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USE OF SOME PLANT PROTEIN SOURCES IN BROILER DIETS

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ABSTRACT

A total number of 540 one - day-old unsexed Arbor Aceres broiler chicks were used in this study to compare the effect of partially replacing of soybean by – product (Okara) or sunflower meal for soy bean meal on broiler performance, nutrients digestibility and economic efficiency. Birds were distributed randomly and divided equally into nine experimental groups with three replicates of 20 birds each . Okara or sunflower meal was used as a substitution of soybean meal at levels of 20 ,40 , 60 and 80 % for each during both growing (1 – 4 weeks of age) and finishing (5 – 7 weeks of age) periods . All experimental diets were compared with the control group, which formulated without replacing okara or sunflower meal for soybean meal . Accordingly, a total of 9 experimental diets were formulated in this study .Birds were allocated in a littered floor poultry house in an open system under the same conditions of management up to 7 weeks of age.

During the whole experimented period (1 – 7 weeks of age), feeding graded levels of okara meal replacing for soybean meal at levels of either 20, 40,60 or 80 % in broiler diets significantly ($P< 0.05$) decreased the average values of body weight , body weight gain and feed intake . While , the feed conversion values were insignificantly differ with using 20 , 40 or 60 % okara or sunflower meal as replacing for soybean meal compared to control. Data showed that replacing sunflower meal for soybean meal at levels of 60 or 80 % in broiler diets significantly ($P <0.05$) decreased the body weight and body weight gain values . However, the differences were insignificant as replacing sunflower meal for soybean meal at levels of 20 and 40 % compared to control group. There were no significant differences in feed intake values due to using different levels of sunflower meal as replacing for soybean meal compared to control. Results showed slight improvement in digestibility of CP and EE and nitrogen balance (NB) with using different levels of okara . While, the use of sunflower meal significantly ($P<0.05$) decreased most nutrient digestibility coefficients specially with high levels of substitution (60 or 80 %). Results indicated that replacing soybean meal by 60 or 80 % okara or 40% sunflower meal recorded the best values of economic efficiency.

Keywords: sunflower, okara, feeding value, , broiler,performance.

INTRODUCTION

In the last years , there has bean a tendency to avoid using ingredients of animal origin in poultry diets , to meet consumer demands for healthier food products. Thus, the search and use of plant protein sources in poultry diets are necessary . Soybean is an oleaginous seed available world wide, containing approximately 44 % protein, essential amino acids, calcium, phosphorus , iron , vitamin A and B. It is considered as an important source of human and animal feed . Okara , the residue left from ground soybeans after extraction of water extractable fraction used to produce soy milk and Tofu (Desmond, 1999). There is a little information about the use of okara in poultry nutrition. Some studies were conducted by Ma *et al.* (1996) and Farhat *et al.* (1998) to evaluate the use of okara in poultry nutrition. They

found that although okara has less protein (34 %) than soybean meal (44%) but its protein quality is high for animal or poultry feeding . They found also that using okara in a balanced diet did not affect on live body weight or carcass yield of pekin or moscovy ducklings. Also, sunflower meal (SFM) is a by – product of sunflower oil extraction . It can be used as a feed ingredient to replace soy bean meal (SBM) in poultry diets . A major advantage of using (SFM) in poultry diets in addition to its lower price compared to (SBM) is that free from toxic compounds and anti nutritional factors which may affect the chick performance. Gheyasuddin *et al* . (1970) found that SFM could be used profitable up to 20 % of broiler or layer diets without negative effects on thier performance. EL–Sherif *et al.* (1995), El–Deek *et al.* (1999) , Zatari and Sell (1990) and Vieira *et al.* (1992) recorded that high levels of SFM can be used successfully in broiler chick and lying hen diets if adequate levels of dietary lysine and metabolizable energy are provided. Also, Vetesi *et al* . (1999) found that body weight ,feed conversion, slaughter value , egg production and hatchability of ducks and geese did not change significantly even at 100 % replacement of SFM for SBM. The low concentration of lysine and higher fiber content of SFM may restrict its higher inclusion rate in broiler diets, also the high levels of substitution for SBM in broiler and layer diets by SFM are limited because of its high fiber and low ME contents (Smith 1986).

Accordingly, the aim of the present experiment was to study the effect of substituting of okara or sunflower meal for soybean meal at levels of 20, 40, 60 and 80 % for each on broiler performance , nutrients , digestibility and economic efficiency .

MATERIALS AND METHODS

The present work was conducted in the Poultry Nutrition Research Unit, Experimental Station , Faculty of Agriculture , Cairo University, during April and May,2004. A total number of 540 one day old unsexed Arbor Acers chicks of nearly similar live body weight (40 gm) were used to study the effect of replacement soybean by–product (Okara) or sunflower meal for soybean meal at levels of 20, 40, 60 and 80 % for each on broiler performance, carcass characteristics, nutrients digestibility and economic efficiency . The reported chemical composition of okara and sunflower meal is presented in Table (1) . Birds were randomly distributed into equal 9 treatments each contained 60 birds in three replicates of 20 birds each .Chicks were allocated in a littered floor poultry house in an open system under the same management condition . Water and feed in mash form were offered *ad- libitum* and artificial lighting was proved 24 hours daily all over the experimental period, which lasted for 7 weeks of age . Birds were fed on growing diets (from 1 – 4 weeks of age) containing 23 % CP and 3100 Kcal/Kg , then switched to the finisher diets (from 5 – 7 weeks of age) containing 20 % CP and 3200 Kcal /Kg . Broiler chick fed on a diet without Okara or sunflower meal were considered as a control group. In all experimental diets, vitamin ,minerals, L- lysine and DL–methionine were added to cover the requirements of broiler chicks according to the strain recommended catalog .

Table (1) Chemical analysis of ingredients on dry matter basis (%) .

Ingredients	CP	EE	CF	Meth.	Lys.	Ca	Av. Ph	ME K.cal/kg
Soybean meal*	44	1.00	7.30	0.65	2.93	0.29	0.27	2230
Sunflower meal*	38	2.90	12.0	0.90	1.50	0.37	0.26	2320
Corn gluten*	60	2.50	2.00	1.90	1.00	-	0.19	3720
Okara**	34	9.50	14.50	0.50	2.30	0.32	0.21	2000

*According to NRC, 1994. **According to Farhat *et al* . (1998) and Desmond (1999) .

The experimental diets and their chemical composition are presented in Tables 2 and 3 . Live body weight and feed intake were recorded weekly ; besides records of daily mortality were obtained . Body weight gain and feed intake were used to calculate feed conversion ratio (Feed intake/body weight gain) .

At the end of 49 days of age 3 cocks of each treatment were chosen to determine the digestibility coefficients of nutrients and nitrogen balance (nitrogen retention/nitrogen intake x100) of the experimental diets where feed and dried excreta were analysed according to the official methods of AOAC, (1990) . Nitrogen – free extract was calculated according to Abou–Raya and Galal (1971). Fecal nitrogen was determined according to Jakobson *et al.* (1960) . Finally, all treatments were economically evaluated by using the net revenue per unit of total costs . All data were subjected to analysis of variance and Duncan,s multible range test (Duncan, 1955) procedures within the statistical analysis system of (SAS, 1996).

RESULTS AND DISCUSSION

Broiler Chicks Performance:

Body weight (BW) and body weight gain (BWG) :

The effects of dietary treatments on broiler performance during the growing period (1 – 4 weeks of age) are presented in Table (4) . Results showed that broiler chicks fed diets replaced okara meal for soybean meal at levels of 60 and 80 % significantly ($P < 0.05$) decreased the average values of live body weight (BW) and body weight gain (BWG) compared to control group .While , the average values were insignificantly with replacing levels of 20 and 40 % for BW and BWG compared to control group . Also, replacing sunflower meal for soybean meal at levels of 60 and 80 % significantly ($P < 0.05$) decreased average values of BW and BWG compared with control group. While, there were no significant differences in BW and BWG values when broiler chicks were fed diets containing 20 or 40 % sunflower meal as replacing for soybean meal compared to control .

At the finishing period (5 – 7 weeks of age) the obtained results showed that replacing okara meal for soybean meal at levels of 20 , 40 , 60 and 80 % in broiler diets significantly ($P < 0.05$) decreased the average of BWand BWG values compared to control group. While, insignificant differences were observed with replacing sunflower meal for soybean meal at levels of 20 or 40 % for both BW and BWG values. But replacing sunflower meal for soybean meal at levels of 60 and 80 % in broiler diets were significantly ($P<0.05$) decreased average live BW and BWG values compared to control group.

Table (2) : Composition and calculated analysis of the experimental diets during the growing period (1 – 4 weeks).

Ingredients	Treatments								
	Cont.	Okara				Sunflower meal			
		20%	40%	60%	80%	20%	40%	60%	80%
Yellow corn	54.40	53.10	51.70	50.40	49.00	54.00	53.30	52.80	52.20
Soybean meal 44%	30.00	24.00	18.00	12.00	6.00	24.00	18.00	12.00	6.00
Okara (34%)	-	6.00	12.00	18.00	24.00	-	-	-	-
Sunflower meal (38%)	-	-	-	-	-	6.00	12.00	18.00	24.00
Corn gluten (60 %)	8.20	9.40	10.60	11.70	12.90	8.90	9.60	10.30	11.00
Vegetable oil	3.40	3.50	3.70	3.80	4.00	3.10	3.00	2.80	2.60
Di- Ca. phosphate	1.70	1.70	1.70	1.80	1.80	1.60	1.60	1.60	1.60
Limestone	1.45	1.45	1.40	1.40	1.40	1.50	1.50	1.48	1.50
Nacl	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Vit & Min.premix*	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
DL-Methionine	0.10	0.10	0.10	0.07	0.05	0.10	0.10	0.05	0.05
L-Lysine HCL	0.15	0.15	0.20	0.23	0.25	0.20	0.30	0.37	0.45
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Calculated analysis**									
CP%	23.1	23.2	23.2	23.2	23.2	23.2	23.1	23.2	23.1
ME Kcal/kg	3103	3102	3103	3102	3100	3100	3102	3100	3100
C/P ratio	134	134	134	134	134	134	134	134	134
EE%	5.92	6.56	7.25	7.84	8.52	5.78	5.79	5.71	5.61
Cf%	3.53	3.98	4.40	4.83	5.25	3.80	4.12	4.40	4.68
Ca %	1.01	1.02	1.02	1.02	1.04	1.02	1.02	1.02	1.00
Av. Ph.%	0.46	0.46	0.45	0.46	0.46	0.45	0.45	0.54	0.45
Meth.%	0.56	0.57	0.58	0.56	0.55	0.58	0.56	0.52	0.52
Lys., %	1.23	1.21	1.21	1.21	1.20	1.20	1.21	1.20	1.20
Meth. + Cys	0.94	0.95	0.96	0.94	0.93	0.98	0.97	0.96	0.99
Price/ ton (LE)	1935	1860	1802	1725	1652	1893	1870	1823	1793

***Vitamin and Mineral premix at 0.3 % of the diet supplies the following per Kg of the diet :Vit.A,12000IU; VitD,2000IU; Vit.E,40mg; Vit.K3 , 4mg; Vit.B2,6mg;VitB6, 4mg;Vit B12,.03mg; Niacin,30mg; Calpan,12mg; folic acid , 1.5mg; Biotin,.08mg;Coline chloride,700mg; Mn,10mg; Fe,40mg; Zn,70mg; Se,0.2mg;Co,0.25mg.**

****According to NRC (1994)**

Table (3) : Composition and calculated analysis of the experimental diets during the finisher period (1 – 4 weeks).

Ingredients	Treatments								
	Cont.	Okara				Sunflower meal			
		20%	40%	60%	80%	20%	40%	60%	80%
Yellow corn	58.00	56.70	55.40	54.00	52.70	57.50	57.00	56.40	55.90
Soybean meal 44%	30.00	24.00	18.00	12.00	6.00	24.00	18.00	12.00	6.00
Okara (34%)	-	6.00	12.00	18.00	24.00	-	-	-	-
Sunflower meal (38%)	-	-	-	-	-	6.00	12.00	18.00	24.00
Corn gluten (60 %)	2.80	4.00	5.00	6.20	7.40	3.40	4.10	4.70	5.40
Vegetable oil	5.50	5.60	5.80	6.10	6.10	5.30	5.10	5.00	4.80
Di- Ca. phosphate	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
Limestone	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
Nacl	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
Vit & Min.premix*	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
DL-Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.05	0.05	-
L-Lysine HCL	-	-	0.10	0.10	0.10	0.10	0.15	0.25	0.30
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Calculated analysis**									
CP%	20.0	20.1	20.1	20.1	20.1	20.0	20.04	20.1	20.0
ME Kcal/kg	3203	3200	3200	3200	3200	3200	3200	3200	3200
C/P ratio	160	160	160	160	160	160	160	160	160
EE%	8.07	8.66	9.35	10.14	10.63	7.98	7.89	7.90	7.82
Cf%	3.52	3.95	4.37	4.80	5.22	3.81	4.10	4.37	4.66
Ca %	0.95	0.95	0.94	0.94	0.93	0.95	0.96	0.97	0.97
Av. Ph.%	0.45	0.45	0.44	0.44	0.44	0.45	0.45	0.45	0.45
Meth.%	0.46	.047	0.45	0.45	0.45	0.48	0.46	0.48	0.47
Lys., %	1.05	1.02	1.08	1.05	1.02	1.06	1.02	1.04	1.01
Meth. + Cys	0.79	0.79	0.78	0.78	0.78	0.83	0.83	0.87	0.89
Price/ ton (LE)	1806	1730	1612	1534	1534	1780	1726	1700	1647

*Vitamin and Mineral premix at 0.3 % of the diet supplies the following per Kg of the diet :Vit.A,12000IU; VitD,2000IU; Vit.E,40mg; Vit.K3 , 4mg; Vit.B2,6mg;VitB6, 4mg;Vit B12,.03mg; Niacin,30mg; Calpan,12mg; folic acid , 1.5mg; Biotin,.08mg;Coline chloride,700mg; Mn,10mg; Fe,40mg; Zn,70mg; Se,0.2mg;Co,0.25mg. **According to NRC(1994)

Table (4) . Effect of treatments on broiler performance .

Items	Treatments									
	Cont.	Okata				Sunflower meal				MSE
		20%	40%	60%	80%	20%	40%	60%	80%	
Growing period (1- 4 weeks)										
IBW (g)	40	40	40	40	40	40	40	40	40	-
BW (g)	850^{a}	835^{ab}	818^{ab}	790^{bc}	770^{c}	840^{ab}	820^{ab}	795^{bc}	780^{c}	38
BWG (g)	810^{a}	795^{ab}	778^{ab}	750^{bc}	730^{c}	800^{ab}	780^{ab}	755^{bc}	740^{c}	38
FI (g)	1430^{a}	1431^{a}	1416^{a}	1390^{a}	1395^{a}	1425^{a}	1420^{a}	1390^{a}	1385^{a}	50
FCR	1.76^{b}	1.80^{ab}	1.82^{ab}	1.85^{ab}	1.91^{a}	1.78^{b}	1.82^{ab}	1.84^{ab}	1.87^{a}	0.10
Finisher period (5 – 7 weeks)										
BW (g)	2050^{a}	1900^{b}	1875^{b}	1795^{c}	1746^{c}	2035^{a}	2015^{a}	1890^{b}	1853^{b}	50
BWG (g)	1200^{a}	1065^{bc}	1057^{c}	1005^{d}	976^{d}	1195^{a}	1195^{a}	1095^{a}	1078^{bc}	50
FI (g)	2710^{ab}	2484^{cd}	2460^{cd}	2382^{d}	2350^{d}	2748^{a}	2735^{ab}	2600^{bc}	2590^{bc}	160
FCR	2.26^{b}	2.33^{ab}	2.33^{ab}	2.37^{ab}	2.41^{a}	2.30^{ab}	2.29^{ab}	2.36^{ab}	2.40^{a}	0.10
Overall period (1 – 7 weeks).										
BWG (g)	2010^{a}	1860^{b}	1835^{bc}	1755^{c}	1706^{c}	1995^{a}	1975^{a}	1850^{b}	1813^{bc}	80
FI (g)	4140^{a}	3915^{b}	3876^{b}	3772^{b}	3745^{b}	4173^{a}	4155^{a}	3990^{ab}	3975^{ab}	200
FCR	2.06^{b}	2.10^{ab}	2.11^{ab}	2.15^{ab}	2.19^{a}	2.09^{b}	2.10^{ab}	2.16^{ab}	2.19^{a}	0.10
Mortality rate	3/60	4/60	4/60	6/60	5\60	2/60	2/60	2/60	2/60	-

a, b, c ..... Means in each row , bearing the same superscripts are not significantly different (P< 0.05).

Generally, the results concerning effect of experimental diets on average values of BWG throughout the experimental period (1 – 7 weeks of age) showed that replacing okara meal for soybean meal at levels of 20 , 40 , 60 and 80 % in broiler diets significantly ($P < 0.05$) decreased the average BWG values compared to control group . The same trend was noticed with replacing sunflower meal for soybean meal but only at levels of 60 and 80 % compared to control group. However, the differences were insignificantly as replacing sunflower meal for soybean meal at levels of 20 or 40 % compared to control group . This may be due to decrease the amount of feed intake with using different levels of okara or high levels of sunflower meal as replacing for soybean meal in broiler chick diets .In this connection , Farhat *et al.* (1998) reported that the partial replacing of okara meal for soybean meal at levels of 13.6 or 27.2 %in duckling diet resulted in insignificantly differences in live body weight. Also, the results of this study are inagreement with those obtained by Valdivie (1982), Michel and Sunde (1985) and Soliman *et al* . (1996) who found that body weight and body weight gain values of broiler chicks which fed diets containing 25 % SFM was not significantly differed from those fed control diet (without SFM) .

Feed intake (FI) and feed conversion ratio (FCR) :

Average feed intake and feed conversion values of chicks fed experimental diets are presented in Table (4). The obtained results showed that there were no significant differences with replacing either okara or sunflower meal for soybean meal at levels of 20, 40 , 60 and 80 % in broiler diets during the growing period (1 – 4 weeks). While , during both finishing (5 – 7 weeks) and whole (1 – 7 weeks) periods there were significant ($P < 0.05$) decreases in the average values of feed intake due to replacing okara for soybean meal at levels of 20 , 40 , 60 and 80 % compared to the control group . In addition replacing sunflower meal for soybean meal in broiler diets at levels of 20 and 40 % slightly increased feed intake but without significant differences compared to control group during the finishing and whole experimental periods . This may be due to the increase of crude fiber content in the diets which containing different levels of okara as replacing for soybean meal .

These results are somewhat coincided with these reported by Farhat *et al.* (1998) who found that replacement of okara meal for soybean meal in Pekin or Muscovy duckling diets significantly decreased feed intake compared to the control group. Also , these results are in a good agreement with those reported by Milner *et al* . (1986) and Sayed (2002) who noticed that there were no significant differences in feed intake with incorporation of sunflower meal in broiler diets at levels of 5, 10 and 15 % compared to the control diet (0 % sunflower meal) .

As shown in Table (4), data showed that the average values of feed conversion ratio (FCR) of broiler chicks fed okara or sunflower meal as replacing for soybean meal in their diets at levels of 20 , 40 and 60 % during either growing , finishing or whole periods were slightly inferior but without significant differences compared to the control group. While , when fed broiler chicks diets containing 80 % okara or sunflower meal as replacing for

soybean meal the average values of FCR were significantly ($P < 0.05$) inferior compared to control group .

These results somewhat coincided with those reported by Rehman *et al.* (2002) and Adeniji (2004) who cited that sunflower meal could successfully replace 50 % of soybean meal in broiler diets. While , the 100 % substitution of soybean meal with sunflower meal increased feed intake required to gain weight.

Mortality Rate :

The numbers of dead birds as affected by dietary treatments are presented in Table (4) . Results revealed that replacing okara meal for soy bean meal at levels of 20, 40, 60 or 80 % increased mortality rate compared to control group. While, using sunflower meal at different levels of replacing soybean meal decreased mortality rate. However, the postmortem examination indicated that the death was not related to dietary treatments. These results are agreement with those reported by Attia *et al.* (2003) Who found that mortality rate was not affected when broiler chicks fed on diet contained 0 , 5, 10 or 15 % sunflower meal .

Digestion coefficients :

The digestion coefficients of nutrients for broiler chicks fed experimental diets are shown in Table (5) . Results showed that there were slightly improvement in average values of CP and EE digestibility and nitrogen balance (NB) with using ókara as replacing for soybean meal . While , the use of sunflower meal instead of soybean meal in broiler chick diets significantly ($P < 0.05$) decreased almost nutrient digestibility and nitrogen balance values specially with high levels of substitution (60 or 80 % of soybean meal) .This may be due to the heating treatment of okara treatments which might improve the utilization of okara. In this connection , Soliman *et al* . (1996) found that digestibility coefficient of OM, CF , EE and CP were numerically increased when broiler chicks fed on diets containing 15 % sunflower meal with or without commercial enzymes. Recently , Aboul – Ela *et al* . (2005) reported that increasing sunflower meal from 8.5 to 17 or 25.5 % in Japanese quail diets resulted in a significant decrease in digestibility coefficient of DM , OM , CP and CF. Also, these results are in agreement with those reported by Ibrahim and EL – Zubeir (1991) who found that increasing sunflower meal up to 30 % in broiler diets decreased significantly nitrogen retention . On the other hand , Ologhobo (1991) noticed that metabolizable energy and nitrogen retention were not affected when broiler chicks fed diet supplemented with 0 or 25 % sunflower meal .

Economic Efficiency (EE) :

The final body weight, length of the growing period and feeding cost generally among the most important factors involved in achievement of maximum efficiency of meet production. The effect of treatments on economic efficiency of meet production is presented in Table (6). It should be pointed that the economic efficiency values were calculated according to the prevailing market (Selling) price of one – kilogram live body weight which was 7.5 LE at the end of the experimental period (May 2004) .

Table (5) : Effect of treatments on digestion coefficients and nitrogen balance (%).

Items	Treatments									
	Cont.	Okara				Sunflower meal				MSE
		20%	40%	60%	80%	20%	40%	60%	80%	
OM	83.7^{b}	83.4^{b}	85.17^{a}	84.9^{ab}	84.0^{ab}	84.4^{ab}	83.9^{ab}	84.6^{ab}	93.9^{ab}	1.27
DM	89.7^{e}	89.8^{de}	90.5^{ab}	90.0^{cde}	90.7^{a}	90.2^{bc}	89.7^{e}	90.4^{ab}	90.1^{cd}	0.31
CP	90.1^{ab}	90.8^{ab}	91.4^{ab}	92.7^{a}	92.9^{a}	89.3^{e}	88.8^{b}	84.9^{c}	79.1^{d}	2.7
EE	67.1^{c}	73.3^{abc}	77.3^{ab}	78.4^{a}	72.0^{ab}	75.5^{b}	77.8^{ab}	71.4^{bc}	58.4^{d}	6.2
CF	24.11	27.75	27.96	31.48	33.20	27.79	26.03	25.39	24.85	13.2
NFE	77.9^{cd}	79.4^{cd}	69.8^{e}	76.8^{d}	83.9^{b}	76.7^{d}	86.0^{a}	82.2^{bc}	76.5^{d}	4.1
NB	63.2^{ab}	62.9^{b}	63.3^{ab}	63.8^{ab}	64.1^{ab}	62.9^{ab}	61.8^{b}	60.3^{c}	46.5^{e}	1.7

a, b, c .... Means in each row , bearing the same superscripts are not significantly different (P< 0.05)

Table (6): Effect of treatments on economic efficiency.

Items	Treatments								
	Cont.	Okara				Sunflower meal			
		20%	40%	60%	80%	20%	40%	60%	80%
Fixed cost[a]	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Feed cost (LE)	7.66	6.96	6.69	6.24	5.91	7.59	7.38	6.95	6.75
Total cost (LE)	10.16	9.46	9.19	8.74	8.41	10.09	9.88	9.45	9.25
BW (Kg)	2.05	1.90	1.88	1.79	1.75	2.04	2.02	1.89	1.85
Cost /Kg (LE)	4.96	4.98	4.89	4.88	4.81	4.95	4.80	5.00	5.00
Total revenue (LE)[b]	15.37	14.25	14.10	13.43	13.13	15.30	15.15	14.18	13.88
Net revenue (LE)	5.21	4.79	4.91	4.69	4.72	5.21	5.27	4.73	4.63
EE[c]	0.51	0.51	0.53	0.54	0.56	0.52	0.53	0.50	0.50
Relative EE[d]	100	100	104	106	110	102	104	98	98

(a) : Bird price and rearing cost. (b) ; Assuming that the selling price of one Kg ,live body weight is (7.5) L.E

(c) : Net revenue per unt total cost. (d): Considering the diet number 1 as a control.

Results indicated that replacing okara for soybean meal at levels of 40 , 60 or 80 % in broiler diets decreased the average value of total cost /Kg body weight and increased economic efficiency and relative economic efficiency values compared to the other experimental groups. This perhaps due to lower price / ton of the diet with using different levels of okara as replacing for soybean meal in broiler diets. While, replacing sunflower meal for soybean meal at levels of 60 or 80 % increased the total cost / kg body weight and decreased both economic efficiency and relative economic efficiency values compared to the control group .

These results coincided with those reported by Soliman *et al* . (1996) , Sayed (2002) and Homoyouni and Shiveze (2003) who found that the cost of live kg body weight production in all treatments containing sunflower meal at levels of 8 or 16 % was higher than the control group . Nevertheless the results here in disagreed with those recorded by Khaled (2001) and Tyagi *et al* .(2003) who found that incorporating sunflower meal in broiler diets up to 10 % of the diet resulted in significantly increased the values of feed cost per unit gain of meat production compared to the control group .

On the basis of the results of this study , it could be concluded that broiler chicks could be fed diets containing 40 % sunflower meal as replacement of soybean meal without adversely effects on broiler performance , nutrients digestibility and economic efficiency. While , the use of okara as replacing for soybean meal at different levels(20, 40, 60 or 80%) decreased broiler performance and increased economic efficiency values.

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استخدام بعض مصادر البروتين النباتي في تغذية بداري انتاج اللحم

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أجريت هذه التجربة بوحدة ابحاث تغذية الدواجن – كلية الزراعة – جامعة القاهرةعلي عدد ٥٤٠ كتكوت أربور ايكرز غير مجنس عمر يوم حيث قسمت الطيور الي تسعة مجاميع متساوية العدد (قسمت كل مجموعة الي ثلاث مكررات بكل منها ٢٠ كتكوت) وذلك لدراسة تأثير إحلال أي من الأوكارا (أحد مخلفات التصنيع الغذائي لفول الصويا) أو كسب عباد الشمس بنسب ٢٠، ٤٠، ٦٠ ، ٨٠ % لكل منهما بدلا من كسب فول الصويا علي الأداء الأنتاجي و معاملات هضم المركبات الغذائية و الكفاءة الإقتصادية لدجاج التسمين . غذيت الطيور علي علائق بادئ (١ – ٤ اسابيع) تحتوي علي ٢٣ % بروتين خام و ٣١٠٠ ك ك طاقة ممثلة /كجم عليقة أما مرحلة الناهي (من ٥ – ٧ أسابيع)احتوت علائقها علي ٢٠ % بروتين خام و ٣٢٠٠ ك.ك/ طاقة ممثلة / كجم عليقة و تم تربية الطيور تحت نفس الظروف من الرعاية والمعاملات البيطرية حتي الأسبوع السابع من العمر.

وقد اوضحت نتائج التجربة الاتي :

١ – المجموعة التي غذيت علي عليقة أحل نها كسب عباد الشمس محل كسب الصويا بنسبة ٢٠ أو ٤٠ % سجلت افضل وزن حي ولم تختلف معنويا مقارنة بمجموعة المقارنة.

٢ – أدي إحلال الأوكارا محل كسب فول الصويا عند المستويات المختلفة إلي إنخفاض كمية الغذاء المأكول معنويا مقارنة بمجموعة المقارنة . أيضا أدي إحلال كسب عباد الشمس محل كسب فول الصويا بنسب ٦٠ ، ٨٠ % إلي إنخفاض كمية الغذاء المأكول ولكن هذا الإنخفاض لم يكن معنويا مقارنة بمجموعة المقارنة.

٣ – لم يكن هناك فروق معنوية بين قيم معامل تحويل الغذاء عند إحلال أي من الأوكارا أو كسب عباد الشمس بمستوي ٢٠ ، ٤٠ ، ٦٠ % بدلا من كسب فول الصويا مقارنة بمجموعة المقارنة.

٤ – أفضل معامل هضم للبروتين لوحظ مع المجموعة التي غذيت علي عليقة أحلت الأوكارا فيها محل كسب فول الصويا عند مستوي ٦٠ ، ٨٠ % كما سجل أفضل معامل هضم لمستخلص الإثير مع المجموعة التي غذيت علي عليقة أحلت فيها الأوكارا محل كسب الصويا بنسبة ٦٠%.

٥ – أظهرت نتائج التحليل الإحصائي لبيانات ميزان النتروجين انه لا توجد اختلافات معنوية بين المعاملات الاربعة التي أحلت فيها الأوكارا محل كسب الصويا بينما كان هناك أختلافات معنوية بين المعاملات الاربعة التي أحل فيها كسب عباد الشمس محل كسب الصويا مقارنة بمجموعة المقارنة.

٦ – سجلت اعلي كفاءة اقتصادية للمعاملة التي احلت فيه الأوكارا محل كسب الصويا بنسبة ٨٠ % حيث أدت الي خفض متوسطقيمة تكلفة الكيلو جرام وزن حي وزيادة الكفاءة الإقتصادية.