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UTILIZATION OF LOCALLY PRODUCED CANOLA SEEDS AS A FEEDSTUFF IN LAYING HEN DIETS

By

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Abstract: *An experiment was conducted to study the possibility of using locally canola seeds as a feedstuff in laying hen diets. A total number of 120 hens (Hy-Line Brown-egg type) from 20 up to 32 weeks of age were randomly divided into four experimental groups; 30 hens each. Each group was sub-divided into ten replicates, (three hens each). Four test diet series were used. (0, 7.5, 12.5 and 17.5 %) canola seeds.*

Chemical composition of canola seeds contained 94.03% DM, 23.23%CP, 38.76%EE, 5.01% ash ,and 11.69% CF. Essential and non- essential amino acids in canola seeds were very similar to those in soybean meal while methionine, lysine and glutamic acid recorded lower values than those of soybean meal.

Body weight changes were significantly (P< 0.01) influenced by dietary difference canola seed levels. Moreover, dietary canola seed level up to 17.5% showed significantly (P< 0.01) lowest value of body weight change (88.66 g).Hens fed a diet containing 17.5 % canola seed recorded a significantly (P< 0.05) lower egg production (73.26%) compared with that recorded from other treatments during the whole experimental period, while there was no significant difference were observed between hens fed control diet, and 7.5 or 12.5% dietary canola seeds. Hens fed diet containing 17.5% canola seed showed significantly lower egg mass value (43.80g) compared with that recorded from other treatments during the whole experimental period. Feed consumption was significantly (P< 0.05) reduced by increased dietary canola seed levels during the whole experimental period. Feed conversion was not significantly affected by dietary differences canola seed levels. Albumin weight (%), egg weight, yolk weight (%),shell weight (%),shape index, yolk index, haugh unit and egg shell thickness did not significantly (P>0.05) affected by dietary difference canola seed levels. Hens fed a diet containing 17.5% canola seed recorded lowest value of economical efficiency and relative economical efficiency(0.61 and 83.56%) respectively.

It could be recommended to use local canola seeds at a level of 12.5 % in laying hen diets. These levels had no detrimental effects on laying performance, economical efficiency and relative economical efficiency.

Key Words: Canola seeds, Egg production, Egg quality and laying hens

INTRODUCTION

Canola crop is easy to cultivate in newly reclaimed lands by using well adapted genotypes with relatively low costs (**Sharaan *et al.*, 2006**). Canola seeds and flax seeds can substitute a part of soybean meal and animal fat in poultry diets when the price is suitable (**Barbour and Sim, 1991**). Moreover, canola seed contains approximately 40% oil and 20% protein and is a valuable source of energy and protein in poultry diets **(Summers and Leeson, 1985).**

Canola was originally derived from rapeseed varieties, it's component have been altered through genetic selection which markedly reduced it's detrimental components, erucic acid and the glucosinolates to a negligible level and to less than 20 μg/g, **(Leeson and Summers, 2001).** Presence of glucosinolates in the diets leads to hypothyroidism in animals and poultry, reducing the level of thyroid hormones and alters the ratio between triiodothyronine (T3) and thyroxin (T4) in blood **(Taraz, et al. 2006),** induce iodine deficiency **(Burel et al., 2000),** changed activities of liver enzymes in the blood of poultry **(Nassar and Arscott, 1986; Schöne *et al.*, 1993)** decreased live weight gain and feed intake of broilers **(Zeb *et al.* ,1999).**

In recent years the production of eggs rich in n-3fatty acids, encouraged the interest to maximizing the use of feed stuffs containing these nutrients because there is a correlation between their levels in feeds and in the yolk **(Leeson *et al.*, 1998).** Omega-3 fatty acids have many health benefits including the ability to decrease cardiovascular disease **(Cherian and Sim, 1991; Grobas *et al.*, 2001),** antithrombic **(Herod and Kinsella, 1986),** rheumatoid arthritis **(Kremer *et al.*, 1987),** lupus nephritis **(Clark and Parbtani, 1996),** high blood pressure **(Pauletto *et al.*, 1996).** Omega-3 fatty acids are also important for the development of brains and retinas in newborns **(Jorgensen *et al.*, 1996; Uauy *et al.*, 1996). Caston and Lesson (1990)** reported a highly significant increase from 0.38 to 8.9% linolenic acid in the egg when diets included 20% flaxseed. Egg yolk linoleic acid ($C_{18:2}$) increased when dietary flaxseed was fed at the 15% level and egg yolk linolenic acid increased linearly (2.31, 4.18, or 6.83%) as flaxseed increased from 5 to 10 and 15% of the diet, respectively **(Scheideler and Froning, 1996).**

On the other hand, **Muztar *et al.*, (1980)** reported that the amino acid digestibility coefficients of canola seed and meal (Tower and Candle) ranged between 82 and 95% except for cystine and tyrosine. It was concluded that some amino acids in canola seed and meal were as available as those in soybean meal, but the others were less available **(Muztar and Slinger, 1980).** Moreover, the availability of most amino acids in canola seed and meals was higher than that of flax seed and meal **(Barbour and Sim, 1991). Lee *et al.*, (1995)** reported that the availabilities of lysine, methionine, and threonine in canola seed were higher ($P<0.05$) than those in flax seed. Moreover, **Najib and Al-Kateeb,(2004)** showed that hens fed diets including up to 10% canola seeds had no effects on egg production, egg weight, egg mass and specific gravity and yolk index while feed consumption increased with increasing canola seeds up to 20 or 30 % in diets . However, **Nwokolo and Sim (1989)** reported depressed egg production in hens fed barely-full-fat canola seeds. **Aymond and Van Elswyk (1995)** reported in a short-term trial (5 weeks) a decrease in egg production in hens fed a diet containing 15% flaxseed by as early as 2 weeks. The objective of this research work was to the study the effects of local canola seeds on egg production, performance parameters and economical efficiency of laying hens

MATERIALS AND METHODS

This experiment was carried out at Maryot Research Station, Alexandria to study the possibility of using of locally canola seeds and its effects on egg production, performance parameters and economical efficiency of laying hens. A total number of 120 hens (Hy-Line Brown-egg type) from 20 up to 32 weeks of age were randomly divided into four experimental groups; 30 hens each. Each group was sub-divided into ten replicates, (three hens each). Four test diet series were used, (0, 7.5, 12.5 and 17.5 %) canola seed levels. Diets were iso-nitrogenous and iso-caloric and formulated according to **NRC (1994)**. Chemical analysis of canola seeds were conducted according to **A.O.A.C.(1990)**. Composition and calculated analysis of the experimental diets are presented in (Table, 1). Total amino acids of canola seed were estimated in (Table, 2) by Amino Acid analyzer (Eppendorf -LC3000) according to the method of (**Block *et al.*, 1958**).

Hens were offered diets *ad libitum* while water was available along time. All hens were kept under the same managerial and environmental conditions and artificial light source was used giving a total of 17 hours of light per day through the experimental periods.

Body weights were recorded at the beginning and monthly till the end of the experiment (32 weeks of age). Egg weight and egg number were recorded daily to calculate the egg production percentage. Egg mass (g/hen/day) was calculated by multiplying egg number by average egg weight. Feed consumption was recorded biweekly, while feed conversion values (g feed /g eggs) were calculated as the amount of feed consumed divided by egg mass.

At the end of the experiment, egg quality parameters were measured using 48 eggs (12 eggs /each treatment group).These measurements involved yolk, albumen and shell weight percentage. Egg shell thickness was measured in μm using a micrometer. Egg shape index was computed as the ratio of egg width to the length (**Awosanya *et al.*, 1998**). Yolk index was calculated according to **Funk *et al.*, (1958)**, as yolk height divided by yolk diameter. Haugh unit was calculated according to Eisen *et al.*, (1962) using the calculation chart for rapid conversion of egg weight and albumen height.

Economical efficiency of egg production was calculated from the input-output analysis which was calculated according to the price of the experimental diets and egg production during the year of 2011.The values of economical efficiency were calculated as the net revenue per unit of total costs.

Statistical analysis:

Data were analyzed by the Computer Program, **SAS (2003)**, using the General Linear Model (GLM) procedure. The significant differences among treatments means were separated by Duncan's Multiple Range-Test (**Duncan, 1955**).

RESULTS AND DISCUSSION

Chemical analysis of the canola seeds used in this study compared to some other studies are summarized in (**Table 2**). Dry mater, Crude protein and ether extract of the canola seeds used were higher than compared with the study of **Lee et al. (1995)**. Ether extract and crude fiber values were slightly higher than compared with the study of those reported by **Najib and Al-Kateeb (2004)** and higher than that of the **SBM (NRC,1994)**. The highest content of ether extract (40%) in canola seeds used resulted in a higher metabolizable energy than that of the corn or **SBM (NRC, 1994)** and other studies by **Lee *et al.*, (1995) and Najib and Al-Kateeb ,(2004)**. Many of the key non-essential amino acids including aspartic acid, serine, glycine, alanine and valine values were similar to those obtained by (**Lee *et al.*, 1995 and Najib and Al-Kateeb ,2004)**, excepted glutamic acid values (2.60%) which was lower than that of the **SBM (NRC, 1994)** and other studies by (**Lee *et al.*, 1995 and Najib and Al-Kateeb ,2004)**. Moreover, many of the key essential amino acid values including isoleucine, leucine, tyrosine, phenylalanine, histidine, arginine and threonine were slightly higher those studies reported by (**Lee *et al.*, 1995 and Najib and Al-Kateeb ,2004)**. However, methionine(0.12%) and lysine(1.39%) values were lower those of the **SBM (NRC, 1994)** and **(Lee *et al.*,1995 and Najib and Al-Kateeb ,2004).**

Results in (Table 3) showed that final body weight was not significantly influenced by dietary canola seed levels. However, body weight changes was significantly (P< 0.01) affected by dietary difference canola seed levels. Furthermore, dietary canola seed level up to 17.5% showed significantly (P< 0.01) the lowest value of body weight change (88.66 g). These results may partially attribute to lower feed intake. It has been hypothesized that anti-nutritional factors presented in flaxseed may impair the digestion and absorption of energy yielding nutrients **(Gonzalez-Esquerra and Leeson, 2000; Rodrı´guez et al., 2001)**. Therefore, it is possible that anti-nutritional factors in the canola seed diet caused a decrease in hen weight that was observed in the current study. This finding is in an agreement with that of **Caston *et al.*, (1994)** who reported negative effects of dietary flaxseed level up to 20% on hen weight gain at 51 and 73 weeks of age. However, **Summers *et al.*, (1982)** reported that including 17.5 % or more of full-fat canola in diets of broilers resulted in lowered weight gain.

Egg production showed no significant difference with using dietary canola seed levels during difference interval experimental periods. Hens fed a diet containing 17.5 % canola seeds had significantly (P< 0.05) lower egg production (73.26%) compared with the other treatments during the whole experimental period. However, there was no significant difference among hens fed a control diet and those fed on 7.5 or 12.5% dietary canola seeds. Similar results were obtained by **Nwokolo and Sim (1989)** who reported depressed egg production in hens, fed barely-full-fat canola seeds. Moreover, **Najib and Al-Kateeb(2004)** showed that hens fed diets including up to 10% canola seeds had no effects on egg production, while increased canola seeds in the diet up to 20 or 30% depressed egg production. Furthermore, the significant depressed in egg production for hens fed a diet containing 17.15% canola seeds may be due to anti-nutrient factors such as erucic acid or glucosinolate that may still be found in raw canola seeds in a minor amount that may impair egg production at high levels of canola seeds in the diet. At the same time dietary glucosinolates (in canola seed) is known to impair the thyroid function of poultry through reducing the level of thyroid hormones and alters the ratio between triiodothyronine (T3) and thyroxin (T4) in blood **(Taraz, *et al.* 2006).** Changed activities of liver enzymes in the blood of poultry **(Nassar and Arscott, 1986; Schöne *et al.*, 1993)** and theses changes such in all metabolism functions may negatively affect egg production.

Egg weight was insignificantly (P< 0.05) reduced by increasing dietary difference canola seed levels during different interval periods and whole experimental period. Egg Mass was significantly (P< 0.01) affected by dietary canola seed level during (28-32) weeks of age and the whole experimental period. Moreover, hens fed a diet containing 17.5% canola seed showed a significant lower egg mass value (52.85 g and 43.80g) compared with the other treatments during (28-32) weeks of age and the whole experimental period, respectively. The lowest significant of egg mass for hens fed diet containing 17.5% canola seed may be due to the lowest significant value in egg production (73.26%) and the lowest insignificant value of egg weight (59.58g) compared with other groups during the whole experimental period (Table 3). These results is in an agreement with those of **Najib and Al-Kateeb, (2004)** who reported that hens fed diets containing up to 20% or 30% canola seeds showed significantly lower egg production, egg weight, egg mass compared with control,5% or 10% canola seed diets.

Feed consumption was significantly (P< 0.05) reduced by increased dietary canola seed levels during interval periods and whole experimental period. Hens fed a diet containing 17.5% canola seed recorded the lowest feed consumption (105.53 g/day) during the whole experimental period (Table 4).Feed conversion was not significantly influenced by dietary treatments. A reduction in feed consumption may be consequent to the increasing of glucosinolates levels found in canola seeds particularly at high level of canola seeds. The evidences indicate that diet palatability can be adversely affected by the glucosinolates of the rapeseed meal (**Mawson *et al.*, 1993**). The palatability of diets can be improved with low glucosinolates rapeseed meal, (**Mawson *et al.*, 1993**). These results are in agreement with those of **Najib and Al-Kateeb (2004)** who reported that a decrease in feed consumption with the increasing of canola seed up to 20 and 30 % in hen diets. Moreover, **Summers *et al.*, (1982)** reported that 17.5 % or more of full-fat canola in diets of broilers recorded the lowest feed intake.

Egg quality measurements showed no significant (P>0.05) differences due to canola seed levels (Table 5) this was in agreement with the findings of **Najib and Al-Kateeb,(2004)** who reported that hens fed diets containing up to 10% canola seeds had no effects on specific gravity and yolk index. Moreover, supplementing linseed and fish oil to laying hens diet did not cause any negative effect on some quality criteria such as egg weight, yolk weight, albumen weight, shell weight, shell strength and shell thickness (**Basmacoglu *et al.* 2003**). **Novak and Scheideler (2001) and Bean and Leeson (2003)** reported that flaxseed did not affect eggshell quality. Total means of shell weight and yolk percentage were not significantly (p>0.05) different from quails consuming 0, 2, 4 or 6% linseed (**Hazim *et al.*, 2010**).

Results in (Table 6) showed that the best values for economical efficiency and relative economical efficiency were recorded by hens fed control diet(0.73 and 100%), followed by those fed diet containing 7.5% and 12.5% canola seeds (0.70 and 95.89%) and (0.69 and 94.52%), respectively. Moreover, hens fed a diet containing 17.5% canola seed recorded the lowest value of economical efficiency and relative economical efficiency (0.61 and 83.56%) respectively.

It could be recommended to use full-fat canola seeds at a level of 12.5 % in laying hen diets. These levels had no detrimental effects on laying performance and economical efficiency and relative economical efficiency.

Table 1. Composition and calculated analysis of the experimental basal diets

Ingredients:	Canola seeds%			
Canola seeds	0	7.5	12.5	17.5
Yellow Corn	57.35	51.28	48.35	41.41
Soybean 44%	20.10	15.64	12.76	9.64
Concentreate48%[1]	10.00	10.00	10.00	10.00
Wheat bran	0.00	4.57	6.84	11.90
Dried fat[2]	2.99	1.45	0.00	0.00
Limestone	7.25	7.25	7.25	7.25
Dicalcium- P	1.75	1.75	1.75	1.75
Na Cl,	0.15	0.15	0.15	0.15
Vit&Min premix[3]	0.30	0.30	0.30	0.30
Lysine	0.06	0.06	0.06	0.06
DL-Methionine	0.05	0.05	0.04	0.04
Total	100	100	100	100
Calculated analysis				
ME,kcal/kg	2819	2819	2819	2819
CP%	18.50	18.50	18.50	18.50
CF%	2.81	3.75	4.31	5.08
EE%	5.99	7.22	7.64	9.44
Ca%	3.80	3.79	3.79	3.78
Av. P%	0.58	0.57	0.57	0.56
Lysine%	1.03	1.05	1.05	1.06
Methionine&Cystin%	0.67	0.67	0.67	0.67
Price (EL)/kg diet	2.445	2.443	2.440	2.443

[1] Concentrate composition: 48% CP, 2350 Kcal ME/Kg, 1.44% CF, 6.58% EE, 7.8% Calcium, 3.11% Phosphorus, 1.46% Methionine, 1.95%, Methionine & Cystine and 2.83% Lysine. Vit A 1,20000IU, Vit D_3 25000IU, Vit E 125mg, Vit K 30 mg, Vit $B_1$10 mg, Vit $B_2$50mg, Vit $B_6$20 mg, Vit B_{12}120 mic, Biotin 500 mic, Manganese 800 mg, Iron 300 mg, Zinc 500 mg, Copper 100mg, Follic acid 10 mg,Niacin 300 mg, Pantothenic acid 100 mg, Choline Chloride 3120 mg, Selenium 1.5 mg, Cobalt 1mg and Iodine4 mg. Product of IBEX international.

[2]New Mark Fat Contains: Mixture of soy bean oil- olive oil coconut oil palm oil sun flower oil and Fatty acids 80% Glycerol and sorbitol 5%; B.H.T 0.5. Chemical analysis :Crude Fat and glycerol 80%, Crude Fiber and Humidity 4% ,Antioxidant B.H.T. 0.25, and H.A. Silicate until 100%; Available energy 7200 Kcal/kg, mid in Egypt.

[3] Vit. and Min. Premix per Kg of diet: 12000 IU. Vit. A, 2000 IU. Vit. D3, 10 mg Vit. E, 4 mg Riboflavin,10 mg Pantothenic acid. 0.01 mg ;Vit. B12,500 mg Choline, 2 mg Vit. K, 1 mg. Vit. B1, 1.5 mg Vit. B6‹1 mg Folic acid, 20 mg Niacin, 0.05 mg Biotin, 10 mg Cu, 1 mg I, 30 mg Fe, 55 mg Mn, 55 mg Zn and 0.1 mg Se.

Table 2. Chemical and amino acid composition of canola seed

Chemical analysis	Canola seed in the current study	Canola in other studies		SBM[1]
		Najib and Al-Kateeb, 2004	Lee *et al.* 1995	
Dry mater %	94.03	95.38	93.03	89.00
Crude protein%	23.23	25.58	20.42	44.00
Ether extract%	38.76	38.18	37.94	0.80
Crude fiber%	11.69	6.89	NA	0.70
Ash%	5.01	4.00	NA	NA
ME,kcal/kg	4727[2]	4128	4460	2230
Amino acid				
Aspartic acid%	1.50	1.78	1.82	NA
Serine,%	1.07	1.11	1.13	2.29
Glutamic acid%	2.60	5.24	5.19	NA
Glycine,%	1.11	1.26	1.41	1.90
Alanine,%	1.11	1.10	1.27	NA
Valine,%	1.15	1.19	1.43	2.07
Methionine,%	0.12	0.54	0.40	0.62
Isoleucine,%	1.25	0.94	1.15	1.96
Leucine,%	1.99	1.67	1.95	3.39
Tyrosine,%	0.68	0.63	0.72	1.91
Phenylalanine,%	1.46	1.06	1.19	2.16
Histidine,%	1.39	0.68	0.66	1.17
Lysine,%	1.39	1.66	1.68	2.69
Arginine,%	2.03	1.13	1.50	3.14
Threonine,%	1.13	1.11	1.34	1.72

[1]NRC, National Research Council. 1994. [2]ME was calculated from the chemical analysis according to **Carpenter and Clegg, (1956)** NA= Not Available.

Table3. Body weights, egg production, egg weight and egg mass of laying hens as affected by canola seed

Items	Canola seed levels				Sig
	C(0)	7.5%	12.5%	17.5%	
Initial body wt.(g)	1563.00±29.08	1550.00±27.38	1565.00±10.40	1560.00±36.85	NS
Final body wt.(g)	1707.83 ±24.74	1693.67±16.93	1695.33 ±10.21	1648.67±37.38	NS
Body wt. changes,(g)	144.83^{a}±12.62	143.67^{a}±14.35	130.33^{a}±4.11	88.66^{b}±10.34	**
Egg Production %					
20-24 weeks	70.76±3.12	69.09±1.62	68.30±4.92	64.26±3.09	NS
24-28 weeks	77.60±3.21	76.16±2.91	75.40±5.80	69.77±0.72	NS
28-32 weeks	89.77±1.33	88.35±1.17	87.00±0.25	85.73±1.32	NS
Overall mean	79.38^{a}±2.32	77.87^{a}±0.91	76.89^{ab}±1.21	73.26^{b}±0.90	*
Egg weight(g)					
20-24 weeks	57.16±0.67	57.15±0.54	56.89±0.19	56.77±0.19	NS
24-28 weeks	62.80±1.75	61.05±1.31	60.29±1.30	60.31±1.00	NS
28-32 weeks	63.02±0.58	62.78±0.89	62.28±0.64	61.65±0.36	NS
Overall mean	60.89±0.81	60.36±0.40	59.82±0.35	59.58±0.41	NS
Egg mass (g/d)					
20-24 weeks	40.33±1.31	39.44±0.62	38.82±2.71	36.51±1.83	NS
24-28 weeks	46.59±2.55	45.69±2.12	45.50±3.10	42.06±0.54	NS
28-32 weeks	56.57^{a}±0.83	55.52^{ab}±0.84	54.18^{bc}±0.49	52.85^{c}±0.72	**
Overall mean	47.83^{a}±1.36	46.89^{a}±0.65	46.17^{ab}±0.85	43.80^{b}±0.59	*

^{ab} Means with different superscripts in same columns are significantly different ($P < 0.05$) .
Sig = Significance NS= Non significance *= ($P < 0.05$) **= ($P < 0.01$) C= Control

Table 4. Feed consumption and feed conversion of laying hens as affected by canola seed.

Items	Canola seed levels				Sig
	C(0)	7.5%	12.5%	17.5%	
Feed consumption (g/day)					
20-24 weeks	103.65^{a}±0.41	103.64^{a}±0.43	103.15^{a}±0.58	101.73^{b}±0.41	*
24-28 weeks	107.92^{a}±0.51	107.33^{a}±0.36	106.83^{ab}±0.40	105.89^{b}±0.20	**
28-32 weeks	110.88a±0.44	110.59^{a}±0.26	109.52^{b}±0.33	108.96^{b}±0.16	**
Overall mean	107.48^{a}±0.27	107.18^{ab}±0.33	106.50^{b}±0.27	105.53^{c}±0.15	*
Feed conversion (g feed/g egg)					
20-24 weeks	2.58±0.08	2.63±0.05	2.74±0.20	2.83±0.15	NS
24-28 weeks	2.35±0.12	2.38±0.11	2.41±0.15	2.52±0.02	NS
28-32 weeks	1.96±0.05	1.99±0.05	2.02±0.02	2.06±0.02	NS
Overall mean	2.25±0.06	2.29±0.03	2.31±0.04	2.41±0.02	NS

^{ab} Means with different superscripts in same columns are significantly different ($P < 0.05$) .
Sig = Significance NS= Non significance *= ($P < 0.05$) **= ($P < 0.01$) C= Control

Table5. Egg quality measurements of laying hens as affected by Canola seed

Parameters	Canola seed levels			
	C(0)	7.5%	12.5%	17.5%
Egg wt.,g	63.48±0.05	62.46±1.10	62.38±0.89	61.80±0.60
Albumen wt.%	63.91±0.83	63.39±0.49	64.05±0.76	64.23±0.86
Yolk wt.%	23.99±0.72	24.42±0.35	23.96±0.49	23.89±0.65
Shell wt.%	12.08±0.18	12.18±0.17	12.31±0.41	12.18±0.41
Shape index	79.62±1.19	79.06±1.15	78.95±1.41	78.30±0.79
Yolk index	50.12±0.78	50.63±0.86	53.27±0.68	50.03±2.13
Haugh unit	90.70±1.74	88.76±2.32	90.273±3.46	89.82±2.43
Shell thickness(µm)	0.4102±0.02	0.4066±0.02	0.4182±0.01	0.4408±0.02

All values in each classification were not significant ($P > 0.05$).

Table 6. Economical evaluation of laying hens as affected by Canola seed

Parameters	Canola seed levels			
	C(0)	7.5%	12.5%	17.5%
Feed intake Kg/hen	9.03	9.00	8.95	8.86
Price of kg diet LE	2.445	2.443	2.440	2.443
Total feed cost,LE.	22.07	22.00	21.83	21.66
Egg mass, Kg/hen	4.02	3.94	3.88	3.68
Total revenue	38.17	37.42	36.84	34.96
Net revenue	16.09	15.42	15.01	13.30
Economical efficiency	0.73	0.70	0.69	0.61
Relative economical efficiency	100	95.89	94.52	83.56

Price of 1.oKg Egg was 9.50 LE. at the time of the experimental period. -Net revenue per unit of total feed cost. -Relative economical efficiency% of the control, assuming that relative EE of the control = 100.

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الملخص العربي

أستخدام بذور الكانولا المنتجة محلياً كخامة علفية فى علائق الدجاج البياض

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قسم تغذية الحيوان والدواجن-مركز بحوث الصحراء– المطرية القاهرة

أجريت هذة الدراسة لدراسة إمكانيه إستخدام بذور الكانولا المنتجة محليا كخامة علفية فى علائق الدجاج البياض.إستخدم في هذه التجربة عدد ١٢٠دجاجة بياض هاى لاين بنى من عمر (٢٠-٣٢) أسبوع وزعت على أربع مجاميع تجريبية بمعدل ٣٠ دجاجة لكل معاملة مقسمة على خمس مكررات بكل مكررة عشرة دجاجات.إستخدم أربع علائق تجربية تحتوى على أربع مستويات بذور الكانولا (٠ ، ٧,٥، ١٢,٥ و ١٧,٥ %).

التركيب الكيماوى لبذور الكانولا أوضح أحتوئها على ٩٠,٠٣% مادة جافة، ٢٣,٢٣% بروتين خام، ٣٨,٧٦% دهن خام، ٥,٠٨% رماد و ١١,٦٩% الياف خام. الأحماض الأمنية الأساسية وغير الأساسية كانت متشابة لحد كبيرمقارنة بالموجودة فى كسب فول الصويا ماعدا الميثيونين والليسين وحمض الجلومتيك كان أقل من الموجود فى كسب فول الصويا.

التغير فى وزن الجسم تأثر معنويا بمستويات بذور الكانولا.علاوة على ذلك فإن العلائق المحتويه على ١٧,٥% بذور كانولا أظهرت أقل قيم معنوية للتغير فى وزن الجسم(٨٨,٦٦جم). سجلت علائق الدجاج المحتوية على ١٧,٥ % بذور كانولا أقل قيم لإنتاج البيض مقارنة بالمجاميع التجربية الأخرى خلال الفترة الكلية للتجربة بينما لايوجد فرق معنوى بين الدجاج المغذى على علائق محتوية على ٧,٥ و١٢,٥% بذور كانولا. أظهرت علائق الدجاج المحتوية على ١٧,٥% بذور كانولا أقل قيم معنوية أقل لكتلة وزن البيض (٤٣,٨٠جم) مقارنة بالمجاميع التجربية الأخرى خلال الفترة الكلية للتجربة.الغذاء المستهلك انخفض معنويا بزيادة مستوى بذور الكانولا خلال الفترة الكلية للتجربة. معامل التحويل الغذائى لم يتأثر معنويا بالمستويات المختلفة لبذور الكانولا. وزن البياض%، وزن الصفار%، وزن القشرة%، دليل البيضة، دليل الصفار، وحدات هاو وسمك القشرة لم يتأثر معنويا بمستويات بذور الكانولا. سجلت علائق الدجاج المغذى على ١٧,٥% بذور كانولا أقل قيم للكفاءة الأقتصادية والكفاءة الأقتصادية النسبية (٠,٦١ و٨٣,٥٦ %) على التوالى.

يستخلص من البحث انه يمكن إستخدام بذور الكانولا المحلية حتى مستوى ١٢,٥% فى علائق الدجاج البياض دون التأ ثير على معدل أداء الدجاج البياض والكفاءة الأقتصادية والكفاءة الأقتصادية النسبية.