معاملات (٣٠ طائر/معاملة) ، كل معاملة اشتملت علي ٣ مكررات (١٠ طيور/مكرر). والمعاملات التجريبية كما يلي:-

معاملة ١ مجموعة المقارنة (عليقة ذرة – صويا) مع ضبط الاحتياجات وفقاً لـ **NRC**.

معاملة٢ استبدال ٢٥ % من الذرة في عليقة الكنترول بمخلفات المخابز مع ضبط احتياجات الطاقة وفقاً لـ **NRC**.

معاملة٣ استبدال ٢٥ % من الذرة في عليقة الكنترول بمخلفات المخابز مع عدم ضبط احتياجات الطاقة وفقاً لـ **NRC**.

معاملة٤ تغذية الطيور علي عليقة ٣ + إنزيم الزيلام ٥٠٠ بمعدل ٠,٠٥ %.

معاملـة ٥ اسـتبدال ٥٠ % مـن الـذرة فـي عليقـة الكنتـرول بمخلفـات المخـابز مـع ضـبط الاحتياجات وفقاً لـ **NRC**.

معاملـة ٦ استبدال ٥٠ % من الذرة في عليقـة الكنترول بمخلفات المخابز مع عدم ضبط احتياجات الطاقة وفقاً لـ **NRC**.

معاملة ٧ تغذية الطيور علي عليقة ٦ +إنزيم الزيلام ٥٠٠ بمعدل ٠,٠٥ %.

معاملـة٨ اسـتبدال ٧٥ % مـن الـذرة فـي عليقـة الكنتـرول بمخلفـات المخـابز مـع ضـبط الاحتياجات وفقاً لـ **NRC**.

معاملـة ٩أسـتبدال ٧٥ % من الذرة في عليقـة الكنترول بمخلفات المخابز مع عدم ضبط احتياجات الطاقة وفقاً لـ **NRC**.

معاملة١٠ تغذية الطيور علي عليقة ٩ + إنزيم الزيلام ٥٠٠ بمعدل ٠,٠٥ %.

والنتائج المتحصل عليها يمكن تلخيصها في الأتي:

كان أعلي وزن للكتاكيت المغذاة علـي عليقـة رقم١٠ علـي عمر ١٤ و ٢١ يوم من العمر وكان أعلي وزن علي عمر ٢٨و ٣٦ و ٤٢ يوم للكتاكيت المغذاة علي عليقة رقم ٧. وكان أعلي زيادة في وزن الجسم الحي للدجاج المغذي علي العليقة رقم ٧ خلال فترة النامي والفترة الكلية. بينما الكتاكيت المغذاة علي عليقة رقـم ١٠ أعلـي زيـادة فـي وزن الجسم خـلال فترة النـاهي. كانت الكتاكيت المغذاة علـي عليقـة الكنترول أقل فـي استهلاك الغذاء خـلال الفترات من ٧-٢٨ و ٢٩-٤٢ و٧-٤٢ يوم من العمر.كانت أعلي كفاءة تحويل غذائي و أعلي كفاءة لتحويل البروتين الكتاكيت المغذاة علي عليقة رقم ٢ ثم عليقة رقم ٧ خلال الفترات ٢٩-٤٢ و٧-٤٢ يوم من العمر.

كانت الكتاكيت المغذاة علي عليقة رقم ٧ أعلي قيمة لمعدل النمو خلال فترتي البادئ والفترة الكلية. وكانت أعلي نسبة لدهن البطن بالنسبة للكتاكيت المغذاة علي عليقة الكنترول وكانت أقل نسبة لدهن البطن للكتاكيت المغذاة علي عليقة رقم ١٠ بالمقارنة بمجموعة الكنترول أو المجموعات الأخرى. وكانت أعلي نسبة GOT و أعلي نسبة للبروتين الكلي والألبيومين بالنسبة للكتاكيت المغذاة علي عليقة رقم ٧ .

كانت أعلي نسبة دهن بالنسبة للحم للكتاكيت المغذاة علي عليقة رقم ٤ وأقل نسبة كانت بالنسبة للكتاكيت المغذاة علي عليقة رقم ١٠. كان للأجزاء الذبيحة تأثير معنوي علي النسبة المئوية للدهن والرماد والكربوهيدرات الذائبة. كان الجزء الأمامي أعلي في نسبة البروتين و الرماد و والكربوهيدرات الذائبة % عن الجزء الخلفي، بينما كان الجزء الخلفي أعلي في نسبة الدهن عن الجزء الأمامي. كانت نسبة النفوق ٣,٣٣٣ % بالنسبة للكتاكيت المغذاة علي علائق ١و ٥ و٨ بالمقارنة بالمجموعات الأخرى خلال فترة البادئ. بينما كانت الكتاكيت المغذاة علي علائق ٣ و٦ أعلي نسبة نفوق خلال فترة الناهي والفترة الكلية. أعطت الطيور

المغذاة علي عليقة رقم ٩ أعلي كفاءة اقتصادية ونسبية ثم الطيور المغذاة علي عليقة ٦ بالمقارن بمجموعة الكنترول والمجاميع الأخرى. بينما الطيور المغذاة علي عليقة الكنترول كانت أقل كفاءة اقتصادية ونسبية. ومن هنا يمكن استخدام مخلفات المخابز بنسبة تصل إلي ٧٥% بدلا من الذرة في علائق بداري التسمين للحصول علي أعلي أداء إنتاجي وأعلي كفاءة اقتصادية.