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RESPONSE OF MALE BROILER CHICKS TO SKIP A DAY FEEDING PROGRAMS

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Abstract: *This experiment was conducted to investigate the responses of broiler chicks to skip a day feeding programs on growth performance, carcass characteristics, some physiological parameters, and economy of broiler production. One hundred and sixty two day-old male broiler (Arbor Acres) chicks were allotted into four equal groups. The control group was fed the starter, grower and finisher diets ad-libtum during the whole experimental period (7 wks). The second group was skipped 10 days, the third group was skipped 6 days and the fourth group was skipped 5 days at the starting period then all groups fed ad-libtum afterwards.*

Regarding the entire experimental period there was significant (P<0.05) increase in total body weight gain in group skipped 5 days at the first three weeks of age compared to the control and other feed restricted groups. While the group skipped 10 days was significantly (P<0.05) decreased in total body weight gain as compared to control group. No significant (P<0.05) differences in total amount of feed consumption were observed during the whole experimental period between the group skipped 5 days as compared to the control group. While, significant decreases (P<0.05) in total amount of feed consumption were observed in groups skipped 10 and 6 days as compared to the control group.

During the starting period and finishing period as well as the whole experimental period, there were no significant improvement (P<0.05) in feed conversion in all feed restricted groups as compared to the control group. While during the growing period, there were significant improvements (P<0.05) in feed conversion in groups skipped 6 and 5 days as compared to the control group and the group skipped 10 days at the starting period. It was shown that mortality rate in broiler chicks reduced in all feed restricted groups as compared to control group.

Data of carcass characteristics showed significant increases (P<0.05) in liver weight, carcass weight, carcass percentages, total edible portions weight and percentages in groups skipped 6 and 5 days at the starting period as compared to the control group. A significant decrease

(P<0.05) in heart weight was observed in the group skipped 10 days as compared to the control and other feed restricted groups. Also a significant decrease (P<0.05) in spleen weight was observed in the group skipped 6 days period as compared to control group. All feed restricted groups decreased significantly (P<0.05) in abdominal fat weight and percentages, subcutaneous fat weight, total body fat weight and percentages as compared to the control group.

Significant decreases were observed in hemoglobin (Hb) and packed cell volume (PCV) in all feed restricted groups as compared to the control group. While plasma total protein, albumin, creatinine, GOT and GPT were not significantly affected by different feeding programs. Regarding, plasma total cholesterol, it was showed a significant decrease in all feed restricted groups as compared to the control group. In addition, a significant decrease was observed in plasma total lipids in the group skipped 10 days as compared to the control group. From the economical point of view, feed restriction regime in groups skipped 6 and 5 days at the starting period improved economic efficiency as compared to the control group. These improvements in economic efficiency were 2.54 and 2.72% than the control value respectively.

In conclusion, broiler males which skipped 10 days (severe restriction) were not able to fully recover body weight depression by the end of the experiment, while, males of group skipped 5 days (mild restriction), showed significant increase in final body weight and total body weight gain as compared to other feed restricted groups. All feed restricted groups showed a decrease in carcass fatness and mortality rate as compared to the control. In general, there seem to be a great advantage of manipulating diet restriction as skipped 5 days during the first three weeks of age of Arbor Acres broiler males.

INTRODUCTION

The poultry meat industry, in continual pursuit of improved efficiency, has demanded rapid growth rate. Rapid growth has also produced problems not seen in slower growing birds (Classen, 2001). This increase in growth rate of modern broiler chickens has been associated with increased fat deposition (Robinson *et al*., 1992) and high incidences of skeletal and metabolic diseases (Leeson and Summers, 1988). These situations most commonly occur with broilers that consume feed *ad libitum* (Pasternak and Shalev, 1983); so many studies have demonstrated the potential for early life feed restriction followed by full feeding to reduce these problems and to induce the contribution of growth compensation.

Several approaches, both qualitative and quantitative have been employed to restrict nutrient or caloric intake in broilers in order to improve performance. It may be used to reduce cost of feeding, improve feed efficiency and reduce excessive abdominal fat deposition and carcass fat among other problems associated with *ad libitum* feeding. However, investigations so far have shown considerable variations concerning early life restrictions, compensatory growth, fat deposition and breed response (Griffiths *et al*, 1977; Saleh *et al*., 1996; Oyedeji and Atteh, 2003 and Oyedeji *et al*., 2003)

Numbers of factors have been suggested that influencing bird's response to a period of restriction. These include, nature, severity and duration of the restriction, the pattern of re-feeding, the stage of growth during restriction as well as sex and genotype of the population (Wilson and Osbourn, 1960; Plavnik and Hurwitz, 1989; Doyle and Leeson, 1996)

Compensatory growth has been shown to occur in most farm animals, even the broiler chicken, which has a very short grow-out cycle. This catch-up growth follows a period of nutrient restriction imposed usually by either feed restriction or feeding low in nutrient-density diet (Doyle and Leeson 1996). The same authors also stated that the process to be of economic interest, such animals must achieve normal weight for age prior to market and/or show improved efficiency of growth and/or exhibit superior carcass characteristics.

The feed restriction techniques have ranged from very severe (maintenance only) to milder forms which involve daily feed restriction or skipping feeding one or two days a week. Feed restriction has proven successful in reducing metabolic diseases but the degree of restriction required to control health problems needs to be balanced with the time required to reach market weight and other effects on bird productivity (Classen, 2001). The different systems of feed restriction affected performance parameters of the broilers as shown by Plavnik and Hurwitz (1991), who found that a mild feed restriction of broilers at 7 days of age could offer an economic advantage over a continuous *ad-libtum* feeding program. They also demonstrated that broilers restricted showed complete body weight recovery by 56 days of age. In addition, feed conversion efficiency was superior in all restricted treatments compared to the control group.

In this study feed tried to be restricted, taking advantage of growth storage potential and compensatory growth as a biological phenomenon (Doyle and Leeson, 1996; Lawrence and Fowler,1997). Most previous

studies of early feed restriction in broilers have been focused on quantitative or qualitative nutritional restriction. The present study was planned to study the effect of the skipping programs on the growth performance, carcass quality bases as the criteria of adequacy in addition to the diet cost of broiler production and to reduce the early growth rate of broilers to minimize susceptibility to certain metabolic and skeletal disorders during the starting period and after re-feeding stage.

MATERIALS AND METHODS

Birds, housing, and management:

One hundred and sixty two day old, male broiler chicks of commercial Arbor Acres strain were obtained from Ismailia Misr Poultry Company and used for this study. Birds were housed in brooder batteries with raised wire floors at the Poultry Experimental Farm, Faculty of Agriculture, Suez Canal University. Chicks were weighed, wing banded and randomly allotted to four groups. Within each group, 40 chicks were divided randomly to four replicates of 10 chicks each. The chicks were reared conventionally under hygienic conditions and each group was in a separate compartment. Water was provided on *ad-libitum* basis and continuous lighting was used. Feed was offered either *ad-libitum* (control group) or restricted, as shown in the following Table:-

Feeding programs during the starting period.

groups	Days/week (0-3wks)		Total days (0-3wks)	
	Feeding	Skipping	Feeding	Skipping
1(control)	Daily feeding	--------	21	------
2	Feed-a-day	Skip-a-day	11	10
3	Feed-2-days	Skip-a-day	15	6
4	Feed-3-days	Skip-a-day	16	5

The feed restriction programs were applied only during the starting period (0-3wks), while during the other two periods (growing and finishing) feed was provided *ad-libitum*. The control group was fed *ad-libitum* during the whole experimental period. The second group was fed one day- skipped one day (skipped 10 days), the third group was fed two days-skipped one day (skipped 6 days) and the fourth group was fed three days-skipped one day (skipped 5 days) for the first three weeks of age then fed *ad-libtum* until they reached 7 weeks old. Individual body weights and feed consumption per replicate were recorded weekly to calculate feed conversion (g feed consumed/g weight gain) and total mortality percentages

were registered. The routine scheme for vaccination of the four groups was followed during the whole period.

Diets:

The diets were formulated to meet NRC (1994) requirement recommendations for all the nutrients during the three age intervals 0-3wks, 3-6 wks and 6-7 wks. A typical three – feed-program was followed in each of the four groups as starter (23% CP and 3200 kcal ME/kg diet), grower (20% CP and 3200 kcal ME/kg diet) and finisher (18%CP and 3200 kcal ME/kg diet). The diets were weekly prepared and mixed; samples from the diets were chemically analyzed using the standard methods of the Association of the Official Analytical Chemists (AOAC, 1995).The calculated and analyzed chemical compositions of the diets are illustrated in Table (1).

Carcass Characteristics:

At the end of the experiment (7 weeks old), five males were chosen randomly from each group for slaughter test. Weights of liver, heart, empty gizzard, carcass, total edible portions, bursa, illume, spleen, abdominal fat, subcutaneous fat and total body fat were recorded to the nearest gram. Carcass, total edible portions, abdominal fat and total body fat weights were calculated as a percentage of the live body weight.

Hematological and Biochemical Parameters:

At the end of the experimental period, blood samples were collected from five males in each group. Blood samples were collected from brachial veins into heparinzed tubes. Part of blood samples was used for hematological analysis including determination of hemoglobin (Hb) according to the method of Schalm,*et al*.(1975) and packed cell volume (PCV%) was calculated. Another part of blood was centrifuged at 3000 rpm for 10 min.to separate plasma. Plasma samples were stored at –20^{o}C until used for determination of total protein (Peter, 1968), albumin (Doumas *et al*.1971), creatinine (Husdan, 1968), total lipids (Zollner and Kirsch, 1962), cholesterol (Waston, 1960), GOT (Glutamic oxaloacetic transaminase) and GPT (Glutamic pyrovic transaminase) by using available commercial kits (Bio-Merieux, France).

Economic Efficiency

At the end of this work, the economical efficiency of the experimental diet was calculated from the input-output analysis based upon the differences in the both growth rate and feeding cost as described by Bayoumi (1980).

Statistical Analysis:

The data of body weight, body weight gain, feed consumption, feed conversion, slaughter test and blood parameters were statistically analyzed using one-way analysis of variance using SAS computer program (SAS, 1986). Differences among treatment means were tested using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

Body Weight

Comparing the results of the body weight recorded by the three feed restricted groups with the control (Table 2), there were, no significant ($P<0.05$) differences in body weight of groups skipped 6 and 5 days during starting period (0-3wks) as compared to the control group. While group skipped 10 days during the same period recorded the least body weight values. Plavnik and Hurwitz (1991) reported that restricted feed with broilers and turkey poults, starting at 7 days of age for a 20-day period, resulted lower body weight as compared to the control.

At the end of the growing period (3-6wks), there was significant increase ($P< 0.05$) in body weight in group skipped 5 days , stored a growth potential in this period high enough to attain the highest weight 2094.78 g compared to control and other feed restricted groups. As the group skipped 10 days may be so severe to be compensated. Plavnik and Hurwitz (1988) reported that in males, the 7-days feed restriction treatment resulted in an improvement on a body weight basis after body weight had reached 0.7 to 1 kg. Furthermore, Doyle and Lesson (1996) stated that the period and degree of under nutrition must not be too severe that animals are unable to compensate in reasonable periods. Moreover, Urdaneta-Rincon and Leeson (2002) indicated that live body weight at 42 day was significantly different between unrestricted and restricted broilers ($P<0.01$).

In the finishing period (6-7wks), the chicks in group skipped 5 days, maintained its surpassing growth rate and attained 2477.91g as compared with the other feed restricted groups (2^{nd} and 3^{rd} groups) which attained 2240.45 and 2351.82 g in a respective order. Some researchers as Leeson and Zubair (1997) who studied the nutrition of the broiler chicken during period of compensatory growth by feed restriction and realimentation programs and found that these programs succeeded in allowing full body weight recovery explained this result. Moreover, Plavnik and Hurwitz (1991) and Al-Taleb (2003)reported that after feed restriction and return to *ad-libitum* feeding the birds were able to fully recover body weight

depression, the body weight of birds from all restricted groups was significantly ($P<0.05$) higher than that of the control at the age of 49 days of age. While, Fontana *et al,* (1992) and Palo *et al*, (1995a) reported that feed-restricted groups were lighter in body weight ($P<0.01$) at 14 and 48 days of age than the control group. They also indicated that restricted groups had reduced specific activities of jejunal alkaline phosphatase and pancreatic trypsin, amylase, and lipase as compared with the control group at 14 days of age but not at 21 and 42 days of age. On the contrary, Lee and Leeson (2001) reported that birds were smaller following feed restriction ($P<0.01$) although growth compensation occurred, and at 49 days all restricted birds were heavier ($P<0.01$) than full-fed control birds. In the same respect, Gonzales *et al.* (1998) reported that compensatory growth could be attributed to the higher plasma growth hormone concentration of previously feed restricted birds and this may be related to the improved nitrogen efficiency during the compensatory growth of broiler chicks. In addition, Gous (1977) reported that the ability of the chicken to absorb amino acids might be increased as a result of prior feed restriction.

Regarding the entire experimental period (0-7wks) there was significant ($P<0.05$) increase in total body weight gain in group skipped 5 days as compared to the control and other feed restricted groups (Table 2). While the group skipped 10 days had significantly ($P<0.05$) lower total body weight gain than the control group. The chicks in control group (fed *ad-libitum*) gained in the 7 weeks 2333.66 g which when considered as 100% the other feed restricted groups will score 93.3, 98.2 and 104.6% respectively (2^{nd},3^{rd} and 4^{th} groups).The last program of feeding, (group skipped 5 days) was the best from the growth performance point of view. Many authors have described how animals and birds that had been restricted in growth exhibited greater rakes of gain once the restriction was removed, depending on the degree of restriction (Plavnik and Hurwitz 1988, 1991, Fontana *et al,* 1992; Zubair and Leeson, 1994) and breed of broilers (Saleh *et al.,*1996).

Feed Intake and Feed Conversion

In the starting period, no significant differences ($P<0.05$) in feed intake were observed in groups skipped 6 and 5 days at the starting period as compared to control group (Table3). While, a significant decrease ($P<0.05$) in feed consumption was observed in group skipped 10 days, as compared to the control (7.16%).This was parallel with obtained in body weight decreases (6.39%).

In the growing period (3-6 wks), there was significant increase (P< 0.05) in feed consumption in group skipped 5 days as compared to the control and the other two feed restricted groups (3.55, 7.43, and 6.69% respectively). While, significant decrease (P<0.05) in feed consumption was observed in groups skipped 10 and 6 days (3.73 and 2.94% respectively) as compared to the control group. In the finishing period (6-7 wks), a significant decrease (P<0.05) in feed consumption was observed in group skipped 10 days (7.65%) as compared to the control group (Table3).

On the other hand, no significant (P<0.05) difference in total amount of feed consumption was observed during the whole experimental period (0-7wks) in group skipped 5 days as compared with the control group. While, significant decreases (P<0.05) in total amount of feed consumption were observed in groups skipped 10 and 6 days as compared to the control group. These decreases were 5.33 and 3.51% respectively.

By reviewing the total feed consumption in the three feeding periods the same trend could be extracted with the level of skipping days as the skipping days decreased the feed intake increased among the three feed restricted groups. Oyedeji and Atteh (2003) revealed that feed intake was significantly reduced (P<0.05)because of feed restriction, and initiation of broilers to 50% *ad-libitum* feeding beyond the 3rd week resulted in poorer performance of broilers compared with the control. In the same respect, Oyedeji *et al.* (2003) showed that skip-a-day feeding regime significantly reduced (P<0.05) feed intake of broiler chicks.

During the starting period and finishing period as well as the whole experimental period, there was no significant improvement (P<0.05) in feed conversion in all feed restricted groups as compared to the control (Table3). Similar to results of the present study, Oyedeji *et al*. (2003b) showed that feed intake to gain ratio was not significantly affected (P<0.05) by skip a day feeding regime as compared to the control. In the contrary, Deaton (1995), Palo *et al* (1995a), Al-Taleb (2003), Oyedeji, and Atteh (2003a) and Saleh *et al*,(2004) reported a significant improvement in feed conversion ratio as a result of early feed restriction.

During the growing period, there was significant improvement (P<0.05) in feed conversion in groups skipped 6 and 5 days as compared with the control and the group skipped 10 days. Also, group skipped 10 days had worst feed conversion than the control group.

It is important to remember that the severity and duration of feed restriction may account for some of the variability in these results. The efficiency of feed utilization was more affected than the rate of feed

consumption. Table (3) showed that restriction of feed intake during 0-3 wks of age by feeding 11, 15 and 16 days did not have a negative effect on feed conversion as compared to the control group but had a positive effect in the second period (3-6 wks). While in the whole experimental period (0-7wks), there was significant improvement ($P<0.05$) in feed conversion in groups fed 15 and 16 days as compared with group fed 11 days. These results agreed with the results mentioned by Zubair and Leeson (1994) that increased growth was due in some way to better nutrient utilization and that the broiler chickens appears to be able to benefit a period of early "undernutrition" in that subsequent compensatory growth will likely improve feed utilization.

Mortality Rate

Mortality rates at the end of the experiment were 12.5, 5.0, 5.0, and 2.5 % in the control, skipped 10, 6, and 5 days groups respectively. It was shown that mortality rates were decreased in all feed restricted groups as compared to the control (Table3).It was clear that the group skipped 5 days (mild restricted) resulted in the lowest mortality rate as compared to the control and the group skipped 10 days (severe restricted). These results are in agreement with those reported by Urdaneta-Rincon and Leeson (2002) and Saleh *et al*. (2004) that feed restriction resulted in a significant reduction in mortality at all feed restricted groups compared to the control. In the same respect Attia *et al*.(1995a) reported that this reduction in mortality rate recorded by the mild restricted group (80% of *ad libitum*) during the early growing period could be attributed to the beneficial effect of feed restriction in improving the antibody responses and disease resistances in the early stage of development. Furthermore, Zulkifli *et al*, (1995) reported that feed restricted birds showed an improvement in immune responses, disease resistance, and decrease mortality rate, as compared to fully fed birds. Similary, Camacho *et al*. (2004) indicated that quantitative feed restriction and microelement supplementation at 7 d of age-reduced mortality from ascites and leg problems.

Carcass Characteristics

The effects of different feeding programs on the carcass characteristics are shown in Table (4). Liver weight, carcass weight, carcass percentages, total edible portions weight and percentages were significantly increased ($P<0.05$) in groups skipped 6 and 5 days as compared to the control group. While, Fontana *et al*, (1993) revealed that no significant differences were observed in liver weight between early-restricted birds and *ad-libitum* controls at 49 days of age. On the contrary, Palo *et al* (1995a)

reported that liver weight was reduced (P<0.01) by feed restriction at 14 days of age as a result of reduction (P<0.01) in liver cell number. A significant decrease (P<0.05) in heart weight was observed in group skipped 10 days as compared to the control and other feed restricted groups. Also a significant decrease (P<0.05) in spleen weight was observed in group skipped 6 days as compared to the control.

On the other hand, no significant differences were observed between the feed restricted groups and control group in both empty gizzard and illume weights. In the same respect, Fontana *et al*, (1993) revealed that no significant differences were observed in gizzard weights between early-restricted birds and *ad-libitum* controls at 49 days of age. In the contrary, Orderkirk (1999) found that gizzard weight was decreased due to feed restriction and stated that the longer off feed; the tighter the gizzard and the harder to peel explained this observation.

Significant decreases (P<0.05) were observed in abdominal fat weight and percentages, subcutaneous fat weight, total body fat weight and percentages in all feed restricted groups as compared to the control. The percentages of decreasing in total body fat were 5.24, 5.16, and 3.85% than the control group for groups skipped 10, 6, and 5 days respectively. Plavnik and Hurwitz (1988),Attia *et al.*(1995a), Saleh *et al.*(1996), Al-Taleb (2003) and Oyedeji *et al*.(2003) observed similar results. In addition, Zhong *et al.* (1995) reported that lipogenesis of the restricted broilers was lower (P<0.05) than that of the full-fed broilers at 14 and 56 d of age. In addition, reduced abdominal fat in the restricted broilers is attributed to the reduction of adipocyte volume, which may be due to decreased lipogenesis. Also, Harvey and Klandorf, (1983) reported that fasting is known to influence a whole array of metabolic processes including a shift from anabolism to catabolism and from lipogenesis to lipolysis. While, Fontana *et al*, (1993), Susbilla *et al*, (1994), Deaton (1995) and Palo *et al*, (1995b) revealed that no significant differences (P<0.05) were observed for abdominal fat weight between early-restricted groups and the control. This contradiction in the above mentioned results could be attributed to the severity and duration of feed restriction (Attia *et al.,* 1995).

Obviously, skipping and realimentation affected abdominal fat weight and its percentage as the reduction in this parameter was significant (P<0.05) in the three feed restricted groups as compared to the control. Sugeta *et al*. (2002) also confirmed our findings, indicating that abdominal fat was reduced by increasing the feed restriction up to 70% during the first two weeks. This fact could improve carcass quality due to decrease carcass fat content, this reduce carcass waste and tasty consumer desire.

Hematological and Biochemical Parameters:

The effects of different restricted feeding programs on hematological and biochemical parameters of broiler chicks are shown in Table (5). The data showed significant decreases in hemoglobin (Hb) concentration, and packed cell volume (PCV) in all feed restricted groups as compared to the control (fed *ad-libtum*). In the same respect Maxwell *et al*, (1990) showed that Hb and, PCV were reduced when broilers fed a restricted diet. However, the results showed that there was a tendency to microcytic norm chromic anemia in these restricted-fed birds.

There were no significant changes in plasma total protein, albumin, creatinine, GOT and GPT in all feed restricted groups as compared to the control. Abd El-moty, (1992) found that plasma protein level of birds fed on 85% of *ad libitum* was not significantly different as compared to the control, whereas restriction of feeding to 70% decreased significantly the plasma proteins levels. In the same respect, Abd el-fattah *et al* (2003) reported that both plasma GOT and GPT were not affected by the different feed restriction regimens in Japanese quail at either 4 or 6 wks of age. This result indicated that Japanese quails are able to defeat the stressful effect of feed restriction without any adverse effect on the liver functions. On the contrary, Nematallah *et al*. (2003) reported that there were significant changes in GOT and GPT between feed restricted ducks (80 and 90%) and the control.

On the other hand, significant ($P<0.05$) decrease in plasma total lipids in group skipped 10 days (severe restricted) when compared to the control. Similarly, Renema *et al*. (1999) and Abd el-fattah *et al*.(2003) reported that, the use of *ad libitum* feeding regimen increased plasma lipid concentrations in broiler breeder birds comparable to the feed restricted birds.

Regarding, plasma total cholesterol concentration, it was showed significant ($P<0.05$) decrease in all feed restricted groups as compared to the control. These hypocholesteremia depending on both the severity and duration of feed restriction program. Moreover, Sturkie, (1986) reported that serum or plasma cholesterol levels of birds are strongly affected by heredity, nutrition, age, sex and environmental conditions.

In the present study, different restricted feeding programs have no adverse effect on blood biochemical profile. This finding as long as the improvement of productive performance which reflected by increasing body weight and enhancing feed efficiency might indicate beneficial role of different restricted feeding programs.

Economic Efficiency (EE)

Economic evaluation study of broiler chicks fed on different restricted feeding programs is summarized in Table (6). Feed restriction regime of groups skipped 6 and 5 days during the first three weeks improved EE compared with the control. These improvements in EE were 2.54 and 2.72% respectively than the control value. These results are in agreement with those reported by Oyedeji and Atteh (2003) and Oyedeji *et al.* (2003), they showed that feed restriction regime (skip-a-day feeding) in broiler diets may be beneficial to economic efficiency. From economic point view, it was clear that the group skipped 5 days during 0-3wks of age (mild restriction) recorded the best EE. On the other hand the group skipped 10 days (severe restriction) recorded the lowest EE value as compared to the control and the other feed restricted groups.

Data from the present study suggest that feed restriction regime in broiler diets especially mild restriction (skipped 5 days) during the first 3 weeks of age, improved growth performance, and economic efficiency, increased carcass weight, carcass percentages, total edible portions weight and percentages. There are other positive effects, including reduced abdominal fat weight and percentages, subcutaneous fat weight, total body fat weight and percentages, and mortality rate as compared to the control. This could improve carcass quality due to the decrease in total fat content which consider a waste product to both processor and consumer. This also increases the economic advantages of male Arbor Acres chicks.

Table (1): Composition and chemical analysis of the experimental diets fed during starting, growing and finishing periods.

Ingredients (%)	Starter (0-3wks)	Grower (3-6wks)	Finisher (6-7wks)
Yellow corn ground	50.24	60.71	64.90
Soybean meal (44%)	33.00	25.70	26.03
Corn gluten	6.90	5.70	1.70
Sunflower oil	6.00	4.30	4.39
Dicalcium phosphate	1.70	1.40	1.01
Limestone	1.40	1.40	1.35
Sodium chloride	0.40	0.40	0.35
Vit. and min. Premix*	0.25	0.25	0.25
DL- methionine	0.11	0.04	0.02
Lysine	--	0.10	--
Chemical composition			
Dry matter	85.80	86.30	85.30
Crude Protein	22.90	20.09	18.10
Crude fat	2.50	2.70	2.80
Crude fiber	3.70	3.42	3.40
Ash	6.04	5.52	5.20
Calculated composition			
ME(kcal/Kg)	3200	3200	3200
Crude Protein	23.00	20.00	18.00
C/P ratio	139.13	160.00	177.77
Calcium	1.00	0.91	0.81
Phosphorous, available	0.45	0.38	0.31
Lysine	1.10	1.01	0.89
Methionine	0.51	0.39	0.32
TSAA**	0.93	0.78	0.69
Price of ton diet (LE)	**961.64**	**877.30**	**819.07**

* Composition of the vitamins and minerals premix

Each2.5 kg of vitamin and minerals mixture contain: 12,000,000 IU vitamin A; 2,000,000 IU D3'; I0, 000 mg E; 1,000 mg K3; 1,000 mg BI; 5,000 mg B2; 1,500 mg B6; I0 mg B12; 10,000 mg pantothenic acid; 20,000 mg Nicotinic acid, 1,000 mg Folic acid; 50 mg Biotin; 500,000 mg choline chloride, 4,000 mg Copper, 300 mg Iodine; 30,000 mg Iron; 60,000 mg Manganese; 50,000 mg Zinc, and 100 mg Selenium.

**TSAA: Total sulfur amino acid

Table (2): Body weight and body weight gain of broiler chicks in the different feed restricted groups (mean ± SE).

Age or Period (weeks)	Experimental groups			
	1 /Control	2	3	4
Body weight (g)				
0 (2days)	58.48±1.13^{a}	58.18±0.92^{a}	59.27±0.88^{a}	57.09±0.99^{a}
1	173.52±4.68^{a}	167.95±4.74^{a}	168.00±4.47^{a}	177.83±4.35^{a}
2	403.00±10.04^{a}	376.59±7.93^{b}	388.95±9.25^{ab}	390.57±7.85^{ab}
3	772.00±17.87^{a}	722.64±15.37^{b}	761.36±15.99^{ab}	766.04±14.30^{ab}
4	1131.76±27.0^{a}	1035.82±22.82^{b}	1082.32±22.8^{ab}	1057.70±21.8^{b}
5	1566.81±37.28^{a}	1475.55±30.50^{b}	1588.41±31.03^{a}	1572.83±30.27^{a}
6	2016.67±57.03^{b}	1882.73±39.40^{c}	2018.18±39.11^{b}	2094.78±43.00^{a}
7	2392.14±80.8^{ab}	2240.45±46.52^{c}	2351.82±52.89^{b}	2477.91±57.75^{a}
Weight gain (g)				
(0-3)	713.52±4.69^{a}	664.46±22.09^{b}	702.12±22.27^{a}	708.95±27.94^{a}
(3-6)	1244.67±35.31^{b}	1160.09±9.41^{c}	1256.79±5.55^{b}	1328.74±8.84^{a}
(6-7)	375.47±54.91^{ab}	357.72±35.00^{ab}	333.64±20.45^{b}	383.13±22.29^{a}
Total gain(0-7)	2333.66±55.21^{b}	2182.27±22.50^{c}	2292.55±48.27^{b}	2420.82±57.23^{a}

a-b Means with different superscripts within each row are significantly different (P< 0.05)

Table (3): Feed intake, feed conversion, and mortality percentage of broiler chicks in the different feed restricted groups (mean ±SE).

Periods in weeks	Experimental groups			
	I /Control	2	3	4
Feed intake (g)				
0-1	153.32±2.68^{a}	144.23±6.32^{a}	145.64±2.82^{a}	150.33±3.33^{a}
1-2	328.31±4.59^{a}	302.91±17.82^{b}	320.05±7.32^{a}	311.10±6.73^{ab}
2-3	618.39±42.21^{a}	574.14±21.32^{a}	603.77±8.05^{a}	585.25±6.63^{a}
(0-3)	1100.02±59.4^{a}	1021.28±32.8^{b}	1069.46±12.1^{a}	1046.88±13.7^{ab}
3-4	745.40±33.50^{a}	680.27±6.45^{b}	671.18±4.36^{b}	665.18±7.82^{b}
4-5	885.95±62.86^{a}	912.50±10.14^{a}	914.77±19.05^{a}	952.82±39.18^{a}
5-6	1196.98±55.62^{b}	1130.05±3.23^{c}	1159.36±25.27^{bc}	1310.84±46.57^{a}
(3-6)	2828.33±51.9^{b}	2722.82±26.6^{c}	2745.31±40.60^{c}	2928.84±68.5^{a}
(6-7)	1091.90±54.91^{ab}	1008.32±15.68^{c}	1029.41±39.77^{bc}	1132.71±50.99^{a}
Total (0-7)	5020.25±72.5^{a}	4752.42±19.41^{c}	4844.18±52.46^{b}	5108.43±78.26^{a}
Feed conversion				
(0-3)	1.542±0.08^{a}	1.536±0.04^{a}	1.523±0.03^{a}	1.477±0.03^{a}
(3-6)	2.272±0.01^{b}	2.347±0.01^{a}	2.184±0.01^{c}	2.204±0.04^{c}
(6-7)	2.908±0.28^{a}	2.818±0.23^{a}	3.085±0.25^{a}	2.956±0.17^{a}
Total (0-7)	2.151±0.03^{ab}	2.177±0.04^{a}	2.113±0.02^{b}	2.110±0.03^{b}
Mortality %	**12.5**	**5.0**	**5.0**	**2.5**

a-c Means with different superscripts within each row are significantly different (P<0.05)

Table (4) Carcass characteristics of broiler chicks in the different feed restricted groups (mean ± SE).

Items	Experimental groups			
	I/Control	2	3	4
Live body weight, g.	2391.25±66.87^{b}	2327.50±51.86^{b}	2442.50±44.98^{a}	2452.50±76.96^{a}
Liver weight, g.	41.88±1.43^{b}	41.73±1.78^{b}	45.50±2.16^{a}	46.28±3.13^{a}
Heart weight, g.	11.23±0.37^{a}	9.75±0.66^{b}	11.38±0.48^{a}	12.09±1.02^{a}
Empty gizzard, g.	34.18±0.88^{ab}	32.50±0.92^{b}	36.13±1.38^{a}	34.03±0.34^{ab}
Carcass weight, g[1]	1710±52.32^{b}	1666.25±45.89^{b}	1772.50±21.36^{a}	1788.75±59.73^{a}
Carcass %	71.45±0.78^{b}	71.53±0.48^{b}	72.53±0.78^{a}	72.90±0.75^{a}
Total edible portion,g.[2]	1797.28±53.66^{b}	1750.23±44.60^{b}	1865.50±22.55^{a}	1881.14±60.46^{a}
Total edible portion %	75.16±0.78^{b}	75.20±0.34^{b}	76.38±0.84^{a}	76.70±0.91^{a}
Bursa weight ,g.	2.86±0.55^{b}	3.33±0.16^{ab}	3.03±0.53^{ab}	3.50±0.17^{a}
Illume weight, g.	134.75±11.91^{a}	129.00±13.13^{a}	122.00±7.15^{a}	124.00±4.78^{a}
Spleen weight, g.	3.18±0.18^{a}	3.00±0.28^{ab}	2.29±0.26^{b}	2.99±0.20^{ab}
Abdominal fat, g.	89.00±1.54^{a}	46.68±9.84^{b}	42.63±8.95^{b}	50.25±5.71^{b}
Abdominal fat %	3.70±0.08^{a}	2.00±0.42^{b}	1.74±0.37^{b}	2.07±0.28^{b}
Subcutaneous fat, g.	105.60±6.32^{a}	20.80±5.72^{d}	30.12±3.21^{c}	4.98±6.36^{b}
Total body fat, g.	194.60±5.82^{a}	67.48±8.13^{c}	72.75±7.82^{c}	105.23±5.85^{b}
Total body fat %	8.14±0.30^{a}	2.90±0.20^{c}	2.98±0.42^{c}	4.29±0.50^{b}

a-d Means with different letters within each row are significantly different ($P < 0.05$).
1-Carcass weight =eviscerated weight.
2-Total edible portion = carcass weight + giblets weight

Table (5): Hematological and biochemical Parameters of broiler chicks fed on different skipping programs.

Blood measure	Experimental groups			
	I /control	2	3	4
PCV%	33.20±2.10^{a}	27.87±2.15^{b}	29.80±2.21^{b}	29.90±2.25^{b}
Haemoglobin (g/d1)	14.07±0.80^{a}	9.13±0.61^{d}	10.97±1.04^{c}	12.23±0.90^{b}
Total Protein (g/d1)	3.87±0.23^{a}	3.90±0.29^{a}	3.90±0.21^{a}	3.73 ±0.13^{a}
Albumen (g/d1)	2.23±0.04^{a}	2.27±0.06^{a}	2.25±0.08^{a}	2.26±0.07^{a}
Creatinine (mg/d1)	1.24±0.03^{a}	1.29±0.04^{a}	1.30±0.02^{a}	1.27±0.03^{a}
Total Lipids(mg/d1)	6.05±0.10$^{a\ b}$	4.47±0.22^{c}	5.73±0.07^{b}	6.32±0.07^{a}
Cholesterol (mg/d1)	162.34 ± 3.84^{a}	138.34±5.24^{c}	139.34±3.18^{c}	150.67±3.84^{b}
GOT	21.70±0.81^{a}	22.40±1.45^{a}	22.43±1.11^{a}	22.20±0.99^{a}
GPT	5.23±0.32^{a}	4. 86±0.25^{a}	4. 97±0.23^{a}	5. 07±0.12^{a}

a-d Means with different letters within each row are significantly different ($P < 0.05$).
GOT=Glutamic oxaloacetic transaminase
GPT=Glutamic pyrovic transaminase

Table (6): Input-output analysis and economical efficiency of different feed restricted groups.

Items	Experimental groups			
	1	2	3	4
Average feed consumed (kg)	5.020	4.752	4.844	5.108
Price/kg feed consumed (PT)[1]	88.316	88.315	88.358	88.175
Total feed cost (PT)	443.346	419.673	428.006	450.398
Average live Weight (kg)	2.392	2.240	2.352	2.478
Price/kg live Weight (PT) [2]	600.00	600.00	600.00	600.00
Total revenue (PT)	1435.20	1344.00	1411.12	1486.80
Net revenue (PT)	991.854	924.327	983.114	1036.402
Economic efficiency (EE)[3]	2.240	2.202	2.297	2.301
Relative economic efficiency[4]	100	98.30	102.54	102.72

1 Total price of feed consumed at starting, growing and finishing periods/ total feed consumed
2 According to the local market price at the experimental time (2002).
3 Net revenue per unit food cost.
4 Assuming the E.E. of control diet equals 100.

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الملخص العربي

استجابة ذكور كتاكيت التسمين لتخطى يوم في برامج التغذية

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أجريت هذه التجربة لدراسة تأثير أستجابة كتاكيت التسمين لبرامج تخطى يوم تغذية على النمو و صفات الذبيحة وبعض قياسات الدم والكفاءة الاقتصادية. تم أجراء التجربة علي ١٦٠كتكوت تسمين أربوايكرز (ذكور) عمر يومين قسمت عشوائيا إلى ٤ مجاميع تجريبية متساوية العدد كانت المجموعة الأولى منها كنترول غذيت تغذية حرة طول فترة التجربة والمجموعة الثانية غذيت يوم وتصويم يوم(حرمت من التغذية ١٠ أيام) والمجموعة الثالثة غذيت يومين وتصويم يوم(حرمت من التغذية ٦ أيام) والمجموعة الرابعة غذيت ثلاثة أيام وتصويم يوم(حرمت من التغذية ٥ أيام) وأستمر هذا البرنامج فى التغذية خلال الأسابيع الثلاثة الأولى من العمر وبعد ذلك أستمرت التغذية الحرة لكل المجاميع حتى عمر ٧ أسابيع وكانت أهم النتائج مايلي:-

١ – كان هناك تحسن معنوي في الزيادة المكتسبة الكلية في وزن الجسم فى نهاية التجربة بالنسبة لكتاكيت المجموعة التى حرمت من التغذية ٥ أيام بالمقارنة بالمجموعة الكنترول. بينما كان هناك

أنخفاض معنوي في الزيادة المكتسبة الكلية في وزن الجسم فى نهاية التجربة بالنسبة لكتاكيت المجموعة التى حرمت من التغذية ١٠ أيام بالمقارنة بالمجموعة الكنترول.

٢- لم يكن هناك اختلاف معنوى فى كمية الغذاء المستهلك طول فترة التجربة بالنسبة لكتاكيت المجموعة التى حرمت من التغذية ٥ أيام بالمقارنة بالمجموعة الكنترول. بينما كان هناك أنخفاض معنوي فى كمية الغذاء المستهلك طول فترة التجربة بالنسبة لكتاكيت المجموعة التى حرمت من التغذية ١٠ أيام وكتاكيت المجموعة التي حرمت من التغذية ٦ أيام بالمقارنة بالمجموعة الكنترول.

٣ - لم يكن هناك تحسن معنوي في كفاءة تحويل الغذاء خلال فترة البادى (صفر-٣أسابيع) وفترةالناهي (٦-٧ أسابيع) وطول فترة التجربة(٢يوم-٧ أسابيع) بالنسبة لكل كتاكيت المجاميع التي تم فيها تحديد الغذاء بالمقارنة بالمجموعة الكنترول. بينما كان هناك تحسن معنوي في كفاءة تحويل الغذاء خلال فترة النمو (٣-٦أسابيع) بالنسبة لكتاكيت المجموعة التي حرمت من التغذية ٦ أيام وكتاكيت المجموعة التي حرمت من التغذية ٥ أيام بالمقارنة بالمجموعة الكنترول والمجموعة التى غذيت حرمت من التغذية ١٠ أيام.

٤- أدى تحديد العليقة الى انخفاض نسبة النفوق بالنسبة لكل المجاميع التجريبية بالمقارنة بالمجموعة الكنترول وأظهرت المجموعة التى حرمت من التغذية ٥ أيام اقل نسبة نفوق(٢,٥%).

٥– أوضحت نتائج صفات الذبيحة وجود زيادة معنوية في وزن الكبد ووزن الذبيحة والنسبة المئوية لوزن الذبيحة والنسبة المئوية للأجزاء المأكولة بالنسبة للمجموعة التى حرمت من التغذية ٦ أيام والمجموعة التي حرمت من التغذية ٥ أيام بالمقارنة بالمجموعة الكنترول. وكان هناك أنخفاض معنوى فى وزن القلب بالنسبة لكتاكيت المجموعة التي حرمت من التغذية ١٠ أيام بالمقارنة بالمجموعة الكنترول وباقي المجاميع التجريبية الأخرى. وكان هناك أيضا أنخفاض معنوى فى وزن الطحال بالنسبة لكتاكيت المجموعة التي حرمت من التغذية ٦ أيام بالمقارنة بالمجموعة الكنترول.

٦- كما كان هناك انخفاض معنوي في النسبة المئوية لدهن البطن ووزن الدهن تحت الجلد والنسبة المئوية لدهن الجسم الكلى بالنسبة لكتاكيت كل المجاميع التجريبية التى تم فيها تحديد غذائي بالمقارنة بالمجموعة الكنترول.

٧- كان هناك أنخفاض معنوى في نسبة الهيموجلوبين وحجم الخلايا المترسبه والكوليسترول الكلى لكل المجاميع التجريبية التى تم لها تحديد غذائى بالمقارنة بالمجموعة الكنترول. كما كان هناك أنخفاض معنوى في مستوى الدهن الكلي للبلازما فى المجموعة التي حرمت من التغذية ١٠ أيام بالمقارنة بالمجموعة الكنترول. بينما لم يكن هناك أختلافات معنوية في مستوى البروتين الكلى للبلازما والألبيومين والكرياتينين وأنزيماتGPT, GOT لكل المجاميع التجريبية التى تم فيها تحديد غذائي بالمقارنة بالمجموعة الكنترول.

٨-كان هناك تحسن للكفاءة الأقتصاديه بالنسبة للمجموعة التي حرمت من التغذية ٦ أيام والمجموعة التي حرمت من التغذية ١٠ أيام بالمقارنة بالمجموعة الكنترول.

وتوضح نتائج هذة الدراسة أن برنامج التحديد الغذائي وذلك بالحرمان من التغذية لمدة ٥ أيام خلال الأسابيع الثلاثة الأولى من العمر كان الأكثر كفاءة في تحسين أداء الكتاكيت والكفاءة الأقتصاديه وكذلك زيادة النسبة المئوية للذبيحة وتقليل نسبة النفوق وتحسين جودة الذبيحة عن طريق خفض نسبة الدهون الكلية في الذبيحة.