Zagazig J.Agric. Res., Vol .31 No.(3) 2004 993-1010

USING LINSEED MEAL IN BROILER CHICK DIETS

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Accepted 28 /12 / 2003

ABSTRACT: Three hundreds and ninety six Hubbard broiler type chicks, one week old were used to study the effect of using linseed meal (LSM) at different levels on growth performance, nutrient digestibility, carcass traits and economical efficiency of broiler chicks. Chicks were randomly divided into six treatment groups of 66 chicks each (3replicates with 22 chicks each). Chicks of each treatment had nearly the same average initial body weight. The first group was fed the basal diet as control, while the other five groups were fed diets containing either 4, 8, 12, 16 or 20% LSM. All the experimental diets were nearly iso-nitrogenous and iso-caloric.

Results obtained could be summarized as follows.

Average percentages of digestibility values of LSM were 70.22, 71.70, 75.10, 84.40, 19.90, and 68.13% for DM , OM , CP, EE , CF and NFE, respectively , while the nutritive values were 24.40% DCP, 55.60% TDN and 2335.00 kcal ME / kg .Live body weight of broiler chicks and daily body weight gain during all the experimental periods was significantly ($P < 0.1$) decreased with increasing the dietary LSM level more than 4%.Daily feed intake was almost decreased significantly($P<0.05$or$P<0.01$) by increasing the dietary LSM during all the experimental periods. Feed conversion of broiler diets during the starter period (1-3 weeks of age) was improved by the incorporation of LSM in the experimental diets , while during the finisher period (3-6 weeks of age) feed conversion values were poorest than those recorded during the starter period. Moreover, during 1-6 weeks of age birds fed 4% LSM diet achieved the best feed conversion value, while the poorest ($p<0.01$) values were recorded for birds fed on the diets with 16 and 20 % LSM. Using LSM in broiler diets up to 20% had little effect on mortality rate. Diets contained more than 8% LSM resulted in significant ($P<0.05$ or $P<0.01$) decrease in the digestibility coefficients of OM, CP, CF

and NFE compared with those of diets contained the lower levels (0, 4 or 8 %) or the control diet. The nutritive values of the experimental diets (DCP, TDN, and ME) were significantly (P<0.01) decreased by increasing the dietary LSM level more than 8% when compared with control and the other treatment groups. It is worthy noting that carcass, dressing and abdominal fat weights were insignificantly decreased with increasing dietary LSM level, while giblets weight was increased. The present results demonstrated that increasing the LSM more than 4% during the finisher and the whole experimental periods increased the value of feed cost /kg gain and decreased the economical efficiency of broiler chicks.

Conclusively, from nutritional and economical point of view, the LSM could be used in broiler chick diets not more than 4%.

INTRODUCTION

Feeding cost of the poultry production represents at least 65 % total cost of and reducing the feed cost is one of the important targets in poultry production. Therefore, a considerable attention has been paid to use un-conventional feedstuffs such as agro- industrial by– products in formulating poultry diets to achieve a suitable efficiency of utilization and economic efficiency of production.

Linseed meal (LSM) is crushed by expellers and the de oiled remaining meal contains 25-35% protein. It contains an antipyridoxine factor and a cynogenic glycoside considered anti-nutritional factors. It has a moderate calcium content but rich in phosphorus and considered as a useful source of B1,B2 , niacin , pantothenic, choline and the amino acid treptophan (Scott et al,1982) .

The aim of this study was an attempt to evaluate the nutritive value of LSM and using it in formulating broiler chick diets.

MATERIALS AND METHODS

This work was carried out at the Poultry Research Farm, Poultry Department, Faculty of Agriculture, Zagazig University, Egypt.

A total number of 396 unsexed one week old Hubbard broiler chicks were randomly distributed into 6 treatment groups of 66 chicks (3 replicates of 22

chicks each) with nearly similar average initial live body weight. Each treatment group was assigned to one of the experimental diets. The LSM was incorporated at levels of 0 (control), 4, 8, 12,16 and 20 % in the starter and finisher diets all the experimental diets were nearly isonitrogenous and isocaloric. The composition and chemical analysis of the experimental diets are presented in Table 1. Chicks were floor brooded and reared under the same managerial and hygienic conditions.

Chicks were wing banded and fed on the starter diets during the period from 1 to 3 weeks of age (starter period) and the finisher diets during the period from 3 – 6 weeks of age (finisher period). Birds were exposed to 23 hrs. Light per day, fed adl-ibitum on mash form diet and had free access to fresh water. Individual body weight of chicks was recorded at 1,3 and 6 weeks of age, Daily body weight gain was calculated as final weight, g,- initial weight, g period, day .Feed intake data were weekly recorded on a replicate basis and daily feed intake was calculated during each experimental period (1-3, 3-6 and 1-6 weeks of age). Consequently, feed conversion was estimated (g feed / g gain). Mortality daily was recorded. Economical efficiency (EE) of each experimental group was calculated according to the following equation:

$$EE\ \% = A - B/B \times 100$$

Where A is the selling price/ kg and B is the feeding cost of 1 kg.

At 6 weeks of age a slaughter test was performed using three chicks around the average body weight from each treatment. The selected chicks were deprived from feed for 16 hrs after which birds were individually weighed and slaughtered to complete bleeding, followed by blucking the feathers, then weighed. The carcass traits studied were giblets, abdominal fat, carcass and dressed weights (dressed weight = carcass weight plus giblets weight) /100g pre slaughter weight.

At the end of the experiment, four birds from each treatment were used to determine the digestibility coefficients of different feed nutrients and to calculate the nutritive values of the experimental diets. Also, an indirect digestion trail was carried

out to evaluate the digestibility coefficients and feeding values of LSM nutrients. Birds were housed in individual metabolism cages. Excreta was quantitatively collected for 5 days. Faecal nitrogen was determined according to Jakobson et. al.(1960). The proximate analysis of feed, dried excreta and LSM were carried out according to the Official methods A.O.A.C, (1994). Nitrogen free extract was calculated according to Abou-Raya and Galal (1971). Nutritive values were calculated as total digestible nutrients (TDN) and metabolizable energy (ME). Metabolizable energy was calculated as 4.2 kcal per gram TDN as suggested by Titus (1961).

Data were statistically analyzed using complete randomized design according to Snedecor and Cochran (1982). The following model was used

$X_{ik} = U + B_i + e_{ik}$

Where, X_{ik} = any observation, U = the overall mean, B_i= effect of dietary treatment (i = 1,2,.....and 6) and e_{ik} = random error.

Duncan's Multiple Range test (Duncan,1955) was used to test the significance for the comparison among means of the experimental groups.

RESULTS AND DISCUSSION

Chemical composition, digestibility coefficients and nutritive values of LSM :

The chemical composition values of the LSM used in this study was 90.40, 82.44, 32.49, 4.07, 8.67,37.22 and 7.95 % for DM,OM,CP,EE,CF,NFE and ash respectively, as shown in Table 2. The values of OM, CP and NFE, obtained were higher than those reported by Amber et. al .(2002) and Abbas. et.al (1990), while CF and EE were lower than those obtained by the same authors. However, the present results agree with those obtained by Mariey (1995) and Anwar (1977). The chemical characteristics of LSM largely varied and that may be due to the differences between cultivars, environmental and soil conditions in different geographical locations (Karunajuwa et. al. 1989) and also due to its oil extraction method.

The digestibility coefficient values of LSM were 70.22, 71.70, 75.10, 84.80, 19.90 and 68.13% for DM,OM,CP,EE,CF and NFE, respectively (Table 2).Results obtained in this study agree with Mariey (1995), Abbas

et. al. (1990), Crampton, (1956), Abou El-Soud etal.(1968) and Abou-Rraya (1967).

The nutritive values of tested LSM were found to be 24.40% DCP, 55.60% TDN and 2335.00 ME kcal/kg. The ME value is higher than that reported in the literature which may be attributed to the higher digestibility values due to associative effect between the basal diets and the tested LSM. It was 1700 kcal/kg (Abbas, et. al. 1990), 1980 kcal/kg (Janseen, et al. 1982) and 2,200 kcal/kg (Anwar,1977). Perhaps the energy content in LSM is widely variable because the variation in extraction methods of oil from linseed.

Growth performance

Results in Table 3 indicated that live body weight at 3 and 6 weeks of age was significantly decreased ($P<0.01$) in chicks fed diets containing more than 4% LSM. The decrease in live body weight increased with increasing dietary LSM level from 8 to 20 %. No significant differences were detected between groups fed 0 or 4 % dietary LSM.

Also, daily body weight gain during the starter, finisher and whole experimental period(1-3,3-6 and 1-6 weeks of age, respectively) were significantly ($P<0.05$ or $p<0.01$) decreased by increasing the dietary LSM more than 8or12%. During the whole experimental period (1-6 weeks of age), increasing the dietary level of LSM to 8,12,16 and 20% reduced daily body weight gain by 6.03, 7.34,15.77 and 31.47 %, respectively, as compared with the control group.

The decrease in growth performance of chicks as affected by dietary LSM level may be due to that LSM has an amorectic effect (Raya et al., 1991 and Mariey 1995). In addition, LSM contains several antinutritional factors namely, cyanogenic glycoside (Trease and Evans, 1992), anti-pyridoxine factor, (Shaible,1970), trypsin inhibitor (El- Khimsawy,1993), phytic acid (Madhusudhan and Singh, 1983),allergens (Spies,1974) and goitrogens (Care,1954).

The decrease in daily feed intake and crude protein digestibility in the experimental diets with the higher dietary LSM levels explain the depression in growth rate of chicks. Results in Table3 indicated that daily feed intake significantly ($P<0.05$ or $P<0.01$) decreased with

increasing the dietary LSM level during all the experimental periods. During the whole experimental period (1-6 weeks of age) chicks fed 0 % LSM (control) consumed 4.76, 7.67, 8.25, 9.03 and 15.24 % more feed than chicks fed diets containing 4,8, 12,16, and 20 % LSM, respectively. This may be due to the presence of different anti-nutritive substances in LSM which may limit feed consumption of diets containing high LSM levels. Also, LSM is made from flaxseed and so it is not as palatable as soybean meal or corn gluten meal (Schaible,1970).

Concerning feed conversion, results in Table 3 during the starter period (1-3 weeks of age)feed conversion was improved by the incorporation of LSM in the diets. While feed conversion values during the finishing period (3-6 weeks of age) were poorest than those recorded during the starter period . It is worth noting that during the whole experimental period (1-6 weeks of age) birds fed on the diet contained 4.0 % LSM achieved the best ($P<0.05$) feed conversion, value followed by those of chicks fed on 8,12 and 0% LSM diets where as the poorest values where recorded by birds fed on the diets with 16 and 20% LSM.

The results of growth performance are in good agreement with those obtained by Mariey (1995) and Abbas et al. (1990),who reported that growth performance of broiler chicks fed on 0 or 5% LSM was significantly better than that of chicks fed on 10 or 15% LSM meal. Raya et al (1991) found that linseed oil meal depressed the performance of chicks when fed at level of 27.5 % of the diet. Jensen et al. (1977) reported that feeding a diet containing 20% LSM meal to chicks partially counteracted the growth depression. Richter et al. (1998) recommended that chicken diets should not contain more than 2%, 4% linseed cake in chick diets and pullet diets not more than 4% linseed cake.

Mortality rate during the whole experimental period (1-6 weeks of age) were 4.50, 0.00, 3.50, 3.03, 4.50 and 7.5 % for chicks fed 0, 4, 8, 12, 16 and 20% LSM, respectively. It seems that using LSM up to 20% in broiler diets had little effect on mortality rate. El-Hawary (1975) found that at levels of 5, 10 and 15% LSM in growing Dokki 4 chicks diets, no mortality was observed. Also Mariey (1995) and Abbas et al (1990) found that mortality was

about 5 %, and was not related to the dietary treatments in which LSM level was 5, 10 or 15 % in the diets.

Digestibility coefficients and nutritive values:

Results in Table 4 indicated that dietary LSM level had significant effect ($P< 0.05$ or $P<0.01$) on all digestibility coefficients except EE one and significant effect ($P< 0.01$) on all nutritive values of experimented diets. It is clear that, dietary LSM level more than 8 % resulted in significant ($P<0.05$ or $P<0.01$), decrease in the digestion coefficient of OM, CP, CF and NFE compared with those of the lower levels (0, 4 or 8%) as shown in, Table4,. Diet contained 4.0% LSM showed the highest digestibility coefficient values of CP, CF and NFE, while that of 20% LSM recorded the lowest values for all nutrients. The decrease in digestion coefficient values as affected by LSM may be due to the mucilages substances (gummy, mucous and gelatinous) present in linseed meal (El-Shafei and Sharobeem ,1959) which might affect digestibility because of the viscous nature of wetted material, also the mucilage contains a water-dispersible carbohydrate (Peterson 1958), which is almost completely indigestible, makes the meal laxative, cause problems of beak the necrosis and other adverse effects, (Mandokhot and Singh 1979 and Ravindran and Blair 1992). Also, imbibition action of mucilage's in gut which results in water remove from ingesta and then both digestion and absorption processes are depressed (El-khimsawy,1993).

The present results agree with those obtained by Amber et al. (2002) with rabbits, who detected significant ($P<0.01$) decrease in digestibility coefficients of DM, OM, CP and NFE when LSM was incorporated in growing rabbit diets by more than 7%.

Regarding the nutritive values of LSM diets in terms of DCP, TDN and ME. (Table 4), it is clear that the nutritive values were significantly ($P<0.01$) decrease by increasing the dietary LSM level more than 8%.The best values of DCP, TDN and ME were obtained with chicks fed the 4% dietary LSM level, while the inclusion of 16% LSM in the chick diet

recorded the lowest nutritive values. It is of great importance to note that the results of the digestibility were coincided generally with growth performance. Chicks fed 4% LSM level showed the highest digestion coefficient values and best growth performance, where as compared to the other experimental levels. The decrease in daily feed intake and crude protein digestibility in the experimental diets with the higher dietary LSM levels explain the depression in growth rate of chicks.

Carcass traits:

Statistical analysis did not reveal any significant differences for all carcass traits (carcass, dressing, abdominal fat and giblets weights) of broiler chicks due to dietary LSM level effect (Table 5). However, carcass, dressing and abdominal fat weights were decreased by increasing dietary LSM level, while giblets weight was increased.

Results obtained in this study are in agreement with those reported by Mahmoud and Malik (1986) who found that dressing percentage was not affected by dietary LSM at levels 2.5, 5.0 and 7.5%. Similar results were obtained by Abbas et al (1990) who concluded that dressing percentage of broilers was not affected by level of LSM in the starter and finisher diets until 10% dietary level.

Economical evaluation:

Results in Table 6 clearly demonstrated that increasing the dietary LSM level more than 4% during the finisher and the whole experimental periods increased the value of feed cost/kg gain and decreased the economical efficiency of broiler chicks. These results are due to the depression of growth at the high levels of LSM more than 4%, but not to the increase in feed price. The lowest feed cost/kg gain and the best economical efficiency values were observed for broiler chicks fed on the 4% LSM level followed almost those by of the control (0% LSM) during all the experimental periods.

Conclusively, from nutritional and economical point of view, the LSM could be used in broiler chick diets not more than 4%, and the higher levels are not recommended.

Table 1. Composition and chemical analysis of the experimental diets.

	Starter diets						Finisher diets					
	Linseed meal level (%)						Linseed meal level (%)					
Ingredients	0. (control)	4	8	12	16	20	0. (control)	4	8	12	16	20
Yellow corn	67.00	68.00	65.75	62.75	60.25	57.00	70.00	70.00	70.00	69.50	65.75	63.00
Soybean meal (48%)	20.25	18.00	15.75	14.00	12.00	10.00	15.00	13.00	11.00	8.25	7.00	5.00
Linseed meal	0.00	4.00	8.00	12.00	16.00	20.00	0.00	4.00	8.00	12.00	16.00	20.00
Broiler concentrate(52%)*	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Wheat bran	2.75	0.00	0.00	0.00	0.00	0.00	5.00	3.00	1.00	0.00	0.00	0.00
Cotton seed oil	0.00	0.00	0.50	1.25	1.75	3.00	0.00	0.00	0.00	0.25	1.25	2.00
Total	100	100	100	100	100	100	100	100	100	100	100	100
Determined chemical analysis(as fed)												
ME Kcal/kg**	2994	3013	3001	2996	2997	3008	3001	2996	2998	2999	3002	3002
DM	91.00	91.00	91.00	90.00	90.00	89.00	90.00	90.70	90.00	88.00	87.00	91.80
CP	22.70	22.50	22.50	21.90	21.80	21.80	20.00	19.80	19.10	19.00	19.20	20.00
EE	4.15	4.20	3.95	3.95	3.92	3.80	4.00	4.01	4.03	4.00	3.96	3.95
CF	3.50	3.50	4.30	4.20	4.10	4.00	4.10	4.10	4.20	4.30	4.50	4.80
Ash	6.30	6.20	6.00	5.75	5.40	5.20	6.00	4.20	4.30	4.50	5.75	6.31
Cost of kg diet (pt)***	74.20	73.20	74.20	75.70	77.30	79.25	71.50	71.50	71.50	71.73	73.98	75.70

* Each 100 Kg of broiler protein concentrate (Lohmman) consisted of 60Kg meat meal (55%). 30Kg fish meal (65%) .2.5 Kg Di-calcium phosphate. 3.00 Kg calcium carbonate , 1.2 Kg Dl-methionine. 1.3 kg salt and 2.00 Kg vitamin mixture . It contains 2200 kcal ME/ Kg, 52.00 % crude protein, 0.20% crude fiber. 5.50% ether extract . 7.00% calcium. 3.30% phosphorus .1.4% methionine + cystine and 3.00% lysine .

** Calculated according to NRC (1994) .

*** Based on local prices at 2000

Tape 2. Chemical composition, digestibility coefficients and nutritive values of linseed meal.

Items	Chemical composition%	Digestibility coefficients%
DM	90.40	70.22
OM	82.44	71.70
CP	32.49	75.10
EE	4.07	84.80
CF	8.67	19.90
NFE	37.22	68.13
Ash	7.95	
Nutritive value (as fed)		
TDN%	55.60	
DCP%	24.40	
ME Kcal / Kg	2335.20	

Table. 3 Growth performance ($\bar{x}$ ± SE)of broiler chicks as affected by dietary linseed meal level during the experimental periods

Items	Linseed meal level (%)						significance
	0 (control)	4	8	12	16	20	
Live body weight,g,							
1-week	136.70±3.07	136.00± 3.00	137.00± 3.60	138.10± 1.80	136.20± 1.10	138.20± 4.00	NS
3-week	628.10± 6.60^{a}	625.00± 4.00^{a}	597.30± 8.00^{b}	552.70± 13.00^{c}	530.40± 11.00^{c}	530.20± 15.00^{c}	**
6-week	1640.10±33.00^{a}	1649.50±43.10^{a}	1641.20± 37.20^{b}	1520.30± 63.30^{b}	1380.60± 26.10^{c}	1123.70± 35.00^{d}	**
Daily weight gain,g,							
1-3week	35.00± 4.00^{a}	34.70±2.80^{a}	32.88± 5.60^{ab}	29.57± 9.20^{b}	28.14± 7.80^{b}	28.00± 10.70^{b}	*
3-6week	46.00± 1.50^{a}	46.50±1.90^{a}	42.90± 16.80^{b}	44.00± 2.00^{ab}	38.63± 1.10^{b}	26.95± 1.50^{c}	**
1-6week	38.10± 1.07^{a}	38.30±1.40^{a}	35.80± 1.16^{a}	35.30± 0.94^{ab}	32.09± 0.94^{bc}	26.11± 0.97^{c}	**
Daily feedintake,g,							
1-3 weeks	59.90± 6.00^{a}	49.70±10.00^{b}	47.50±11.00^{bc}	46.60± 17.00^{c}	46.10± 12.00^{c}	44.00± 2.00^{d}	**
3-6 weeks	129.00± 3.60^{a}	130.10± 5.90^{a}	126.70±6.50^{b}	125.20± 8.00^{b}	124.30± 7.90^{b}	115.40± 5.90^{c}	*
1-6 weeks	103.00± 2.50^{a}	98.10± 5.30^{b}	95.10±1.70^{c}	94.50± 2.60^{c}	93.70± 6.40^{c}	87.30± 0.60^{d}	*
Feed conversion							
1-3 weeks	1.71± 0.76^{c}	1.42± 0.60^{a}	1.44± 0.50^{a}	1.57± 0.60^{b}	1.63± 0.88^{bc}	1.57± 0.60^{b}	**
3-6 weeks	2.80± 0.50^{a}	2.79± 0.60^{a}	2.96± 0.70^{a}	2.84± 0.6^{a}	3.21± 0.30^{a}	4.43± 0.40^{b}	*
1-6 Weeks	2.70± 0.50^{ab}	2.56± 1.03^{a}	2.65± 1.13^{a}	2.67± 0.60^{ab}	2.91± 0.79^{b}	3.34± 0.69^{c}	**
Mortality rate (%)							
1-3weeks	1.50	0.00	0.00	1.50	1.50	0.00	
3-6weeks	3.07	0.00	3.50	1.53	3.07	7.50	
1-6weeks	4.50	0.00	3.50	3.03	4.50	7.50	

* = P<0.05 , ** = P<0.01 and NS= not significant

Means in the same row bearing different letters are significantly (P< 0.05) different

Table 4. Digestion coefficients and nutritive values ($\bar{x}$ ± SE)of experimental diets as affected by dietary linseed meal level.

Trait	Linseed meal level (%)						Significance
	0 (control)	4	8	12	16	20	
Digestibility coefficients(%)							
DM	71.20± 4.20^{a}	71.35±3.70^{a}	71.50±5.90^{a}	68.80± 2.00^{ab}	67.40± 9.00^{b}	66.60± 2.30^{b}	*
OM	71.70± 2.40^{a}	72.05±4.70^{a}	72.10±5.60^{a}	69.30± 9.00^{b}	68.50± 4.30^{b}	67.60± 9.40^{b}	*
Cp	71.90± 5.80^{a}	72.80±7.00^{a}	71.50±6.40^{ab}	67.60± 7.70^{bc}	66.70± 4.40^{c}	66.40± 1.77^{c}	**
EE	89.30± 2.10	88.70±5.00	88.50±6.10	87.80± 7.30	87.60± 7.00	87.40± 1.60	NS
CF	16.80± 3.20^{a}	17.70±4.30^{a}	17.50±3.70^{ab}	16.02± 2.70^{b}	13.40± 5.20^{c}	11.20± 4.80^{d}	**
NFE	77.80± 4.90^{ab}	78.70±3.50^{a}	77.90±10.10^{ab}	76.20± 9.30^{bc}	74.70±8.90^{cd}	73.80± 2.10^{d}	**
Nutritive values, (as fed)							
ME kcal / kg	282.36± 3.37^{b}	291.10±4.47^{a}	285.81± 38.9^{c}	266.36± 15.63^{e}	253.34±5.02^{f}	271.78± 580^{d}	**
DC p %	14.71± 0.07^{a}	14.39 ± .07^{ab}	14.29± 0.05^{ab}	13.42± 0.12^{c}	13.29± 0.12^{c}	13.96± 0.13^{b}	**
TDN%	67.23± 0.15^{b}	69.31±0.27^{a}	68.05± 0.28^{ab}	63.42± 0.48^{cd}	62.07± 0.38^{d}	64.71± 0.62^{c}	**

* = P<0.05 , ** = P<0.01 and NS= not Significant

Means in the same row bearing different letters are significantly (p< 0.05) different

Table 5. Some carcass traits, g /100g pre slaughter weight, ($\bar{x}$ ± SE), of broiler chicks as affected by dietary linseed meal level.

Linseed meal level (%)	Pre- slaughter weight	Carcass weight	Dressing weight	Abdominal fat weight	Giblets weight
0	1646.39± 4.46	69.96± 1.57	76.70± 1.64	2.49± 0.13	6.74± 0.21
4	1655.71± 2.80	69.15± 0.59	74.78± 2.98	2.27± 0.45	6.62± 0.47
8	1540.52± 5.77	67.67± 2.79	74.63± 0.89	2.20± 0.26	6.95± 0.27
12	1530.71± 11.54	66.44± 2.14	73.77± 2.38	2.00± 0.48	7.30± 0.29
16	1383.33± 8.81	65.44± 0.86	72.93± 0.75	2.10± 0.24	7.49± 0.19
20	1127.66± 11.78	64.59± 0.76	72.48± 0.43	1.85± 0.31	7.89± 0.35
Significance		NS	NS	NS	NS

NS= not significant

Table 6. Economical efficiency of broiler chicks as affected by dietary linseed meal level.

Items	Linseed meal level (%)						Significance
	0 (control)	4	8	12	16	20	
Feed cost/ kg gain, LE							
1-3 weeks	1.26± 0.02	1.03± 0.18	1.07± 0.17	1.18± 0.18	1.25± 0.11	1.24± 0.10	NS
3-6 weeks	2.00± 0.05^{b}	1.99± 0.23^{b}	2.10± 0.23^{b}	2.03± 0.17^{b}	2.37± 0.18^{b}	3.35± 0.38^{a}	*
1-6 Weeks	1.95± 0.20^{b}	1.83± 0.30^{b}	1.91± 0.15^{b}	1.94± 0.17^{b}	2.16± 0.31^{b}	2.54± 0.28^{a}	*
Economical efficiency							
1-3 weeks	19.04± 0.39^{b}	45.61 ± 7.00^{a}	40.18± 9.00^{a}	27.11± 3.20^{b}	20.00± 4.50^{b}	20.98± 6.54^{b}	*
3-6 weeks	30.96± 1.10^{a}	31.65 ± 7.95^{a}	19.04± 4.90^{b}	14.28± 5.12^{b}	6.32± 0.97^{c}	3.91± 2.30^{a}	**
1-6 Weeks	252.82± 7.9^{b}	278.14± 4.20^{a}	238.74± 27.00^{c}	228.86± 17.00^{c}	168.05± 12.00^{d}	85.43± 10.00^{e}	**

* = P<0.05 ** = P<0.01 and NS= not significant

Means in the same row bearing different letters are significantly (P< 0.05) different

Feed cost = feed conversion × price of kg diet

Price of one kg gain = 4.20 LE

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استخدام كسب الكتان في علائق كتاكيت اللحم

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تم استخدام ٣٩٦ كتكوت عمر أسبوع من سلالة الهبرد لدراسة تأثير استخدام كُسب الكتان بمستويات مختلفة على معدل أداء النمو ومعاملات الهضم وخصائص اللحم والكفاءة الاقتصادية لكتاكيت اللحم.

قسمت الكتاكيت عشوائياً إلى ٦ مجموعات بكل منها ٦٦ كتكوت واشتملت كل مجموعة على ثلاث مكررات في كل مكرر ٢٢ كتكوت وكانت الكتاكيت في كل المجموعات متساوية في متوسط الوزن تقريباً عند البداية.

وتغذت المعاملة الأولى على العليقة الأساسية (الكنترول) بينما تغذت باقي المجموعات الخمس على علائق تحتوي على ٤ ، ٨ ، ١٢ ، ١٦ ، ٢٠ % كسب كتان خلال فترتي البادي (١-٣ أسبوع) والناهي (٣-٦ أسبوع) ، وكانت العلائق التجريبية متساوية تقريباً في نسبة البروتين والطاقة الممثلة.

ويمكن تلخيص النتائج المتحصل عليها من التجربة كالآتي :

١- كانت النسب المئوية لمعاملات الهضم لكُسب الكتان هي ٧٠,٢٢ ، ٧١,٧٠ ، ٧٥,١٠ ، ٥١,٠٥ ، ٦٠,٥١ ، ٦٣,٣١ % لكل من المادة الجافة والمادة العضوية والبروتين الخام ومستخلص الإثير والألياف الخام والكربوهيدرات الذائبة على التوالي ، بينما كانت القيم الغذائية ٢٤% بروتين مهضوم ، ٥٧,٨٢ مركبات كلية مهضومة ، ٢٤٢٨,٨١ ك كالوري طاقة ممثلة / كجم.

٢- انخفض متوسط وزن الجسم عندعمر ٦،٣ أسابيع وكذلك انخفضت الزيادة اليومية في متوسط وزن الجسم خلال كل الفترات التجريبية (١-٣ ، ٣-٦ ، ١-٦ أسبوع) معنوياً ($P<0.05$ or $P<0.01$) في الكتاكيت التي غذيت على علائق تحتوي على كسب كتان بنسب أعلى من ٤% وهذا الانخفاض كان يزداد بزيادة مستوى كسب بذرة الكتان في علائق الكتاكيت من ٨% إلى ٢٠%.

٣- انخفض متوسط وزن الغذاء المأكول يومياً معنوياً ($P<0.05$ or $P<0.01$) بزيادة مستوى كسب الكتان في العلائق التجريبية.

٤- تحسن معدل التحويل الغذائي خلال فترة البادي (١-٣ أسبوع) بإضافة كسب الكتان إلى العلائق، بينما خلال فترة الناهي (٣-٦ أسبوع) كان معامل التحويل الغذائي سيء بالمقارنة بفترة البادي ما عدا مستوى ٤% كسب بذرة كتان لم تتأثر معنوياً.

٥- لم يؤثر استخدام كسب بذرة الكتان في علائق كتاكيت اللحم على معدل النفوق خلال الفترة من ١ - ٦ أسبوع.

٦- أدى إضافة كسب الكتان بمستوى أكبر من ٨% إلى علائق كتاكيت اللحم إلى نقص معنوي ($P<0.05$ or $P<0.01$) في قيم معاملات الهضم لكل من المادة العضوية، البروتين الخام، والألياف الخام والكربوهيدرات الذائبة مقارنة بهذه القيم للمستويات الأقل من كسب الكتان (٤ أو ٨%) أو الكنترول ، في حين لم يكن هناك أي تأثير معنوي لمستوى كسب الكتان في العلائق على معامل هضم مستخلص الإثير.

٧- تأثرت القيم الغذائية للعلائق التجريبية في صورة بروتين مهضوم ومركبات كلية مهضومة وطاقة ممثلة معنوياً بمستوى كسب الكتان في العلائق، وقد انخفضت تلك القيم الغذائية بزيادة كسب الكتان أكثر من ٨% في العلائق وذلك عند مقارنتها بالمستويات الأقل والكنترول.

٨- لم يظهر التحليل الإحصائي أي تأثير معنوي لمستوى كسب الكتان في العلائق على خصائص الذبيحة ، ولكن كان من الملاحظ أن وزن الذبيحة، ونسبة التصافي، ودهن البطن قد انخفض بزيادة مستوى كسب الكتان في علائق الكتاكيت بينما زاد وزن الـ giblets .

٩- أوضحت النتائج أن زيادة كسب الكتان ٤% في علائق كتاكيت اللحم خلال فترة الناهي وفترة التجربة كلها أدى إلى زيادة قيمة تكاليف الغذاء اللازم لكل كجم زيادة في الوزن وانخفاض الكفاءة الاقتصادية لكتاكيت اللحم.

وتشير النتائج السابقة أنه من الوجهة الغذائية والاقتصادية فإن كسب الكتان يمكن أن يستخدم في تكوين علائق كتاكيت اللحم بنسب لا تزيد عن ٤%.